REQUEST AUTHORIZATION FOR MAYOR AND FINANCE OFFICER TO SIGN PROFESSIONAL SERVICES AGREEMENT OR AMENDMENT

Date:

Project Name & Number: 14-2192
CIP #: 50819

Project Description: Wastewater Utility System Master Plan Update / Model Recalibration

Consultant: Black & Veatch Corporation

Original Contract Amount: $1,386,212.00  Original Contract Date: Nov 20th, 2017  Original Completion Date: Dec 31st, 2019

Addendum No:
Amendment Description:

Current Contract Amount: $1,386,212.00  Current Completion Date:
Change Requested:
New Contract Amount: $1,386,212.00  New Completion Date:

Funding Source This Request:

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Agreement Review & Approvals

Project Manager
Date: 11/6/17
Division Manager
Date: 11/9/17
Compliance Specialist
Date: 11/6/17
Department Director
Date: 11/9/17
City Attorney
Date: 11/9/17

ROUTING INSTRUCTIONS
Route two originals of the Agreement for review and signatures.
Finance Office - Retain one original
Project Manager - Retain second original for delivery to Consultant
cc: Public Works
Engineering
Project Manager

FINANCE OFFICE USE ONLY
(Note to Finance: Please write date of Agreement in appropriate space in the Agreement document)

Appropriation
Date: 11/13/17  Initials: Y  Approved: N
Cash Flow

106A Authorization for Mayor & Finance Officer to Sign
Rev. 03/2009
AGREEMENT made November 20th, 2017, between the City of Rapid City, SD (City) and Black & Veatch Corporation, (Engineer), located at 4600 South Syracuse Street, Suite 800, Denver, CO 80237. City intends to obtain services for design and bidding for the Wastewater Utility System Master Plan Update/Model Recalibration, Project No. 14-2192, CIP No. 50819. The scope of services is as described within this document and as further described in Exhibits A, B and C (attached).

The City and the Engineer agree as follows:

The Engineer shall provide professional engineering services for the City in all phases of the Project and as further defined in Exhibits A, B and C (attached), serve as the City’s professional engineering representative for the Project, and give professional engineering consultation and advice to the City while performing its services.

Section 1—Basic Services of Engineer

1.1 General

1.1.1 The Engineer shall perform professional services described in this agreement, which include customary engineering services. Engineer intends to serve as the City’s professional representative for those services as defined in this agreement and to provide advice and consultation to the City as a professional. Any opinions of probable project cost, approvals, and other decisions provided by Engineer for the City are rendered on the basis of experience and qualifications and represent Engineer’s professional judgment.

1.1.2 All work shall be performed by or under the direct supervision of a professional Engineer licensed to practice in South Dakota.

1.1.3 All documents including Drawings and Specifications provided or furnished by Engineer pursuant to this Agreement are instruments of service in respect of the Project and Engineer shall retain an ownership therein. Reuse of any documents pertaining to this project by the City on extensions of this project or on any other project shall be at the City’s risk. The City agrees to defend, indemnify, and hold harmless Engineer from all claims, damages, and expenses including attorney’s fees arising out of such reuse of the documents by the City or by others acting through the City.
1.1.4 The contract will be based on an hourly rate and reimbursable fee schedule with a maximum not-to-exceed amount.

1.2 Scope of Work

The Engineer shall:

1.2.1 Consult with the City, other agencies, groups, consultants, and/or individuals to clarify and define requirements for the Project and review available data.

1.2.2 Perform the tasks described in the Scope of Services. (See Exhibit A and B.)

1.2.3 Conduct a location survey of the Project to the extent deemed necessary to provide adequate site information.

1.2.4 Prepare a report presenting the results of the study as outlined in the scope of services.

Section 2—Information Provided by City

The City will provide any information in its possession for the project at no cost to the Engineer.

Section 3—Notice to Proceed

The City will issue a written notification to the Engineer to proceed with the work. The Engineer shall not start work prior to receipt of the written notice. The Engineer shall not be paid for any work performed prior to receiving the Notice to Proceed.

Section 4—Mutual Covenants

4.1 General

4.1.1 The Engineer shall not sublet or assign any part of the work under this Agreement without written authority from the City.

4.1.2 The City and the Engineer each binds itself and partners, successors, executors, administrators, assigns, and legal representatives to the other party to this agreement and to the partners, successors, executors, administrators, assigns, and legal representatives of such other party, regarding all covenants, agreements, and obligations of this agreement.

4.1.3 Nothing in this agreement shall give any rights or benefits to anyone other than the City and the Engineer.
4.1.4 This agreement constitutes the entire agreement between the City and the Engineer and supersedes all prior written or oral understandings. This agreement may only be amended, supplemented, modified, or canceled by a duly executed written instrument.

4.1.5 The Engineer shall make such revisions in plans which may already have been completed, approved, and accepted by the City, as are necessary to correct Engineer’s errors or omissions in the plans, when requested to do so by the City, without extra compensation therefore.

4.1.6 If the City requests that previously satisfactorily completed and accepted plans or parts thereof be revised, the Engineer shall make the revisions requested by the City. This work shall be paid for as extra work.

4.1.7 If the City changes the location from the one furnished to the Engineer, or changes the basic design requiring a new survey for the portions so changed, the redesign will be paid for as extra work.

4.1.8 The City may at any time by written order make changes within the general scope of this Agreement in the work and services to be performed by the Engineer. Any changes which materially increase or reduce the cost of or the time required for the performance of the Agreement shall be deemed a change in the scope of work for which an adjustment shall be made in the Agreement price or of the time for performance, or both, and the Agreement shall be modified in writing accordingly. Additional work necessary due to the extension of project limits shall be paid for as extra work.

4.1.9 Extra work, as authorized by the City, will be paid for separately and be in addition to the consideration of this Section.

4.1.10 For those projects involving conceptual or process development services, activities often cannot be fully defined during the initial planning. As the project does progress, facts and conditions uncovered may reveal a change in direction that may alter the scope of services. Engineer will promptly inform the City in writing of such situations so that changes in this agreement can be renegotiated.

4.1.11 This Agreement may be terminated (a) by the City with or without cause upon seven days’ written notice to the Engineer and (b) by the Engineer for cause upon seven days’ written notice to the City. If the City terminates the agreement without cause, the Engineer will be
paid for all services rendered and all reimbursable expenses incurred prior to the date of termination.

If termination is due to the failure of the Engineer to fulfill its agreement obligations, the City may take over the work and complete it. In such case, the Engineer shall be liable to the City for any additional cost to the extent directly resulting from Engineer’s action.

4.1.12 The City or its duly authorized representatives may examine any books, documents, papers, and records of the Engineer involving transactions related to this agreement for three years after final payment. All examinations will be performed at reasonable times, with proper notice. Engineer’s documentation will be in a format consistent with general accounting procedures.

4.1.13 The City shall designate a representative authorized to act on the City’s behalf with respect to the Project. The City or such authorized representative shall render decisions in a timely manner pertaining to documents submitted by the Engineer in order to avoid unreasonable delay in the orderly and sequential progress of the Engineer’s services.

4.1.14 Costs and schedule commitments shall be subject to renegotiation for delays caused by the City’s failure to provide specified facilities or information or for delays caused by other parties, excluding subcontractors and sub-consultants, unpredictable occurrences including without limitation, fires, floods, riots, strikes, unavailability of labor or materials, delays or defaults by suppliers of materials or services, process shutdowns, acts of God, or the public enemy, or acts of regulations of any governmental agency or any other conditions or circumstances beyond the control of the City or Engineer. Temporary delays of services caused by any of the above which results in additional costs beyond those outlined may require renegotiation of this agreement.

4.1.15 The City will give prompt written notice to the Engineer if the City becomes aware of any fault or defect in the Project or nonconformance with the Project Documents.

4.1.16 Unless otherwise provided in this Agreement, the Engineer and the Engineer’s consultants shall have no responsibility for the discovery, presence, handling, removal or disposal of, or exposure of persons to hazardous materials in any form at the project site, including but not limited to asbestos products, polychlorinated biphenyl (PCB), or other toxic substances.
4.1.17 In the event asbestos or toxic materials are encountered at the
jobsite, or should it become known in any way that such materials
may be present at the jobsite or any adjacent areas that may affect
the performance of Engineer’s services, Engineer may, at their option
and without liability for consequential or any other damages, suspend
performance of services on the project until the City retains
appropriate specialist CONSULTANT(S) or contractor(s) to identify,
abate, and/or remove the asbestos or hazardous or toxic materials.

4.1.18 This agreement, unless explicitly indicated in writing, shall not be
construed as giving Engineer the responsibility or authority to direct or
supervise construction means, methods, techniques, sequences, or
procedures of construction selected by any contractors or
subcontractors or the safety precautions and programs incident to the
work of any contractors or subcontractors.

4.1.19 Neither the City nor the Engineer, nor its Consultants, shall hold the
other liable for any claim based upon, arising out of, or in any way
involving the discharge, dispersal, release or escape of smoke,
vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids, or gases,
wear materials, or other irritants, contaminants, or pollutants.

4.1.20 Neither the City nor the Engineer, nor its Consultants, shall hold the
other liable for any claim based upon, arising out of, or any way
involving the specification or recommendation of asbestos, in any
form, or any claims based upon use of a product containing asbestos.

4.1.21 Engineer hereby represents and warrants that it does not fail or refuse
to collect or remit South Dakota or City sales or use tax for transactions
which are taxable under the laws of the State of South Dakota.

4.2 City of Rapid City NonDiscrimination Policy Statement

In compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the
Rehabilitation Act of 1973, the Age Discrimination act of 1975, the Americans
with Disabilities Act of 1990, and other nondiscrimination authorities it is the
policy of the City of Rapid City, 300 Sixth Street, Rapid City, SD 57701-5035, to
provide benefits, services, and employment to all persons without regard to race,
color, national origin, sex, disabilities/handicaps, age, or income status. No
distinction is made among any persons in eligibility for the reception of benefits
and services provided by or through the auspices of the City of Rapid City.

Engineer will permit access to any and all records pertaining to hiring and
employment and to other pertinent data and records for the purpose of enabling
the Commission, its agencies or representatives, to ascertain compliance with
the above provisions.
This section shall be binding on all subcontractors or suppliers.

Section 5—Payments to the Engineer

5.1 Schedule of Pay Rates

The City will pay the Engineer for services rendered or authorized extra work according to the Engineer’s hourly and reimbursable rate schedule described in Exhibit C.

5.2 Fee

The maximum amount of the fee for the services as detailed in Section 1.2 shall not exceed $1,386,212.00 unless the scope of the project is changed as outlined in Section 4. If expenses exceed the maximum amount, the Engineer shall complete the design as agreed upon here without any additional compensation. Sub task dollar amounts may be reallocated to other tasks as long as the total fee is not exceeded. Prime consultant may not mark up sub-consultant or sub-contractor services.

5.3 Progress Payments

Monthly progress payments shall be processed by the City upon receipt of the claim as computed by the Engineer based on work completed during the month per the hourly rates and allowable reimbursable as established in Section 5.1 and approved by the City.

Net payment to the Engineer shall be due within forty-five (45) days of receipt by the City.

Section 6—Completion of Services

The Engineer shall complete services on or before December 31st, 2019 based on an award date of November 20th, 2017.

Section 7—Insurance Requirements

7.1 Insurance Required

The Engineer shall secure the insurance specified below. The insurance shall be issued by insurance company(s) acceptable to the City and may be in a policy or policies of insurance, primary or excess. Certificates of all required insurance including any policy endorsements shall be provided to the City prior to or upon the execution of this Agreement.
7.2 **Cancellation**

The Engineer will provide the City with at least 30 days’ written notice of an insurer’s intent to cancel or not renew any of the insurance coverage. The Contractor agrees to hold the City harmless from any liability, including additional premium due because of the Contractor’s failure to maintain the coverage limits required.

7.3 **City Acceptance of Proof**

The City’s approval or acceptance of certificates of insurance does not constitute City assumption of responsibility for the validity of any insurance policies nor does the City represent that the coverages and limits described in this agreement are adequate to protect the Engineer, its consultants or subcontractors interests, and assumes no liability therefore. The Engineer will hold the City harmless from any liability, including additional premium due, because of the Engineer’s failure to maintain the coverage limits required.

7.4 **Specific Requirements**

7.4.1 Workers’ compensation insurance with statutory limits required by South Dakota law. Coverage B-Employer’s Liability coverage of not less than $500,000 each accident, $500,000 disease-policy limit, and $500,000 disease-each employee.

7.4.2 Commercial general liability insurance providing occurrence form contractual, personal injury, bodily injury and property damage liability coverage with limits of not less than $1,000,000 per occurrence, $2,000,000 general aggregate, and $2,000,000 aggregate products and completed operations. If the occurrence form is not available, claims-made coverage shall be maintained for three years after completion of the terms of this agreement. The policy shall name the City and its representatives as an additional insured.

7.4.3 Automobile liability insurance covering all owned, nonowned, and hired automobiles, trucks, and trailers. The coverage shall be at least as broad as that found in the standard comprehensive automobile liability policy with limits of not less than $1,000,000 combined single limit each occurrence. The required limit may include excess liability (umbrella) coverage.

7.4.4 Professional liability insurance providing claims-made coverage for claims arising from the negligent acts, errors or omissions of the Engineer or its consultants, of not less than $1,000,000 each occurrence and not less than $1,000,000 annual aggregate.
Coverage shall be maintained for at least three years after final completion of the services.

Section 8—Hold Harmless

The Engineer hereby agrees to hold the City harmless from any and all claims or liability including attorneys’ fees arising out of the professional services furnished under this Agreement, and for bodily injury or property damage arising out of services furnished under this Agreement, providing that such claims or liability are the result of a negligent act, error or omission of the Engineer and/or its employees/agents arising out of the professional services described in the Agreement.

Section 9—Independent Business

The parties agree that the Engineer operates an independent business and is contracting to do work according to his own methods, without being subject to the control of the City, except as to the product or the result of the work. The relationship between the City and the Engineer shall be that as between an independent contractor and the City and not as an employer-employee relationship. The payment to the Engineer is inclusive of any use, excise, income or any other tax arising out of this agreement.

Section 10-Indemnification

If this project involves construction and Engineer does not provide consulting services during construction including, but not limited to, onsite monitoring, site visits, site observation, shop drawing review and/or design clarifications, City agrees to indemnify and hold harmless Engineer from any liability arising from the construction activities undertaken for this project, except to the extent such liability is caused by Engineer’s negligence.

Section 11-Controlling Law and Venue

This Agreement shall be subject to, interpreted and enforced according to the laws of the State of South Dakota, without regard to any conflicts of law provisions. Parties agree to submit to the exclusive venue and jurisdiction of the State of South Dakota, 7th Judicial Circuit, Pennington County.

Section 12-Severability

Any unenforceable provision herein shall be amended to the extent necessary to make it enforceable; if not possible, it shall be deleted and all other provisions shall remain in full force and effect.
Section 13—Funds Appropriation

If funds are not budgeted or appropriated for any fiscal year for services provided by the terms of this agreement, this agreement shall impose no obligation on the City for payment. This agreement is null and void except as to annual payments herein agreed upon for which funds have been budgeted or appropriated, and no right of action or damage shall accrue to the benefit of the Engineer, its successors or assignees, for any further payments. For future phases of this or any project, project components not identified within this contract shall not constitute an obligation by the City until funding for that component has been appropriated.

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement as of the day and year first above written.

City of Rapid City:

________________________________________
MAYOR

DATE:______________________________

ATTEST:

_________________________________
FINANCE OFFICER

Reviewed By:

STACEY TITUS, PROJECT MANAGER

DATE: ____________________________

CITY’S DESIGNATED PROJECT REPRESENTATIVE

NAME Michelle Lashley / Stacey Titus
PHONE: 605-394-4154
EMAIL: Michelle.lashley@rcgov.org
Stacey.titus@rcgov.org

ENGINEERING FIRM’S DESIGNATED PROJECT REPRESENTATIVE

NAME: Karen Burgi
PHONE: 720-834-4259
EMAIL: BurgiKC@bv.com
SCOPE OF SERVICES

As the Prime Consultant, Black & Veatch has responsibility to complete the work activity in this scope of services. Serving as sub consultants, Banner and FMG will have varying levels of responsibility throughout the project's tasks. Tasks are described in this scope of services section.

The objective of this project is to update the 2008 Utility System Master Plan (2008 Master Plan) and recalibrate/update the collection system hydraulic model. The following main goals have been identified:

- Update the Geographical Information System (GIS) database and hydraulic model. Recalibrate the hydraulic model.
- Identify improvements required to support growth of the wastewater utility over a 100-year planning period (2015, 2025, 2045, and 2115 infrastructure needs). The hydraulic modeling will be the primary tool for this evaluation.
- Assess collection system facility assets (excluding the Water Reclamation Facility)
- Survey using Global Positioning System (GPS) for GIS feature definition
- Provide policies, processes, and procedures for planning and operation of the collection system. Includes review of City of Rapid City (City) design criteria and recommendations.
- Provide assistance in helping the City in improving water and wastewater utility asset management
- Identify next steps in water quality protection with respect to septic systems
- Provide capital improvement plan and master plan report. To include mapping showing proposed improvements that demonstrate smart growth expansion, existing system improvements, and replacement of aging assets. Provide development community with guidance for development and submittals
- Provide training and on-call services.

Additional detail on the accomplishment of these goals is included in the following tasks.

An outline of tasks used to accomplish the objectives of this project is as follows:
TASK 100 – PROJECT INITIATION, RECURRING MEETINGS, AND MANAGEMENT
101 – Prepare and Finalize Project Execution Plan
102 – Data/Information Request
103 – Review and Incorporation of Previous Reports
104 – Workshop 1-1 – Project Initiation
105 – Recurring Meetings
106 – Project Management and Administration

TASK 200 – GIS DATA AND GPS DATA COLLECTION AND VERTICAL CORRECTION
201 – GIS Wastewater System Feature Update
202 – NGVD29 to NAVD88 Vertical Datum/Elevation Conversion
203 – New Manhole Identification and Inventory Development
204 – GPS Field Survey
205 – GPS Survey of Wastewater Service Lines
207 – Workshop 2-1 – GIS Review and GPS Field Survey Workflows and Results

TASK 300 – HYDRAULIC MODEL RECALIBRATION/UPDATE
301 – Collection System Operations Review.
302 – GIS Data Extraction and Hydraulic Model Inventory Update
303 – GIS/Hydraulic Model Inventory Update and Maintenance Procedures
304 – Previous Flow Monitoring Data Review
305 – Historical Population, Wastewater Flow, and Per Capita Use Rates
306 – Future Service Area Population and Wastewater Flow Projections
307 – Workshop 3-1 – Hydraulic Model Update and Future Flow Projections
308 – Hydraulic Model Calibration Data Development and Input
309 – Hydraulic Model Calibration
310 – Collection System Design Criteria
311 – Design Storm Selection
312 – Workshop 3-2 – Model Calibration and Existing System Deficiencies

TASK 400 – HYDRAULIC MODELING ANALYSES AND IMPROVEMENTS PLANNING
401 – Existing System Analysis
402 – Long-Term Hydraulic Modeling Analyses
403 – Medium-Term Hydraulic Modeling Analyses
404 – Short-Term Hydraulic Modeling Analyses
405 – Develop System Improvement Alternatives
406 – Develop Hydraulic Model Results and System Improvement Alternatives TM
TASK 500 – WASTEWATER FACILITY ASSESSMENTS AND REPLACEMENT CAPITAL IMPROVEMENT PLAN (CIP) DEVELOPMENT

501 – Review Wastewater Facility Information and Compile Inventory Listing
502 – Establish Useful Life Values for Wastewater Facilities
503 – Establish Criticality Ranking For Wastewater Facilities
504 – Workshop 5-1 – Wastewater Facility Inventory, Criticality, and Useful Life Values
505 – Conduct Facility Site Tours and Determine Remaining Useful Life De-rating Score
506 – Develop Facility Replacement Costs
507 – Develop Facility Replacement CIP
508 – Wastewater Facility Assessment and Replacement CIP TM
509 – Workshop 5-2 – Wastewater Facility Replacement CIP

TASK 600 – PIPELINE REPLACEMENT PLANNING AND CIP DEVELOPMENT

601 – Compile Pipe Installation Decade, Materials, SSO and Break/Collapse History
602 – Pipe Attribute Data
603 – GIS Based Pipe Inventory Analysis and Development of Risk Criteria
604 – Risk of Failure and Replacement Priority Ranking Evaluation
605 – Develop Pipeline Rehabilitation/Replacement Costs
606 – Pipe Replacement Budget Strategy Evaluation
607 – Pipeline Replacement Priority and Budget Strategy Evaluation TM
608 – Workshop 6-1 – Pipeline Replacement Priorities and Budget Strategies
609 – Develop Pipeline Replacement CIP

TASK 700 – ASSET MANAGEMENT

701 – Wastewater GIS Database Schema Review
702 – Asset Management Policy
703 – Asset Management Framework Outline
704 – Asset Management Work Processes for Cityworks
705 – To-Be Asset Management Work Processes Implementation for Cityworks

TASK 800 – DEFINITION OF POLICIES, PROCESSES, AND PROCEDURES

801 – Master Plan Updates, Amendments, and Revisions
802 – GIS and Model Maintenance and Update Procedures
803 – Wastewater System Surface and Service Line Feature GPS Definition
804 – Project Development Submittal Requirements for Evaluation and GIS/Model Integration
805 – Design Criteria Review and Amendments
806 – Review of Potential Wastewater System Base Map Accessibility Approaches and Systems
Scope of Services

City of Rapid City, SD
Wastewater Utility System Master Plan
Update & Model Recalibration
City Project No. 14-2192 (CIP No. 50819)

807 – Review of Existing and Future IT Hardware Requirements for Hydraulic Modeling and GIS Functions in Public Works and Utility Maintenance
808 – Asset Management Policy, Framework, and Work Processes
809 – Septic Conversion Framework Evaluation and Implementation

TASK 900 – CAPITAL IMPROVEMENT PLAN AND MASTER PLAN REPORT
901 – Recommended CIP
902 – Workshop 9-1 - Recommended CIP Review
903 – Draft Reports
904 – Workshop 9-2 – Draft Reports Review
905 – Draft Final Reports
906 – Workshop 9-3 – Draft Final Reports Review
907 – Final Reports and Deliverables

TASK 1000 – ADDITIONAL SERVICES SUPPORT
1001 – Bulk Customer Meetings
1002 – Development of Card Files from GPS Survey of Water Service Lines
1003 – Water GIS Database Schema Review
1004 – Reconciliation of GPS Survey Data with Existing GIS Data
1005 – General Valve Box Condition Assessment Acquisition
1006 – Infrastructure Design Criteria Manual Update – Section 1
1007 – Coordination of IDCM Revisions With City Ordinance Requirements
1008 – Revision of Future Population and Employment Distribution and Establishment of Service Boundary Guidelines
1009 – Alternative CIP Development

TASK 1100 – TRAINING AND CONTINUING SERVICES SUPPORT
1101 – Training
1102 – Continuing On-Call Modeling Support Services

TASK 1200 – ASSET REGISTRY DEVELOPMENT FOR WATER AND WASTEWATER FACILITIES
1201 – Current Process Understanding and Data Gathering
1202 – Hierarchy Structure and Asset Naming Convention Development for Wastewater Facilities
1203 – Asset Registry Development for Selected Wastewater Facilities
1204 – Hierarchy Structure and Asset Registry Development for Water Facilities
1205 – Technical Memorandum and Training Workshop
The following acronyms and abbreviations are used in this Scope of Services.

<table>
<thead>
<tr>
<th>Acronym/Abbreviation</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>2008 Master Plan</td>
<td>2008 Utility System Master Plan</td>
</tr>
<tr>
<td>2013 I/I Study</td>
<td>“Inflow &amp; Infiltration Study” (Burns &amp; McDonnell, 2013)</td>
</tr>
<tr>
<td>ADDF</td>
<td>Average daily dry weather flow</td>
</tr>
<tr>
<td>COF</td>
<td>Consequence of failure</td>
</tr>
<tr>
<td>CIP</td>
<td>Capital Improvement Program</td>
</tr>
<tr>
<td>City</td>
<td>City of Rapid City</td>
</tr>
<tr>
<td>DENR</td>
<td>Department of Environment and Natural Resources</td>
</tr>
<tr>
<td>EPS</td>
<td>Extended period simulation</td>
</tr>
<tr>
<td>FEB</td>
<td>Flow equalization basin</td>
</tr>
<tr>
<td>FOG</td>
<td>Fats, oils, and grease</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographical Information System</td>
</tr>
<tr>
<td>GPS</td>
<td>Global positioning system</td>
</tr>
<tr>
<td>IDCM</td>
<td>Infrastructure Design Criteria Manual</td>
</tr>
<tr>
<td>IGA</td>
<td>Inter-governmental agreement</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicators</td>
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<tr>
<td>LOF</td>
<td>Likelihood of Failure</td>
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<tr>
<td>LOS</td>
<td>Level of Service</td>
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<tr>
<td>MOU</td>
<td>Memorandum of understanding</td>
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<tr>
<td>MPO</td>
<td>Metropolitan Planning Organization</td>
</tr>
<tr>
<td>P&amp;P</td>
<td>Policy and Procedure</td>
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<tr>
<td>PEP</td>
<td>Project execution plan</td>
</tr>
<tr>
<td>PPP</td>
<td>Policies, Processes, and Procedures</td>
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<tr>
<td>QA/QC</td>
<td>Quality assurance/quality control</td>
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<tr>
<td>ROF</td>
<td>Risk of failure</td>
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<tr>
<td>SSO</td>
<td>Sanitary sewer overflow</td>
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<td>TAZ</td>
<td>Traffic Analysis Zone</td>
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<tr>
<td>TM</td>
<td>Technical Memorandum</td>
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<tr>
<td>WRF</td>
<td>Water reclamation facility</td>
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<td>WUSM</td>
<td>Water Utility System Master Plan Update &amp; Model Recalibration</td>
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<tr>
<td>WWUSM</td>
<td>Wastewater Utility System Master Plan Update &amp; Model Recalibration</td>
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CITY REVIEW FRAMEWORK

Throughout the scope of services described herein, Black & Veatch will submit interim deliverables to the City for review and comment on the technical progress of the work activity. Black & Veatch’s project schedule incorporates critical path review time by the City as well as council timeframe. The following table defines the project’s document review time frame for the City:

<table>
<thead>
<tr>
<th>Draft Document or Technical Memorandum (TM) Length (Pages)</th>
<th>City Review by Public Works Only</th>
<th>City Review by Public Works and Other Departments (Fire, Planning, etc.)</th>
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<tbody>
<tr>
<td>5 Pages or Less</td>
<td>5 Working Days</td>
<td>10 Working Days</td>
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<tr>
<td>6-25 Pages</td>
<td>10 Working Days</td>
<td>15 Working Days</td>
</tr>
<tr>
<td>25 – 50 Pages, or multiple submittals at one time</td>
<td>15 Working Days</td>
<td>15 Working Days</td>
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<tr>
<td>Greater than 50 Pages</td>
<td>To Be Determined</td>
<td>To Be Determined</td>
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The schedule above is subject to change based on the number of submittals, complexity of the submittal, personnel schedule constraints, or other considerations. An alternative review time frame shall be agreed on by the City and Black & Veatch.

GENERAL NOTES

- The schedule for this project is anticipated to occur over approximately 18 months in 2017, 2018, and 2019. A more detailed schedule is in a separate document.
- Unless otherwise indicated, for all workshops and meetings Black & Veatch will prepare and distribute workshop agenda at least 7 working days prior to workshop, as well as, prepare minutes to document discussion, meeting results, and action items within 5 working days after workshop.
- Unless otherwise indicated, it shall be assumed that workshops will be in-person. Bi-monthly meetings will be via conference call for all attendees. Other meetings will be in person for local staff (FMG and Banner) and conference calls for Black & Veatch (unless scheduled in conjunction with other on-site activities).
- FMG and Banner will be subconsultants to Black & Veatch for this project. The Scope of Services for FMG will include surveying, review of previous reports, review of major deliverables, meeting attendance and participation, and other input based on local knowledge and experience. The Scope of Services for Banner will include facility assessments, review of previous reports, assistance with capital cost development, review of major deliverables, meeting attendance and participation, and other input based on local knowledge.
- Unless otherwise indicated, for each TM (or Policy & Procedure (P&P) Memoranda) submitted, the following steps will be included:
City of Rapid City, SD
Wastewater Utility System Master Plan
Update & Model Recalibration
City Project No. 14-2192 (CIP No. 50819)

- Submit draft TMs to City following internal quality assurance/quality control (QA/QC) review of content for technical accuracy, formatting, and grammar
- City will provide written review comments within the time frame defined in City Review Framework Table.
- Conduct a review meeting with City via conference call to review comments, or in conjunction with a scheduled workshop.
- Revise TMs with changes agreed to with the City for use in subsequent master planning tasks.
- Black & Veatch will provide hard copies of the documents to be discussed at the workshops which may include agendas, TMs, maps, etc. These may be provided in advance, for review, or at the workshops, depending on topic.
- Black & Veatch will provide the following as deliverables throughout the project:
  - Final Project Execution Plan – 10 hard copies; one pdf format electronic copy
  - Draft TMs – one pdf format electronic copy and one MS Word copy
  - Draft Chapters – six hard copies; one pdf format electronic copy; one MS Word copy
  - Draft Final Reports – six hard copies; one pdf format electronic copy and one MS Word copy
  - Final Reports – Ten hard copies, 10 accompanying DVDs, and one pdf format electronic copy (final pdf shall include tabs for ease of navigation).
  - Final Project Support Files – 3 copies on DVD (MS Word, MS Excel, model files, GIS, etc.).

**TASK 100 – PROJECT INITIATION, MEETINGS, AND MANAGEMENT**

**Task 101 – Prepare and Finalize Project Execution Plan**
Using the project execution plan (PEP) developed for the Water Utility System Master Plan Update & Model Recalibration (WUSMP) as a template, update the PEP for the Wastewater Utility System Master Plan Update & Model Recalibration (WWUSMP). The PEP establishes the project’s baseline staffing plan, scope of services, schedule, submission and review process, communications plan, quality control plan, and budget to which actual project activity is tracked during progression of the work. Submit the PEP to the City for review and comment. Incorporate comments and submit the PEP to the City following Workshop 1-1.

**Task 102 – Data Information Request**
Prepare and submit a list of data and information to be provided by the City for use during the study including but not limited to operations data from SCADA, GIS data, hydraulic model, land use planning information, wastewater flows and patterns, existing level of service and goals, and facility information, and related studies and reports. Note: In order to minimize additional data collection efforts, the wastewater flows will be allocated using the 2015 billing information collected for the water model.

As needed, Black & Veatch will make arrangements to assist with gathering data, including obtaining billing records for wastewater.
Task 103 – Review and Incorporation of Previous Reports

Black & Veatch will obtain copies of the wastewater system studies and reports completed previously for the City for review from the City. Review the studies and reports and identify important components of each study that are relevant to the current project. Consolidate review information by collection basin. A meeting (MTG-101) will be held to identify major information and higher and lower priority studies to integrate into the current project’s effort. Note previous work that has been superseded and/or is outdated or will be superseded with the current project’s effort.

A Previous Report TM will be prepared and include the following: 1) establish the purpose of the review effort, 2) provide a summary of findings, 3) a key map to indicate the locations of the reviewed reports, and 4) report summaries for each report. The Previous Report TM will be submitted to the City prior to WS-1-1. It will be reviewed and discussed in WS-1-1 to answer any outstanding questions, resolve discrepancies, and to confirm the City’s recommendations in order to retire the documents and carry forward into the WWUSMP. The Previous Report TM will be finalized following WS-1-1.

The following documents are included in this review and divided into 3 levels of documents: critical, review, and general background information. Although all documents will be mentioned in the Previous Report TM, only those listed as “critical documents” will be discussed in detail in the Previous Report TM. Both documents listed as “critical” and “review” will be included on the key maps. The documents are summarized by type in the table below.

### Studies, Reports, Inspections, Master Plans and Design Reports

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Number</th>
<th>Firm</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Critical Documents – Citywide</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source Water Protection Report</td>
<td>W07-1684</td>
<td>Stanley Consultants</td>
<td>2009</td>
</tr>
<tr>
<td>Inflow and Infiltration Study</td>
<td>SS10-1919</td>
<td>Burns &amp; McDonnell</td>
<td>2013</td>
</tr>
<tr>
<td>Capacity, Management, Operation, and Maintenance Inspection of the Rapid City Sanitary Sewer Collection System and CMOM Inspection Correction Actions Report</td>
<td></td>
<td>South Dakota Department of Environment and Natural Resources</td>
<td>2015</td>
</tr>
<tr>
<td><strong>Critical Documents –Northeast Area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preliminary Design Submittal Country Road Regional Lift Station</td>
<td>SS03-1255</td>
<td>Cetec Engineering Services, Inc.</td>
<td>2005</td>
</tr>
<tr>
<td>Summary Report Wastewater Flow Study in Connection with Mallridge Lift Station Improvements</td>
<td>SS03-1255</td>
<td>Cetec Engineering Services, Inc.</td>
<td>2005</td>
</tr>
<tr>
<td>Summary Report Preliminary Engineering Study Mallridge Lift Station Improvements</td>
<td>SS03-1255</td>
<td>Cetec Engineering Services, Inc.</td>
<td>2005</td>
</tr>
</tbody>
</table>
## Name | Project Number | Firm | Year
--- | --- | --- | ---
East Anamosa Street Extension Study | ST-98-660 | HDR and Alliance Architects and Engineers | 2000
North Rapid Valley Sanitary Sewer Master Plan (Draft) | 13-2076 | Dream Design International, Inc. | 2014

### Critical Documents – Southeast Area

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Number</th>
<th>Firm</th>
<th>Year</th>
</tr>
</thead>
</table>
| Omaha Street / West Boulevard Intersection Reconstruction – Utilities Memorandum | 14-2097 | Ferber Engineering Company | 2013
| Southside Drive Sanitary Sewer Extension, Draft Technical Memorandum 2, Southside Drive Sewer Master Plan | 15-2095 | HDR | 2014
| Trunk Sewer Master Plan E. Blvd. to St. Patrick | 16-2353 | FMG Engineering, Inc. | 2017

### Review Documents – Citywide

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Number</th>
<th>Firm</th>
<th>Year</th>
</tr>
</thead>
</table>
| Summary Report to Southeast Rapid City Infiltration/Inflow Study | MSC87-018 | Cetec Engineering Services, Inc. | 1997
| Information Regarding Combined Sewer With Box Elder and Ellsworth AFB | | | 2017?

### Review Documents – Northeast Area

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Number</th>
<th>Firm</th>
<th>Year</th>
</tr>
</thead>
</table>
| Elk Vale Sewage Pump Station Study | SS07-1664 | HDR | 2007
| East Boulevard/East North Street Reconstruction | ST09-1511 | Kadrmas Lee & Jackson | 2010
| Preliminary Engineering Report for East Eglin Lift Station and Force Main Project | | Kadrmas Lee & Jackson | 2003

Rapid Valley Sanitary District Maps – The City does not have these at this time.

Menards Subdivision Master Plan (Creek Drive) – the Engineering Design Group does not have this document at this time, and we are not quite sure if there is anything beneficial in the report. Have requested it from the Development Group.

### Review Documents – Northwest Area

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Number</th>
<th>Firm</th>
<th>Year</th>
</tr>
</thead>
</table>
| Omaha Street Utilities-12th Street to East Boulevard | SSW02-1106 | Cetec Engineering Services, Inc. | 2002

### Review Documents – Southeast Area

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Number</th>
<th>Firm</th>
<th>Year</th>
</tr>
</thead>
</table>
| St. Patrick St. Siphon Odor Control – Design Criteria Review Standpoint | SS09-1825 | HDR | 2010
| Preliminary Design Report for Catron Boulevard Sanitary Sewer Extension Hwy. 79 to 5th Street - Final | SS01-1052 | Cetec Engineering Services, Inc. | 2004

### General Background Information Documents - Citywide

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Number</th>
<th>Firm</th>
<th>Year</th>
</tr>
</thead>
</table>
| Facility Plan Water Reclamation Facility | 14-2214 | HDR | 2016

### General Background Information Documents – Northwest Area
In addition to the list of 38 items above, the City may identify additional studies and reports for review and integration into this project’s work effort. For purposes of establishing a level of effort to review additional documents, an additional 7 documents is included.

Conduct an initial review of the 2008 Master Plan and develop an initial listing of chapters and sections that will be (1) superseded/replaced by work prepared on this project; (2) unchanged from 2008 Master Plan and remain valid following completion of this project and appended to the WWUSMP and (4) modified by work prepared on this project, but remain in use following completion of this project and added accordingly to this project’s report. Use this review and initial listing to develop an Initial P&P TM (Master Plan Report Sections) that will be used and updated in subsequent tasks (801-Master Plan Updates, Amendments, and Revisions; 902 – Draft Master Plan Report) to establish processes for future updates as well as to identify the portions of the 2008 Master Plan that will continue to be utilized for information by the City in conjunction with the WWUSMP. Incorporate comments into the Initial P&P TM following WS-1-1.
Task 104 – Workshop 1-1 (WS-1-1) - Project Initiation

Conduct workshop to review and confirm the final PEP, procedures to complete the GIS and hydraulic model update, collection system operation review (described in Task 301), review the previous reports TM (Task 103) and review the draft Master Plan Updates, Amendments, and Revisions TM (Task 801). In addition, conduct an initial review of the Infrastructure Design Criteria Manual (IDCM) to identify components that will be reviewed during Task 805.

Following WS-1-1, conduct a windshield tour of the major collection system facilities with City operations and engineering staff. The intent of the tour is to allow Black & Veatch staff to get a better understanding of the layout of the system, not to inspect individual facilities.

Task 105 – Recurring Meetings

Twice monthly project management conference call to discuss an overview of project status, issues requiring resolution or revised approach, and action items with City project management. Three days prior to the meeting Black & Veatch will send an agenda and updated action log to the City. Prepare meeting minutes and submit in draft form within 3 working days after the meeting. City will review and provide comments within 3 working days. Finalize minutes within 2 days after receiving City comments.

Task 106 – Project Management and Administration

Provide management and administration of the project including progress reporting, schedule and budget adjustment, and invoicing.

Prepare and submit a monthly narrative progress report summarizing progress and status of each task along with discussion of project issues requiring resolution and attention.

Prepare and submit monthly invoices.

Prepare and submit a monthly review of the project schedule. Schedule review will compare actual progress and completion to a project baseline schedule. If progress falls behind schedule to a point where recovery is unlikely or not feasible, Black & Veatch will work with City to develop a recovery plan or to develop a re-forecasted schedule.

Prepare and submit a monthly review of the project budget. Budget review will consist of an earned value analysis that compares baseline forecasted expenditures, spent (invoiced) value, and earned value calculated from an estimate of completion for each task.

The QA/QC Plan shall be submitted as part of the PEP in Task 101. It shall include QA/QC reviews on all project deliverables prior to submission to the City (includes Black & Veatch review of all deliverables developed by FMG and Banner). All reviews shall be conducted with professionals of appropriate level and subject matter expertise. Document QA/QC plan compliance by submitting the current plan with each monthly progress report.
TASK 200 – GIS DATA AND GPS DATA COLLECTION AND VERTICAL CORRECTION

Task 201 – GIS Wastewater System Feature Update

Identify GIS wastewater system features (pipes, fittings, manholes, siphons, etc.) that have been updated since the construction of the 2008 InfoSewer hydraulic model.

Prior to beginning this task, the City will enter/update all collection system feature information in GIS for projects substantially completed through December 31, 2016. No time is budgeted for Black & Veatch to perform updates. The basis for work to be completed by the City in relation to the GIS feature update is a series of City database reports (Construction Report, Design Report, Warranty Report, and Development Report) that identify projects and developments in various stages of completion. The GIS feature update will include all projects from the database reports that have not yet been entered into the GIS.

Following completion of input/update of project features by the City, Black & Veatch will evaluate and identify connectivity errors and incorrect or missing attribute data. Complete an update of the GIS wastewater system features necessary for subsequent collection system hydraulic model update, and return GIS data to the City.

Black & Veatch will use two-way replication to connect to a child version of the City’s wastewater system enterprise geodatabase, complete the necessary revisions, and sync change back to the child version for the City to review. The City will then have the option to review and reconcile the changes prior to posting changes to the City’s enterprise geodatabase. Through the two-way replication process, the City will be able to continue to incorporate as-built information into the GIS while Black & Veatch reviews network connectivity and attribute information. However, it should be noted that while a version of the geodatabase is being reviewed by Black & Veatch, as-built information added to the GIS by the City after December 31, 2016 will not be reviewed for connectivity and attribute completeness.

Task 202 – NGVD29 to NAVD88 Vertical Datum/Elevation Conversion

Following the GIS wastewater system feature update, perform a NGVD29 to NAVD88 vertical datum conversion allowing elevations for wastewater system GIS manhole rim elevations and pipe invert elevations to be assigned elevations on the NAVD88 datum. This datum conversion allows GIS data transferred to the hydraulic model to be on the NAVD88 coordinate system. Horizontal datum currently in use by the City is South Dakota State Plane South Zone NAD 83 (2011).

To assure accuracy and precision during this conversion process, Black & Veatch will submit their proposed process to the City to confirm methodology with City survey staff prior to proceeding with the conversion.

The City has surveyed manhole rim elevations and has the data in NGVD 29. The proposed methodology is as follows: Step 1 – Convert all GIS wastewater manhole rim and pipe invert
elevations from NGVD29 datum to NAVD88 datum using the USGS VERTCON computer software or similar. Step 2 - Return updated GIS data with NAVD88 based manhole and pipe elevations to the City.

Task 203 – New Manhole Identification and Inventory Development

The purpose of this task is to determine the number and location of new manholes that have been installed since the 2006 survey effort related to the 2008 Master Plan. The identified manholes will then be GPS field surveyed and observed to gather GIS attribute features.

203.1 Develop Survey Form. Develop a survey form to be used during the GPS field survey. This form shall be aligned with the GIS Schema Review in Task 701. The draft survey form shall be submitted to the City for review.

203.2 Identify manholes in the GIS database to be surveyed. City to provide a geodatabase that identifies all manholes to survey. This geodatabase will be used to navigate to the manholes in the field and will provide a checklist of manholes that have been surveyed vs. those that have been identified as new.

203.3 Meeting 201 (MTG-201). Review the survey form and list of manholes to be surveyed with the City to ensure that the information collected includes all of the attributes of interest to the Utility Maintenance and Engineering Departments.

Survey activities shall begin after the City has approved the final survey form. This scope of services only includes collection of data on features that are readily available in the field when the survey is conducted. Completing attribute features and field codes through records search, as-built drawing review, GIS data extraction, excavation, and feature operation is not included as part of this work.

The following attributes have been initially identified by the City:

- Manholes
  - Survey Date (Date Field)
  - Location (X, Y Coordinates)
  - Installation Date (not readily available from field survey)
  - Sub-Type (Standard, Drop, Termination)
  - General Condition (New, Good, Average, Poor, Failed)
  - Primary Image
  - Comments (Text Field)
  - Access Type (Door, Hand, Lid, MH Cover, Other, Unknown)
  - Access Manufacturer (Bruns, Deeter, DFI, Fargo, Neenah, etc)
  - Surface Type (Dirt, Asphalt, Concrete, Grass, Other, Unknown)
  - Interior Drop (Yes, No)
  - Depth to invert(s)
  - Rim Elevation (Z Coordinate)
City of Rapid City, SD
Wastewater Utility System Master Plan
Update & Model Recalibration
City Project No. 14-2192 (CIP No. 50819)

- Barrel Diameter (36”, 48”, 60”, 72”, 84”, 96”, Other)
- Barrel Material (Concrete, Brick, Block, Other, Unknown)
- Bench Material (Concrete, Brick, Block, Other, Unknown)
- Channel Material (Concrete, Brick, Block, Other, Unknown)
- Cone Material (Concrete, Brick, Block, Other, Unknown)
- Steps (Yes, No)
- Step Material (Cast Iron, Cast Aluminum, Steel, Rubber Coated, Other Unknown)
- Cover Thickness (Number Field)
- Adjusting Rings (Yes, No, Unknown)
- Adjusting Ring Thickness (Number Field)
- Chimney Seal (Yes, No)
- Flow During Inventory (Yes, No)
- Debris or Buildup (Yes, No)
- Inflow or Infiltration (Yes, No)
- Condition of Invert (New, Good, Average, Poor, Failed)

Task 204 – GPS Field Survey

Once manholes for the GPS survey are selected in Task 203, survey crews will GPS the manholes to define locational coordinates, ground surface elevations for manhole rims, and depth measurements to establish connected pipe inverts. GPS survey will be conducted with a horizontal and vertical accuracy of +/- 0.3 ft. Manhole condition information and photographs will also be collected.

204.1 GPS Field Survey of New Manholes. Obtain locational coordinates, rim elevations, and depths for invert elevations for new manholes. Utilize NAVD88 vertical elevation datum and South Dakota State Plane South Zone NAD 83 (2011) for this field survey effort. Manhole condition information will be collected during the field survey to fill out the survey form identified in Task 203. The task is scoped to include up to 1200 new manholes.

204.2 GPS Field Survey Verification of Existing Manholes. 25 manholes in various locations (horizontal and vertical) will be selected for GPS survey to provide a comparison of NAVD88 based surface elevations versus the elevation obtained from previous tasks related to the system wide conversion of NGVD29 to NAVD88.

Task 205 – GPS Survey of Wastewater Service Lines

Map five new service lines (from tap to clean out to service entrance at building as available) with GPS location and field codes with the intent to map the services to a level that one-call locates can be conducted using the GPS mapped service line data.

The GPS field survey effort will generate data that will update the GIS database with regard to sewer system surface features that can in turn be used to update the sewer model. This task will document procedures for collecting and incorporating future GPS surveys into the GIS. Coordinate these procedures with a similar document for the WUSMP.

206.1 Compile surveyed GPS features of manholes and pipes into a comprehensive geodatabase. Compile GPS survey information in a geodatabase, with the information from Task 201, and deliver to the City. Black & Veatch will incorporate the geodatabase information into the GIS database, update GIS linework, confirm connectivity, and eliminate orphan nodes as necessary.

206.2 GPS Field Survey Verification TM. Summarize the results of the verification survey in Task 204.2.

206.3 Document GPS Survey Results and Workflow for Sewer Mains and Manholes. Following completion of the GPS field survey effort, develop a recommended workflow process that documents: tasks, level of effort/time, and division of responsibilities between the City and a contractor in a New Manhole and Pipeline Survey TM. This will be based on similar documentation from the WUSMP.

206.4 Document GPS Survey Results and Workflow for Sanitary Sewer Services. Development of the recommended workflow to create the City Card Files for the service lines and incorporate the data into the City’s GIS database is included in Task 1002, a small amount of review effort is included in this task to make sure the wastewater facilities are captured properly.

Task 207 – Workshop 2-1 – GIS Review and GPS Field Survey Workflows and Results

Conduct WS-2-1 to review the GIS Review and GPS field survey results and recommended workflows developed during this task. Revise recommended workflows based on input from the City and incorporate into documents prepared in Task 703

TASK 300 – HYDRAULIC MODEL UPDATE/RECALIBRATION

The intent of this task is to update the City’s existing hydraulic model to current inventory and flow loading conditions. The model update will be based on the following information:

- The updated GIS database from Task 200.
- Flow and rainfall data from the 2011 flow and rainfall monitoring program.
- Water billing records (metered sales) for 2015 for the months of January through March.
- Sewer billing records for 2011 and 2015.
- Population and employment projections developed for the WUSMP and adjusted for the collection system service area.
Task 301 – Collection System Operations Review.

At the kick-off meeting (WS-1-1), discuss with City staff the basic operations of the collection system. The purpose of the discussion is to understand operations of special structures or facilities in the collection system including: lift stations, siphons, diversions, odor control facilities, air relief valves, water reclamation facility (WRF), and other collection system structures (including vortex manholes).

Discussion items will include, but are not limited to:

- During periods of high flows, are special operation procedures performed?
  - Lift stations slowed down to allow surcharging where it won’t affect customers.
  - Overflow storage tanks
  - Automatic or manually controlled diversions.
  - Areas of the collection system that typically experiences capacity issues.
  - WRF special procedures to receive peak flows.
- High maintenance areas:
  - Increased cleaning due to sedimentation.
  - Increased cleaning due to blockages or root intrusions.
  - Fat, oil, and grease (FOG) areas.
  - High odor areas.
- Sanitary sewer overflows and potential causes.

Prior to commencing hydraulic modeling, MTG-301 will be held to review Task 300 and 400 work and revisit collection system operations review.

Task 302 – GIS Data Extraction and Hydraulic Model Inventory Update

Update the InfoSewer hydraulic model pipes and manholes by extracting the collection system features from the City's updated GIS data from Task 200.

Complete additional tasks as part of this model update including:

- Delete facilities (pumps, pipes, manholes, etc.) abandoned or taken out of service from the model.
- Review and update connections to existing pumps, tanks, etc. already in the hydraulic model as needed.
- Update pump curves from 3-point to multiple point curves if information is available.
- Verify all flow control structures or special facilities are modeled based on actual field conditions including: siphons, diversions, and vortex manholes.

Task 303 – GIS/Hydraulic Model Inventory Update and Maintenance Procedures

The City's hydraulic model will be utilized extensively during development of the WWUSMP and subsequently to support City engineering and utility operations. There are several possible methods to update and maintain these systems while improving efficiency and functionality.
Following completion of the hydraulic model update, develop a recommended workflow process for model updates to update the all pipes model (model elements have a 1-to-1 relationship with GIS features). The GIS/Hydraulic Model Inventory Update and Maintenance Procedures TM will include workflows for the following:

- Incorporating completed development projects into the City's GIS
- Using the GIS Gateway to incorporate new developments from GIS
- Incorporating proposed developments and flows into the model for capacity review
- Development of new model scenarios
- Removing abandoned facilities

Submit the GIS/Hydraulic Model Inventory Update and Maintenance Procedures TM to the City. These procedures will be used during training (Task 1101) and revised based on training and input from the City and incorporate into documents prepared in Task 802. Coordinate these procedures with similar documents for the WUSMP.

**Task 304 – Previous Flow Monitoring Data Review**

The following reports and rainfall and flow monitoring data will be reviewed and summarized in a Rainfall and Flow Data Review TM:

- Southeast I/I report (1998)
- West Boulevard Study (2010)

The rainfall review will include an analysis to determine the historical size of the storm events from the 2011 monitoring period. The goal of this review is to determine what flow meter and rain gauge data can be utilized for hydraulic model calibration.

In the review of the rainfall data, consideration will also be given to using radar rainfall data. If it is determined that radar rainfall data should be used for this evaluation, the City will obtain the radar rainfall for use by Black & Veatch. No budget for purchase of radar rainfall data is included in this scope.

The assumption for this project is that the 2011 flow monitoring data has adequate data quantity and quality to be used for the analysis and calibration of the City's hydraulic model. For best model calibration results all the flow meters need to have collected data during the same time periods and consistent with the flow meters upstream and downstream. Reasons that may exclude meters or data from being used for model calibration can include:

- Sensor or data drop outs, missing data.
- Flow balance with adjacent flow meters not consistent.
• Adjacent meters monitored during different time periods.

The Rainfall and Flow Data Review TM will include the confirmation of dry weather flows for each flow meter and confirming the meter relationship developed in the 2013 I/I Report.

**Task 305 – Historical Population, Wastewater Flow, Per Capita Use Rates**

Review historical population and employment data provided by the City. The review will be performed on the data analyzed as part of the WUSMP project. The population and employment data will be adjusted to account for customer differences between water and sewer service areas.

Evaluate historical winter day water use for year 2015 and wastewater generation data for 2011. The purpose of the evaluation is to determine the adjustments needed in the hydraulic model for the dry weather flows or wastewater production values between the 2011 monitoring period and the 2015 “existing” system to account for any growth or redevelopment. The evaluation will determine the per capita flow rates and identify any large water users/wastewater generators in the collection system as monitored during the 2011 monitoring period and any adjustments needed for the existing system analysis.

In areas that either weren't flow monitored or don't have adequate data from the 2011 monitoring period will then use a combination of areas of similar age, development type, and proximity, water and sewer records (and maybe 2008 Master Plan) information will be used to develop the flows for loading into the hydraulic model.

Information from tasks 305 and 306 will be documented in a single TM described in Task 306.

**Task 306 – Future Service Area Population and Wastewater Flow Projections**

Planning horizons and design years selected for the WWUSMP include the following (same planning years as the WUSMP and service area coordinated with the WUSMP):

• Short-term, 10 year (2025)
• Medium-term, 30 year (2045; Approximately the Urban Services Boundary)
• Long-term, 100 year (2115; Approximately the Tier 1 Boundary)

Future City population and employment estimates for the three design years will be based on the population and employment estimates calculated for the WUSMP (in Task 1008) with adjustments being made to account for differences between water and sewer customer bases.

Coordinate with the City to compile a list of existing and potential future wholesale/bulk wastewater generator customers for inclusion into future dry weather flow projections. Black & Veatch will contact the agencies as detailed in Task 1001 to obtain necessary information for the project’s effort. No additional interviews are included in this task.

In support of this task, it is assumed the City has provided the following for the WUSMP project with updates needed for collection system adjustments:
City of Rapid City, SD
Wastewater Utility System Master Plan
Update & Model Recalibration
City Project No. 14-2192 (CIP No. 50819)

- 2045 and 2115 service area population and employment projections
- Traffic Analysis Zone (TAZ) data for 2045 (household population, employment data, etc.)
- 2115 land use data with percentage of area developed in each use area to allow distribution of wastewater flows and population and employment within each land use area.
- Compiled listing of existing and potential future wholesale/bulk water customers along with anticipated flows for each.

Based on the results of the flow and rainfall data analysis, recent wastewater flow evaluation including defining all areas of wastewater service, and the projected demands developed for the WUSMP, determine future flow rates to be used in the hydraulic model for the future scenarios.

Document the existing and future population and employment and flow (Tasks 305 and 306) in a summary Historical Wastewater Flow Data and Future Wastewater Flow Projections TM.

**Task 307 – Workshop 3-1 - Hydraulic Model Update and Future Flow Projections**

Conduct WS-3-1 to review the rainfall and flow data, updated hydraulic model and future wastewater flow projections. In addition, review proposed approach and schedule for completing subsequent tasks and design criteria (from Task 310).

**Task 308 – Hydraulic Model Calibration Data Development and Input**

Performing additional, more detailed, flow data analysis on the 2011 flow and rainfall data, the following model calibration parameters will be developed for each flow meter:

- Average Daily Dry Weather Flows (ADDF)
- Dry weather flow diurnal patterns for weekdays and weekends.
- Infiltration and Inflow generation parameters (R1, T1, K1, R2, T2, K2, R3, T3, K3).

In order to calibrate the hydraulic model for wet weather conditions, the rainfall data will be analyzed to determine the best two storms to use for the hydraulic model calibration and which third storm will be used for model verification. As part of the analysis, each storms recurrence interval or size of the storm will be determined.

**Task 309 – Hydraulic Model Calibration**

The hydraulic model calibration goals are based on the United Kingdom’s 2002 Water Professional Users Group guidelines now organized as the Urban Drainage Group under the Chartered Institution of Water and Environment Management.

**309.1 Dry Weather Flow Calibration.** The dry weather flow calibration will consist of making a 24 hour Extended Period Simulation (EPS) using InfoSewerID. The predicted flows in the model at each of the monitoring locations will be compared to the monitored flows. The goal of the dry weather model calibration is to get the predicted model flow volumes to within +/- 2% or +/- 0.1 MG for low flows and peak flows to within +/- 10% or +/- 0.1 MGD for low flows. It is possible that not all
monitoring locations can be calibrated to the goals but a reasonable effort will be made to reach the goals.

309.2 Wet Weather Flow Calibration. The wet weather flow calibration will consist of making a model run a minimum of 24 hours but long enough to include the storm event and time after the event to include a period of infiltration flows. The predicted flows in the model at each of the monitoring locations will be compared to the monitored flows. The goal of the wet weather model calibration is to get the predicted model flow volumes to within -10% and +20% or +1 0.1 MG for low flows and peak flows to within ±20%. It is possible that not all monitoring locations can be calibrated to the goals but a reasonable effort will be made to reach the goals.

Document the hydraulic model calibration process and results in a Hydraulic Model Calibration TM.

Task 310 – Collection System Design Criteria

Develop collection system design criteria that defines what makes a collection system component deficient or the “trigger” point and what criteria is used to design system capacity increases to eliminate the deficiencies. The basis of the criteria will use the City’s IDCM.

Document the design criteria in a Collection System Design Criteria TM. This will also include a discussion of the recommended design storm for use in the wet weather analyses.

Document the design storm selection process and recommendation in a Design Storm Selection Recommendation TM.

Task 312 – Workshop 3-2 - Model Calibration and Existing System Deficiencies

Conduct WS-3-2 to review results from the hydraulic model calibration. Review collection system deficiencies based on the calibration and verification storm hydraulic model runs. Also review and get approval for the design criteria and design storm event to use for the hydraulic model system analyses and development of the Capital Improvement Plan (CIP).

Task 400 – HYDRAULIC MODELING ANALYSES AND IMPROVEMENTS PLANNING

The medium and long-term analyses performed using the hydraulic model will include evaluation and refinement of alternatives as well as development of operational, growth based, and localized collection system improvements. The short-term hydraulic analyses will focus on staging of improvements for the recommended alternative.

Final short, medium, and long-term analyses using the hydraulic model will be used to identify and select the final system-wide and localized improvements for the recommended alternative for serving the City’s customers.

The following design years, which are the same as the WUSMP, establish the short, medium, and long-term planning periods:
City of Rapid City, SD
Wastewater Utility System Master Plan
Update & Model Recalibration
City Project No. 14-2192 (CIP No. 50819)

- Short-Term, 10 year (2025).
- Medium-Term, 30 year (2045; with a new modified Tier 1 growth boundary).
- Long-Term, 100 year (2115; with the established Tier 2 growth boundary and area of development within the Tier 2 boundary indicated).

Task 401 – Existing System Analysis

The purpose of this task is to update the calibrated hydraulic model to existing conditions and perform an analysis of the collection system based on 2015 flow data.

In Task 309, the hydraulic model was calibrated to year 2011 flow and rainfall monitoring data. So the model represents the flows in the collection system in 2011. In order to adjust the flows to year 2015 “existing” system conditions the dry weather flows will be adjusted based on 2015 flow data from the WRF and water and sewer billing data (metered sales) and an assumption that the I/I conditions of the collection system has changed very little in the time frame.

401.1 The dry weather flows for the calibrated model were distributed in the collection system hydraulic model based on the water usage data from 2015. The differences between the 2011 sewage generation data and 2015 water usage, locations and flow quantities, will be used to adjust dry weather flow loadings in the collection system hydraulic model. Making the dry weather flow load adjustments will ensure the hydraulic model best represents the collection system for the existing system analysis for the year 2015 time frame. This 2015 model will be considered the base year for analysis.

401.2 The existing system analysis will consist of performing hydraulic model runs using a 5-year synthetic rainfall distribution to compare the results to the design criteria to define the areas of the collection system where capacity concerns exist.

In the areas where capacity concerns exist, the modeled pipe diameters will be iteratively increased in size to determine the size of pipe that would be required to eliminate the capacity concern. This is an initial assessment of how extensive or how much of the collection system is affected with capacity concerns.

401.3 The InfoSewer hydraulic engine does not have a robust lift station and force main capacity analysis engine. With that in mind, a separate lift station and force main analysis will be performed. The analysis will consist of developing a tool in spreadsheet format that will be used to compare the collection system flow rates to the existing conditions of the lift station and force mains. The analysis will determine if any capacity concerns exist and provide planning level options for increasing capacities so they can adequately convey the collection system peak flows. Results will be integrally submitted and a workflow for how the data is integrated into the model provided.

401.4 Present capacity analyses results to City staff in a conference call (MTG-401). Develop figures for each basin highlighting the collection system capacity concerns identified by the hydraulic model. In addition, summary tables will be developed listing the pipes in the collection system with the hydraulic model results.
Task 402 – Long-Term Hydraulic Modeling Analyses

The existing collection system hydraulic model will be modified to include the service area and customers projected to be served in year 2115. For areas that currently aren’t served by collection system sewers, planning level sewers or “growth sewers”, will be added to the hydraulic model. When the sewers have been added then the flows in the hydraulic model will be adjusted to account for the dry weather flows as noted in the Future Wastewater Flows TM. As part of the model modification, the I/I parameters in the hydraulic model will be adjusted to account for the increased service area.

402.1 Wet Weather flow analysis. The hydraulic model will be run using the design storm determined in Task 311 to determine the projected peak flows in the collection system for the year 2115 planning period.

In the areas where capacity concerns exist, the modeled pipe diameters will be iteratively increased in size to determine the size of pipe that would be required to eliminate the capacity concerns. This is an initial assessment of how extensive or how much of the collection system will be affected with capacity concerns caused by all the growth and increased system flows. This analysis is the “worst case” scenario for the projected peak flows the collection system will have to convey.

402.2 Dry weather flow analysis. The hydraulic model will be run using only dry weather flows to determine the average daily flows that are projected to be conveyed in the year 2115.

402.3 Lift station and force main analysis. The projected peak flows generated in the hydraulic model will be analyzed in the lift station and force main capacity analysis spreadsheet. If the analysis determines any of the lift stations to have capacity concerns then the analysis will determine the appropriate sizing of the facilities to convey the projected peak flows. The analysis will include any potential future lift stations and force mains.

Task 403 – Medium-Term Hydraulic Modeling Analyses

The long-term collection system hydraulic model will be modified to include only the service area and customers projected to be served in year 2045. The “growth sewers” in areas not served in 2045 will be inactive for the medium-term analysis. The flows in the hydraulic model will be adjusted to account for the dry weather flows as noted in the Future Wastewater Flows TM. As part of the model modification, the I/I parameters in the hydraulic model will be adjusted to the medium-term service area.

403.1 Wet Weather flow analysis. The hydraulic model will be run using the design storm determined in Task 311 to determine the projected peak flows in the collection system for the year 2045 planning period.

The pipes which had diameters increased in the long-term analysis will be iteratively decreased in size to properly size them for the medium-term collection system flows. This is an initial assessment of how extensive or how much of the collection system will be affected with capacity concerns caused by all the growth and increased system flows for the 2045 planning period.
403.2 Dry weather flow analysis. The hydraulic model will be run using only dry weather flows to determine the average daily flows that are projected to be conveyed in the year 2045.

402.3 Lift station and force main analysis. The projected peak flows generated in the hydraulic model will be analyzed in the lift station and force main capacity analysis spreadsheet. If the analysis determines any of the lift stations to have capacity concerns then the analysis will determine the appropriate sizing of the facilities to convey the projected peak flows. The analysis will include any potential future lift stations and force mains.

Task 404 – Short-Term Hydraulic Modeling Analyses

The medium-term collection system hydraulic model will be modified to include only the service area and customers projected to be served in year 2025. The "growth sewers" in areas not served in 2025 will be inactive for the short-term analysis. The flows in the hydraulic model will be adjusted to account for the dry weather flows as noted in the Future Wastewater Flows TM. As part of the model modification, the I/I parameters in the hydraulic model will be adjusted to the short-term service area.

404.1 Wet Weather flow analysis. The hydraulic model will be run using the design storm determined in Task 311 to determine the projected peak flows in the collection system for the year 2025 planning period.

The pipes that had diameters increased in the medium-term analysis will be iteratively decreased in size to properly size them for the short-term collection system flows. This is an initial assessment of how extensive or how much of the collection system will be affected with capacity concerns caused by all the growth and increased system flows for the 2025 planning period.

404.2 Dry weather flow analysis. The hydraulic model will be run using only dry weather flows to determine the average daily flows that are projected to be conveyed in the year 2025.

404.3 Lift station and force main analysis. The projected peak flows generated in the hydraulic model will be analyzed in the lift station and force main capacity analysis spreadsheet. If the analysis determines any of the lift stations to have capacity concerns then the analysis will determine the appropriate sizing of the facilities to convey the projected peak flows. The analysis will include any potential future lift stations and force mains.

404.4 Present results to City staff at MTG-402. Develop figures (maps by the four basin areas) highlighting the collection system capacity concerns identified by the hydraulic models for the long, medium and short-term analyses. In addition, summary tables will be developed listing the pipes in the collection system with the hydraulic results.

Task 405 – Develop System Improvement Alternatives

This task will look at various methods of serving the year 2115 population, employment and service area. The analysis performed in the previous tasks looked at increasing pipe sizes to increase system capacities. Alternatives to increasing pipe sizes can include some of the following:
City of Rapid City, SD  
Wastewater Utility System Master Plan  
Update & Model Recalibration  
City Project No. 14-2192 (CIP No. 50819)

- Infiltration and inflow reductions based on system rehabilitation and I/I source removal.
- Constructing flow equalization basins (FEBs) to store projected peak flows during rain events and then release the flows back into the collection system when the pipes downstream have available capacity after the storm.
- Replacing a lift station and force main with gravity sewers.
- Constructing a lift station and force main and pump flows in a different direction to a part of the collection system that has adequate capacity. This could be a temporary or permanent solution.
- Constructing an entirely new interceptor sewer to have dedicated service to a particular part of the service area.
- Installing an on-site treatment system as either a temporary or permanent solution.

Developing the system improvements alternatives will consist of a desktop analysis and develop a list of alternatives that will be presented to the City for discussion at MTG-402.

Task 406 – Develop Hydraulic Model Results and System Improvement Alternatives TM
Document the hydraulic model analysis results (Tasks 401, 402, 403, and 404) and the system improvement alternatives (Task 405) for capacity concerns in the Hydraulic Model Results and System Improvement Alternatives TM.

Task 407 – Workshop 4-1 – Hydraulic Model Results and System Improvement Alternatives
Conduct WS-4-1 to review results from the short, medium, and long-term hydraulic model analyses (Tasks 401 – 404) and discuss the system improvement alternatives (Task 405). For the purposes of establishing a level of effort, discuss the system improvement alternatives and decide on up to four (4) alternative configuration scenarios to be analyzed in subsequent tasks.

Task 408 – Recommended Alternative Analyses and Improvement Planning
The hydraulic model analyses will focus on the recommended alternatives selected from WS-4-1. The hydraulic model will be used to perform the capacity analyses to determine the staging of the improvements required to meet the projected collection system growth.

408.1 Long-term model analysis. Update the long-term model to incorporate the recommended alternatives and perform the system analyses to determine the long-term sizing of the collection system required for the planning year 2115.

408.2 Medium-term model analysis. Update the medium-term model to incorporate the recommended alternatives and perform the system analyses to determine the medium-term sizing of the collection system required for the planning year 2045.

408.3 Short-term model analysis. Update the short-term model to incorporate the recommended alternatives and perform the system analyses to determine which improvements are required for the planning year 2025.
408.4 System improvement timing. The hydraulic model analyses results will be used to determine when capacity system improvements will be needed, the improvement trigger, and to develop the CIP.

408.5 Recommended Alternatives Analysis and CIP TM. Document the recommended alternatives hydraulic analyses performed in Task 408 including long term monitoring program information in the Recommended Alternatives Analyses and CIP TM.

**Task 409 – Workshop 4-2 - Recommended Alternative Analysis and Overall Plan**

Conduct workshop to review results of the recommended alternatives hydraulic analyses and staging of recommended improvements into a CIP.

Included in the workshop discussions is a philosophical discussion on asset assessment CIP versus hydraulic needs CIP for short, medium and long term conditions.

**TASK 500– WASTEWATER FACILITY ASSESSMENTS AND REPLACEMENT CAPITAL IMPROVEMENT PLAN DEVELOPMENT**

The purpose of this task is to establish a recommended CIP (cost and timing) for replacement of existing wastewater collection system facilities. The scope assumes no confined space entry and no pulling of submerged pumps. The assessment is intended to be based on site visits with civil engineers experienced in assessing general facility condition; establishment of facility criticality; development of facility useful life and remaining useful life; development of replacement costs; and staging of replacements into a recommended CIP. This effort will be at a similar level to Phase E of the WUSMP and will be based on similar risk criteria.

**Task 501 – Review Wastewater Facility Information and Compile Inventory Listing**

Review existing facility information from the 2008 Master Plan to gain familiarity with existing wastewater system facilities and operational practices of the City.

Compile an inventory listing of wastewater collection system facilities including lift stations (9), inverted siphons (2), vortex drop manholes (2), air release valve stations, and odor control facilities (2). Evaluation of the Rapid City WRF is not part of the scope. The City will provide the year of installation/retirement (retirement is any asset decommissioned as of December 2016) for each wastewater facility listed in the inventory in an excel spreadsheet format, and the year of any significant renovation or expansion work (and any planned CIP improvements).

The City will provide any supplemental condition assessment information that is currently available and deemed relevant for the Task 500 effort (i.e. assessment information on the Plum Creek LS).
Task 502 – Establish Useful Life Values For Wastewater Facilities

Establish a “standard” useful life for each facility in the inventory listing using industry available standards for useful life values. The Useful Life Values will build off list already developed for the WUSMP with wastewater specific values developed for similar equipment.

Establish a “stretched” useful life value for each facility in the inventory listing which is defined as the product of the facility’s “standard” useful life and criticality rank multiplier. The purpose of the “stretched” useful life is to provide a pathway for extending the service of facilities that do not significantly compromise operations if they experience an outage.

Calculate both “standard” and “stretched” remaining useful life values for facilities in the inventory listing by subtracting the current facility age from the “standard” and “stretched” useful life values.

Task 503 – Establish Criticality Ranking For Wastewater Facilities

With City input, review each facility and establish a criticality ranking based on the facility’s consequence of failure. The Criticality Ranking criteria will build off list already developed for the WUSMP with wastewater specific considerations.

Consider factors such as public health and safety, impact of failure on collection system operations, potential for negative environmental impacts, negative political or public relations exposure, etc. Assign a criticality rank of high, medium, or low to each facility in the inventory listing.

Establish/confirm criticality rank multipliers for use in calculating “stretched” useful life values (high criticality = 1.0; medium criticality = 1.15; low criticality = 1.3).

Prepare and submit a wastewater facility inventory listing with criticality ranking indicated for each facility.

Task 504 – Workshop 5-1 – Wastewater Facility Inventory, Criticality, and Useful Life Values

Conduct WS-5-1 to review inventory listing, criticality ranks, and useful life values of the wastewater facilities. In addition, the scoring system for the facility site tours will be reviewed. Prior to this workshop, obtain from the City relevant maintenance and inspection records for wastewater facilities. During the workshop, review these records with City staff to identify high priority areas prior to conducting site tours in a subsequent task.

Task 505 – Conduct Facility Site Tours and Determine Remaining Useful Life De-rating Score

In conjunction with WS-5-1 and working with the City, conduct site tours of each facility in the inventory list to qualitatively assess existing facility conditions and identify immediate deficiencies and repair/replacement needs. Site tours are not intended to conduct an intensive asset condition assessment of all components and systems at a facility. Instead, the tours are intended to identify any existing conditions that would impact or de-rate the remaining useful life thereby accelerating in the replacement capital improvement plan. Utilize condition assessment information compiled during the 2008 Master Plan to assist with current condition assessment.
Prior to the Site Tours scoring for existing condition, existing functionality, and utilization will be developed. During WS-5-1, review the scoring system with the City. Working with the City during the site tours, consider the condition, function, and utilization of facility components to assign scores. Following facility site tours, apply de-rating factors to each facility’s calculated “standard” and “stretched” remaining useful life.

Task 506 – Develop Facility Replacement Costs

Using parametric cost estimating tools and methods and region specific cost data, develop facility replacement costs for each facility in the inventory listing. Cost estimating will be completed as a Class 5 Estimate based on the Association for the Advancement of Cost Engineering. Class 5 estimates carry an accuracy range of -30% to +50%.

Obtain from the City, any historical project construction cost information to integrate into the parametric cost model.

Develop total project costs for replacement of each facility including:
- Estimated construction cost and construction contingency.
- Engineering allowance for study, predesign, detailed design, bidding, services, engineering services during construction, resident field representation during construction, and post-construction services.
- City legal and administrative allowances.
- Total project contingency.

Task 507 – Develop Facility Replacement CIP

Based each facility’s remaining useful life and total project cost estimates, establish the Facility Replacement CIP for inclusion into the WWUSMP (includes one iteration on CIP). MTG-502 will be held to review the Facility Replacement CIP.

Task 508 – Wastewater Facility Assessment and Replacement CIP TM

Document the facility assessment, criticality ranking, useful life basis, remaining useful life methodology, replacement costs, and replacement CIP in Wastewater Facility Assessment and Replacement CIP TM.

Task 509 – Workshop 5-2 – Wastewater Facility Replacement CIP

Conduct WS-5-2 to review the recommended wastewater facility replacement CIP.

**TASK 600 – PIPELINE REPLACEMENT PLANNING AND CIP DEVELOPMENT**

The intent of this task is to establish and implement a pipeline replacement CIP program based on a logical prioritization of pipe replacement needs and a basis for annual pipeline replacement budgets. This effort will be at a similar level to Phase F of the WUSMP and will be based on similar
risk criteria. This evaluation does not include manhole prioritization. No field evaluations or inspections are included in the scope of work for Task 600.

**Task 601 – Compile Pipe Installation Decade, Materials, SSO and Break/Collapse History**

Collect and process existing collection system piping data necessary to develop a pipeline replacement CIP. Complete three data collection and processing tasks:

**601.1 Pipe Installation Decade and Material.** It is assumed that the majority of the system has pipe material information in the GIS. Pipe decade information will generally be assumed based on the decade of installation, similar to the WUSMP. The City will review the dates.

Transfer additional installation decade and material data to GIS.

**601.2 Pipe Blockage/Collapse History.** Obtain and review the City’s collection system SSO, collapse, and blockage data, and develop an approach to assign this data to pipes in GIS. The City will provide the above data in Excel format spreadsheet format that matches the blockage/collapse incident to a physical address and Cityworks data related to pipe segments. Utilize GIS based address matching of main break data to identify the pipe experiencing the failure.

**Task 602 – Pipe Attribute Data**

Compile pipe attribute data (to the extent made available by the City) necessary for the pipeline replacement planning effort in a GIS compatible format. Relevant attribute data includes pipe age, pipe material, sanitary sewer overflow (SSO) history, work order / repair history, and soil corrosion potential.

**Task 603 – GIS Based Pipe Inventory Analysis and Development of Risk Criteria.**

**603.1 Prepare an initial analysis of pipe attribute data impacting pipe replacement needs.** Summarize findings in figures (maps by each basin area) and tables depicting existing system information as made available from the City including location/occurrence of pipe by: age, material, SSOs, pipe depth, bedding type, service requests / work orders, installation in corrosive soil, etc.

**603.2 Develop risk of failure (ROF) criteria and respective scoring methodology to use in developing replacement prioritization.** ROF criteria include two categories – likelihood of failure (LOF) and consequence of failure (COF). LOF and COF criteria will use WUSMP Phase F criteria as a base and will be customized for wastewater system during meeting.

In conjunction with workshop WS-5-1, conduct a review meeting with the City to review potential risk criteria and scoring methodology to be utilized during the replacement planning effort.

**603.2a Work with City to finalize LOF criteria for use in the pipeline replacement planning effort.** Initial items include:

- Inspection Data – limited CCTV data
- Age – Pipes are assigned progressively higher scores as their age increases.
Material – Each pipe type (Cast iron, VCP, HDPE, steel, PVC, and concrete) are assigned scores based on potential for accelerated failure.

SSO’s – Pipe segments with elevated SSO’s are assigned higher scores.

Blockages, root intrusion, and bluebook maintenance – Pipe segments with elevated maintenance are assigned higher scores.

Service requests/Work orders – in the absence of inspection data, service requests/work orders can indicate likelihood of sewer main characteristics or cohorts (age, material, and diameter) that are known to fail based on historical information.

Modeled capacity - As capacity is limited, higher scores are assigned.

Soil corrosion potential – Pipe segments located in corrosive soils are assigned higher scores.

**603.2b** Work with the City to finalize COF criteria for use in the pipeline replacement planning effort. Initial items include:

- Critical collection system main – Sewer mains connected to critical facilities such as WRF, lift stations, etc. are assigned a higher score.
- Critical services – Sewer mains downstream of critical facilities such as lift stations, hospitals, emergency response facilities, large retail centers, large schools, and emergency shelters are assigned a higher score.
- Environmentally sensitive areas – Areas where discharge could impact drinking water sources or water bodies.
- Related project coordination – This allows bringing a sewer main replacement forward in time if, for example, a street widening project or interceptor sewer project would allow convenient, simultaneous sewer main replacement under the same project. Utilize existing information from the City (5 year CIP Plan, Future Project List, etc.) where appropriate to identify related projects.
- Depth - Higher score is associated with pipes that are installed at excessive depths that would require more costly excavation activity to expose and replace.
- Diameter – higher score for large diameter trunk sewer.
- Manager/Director Flag – This allows bringing a sewer main replacement forward in time in conjunction with overall development needs, emergency services, future plans, and other considerations that are best known to the City.

**Task 604 – Risk of Failure and Replacement Priority Ranking Evaluation**

Combine LOF and COF scores to develop ROF scores for individual pipe segments (manhole to manhole). Using the ROF scores, compile a prioritized pipeline replacement ranking in GIS and Excel similarly to Phase F in the WUSMP. Prepare maps, figures, and tables to graphically depict the location and varying levels of pipe ROF scores as well as to summarize total miles of pipe and total pipe replacement costs contained in various ROF category groups.
Task 605 – Develop Pipeline Rehabilitation/Replacement Costs

Using parametric cost estimating tools and methods and region specific cost data, estimate pipeline rehabilitation and replacement costs. Cost estimating will be completed as a Class 5 Estimate based on the Association for the Advancement of Cost Engineering. Class 5 estimates carry a contingency range of -30% to +50%.

Obtain from the City, any historical project construction cost information. Develop total project costs for replacement of pipelines including:

- Estimated construction cost and construction contingency.
- Engineering allowance for study, predesign, detailed design, bidding, services, engineering services during construction, resident field representation during construction, and post-construction services.
- City legal and administrative allowances.
- Total project contingency.

Task 606 – Pipe Replacement Budget Strategy Evaluation

Using pipe survival curves, or other similar methodologies, develop alternative budget framework strategies for a long-term, annual pipeline replacement program required to manage aging pipeline infrastructure. Include various pipe survival curve assumptions (pessimistic versus optimistic versus Rapid City specific) in the development of budget framework strategies. The budget strategies may be re-evaluated by Black & Veatch based on recommended available budget from the Rate Study.

Task 607 – Pipeline Replacement Priority and Budget Strategy Evaluation TM

Develop a Pipeline Replacement Priority and Budget Strategy TM for the evaluation.

Task 608 – Workshop 6-1 – Pipeline Replacement Priorities and Budget Strategies

Conduct WS-6-1 to review the priority ranking of pipeline replacements and budget framework strategies for long-term, annual pipeline replacement program.

Task 609 – Develop Pipeline Replacement CIP

Based on the prioritized replacement ranking and selected budget framework strategy, group high priority pipe segments into discreet replacement projects. Compile listing of replacement projects to establish a near-term (2015-2025) pipeline replacement CIP for inclusion into the 2015 WUSMP. The pipeline replacement CIP for years 2025 to 2045 will be established in 5-year periods to demonstrate 5-year funding requirements for the medium-term replacement program and in 10-year periods (2055 – 2115) for the long-term replacement program. MTG-602 will be held to review the Pipeline Replacement CIP. Black & Veatch will update the CIP with comments received at this meeting.
TASK 700 – ASSET MANAGEMENT

The intent of this task is to establish an overall asset management policy and framework for the City for the water and wastewater utilities and support enhancements to the City’s use of Cityworks.

Task 701 – Wastewater GIS Database Schema Review

Conduct a review of the City’s existing wastewater geodatabase schema (GIS feature class attribute fields) and provide recommendations for the addition of new fields and/or removal of existing fields to support engineering, modeling, inspections and emergency activities based on industry standard wastewater database information models (Water geodatabase schema review is included in Task 1103). Black & Veatch will review schema recommendations from the WUSMP work to ensure similar methodology where applicable in the wastewater geodatabase. Black & Veatch will compare schemas from two to three other comparable utilities wastewater GIS databases to see if different methodologies may be beneficial to the City. Black & Veatch will provide summary of review and recommend schema additions or deletions to the City. In addition, consideration will be given to whether or not NASSCO fields should be included in the schema. The City may also want to include a field to track the status of projects (existing, abandoned, planned, etc.)

In association with the schema review, a preliminary list of field codes to be used in the manhole survey form (see Task 203) will be developed. Include for consideration, attributes of interest to the Utility Maintenance and Engineering Departments. The following attributes have been initially identified by the City:

Manholes:
- Survey Date (Date Field)
- Location (X, Y Coordinates)
- Installation Date (not readily available from field survey)
- Sub-Type (Standard, Drop, Termination)
- General Condition (New, Good, Average, Poor, Failed)
- Primary Image
- Comments (Text Field)
- Access Type (Door, Hand, Lid, MH Cover, Other, Unknown)
- Access Manufacturer (Bruns, Deeter, DFI, Fargo, Neenah, etc)
- Surface Type (Dirt, Asphalt, Concrete, Grass, Other, Unknown)
- Interior Drop (Yes, No)
- High Pipe Elevation
- Depth
- Rim Elevation (Z Coordinate)
- Barrel Diameter (36", 48", 60", 72", 84", 96", Other)
- Barrel Material (Concrete, Brick, Block, Other, Unknown)
- Bench Material (Concrete, Brick, Block, Other, Unknown)
The review of the GIS feature class attribute fields will include (1) a discussion of what the existing fields provide and how they should be used moving forward (or a recommendation to delete the field); and (2) identification of additional fields that should be considered and their use moving forward. Document the Water GIS database schema review in the GIS feature class/attribute tables created during the WWUSMP.

Following review of the tables by the City, conduct a review meeting (MTG-701) and develop a final recommended schema structure for the GIS feature class/attributes that list attribute definitions and hierarchies.

Using the final GIS feature class/attribute field tables, the City will implement recommended schema structure modifications. Black & Veatch will provide consultation during implementation to answer questions and discuss implementation issues as they arise.

**Task 702 – Asset Management Policy**

Consultant will develop an Asset Management Policy for the City using an ISO 55001-compliant template. The asset management policy is a short statement that sets out the principles for applying asset management. The policy will be a short document and will include:

- City's mission and obligations
- The principles to be applied to asset management
- A commitment to comply with regulatory requirements
- A commitment to continual improvement

Conduct Workshop 7-1 (and MTG-702, if needed) with City staff to review and further develop the policy. The resulting policy will be delivered to the City for final review and approval.

**Task 703 – Asset Management Framework Outline**

In lieu of a formal gap assessment, conduct a high-level review of existing asset management practices and assist the City in developing a "to-be" Asset Management Framework structure
The framework outline will define the structure for developing a full asset management strategy by the City. Black & Veatch will provide sample documents or draft text to support each of the sections of the framework. Development of the actual framework sections and asset management plans will be the City's responsibility. This task will incorporate asset management principles (including various components from the WWUSMP) into the AM Framework for the City. The AM Framework structure (outline) will include the following sections:

- Preliminary proposed asset management objectives based on common experiences with other clients, including draft levels of service (LOS) and key performance indicators for the City to further develop
- Defining organizational roles, responsibilities, and authorities
- A description of the approach for developing asset management plans that incorporate future demands and the impacts on assets that are risk-based and cover the full asset lifecycle. This will include a review of current asset hierarchy (parent-child relationship between assets). For example, “Pumps” roll up to “Lift Stations” which rolls up to the “Collection System”.
- Criteria for decision making (including capital prioritization) and risk management methodology and processes (including utilizing condition and criticality of assets)
- Business processes covering the asset lifecycle: planning, asset creation, operation, maintenance, corrective and preventative actions, and asset disposal. As part of other tasks, Black & Veatch will support development of maintenance business processes. These will provide an example for the City to use to develop remaining business processes.
- Enablers and controls, such as resource management, training, communication, and document management
- Information management
- Performance management, including evaluation and reporting
- Audit and management review

Conduct up to two (2) full-day workshops (WS-7-2 & WS-7-3) and three (3) meetings (MTG-703, MTG-704, MTG-705) with the City to review the framework structure.

**Task 704 Asset Management Work Processes for Cityworks**

This task would include a review of up to four existing Asset Management (AM) Work Processes which may include the following below. Review for selected “as-is” work processes and development of the “to-be” work processes would be included in this task.

- Water Work Orders – Cityworks
  - Water Reactive Maintenance including water main breaks
  - Water Preventive Maintenance and Inspections
    - Valve exercising, hydrant flow tests, hydrant inspections, new service install, meter change-outs, water shut-offs/turn-ons
City of Rapid City, SD
Wastewater Utility System Master Plan
Update & Model Recalibration
City Project No. 14-2192 (CIP No. 50819)

- Wastewater Work Orders - Cityworks
  - Wastewater Reactive Maintenance including SSO response
  - Wastewater Preventive Maintenance and Inspections
    - Manhole inspections, line cleaning, hot spot cleaning
    - CCTV data collection – WinCan

Consultant will be on-site work with City staff to develop the “as-as” and “to-be” work process flow diagrams. A meeting (MTG-705) with the City to review the “as-as” and “to-be” work process flow diagrams will be conducted.

**Task 705 To-Be Asset Management Work Processes Implementation for Cityworks**

Building from Task 704, this task will include implementation of the selected AM Work Processes with additional on-site implementation support and training services. **The actual scope and fee will be negotiated following Task 704 and will require a separate notice-to-proceed prior to starting work.** This may involve providing oversight services to City staff or assisting in implementation. Possible implementation assistance could include:

- **Assisting the City in finalizing the configuration of Cityworks with WinCan CCTV**
  Assumes NASSCO compliant CCTV inspections to the database version that is supported by Cityworks.

- **Water and Wastewater Asset Data Repository Review and Updates:** At the core of any asset management system is the asset repository. Cityworks, being a GIS-centric application, uses the GIS database (geodatabase) to store all asset records. The review of the Asset Repository and any recommendations will be updated in Cityworks.

- **Water and Wastewater Reporting Requirements:** An understanding of the information that is expected to be reported out of the system is needed. The project team reviews existing reports, documents their requirements, and determines if additional reports that are not already in use are needed.

- **Water and Wastewater Work Order Clean-up and Asset Association:** Work orders not currently associated to an asset will be reviewed and a methodology will be developed to assign an asset to each work order based on the address location. Consultant will provide support to associate assets to work order records using the agreed upon methodology within the specified budget. The City will be responsible for confirming the asset association.

- **Water Main Break Review and Asset Association:** Main break records not currently associated to an asset will be reviewed and a methodology will be developed to assign an asset to each main break record based on the address location. Consultant will provide support to associate assets to main break records using the agreed upon methodology.
within the specified budget. The City will be responsible for confirming the asset association.

- **Cityworks Configuration Design:** Configuration workshop(s) are held to build upon all reviews and requirement gather sessions for water and wastewater groups, focusing on the following topics: service requests, work orders, inspections, assets, materials, equipment, employees and security, custom fields, and user interface modifications. Information obtained during the workshop(s) is used to complete the configuration plan.

- **System Configuration:** Configuration of the Cityworks system is completed using the information outlined in the Cityworks Configuration Plan. Higher priority configuration services will be performed first and completed until the specified budget is exhausted.

- **Reporting:** Reports are created using Crystal Reports, or SQL Server Reporting Services, whichever is preferred. Higher priority reports are created first and completed until the specified budget for reporting is exhausted.

- **Core Team Training:** To tailor the configuration of Cityworks to division-specific requirements and work processes, it will be necessary to involve division staff to make decisions on a variety of functional configurations of the software. In order to ensure that staff are able to make informed decisions, Black & Veatch will provide a one (1) day on-site training session to a core team of personnel on a “vanilla” configuration of the system. This will allow staff to better understand software functionality and configuration options prior to being asked to make decisions on those topics during system configuration design workshops. With training sites installed locally, Cityworks can be accessed at any time by the project team.

- **Cityworks Administrator Training:** Cityworks administration training is provided for designated staff that is responsible for the daily administration of the system. This training occurs at the end of the project to ensure that administrators are able to maintain the system.

- **Report Writing Training:** The goal of this training is to provide report writers knowledge of the Cityworks database structure and where information is stored within the database. Report writers also learn how many of the Cityworks tables are linked to each other.

- **End-User Training:** Three (3) day end-user training is conducted on-site for either all users or using a train-the-trainer approach. Custom training materials are created for the training sessions. These customized training materials are tailored to the client's business processes, data, and Cityworks configuration.

- **Go-Live Support:** On-site go-live support is available to respond quickly to any issues that may arise. This time is also used to work one-on-one with any users that may need additional support after training. Providing the quick resolution to any issues when a new system is put into place increases the level of user acceptance.
TASK 800 – DEFINITION OF POLICIES, PROCESSES, AND PROCEDURES

The intent of this task is to identify policies, processes, and procedures that will be included in the WWUSMP work. For work completed in other tasks, the deliverable is noted in this task. For work not done in other tasks, the description of the required level of effort to achieve the desired deliverable is described. The policies, processes, and procedures will be coordinated with the WUSMP where appropriate including formatting similarities. Documents described in this task will be combined into Definition of Policies, Processes, and Procedures Report that will be separate from the WWUSMP Report.

Task 801 – Master Plan Updates, Amendments, and Revisions

Develop a Master Plan Updates, Amendments, and Revisions TM, as a Process and Procedure (P&P) Memorandum, defining requirements and guidelines to be followed for amending, revising, and updating the WWUSMP. Establish a frequency for updating the WWUSMP and an outline of topics that are required for each major update such as population and employment projections, land use projections, design year designations, etc. Establish procedures for documenting and incorporating smaller scale changes and revisions into the WWUSMP using amendments. Apply the processes and procedures developed in this task to the 2008 Master Plan to establish how that master plan will continue to be utilized following completion of this project. Coordinate this TM with a similar document for the WUSMP.

Review the Master Plan Updates, Amendments, and Revisions TM with the City at MTG-801. Incorporate comments from the City into a Final TM.

Task 802 – GIS and Model Maintenance and Update Procedures

Based on work previously completed in Tasks 200 and 300, but primarily in Task 303, develop a P&P Memorandum (GIS/Hydraulic Model Inventory Update and Maintenance Procedures) that documents procedures to update the GIS database and hydraulic model inventory from GIS data. Conduct MTG-802 to review the P&P Memorandum and identify changes made from the original Task 303 TM.

Task 803 – Wastewater System Surface and Service Line Feature GPS Definition

Based on work previously completed in Task 206 & 1002, develop a P&P Memorandum (Wastewater System Surface Feature GPS Definition) documenting work effort for defining a measured approach to (1) GPS survey for surface feature definition in GIS, and (2) GPS survey for service line data collection. Review the P&P Memorandum at MTG-803.

Task 804 – Project Development Submittal Requirements for Evaluation and GIS/Model Integration

Develop a P&P Memorandum (Project Development Submittal Requirements for Evaluation and GIS/Model Integration) defining submittal requirements for development plans and projects so that initial pipe sizing can be defined, new project information can be efficiently
input/established/documented in GIS (in order to preserve capacity on a first come-first serve basis based on approved plans), and information can be made available for subsequent GIS data extractions and hydraulic model updates. Expand on a similar document from the WUSMP and create a single document for both water and wastewater.

Develop the memorandum to also address submittal requirements that will allow the City to evaluate the infrastructure requirements of a planned development and its impact on existing City facilities. Establish:

- Initial, final, approved, and as-constructed submittal requirements/format including CAD layer standards, GIS attribute data, GPS field data for sewer mains and service lines as-constructed data (pipe invert elevation, pipe stub out locations and invert elevation, manhole locations and rim elevation, etc.) for future one-call locates
- Fee schedules for hydraulic modeling services and GIS data integration
- Hydraulic model scenario management and GIS database management procedures for planned developments in various stages of approval (proposed but not approved; approved but not constructed; construction in progress; construction completed).
- Procedures and submittal requirements to allow the City to evaluate and determine the size/capacity requirements for proposed infrastructure as it pertains to developments and City projects.
- Procedures to incorporate completed projects into GIS and hydraulic model updates for future analyses or one-call utility locates.
- Procedures for having hydraulic modeling completed exclusively by the City versus allowing consultants to conduct modeling evaluations (with either a City owned work station or via distribution of the hydraulic model files directly to consultants).

Review the P&P Memorandum at MTG-804.

Task 805 – Design Criteria Review and Amendments

Review components of the City’s Infrastructure Design Criteria Manual (IDCM) as it relates to the items identified in WS-1-1 – Kickoff Meeting including:

- General review of Section 3 (Water and Wastewater Utilities) for collection system components.
- More detailed review and recommended modifications to Sections 3.12 – Wastewater Collection System, 3.13 – Regional Wastewater Facilities, 3.14 – Alternative Collection Systems, and their associated tables and figures. May need specific updates to Section 3.3.
- General review of Section 1 as it relates to wastewater collection. (This section is primarily updated by the WUSMP).
- Incorporate supplemental criteria for wastewater facilities (Attachment 7, to Section 3.13.).
- Section 3.15 for wastewater (This section is primarily updated by the WUSMP).
- Table 3.3 needs reviewed.
- Figures related to sewer shall be reviewed. In particular, Figure 3.11 needs reviewed.
This review will include special attention to evaluating and recommending improvements to the design criteria for determining whether or not a manhole requires coating for H2S protection.

Develop a Recommended Wastewater Design Criteria TM (with proposed amendments to the IDCM and the wastewater pipe oversizing policy for use in adoption of new/revised City requirements, documents, and ordinances. Review the draft TM at MTG-805. Coordinate this Memorandum with a similar document for the WUSMP.

**Task 806 – Review of Potential Wastewater System Base Map Accessibility Approaches and Systems**

Review potential GIS based systems and approaches for accessing high-resolution mapping of collection system infrastructure in the field using electronic accessibility systems, hardware devices, and software.

806.1 Needs and Existing Process Assessment. Wastewater already uses tablets in the field. The scope of this work will be limited to interviewing City staff, in MTG-806, to understand existing methods and establish additional desired functionality. Information collected for Task 205 will be included in the assessment.

806.2 Strategy Development. Based on current activities and operations, develop alternative strategies and approaches for improving handling and modifying GIS based collection system base maps during system operation and maintenance including processes for updating the GIS data when an error is found in the data. Consider hardware/software alternatives and electronic accessibility alternatives.

806.3 Collection System Base Map Accessibility Approaches and Systems TM and MTG-807. Document alternative strategies and approaches in the Collection System Base Map Accessibility Approaches and Systems TM. At MTG-807 discuss the TM with the City and develop a preferred approach.

806.4 Implementation Assistance. Implementation of a GIS based collection system base mapping for use in the field will be completed by the City. Provide up to 40 hours of implementation assistance to City staff during the implementation period.

**Task 807 – Review of Existing and Future IT Hardware Requirements for Hydraulic Modeling and GIS Functions in Public Works and Utility Maintenance**

In MTG-808, conduct a review and evaluation of IT hardware requirements for City staff in Public Works who will be involved with activities relating to future hydraulic model and GIS updates, ongoing, routine hydraulic modeling tasks, and graphics/mapping development related to the wastewater utility system. Recommend preferred hardware devices and other related equipment for efficient functionality.

Conduct a review and evaluation of IT hardware requirements for City staff in Utility Maintenance for retrieval of GIS data and for data transfer of GPS survey information into GIS from the Utility
Maintenance location. It is our understanding that Utility Maintenance already has access to the GIS data so the emphasis is for GPS survey information transferring into the GIS. Recommend preferred hardware devices and other related equipment for efficient functionality.

Included in the review and evaluations is a meeting (MTG-809) with City IT staff to understand the City’s equipment to determine if compatibility issues may arise. Summarize IT hardware recommendations in a summary TM (IT Hardware Recommendations for Public Works and Utility Maintenance related to hydraulic modeling and GIS data retrieval).

**Task 808 – Asset Management Policy, Framework, and Work Processes**

Documentation of work previously completed in Task 700 will be included in the PPP report.

**Task 809 – Septic Conversion Framework Evaluation and Implementation**

The following are the key objectives for the Septic Conversion Study:

- Review the existing policies & practices on utility service provision, land development, septic conversion, and annexation of service area;
- Document the financial, operational, infrastructure, and administration impact of the existing and proposed policies and practices;
- Define and develop a consensus on the strategic goals and objectives related to utility service provision, land development, annexation and septic conversion;
- Based on the strategic goals and objectives develop two alternative policy/practice framework;
- Evaluate the pros and cons of the two alternative policy/practice frameworks, in terms of financial, operational, infrastructure, and administrative implications;
- Evaluate and forecast the schedule of septic conversions and the associated capital costs for the existing and the two alternative policy/practice frameworks; and
- Develop a funding strategy to recover both the capital costs and ongoing operations & maintenance costs of the Septic Conversion program for each of the two alternative policy/practice framework.

**809.1 Conceptual Framework of a Septic Conversion Program.** This phase involves performing an evaluation of existing policies and practices, defining strategic goals and objectives, and defining alternative the policy/practice framework to help achieve the defined strategic goals and objectives.

**809.1a Existing Policy/Practice Review.** The purpose of this task is to both understand and document key existing policies/practices associated with the following:

- Sewer utility service provision;
- Source water protection;
- Land use development within proximity to the City;
- Annexation of service area; and
- Septic conversion initiatives.
Black & Veatch will gather available documentation on policies, regulations, any practice manuals to review and understand the existing policies and practices specific to the areas referenced above.

**Workshop 8-1- Existing Septic Policies.** Black & Veatch will conduct a workshop with the City to further gather insights into the strengths and issues associated with existing policies/practices, and document the key pros and cons of the existing policies and procedures. Black & Veatch will facilitate discussions to clearly develop a consensus on the City’s strategic goals and measurable objectives pertaining to the provision of sewer services and source water protection. Black & Veatch recommends that a City task force of five or six key representatives (representing appropriate departments) be formed.

**Deliverable:** Existing Policies, Strategic Goals and Objectives Related to Source Water Protection TM.

**809.1b Evaluate Alternative Policy Frameworks.** The purpose of this task is to develop alternative policy/practice frameworks that can help the City achieve the strategic goals and objectives that are defined in Task 809.1a.

**Workshop 8-2-2 Define Source Water Protection Approaches.** Black & Veatch will conduct a second workshop with the City task force to define two potential alternative approaches to address source water protection, land use development, sewer service provision, annexation of service area, and related aspects. The pros and cons for each of the two alternative approaches will be defined and documented. Consistent with the evaluation of the existing policy/practices, the alternative frameworks will also be analyzed in terms of financial, operational, infrastructure, and administration aspects, to the extent practical.

**Deliverable:** Source Water Protection Policy/Practice Framework Alternatives TM.

**809.1c Research on Septic Conversion Programs.** Black & Veatch will perform research on six peer communities from the States of Nebraska, Colorado, Montana, and South Dakota that may have septic conversion programs. Based on this research, fact sheets will be prepared for each agency. The fact sheets will include information, to the extent available, on the following aspects:

- Goals and objectives of the Septic Conversion Program;
- General information on the entities including number of septic systems, area geography including typical lot sizes, topography, proximity to source water, etc;
- Capital and operations program costs and the funding mechanism;
- Septic user fee and other applicable fee structure and schedules; and
- Program policies, ordinances, and administration

**809.1d Evaluation of Septic Conversion Capital and Operations Costs.** Black & Veatch will develop a forecast of the capital expenditures that would be necessary to support the septic conversion program, for the existing and each of the two alternative policy frameworks. Existing reports and available data will be leverage in performing this task. The key subtasks will include:
City of Rapid City, SD  
Wastewater Utility System Master Plan  
Update & Model Recalibration  
City Project No. 14-2192 (CIP No. 50819)

- Review available data on the geographic spread of the septic systems, and the priority and timing of conversion that may be critical to protect source water;
- Evaluate available capital project cost data from the four or five pilot projects that the City has already performed, and the funding mechanism used for those projects;
- Determine a 10-year CIP schedule and the associated capital costs for the Program;
- Evaluate impact on any potential annual personnel and non-personnel costs needed to support program administration, O&M, customer engagement and other pertinent functions; and
- Develop a 10-year cash flow of total Program Revenue Requirements.

809.1e Evaluation of a Funding Framework. Based on the research findings in Tasks 809.1c and d, and the City's experience with the pilot program, Black & Veatch will evaluate and develop a funding strategy. Key subtasks include:

- Identify the potential list of funding options including septic impact fees, user benefit assessment fees; developer contribution, grants, any feasible low interest loan and bond financing options. Existing funding mechanisms the City has such as septic impact fees and grants will be reviewed as part of the funding options evaluation.
- Evaluate the pros and cons of each funding source and a high level estimate of the magnitude of cost recovery from each option;
- Based on the evaluation of various funding mechanism options, develop a funding strategy that is defensible, aligns with industry accepted principles and State and local legislative statutes and regulations.
- For each fee-based component of the funding framework, define a potential defensible fee methodology.
- Provide Recommendation and Policy

Deliverable: Source Water Protection Policy/Practice Framework Alternatives TM.

809.1f Stakeholder Engagement. A broader stakeholder engagement will be critical to fully determine the implications of alternative policy frameworks including coordination and collaboration that may be necessary with other adjoining cities, counties, sanitation districts and relevant State agencies. BLACK & VEATCH will assist the City in conducting one stakeholder engagement workshop (WS-8-3) to share information and solicit input on the City's strategic goals and objectives, and the alternate frameworks that are developed in Tasks 809.1a and b.

809.2 Development and Implementation of the Program. This phase involves the development of the fees, ordinances and policies, program business process, and the development of Key Performance Indicators (KPI) and targets. In addition, an implementation plan to launch and sustain the Program will be developed. The actual scope and fee will be negotiated following Task 809.1 and will require a separate notice-to-proceed prior to starting work.
809.2a Determine Fees for the Fee-Based Funding Components. If fee-based funding component such as septic impact fee and/or user benefit assessment fee are defined as part of the funding framework, then Black & Veatch will develop the fee criteria and the schedules per the methodology that is defined in Phase 1 for these fees. Black & Veatch will review the draft fee schedules and the methodology with the City team and deliver the final schedules.

809.2b Finalize Program Policies and Ordinances. In this task, the Black & Veatch will collaborate with the City task force to finalize the policies and ordinances that are needed to continue any existing aspects of the Program and launch any new aspects of the Program.

809.2c Business Process. The team will assist with Workshop WS-4 with the City task force to define the business processes and procedures that would be needed to fully implement the Program Framework that is selected in Phase 1. The business process will be developed as workflow maps.

809.2d Program Key Performance Indicators. To assure effective alignment of the Program activities with the Strategic Program Objectives, it is prudent to define KPIs for the Program. Performance indicators could include metrics such as average capital cost per conversion, percent of conversions completed against target, and other indicators that would be appropriate to measure the efficiency and effectiveness of the Program. Black & Veatch will assist the City in defining the KPIs, the data sources and the calculation approach for each KPI. If desired, a tool to track the KPIs will be developed as an additional scope.

809.2e Implementation Plan and Timeline. On completion of Tasks 2a through 2d in this Phase, Black & Veatch will develop an Implementation checklist along with a timeline to document the remaining specific tasks that the City would have to perform to launch the Program. Such tasks could include staffing acquisition and training; public outreach; memorandum of understanding (MOU) that may need to be established with other governmental entities and/or business partners; and applications for any potential grants/loans for the Program. Black & Veatch will review the draft implementation checklist and timeline with the City team and deliver the final checklist and timeline.

**TASK 900 – CAPITAL IMPROVEMENT PLAN AND WWUSMP REPORT**

**Task 901 – Recommended CIP**

Compile and document the recommended CIP based on efforts completed in previous tasks for the following project categories:

- Collection system capacity improvements
- Growth based improvements
- Facility replacement program
- Manhole and pipeline replacement programs
- Septic conversion
Task 901.1 – Develop CIP and Recommended CIP Chapter

Using CIP data provided by the City for Streets and Storm Sewers and the under development Water CIP plan overlay the layers with the Sewer layer developed for this project. Use the overlaid data to make adjustments as needed to the following short term CIP project staging tasks.

Stage capacity and growth based improvements for the short, medium, and long-term design years, and in one-year increments through first 10-year period.

Stage facility replacement projects into the CIP such that their replacement is completed prior to the expiration of their remaining useful life.

Stage pipeline rehabilitation and replacement CIP projects in one-year increments through the first 10-year period (2016 – 2025) based on a replacing the highest priority pipelines first with available budget established for the replacement program. The manhole and pipeline replacement CIP for subsequent years will be established in 5-year periods (2025 – 2045) to demonstrate 5-year funding requirements for the mid-term replacement program and in 10-year periods (2055-2115) for the long-term replacement program. For each identified phase Black & Veatch will prepare two preliminary CIP budgets including (1) Improvements staged into the CIP when needed without consideration for funding constraints, and (2) Improvements staged into the CIP only when they become absolute necessity for system operation.

Organize recommended CIP projects by collection system basin. Document the recommended CIP in the Recommended CIP Chapter along with maps, figures, tables, and graphics.

Task 901.2 – Incorporate Rate Study Consultant Results

The City’s Rate Study Consultant will evaluate potential rate increases necessary to support both preliminary CIP budgets. Following this evaluation, the Rate Study Consultant will propose a final CIP funding level that can be supported by a proposed rate increase. Using this final CIP funding level, Black & Veatch will develop a final CIP.

Task 902 – Workshop 9-1 – Recommended CIP Review

Conduct workshop to review the recommended CIP. This workshop will also include discussions to determine preferred approach for sizing and phasing of mid-term and long-term improvements.

Task 903 – Draft Reports

903.1 Based on TMs and chapters developed in previous tasks prepare and submit a Draft WWUSMP report focusing on the technical aspects of the collection system planning effort and summarizing the project efforts and recommendations including:

- GPS field survey for GIS surface feature definition.
- Historical and future wastewater demands.
- Level of growth in each basin.
- Hydraulic model update and calibration.
• Existing system deficiencies.
• Short, medium, and long-term hydraulic analyses.
• Alternatives analyses.
• Facility criticality ratings and replacement plan.
• Manhole and pipeline criticality ratings and replacement plan.
• Phased Capital Improvements Plan including Improvement, Growth, and Replacement Projects.
• Define how various chapters and sections of the 2008 Master Plan will continue to be utilized following completion of this project by identifying portions of that report that are to be replaced, left unchanged, or modified by work completed during this project. The City’s goal is to have the WWUSMP be a stand-alone document, so any portions of the 2008 Master Plan Report that are not changed or superseded by this project may be incorporated into the WWUSMP as appendices.
• Coordinate the report with the WUSMP so that both reports provide similar structure and level of detail, where applicable.

Perform all Black & Veatch internal QA/QC reviews on the Draft WWUSMP Report and update the report accordingly.

903.2 In a separate document, prepare and submit a Draft Definition of Policies, Processes, and Procedures (PPP) Report focusing on outcomes of Task 800.

Generally, the PPP Report compiles TMs and standard operating procedures prepared during previous tasks into a separate document.
Perform all Black & Veatch internal QA/QC reviews on the Draft PPP Report and update the report accordingly.

903.3 Submit drafts of both report documents to the City for review and comment. Include with the submittals electronic copies of all documents, spreadsheets, maps and figures needed to support the report documents.

City will provide written review comments within the time frame defined in the City Review Framework Table.

Black & Veatch will review City’s comments for both draft reports and develop questions to discuss at Workshop 9-2.

Task 904 – Workshop 9-2 - Draft Reports Review

Conduct workshop to review the draft Master WWUSMP and the Draft Definitions of PPP Report. This workshop will include discussions on the City’s comments and any questions Black & Veatch has about the City’s comments.
Task 905 – Draft Final Reports

Prepare a Draft Final WWUSMP and PPP Report incorporating revisions agreed to with the City in WS-9-2.

Perform all Black & Veatch internal QA/QC as necessary on the report documents. Submit draft finals of both report documents to the City for review and comment.

City will provide written review comments within the time frame defined in the City Review Framework Table.

Task 907 – Final Reports and Deliverables

907.1 Prepare the Final WWUSMP with changes agreed to with the City, and submit the final report.

907.2 Prepare the Final PPP Report with changes agreed to with the City, and submit the final report.

907.3 Revise all supporting files and documentation as necessary and deliver final products including:

- Final versions of all GIS databases and MXD files updated and developed for the project deliverables.
- Final wastewater collection system hydraulic models
- Final version PDF and Word documents:
  - TMs/Other agreed upon question and answer documentation.
  - P & P Memorandums
  - Reports
  - Meeting/workshop agendas and minutes
- Final version spreadsheets:
  - Rainfall and Flow Analysis
  - Hydraulic model loading and calibration tools
  - Lift station and force main analysis tool
- Any other final electronic documentation of the project including previously electronically submitted files.

TASK 1000 – ADDITIONAL SERVICES AND SUPPORT FOR THE WUSMP

Task 1001 – Bulk Customer Meetings

Coordinate with the City to compile a list of existing and potential future wholesale/bulk water use customers and wastewater generator customers for inclusion into future water load demands and wastewater dry weather flow projections.

Through contact with the South Dakota Department on Environment and Natural Resources (DENR), the City has identified a listing of 140 public drinking water systems within the current
MPO boundary. Access information on the DENR website (System Information Report, Drinking Water Report, water quality information, etc.) for each of the 140 systems and compile relevant information including population served, annual water volume supplied, number of water system connections, and source of drinking water.

Review the system listing and DENR information with City staff to confirm which of the 140 systems are candidates to schedule and conduct up to 25 supplemental in-person interviews for gathering information related to the size and configuration of water and wastewater systems, anticipated future growth patterns, and the potential to integrate water and/or wastewater service with the City’s utilities in the future. Interviews will be documented in an interview questionnaire developed jointly between the City and Black & Veatch. An initial listing of 21 candidate systems is presented in the following table. For purposes of establishing level of effort, 4 additional interviews of candidate systems will be conducted at the City’s request if identified (total 25 interviews).

For the balance of the 115 public water systems (140 less 25 entities interviewed), use the information compiled from the DENR website to determine with City input if additional questionnaires should be sent to systems of interest. This task activity provides an allowance to submit the questionnaire to an additional 25 entities identified by the City and/or Black & Veatch to warrant additional information gathering.

The task activities described above are summarized as follows:

- Access and compile relevant water system information from DENR for 140 public water systems.
- Distribute water/wastewater system questionnaire and conduct interviews with 25 entities of primary interest to the City
- Distribute water/wastewater system questionnaire (without subsequent interviews) to an additional 25 entities if warranted to gather additional information at the City’s direction.

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<th>Northern Tier Systems</th>
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<tr>
<td>Indian Hills Sanitary District</td>
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<td>Hermosa</td>
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<tr>
<td>Woodland Hills Sanitary District</td>
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<tr>
<td>Weston Heights Sanitary District / Road District</td>
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System information will be subsequently utilized during the development of future water demand projections (WUSMP) and wastewater dry weather flow projections (WWUSMP) if the systems are deemed potential candidates for integration with the City’s utilities in the future.

Develop a Bulk Customer Meeting TM to summarize the meetings held and the results of the meetings.

Task 1002 – Development of Card Files from GPS Survey of Water Service Lines

Other scope tasks provide for GPS surveys of a limited number of water and wastewater service lines. This task provides for development of a workflow process and demonstration of that process that utilizes the GPS survey data to automatically develop Card Files for each service line (including both water and wastewater services). The intent is that future service lines be represented in the GIS database in the same way water and sewer mains currently are, and that Card Files can be used for service line locates. Black & Veatch will:

- Meet with City Utility Maintenance staff to review and document the existing process of service line Card File creation, archiving, and utilization by the City.
- Develop a new automated workflow process for Card File creation using GPS survey collected data. The workflow process will account for a multi-step permitting process that takes place incrementally over extended periods of time between multiple City stakeholders reflective of how service lines are installed.
- Define the data linkage and transfer between GPS survey collected data, the City’s CMMS system (CityWorks), and the City’s GIS database.
- Demonstrate the Card File creation and workflow process on the service lines surveyed during the GPS field surveys. The City’s vision for this process is for service lines to be shown in GIS, and the card file information stored in a manner that is accessible using GIS as well as being retrievable for One-Call utility locates.

This task does not currently include any effort or cost related to procurement of 3rd party software development costs for automatic generation of card files such as the parcel report feature used with the online Rapid Map Viewer. The City will be required to procure supplemental software coding services to allow handling and viewing of card file drawings.
Task 1003 – Water GIS Database Schema Review

Several tasks under the City’s WUSMP required input from Black & Veatch on GIS database fields needed for the hydraulic model update, for storing historical main break data, and for collection of GPS field survey data. During development of those tasks, the City identified an additional need to conduct a review of the existing water geodatabase schema structure and provide recommendations for modifications to GIS feature classes and related attribute fields. Work completed under the WUSMP included the development of GIS feature class/attribute tables that identified Part 1 and Part 2 geodatabase changes. The Part 1 changes were completed to allow subsequent tasks to progress. The Part 2 changes identified existing attribute fields that will be included in this schema review task.

Using the Water GIS feature class/attribute tables developed previously, conduct a review of the Water geodatabase schema structure for the following feature classes:

- Pressurized Water Mains
- System Valves
- Control Valves
- Service Lines
- Meters
- Service Points
- Fire Hydrants
- Fittings
- Cathodic Protection

The review of the GIS feature class attribute fields will include (1) a discussion of what the existing fields provide and how they should be used moving forward (or a recommendation to delete the field); and (2) identification of additional fields that should be considered and their use moving forward. Document the Water GIS database schema review in the GIS feature class/attribute tables created during the WUSMP.

Following review of the tables by the City, conduct a review meeting and collaboratively develop a final recommended schema structure for the Part 2 GIS feature class/attributes that list attribute definitions and hierarchies.

Using the final GIS feature class/attribute field tables, the City will implement recommended schema structure modifications. Black & Veatch will provide consultation during implementation to answer questions and discuss implementation issues as they arise.

Task 1004 – Reconciliation of GPS Survey Data with Existing GIS Data

Effort being completed under the WUSMP is gathering and compiling water system feature data under two different tasks. The first effort has assigned surface elevation data within GIS to various water system features (water feature junctions, control valves, enclosed storage facilities, fittings, hydrants, meters, service point, and system valve) based on an elevation assignment process using
Contours from the 2015, 5ft resolution LiDAR composite DEM City survey data. X,Y location data for these features already exists and is based on non-survey information (as-built drawings, aerial photos, etc). The second effort is collecting survey grade surface elevation and X,Y coordinates of water system features in the Terracita and Pinedale pressure zones via GPS surveying.

Under this task, develop a standard procedure for reconciling and utilizing the two different sets of location data into a single X, Y, Z dataset for the feature in GIS:

- Should two elevation fields be maintained in GIS? Or should the survey grade elevation be used to replace the elevation assigned from the LiDAR contours once the survey elevation is collected?
- What is the process for bringing GPS survey X, Y, Z location data into GIS?
- Considering that GPS survey of system features will be completed incrementally over a number of years, should the GPS survey-to-GIS database import also be completed incrementally? Or should the import be completed only after the entire system has been GPS surveyed? How is this process integrated with viewing data in the City's Rapid Map system?
- What GIS attribute fields are needed to properly identify the source of information (survey, as-builts, aerial photo, etc)?
- How will the hydraulic model development via GIS gateway extraction handle elevation and location data from GIS?

Document a proposed standard procedure in a draft TM and submit to the City for review. After incorporating City comments, prepare a draft-final TM for the standard procedure.

Using the draft-final TM, execute the GIS survey data reconciliation using the GPS survey data obtained from the Terracita and Pinedale Zones. This may include movement/re-alignment of water mains currently in GIS to new locations that are confirmed from GPS survey data. This may also include re-connection of modified piping in the Terracita and Pinedale Zones to adjacent zone piping at zone boundaries. New water main locations will be based on a review of existing mapping, as-built drawings, dimensions from water service cards, and other institutional knowledge to adjust the layout of the subsurface features to a most logical position.

Following completion of the GIS survey data reconciliation for the two zones, modify the draft-final TM and prepare a final TM for use by the City moving forward as additional pressure zone surveys are conducted.

Task 1005 – General Valve Box Condition Assessment Acquisition

As part of the GPS survey effort on the WUSMP, location and elevation data will be obtained for each visible valve box in the Terracita and Pinedale pressure zones. This task adds acquisition of general conditions of the valve boxes when they are accessible.
After the GPS survey location data is collected for main line isolation valves and hydrant auxiliary valves (curb stop valve boxes are not included), remove the valve box lid and lamp the valve box with a flashlight noting any general observations. Note the condition as (1) fully functional, (2) degraded conditions (see comment); (3) maintenance needed (see comment). For conditions (2) and (3) enter a descriptive text comment into the comment field. Depth to nut measurements will not be taken.

**Task 1006 – Infrastructure Design Criteria Manual Update – Section 1**

Effort being completed under the WUSMP is reviewing and updating Section 3 of the IDCM for water system components. This task provides for a supplemental review of Section 1 as it relates to the water distribution system. This supplemental review will be integrated with the Section 3 review and update into the same TM.

**Task 1008 – Revision of Future Population and Employment Distribution and Establishment of Service Boundary Guidelines**

Under the WUSMP effort, the City establishes projections for population and employment through the Year 2115. The City also provides the distribution of population and employment projections within the current Metropolitan Planning Organization (MPO) boundary using TAZs. Black & Veatch then develops a water infrastructure CIP to deliver water to the population and employment centers projected by the City.

This task provides for a supplemental review and revision of the population and employment distribution within the MPO. Using the TAZ area distributions, Black & Veatch and City staff will collaboratively identify areas where it may not be in the City's best interest to provide service either due to very low density population, extended geographic location, or "leap frog" growth that is not adjacent to the City's existing service boundary.

Following identification of questionable service area TAZs, meet with City Planning staff to discuss possible redistribution of population and employment within these areas to other TAZs.

Following this redistribution step, Black & Veatch and City staff will collaboratively develop service area boundaries for use in the WUSMP and general descriptive criteria that define service responsibilities within these boundaries such as:

- Urban service boundary where potable water and fire protection are supplied, and wastewater is collected by the City.
- Rural service boundary where only domestic potable water is supplied.
- Areas where no water supply or wastewater collection is provided.
- Revision and/or redefinition of the current Tier 1 and Tier 2 boundaries.

In support of developing and adjusting service area boundaries, this task provides for identification and exclusion of land areas within TAZs that are deemed to be undevelopable such as large
parklands, floodways and floodplains, airport and airport buffer, national forest land, U.S. Federal Government land, and land with excessive vertical relief. The resulting developable land area along with population/employment projections will then be processed to determine TAZ density (population per acre and employment per acre) for each TAZ. Density information will then be used as a basis for modification (either expansion or contraction) of service area boundaries for the master planning years of 2045 and 2115.

In support of defining service responsibilities within as well as outside of the defined service area boundaries, work collaboratively with the City to develop and document an inter-governmental agreement (IGA) framework/process that can be used by the City to approach other governmental agencies regarding jurisdiction, responsibility, and criteria for platting, design, construction, and operation of utility services in near proximity but outside of the City’s jurisdiction. Task activities for this item include (1) a preliminary planning meeting with City staff to understand the extent of current issues experienced by the City regarding development outside its jurisdictional boundaries, and (2) development of a draft IGA framework/process and documents for the City to begin outreach and communication with City management and other governmental agencies.

Document the population and employment redistribution, proposed service area boundaries, and service criteria in the Future Population/Employment Distribution and Service Area Boundary Guidelines TM.

**Task 1009 – Alternative CIP Development**

Under the WUSMP, CIP budgets are developed for improvement in Phase D (Existing System Hydraulic Analyses), Phase E (Water Facility Assessments), and Phase F (Pipeline Replacement Planning). This supplemental task provides for development of alternate CIP budgets in collaboration with the Rate Study Project. For each identified phase Black & Veatch will prepare two preliminary CIP budgets including (1) Improvements staged into the CIP when needed without consideration for funding constraints, and (2) Improvements staged into the CIP only when they become absolute necessity for system operation.

The City’s Rate Study Consultant will evaluate potential rate increases necessary to support both preliminary CIP budgets. Following this evaluation, the Rate Study Consultant will propose a final CIP funding level that can be supported by a proposed rate increase. Using this final CIP funding level, Black & Veatch will develop a final CIP for Phases D, E, and F.

Phase C (Hydraulic Modeling Analyses and Improvement Planning) of the WUSMP is focused more on planning long-term growth and operational improvements for the City’s service area. As such, Phase C will not be required to develop the three alternate CIP budgets described in this task.
TASK 1100 – TRAINING AND CONTINUING SERVICES SUPPORT

Task 1101 – Training

The City has previously committed staff for maintaining and providing GIS and hydraulic modeling services. Through the model update and recalibration process, inform and train City staff in model structure, construction, scenario management, use of the model, and database interface. This task arranges for on the job training as the work progresses so that City staff is fully involved in the modeling efforts and process as they occur. The following training tasks are planned:

1101.1 Weekly Review and Training Sessions. The concept is to conduct review and training sessions with City staff to share experience and demonstrate modeling tasks/activities as they are completed during the project. Conduct the review and training sessions via internet video and audio sharing. Hands-On modeling practice by City staff during the sessions will be encouraged. Conduct review and training sessions on a bi-weekly basis, during appropriate modeling tasks, with the session schedules adjusted to integrate with but not overlapping workshops, other project meetings, and water training. It is anticipated the review and training sessions will last 2 hours each for a total of 8 review and training sessions.

1101.2 On site Review and Training Sessions. Conduct on site review and training sessions with the City as an extension of Workshops planned during progression of the work. This training task includes four (4) days, 8 hours for each day, of Black & Veatch’s onsite time in Rapid City spread over four (4) separate trips to coincide with project meetings or workshops either the day before or the day after the meetings or workshops.

Black & Veatch will provide a training agenda at least 7 working days prior to each training session for City review and comment. The City will provide feedback within 2 working days to allow adequate time for Black & Veatch to finalize training planning and materials.

Training for the wastewater modeling, is not scoped to include model calibration. Final training session topics will be finalized with the City, but could include:

- Model update procedures
- Scenario management and datasets
- Model maintenance procedures

1101.3 Service connection GPS Survey and Line Card Development. Conduct training with the City’s Utility Maintenance staff to establish procedures for obtaining GPS data on wastewater service lines as described in Task 206 including GPS survey logistics and activities and development of line cards from the collected data. This includes work flow training with City staff.

1101.4 GPS Survey Data Reconciliation with Existing GIS Data Training. Task 1004 provides for reconciliation of field collected GPS survey grade data with existing GIS database data for water system features in the Terracita and Pinedale pressure zone. It is the intent that the City will conduct the data reconciliation activities for the remaining pressure zones at a
later date. Under this task Consultant will provide training and guidance to City staff for completing future pressure zones.

**1101. 5 Additional Training.** The concept is to retain budget to provide additional training for City staff. This could include additional on-line training sessions, in person training, City Staff training at Black & Veatch offices, or group training. The format, duration, and content of this training to be determined later and authorized by a separate notice-to-proceed.

**Task 1102 – Continuing On-Call Modeling Support Services**

Provide on-call, as-needed services for a 2-year period following completion of project tasks. On-call modeling support services are intended to provide additional training, operational analyses, and troubleshooting of model functionality where Black & Veatch will act as an extension of City staff to provide specialized expertise or additional resource capability to accomplish tasks.

All on-call modeling support services will be authorized by task orders issued by the City. **No work for on-call modeling services will be performed until the Task Order is final and approved by the City and Black & Veatch.** Task orders will be developed to include:

- A detailed statement of work to be performed
- The format and content of any deliverables which may be required
- A performance time schedule indicating when tasks are to be completed and/or deliverables submitted
- Estimates of hours and costs required to perform the statement of work along with upper cost limits not to be exceeded.

Following the completion of the 2-year period, the City and Black & Veatch can renew the on-call modeling support services annually.

**TASK 1200 – ASSET REGISTRY DEVELOPMENT FOR WATER AND WASTEWATER FACILITIES**

**Task 1201 – Current Process Understanding and Data Gathering**

Consultant will hold workshops with the appropriate City staff to (1) gain an understanding of the current asset hierarchy and asset naming convention used by the Finance group and Wastewater Division; (2) gain an understanding of current asset and maintenance tracking to support development of an asset registry for vertical water and wastewater facilities including: pump stations, wells, pressure reducing valve, air release valves, pressure sustaining valves, reservoirs (both spheroid and ground), water meter facilities, lift stations, siphons, odor control stations, air release valves, and flow meters, exclusive of the treatment plants; and (3) gain an understanding of current asset and maintenance tracking being developed by staff for the Water Reclamation Facility. The on-site workshops will take place in one day and include a staff kick-off/review meeting and individual meetings with City staff to understand each of the various software systems in use.
The following systems will be reviewed to understand the system specific asset ID numbering configuration and connection points for current and/or future data sharing: Tyler Technologies (MUNIS), ESRI’s ArcGIS, Cityworks, and SCADA (data historian/warehouse).

To support development of the asset registry, two key decisions will need to be agreed upon and finalized by the City:

- the lowest level of equipment (asset versus component to an asset) that will be included in the asset registry for water and wastewater facilities.
- the system of record (i.e. Tyler, Cityworks) that will be used for the water and wastewater facilities assets are: Tyler for the vertical assets and Cityworks for the horizontal assets.

**Task 1202 – Hierarchy Structure and Asset Naming Convention Development for Wastewater Facilities**

Based on the findings from Task 1201 and in conjunction with Task 1203, Consultant will develop a hierarchy structure for wastewater facilities that will align with the current asset hierarchy structure in place for wastewater treatment plants. When developing the hierarchy structure, the roll-up of assets used for operation and maintenance, risk analysis, or condition assessments will be considered.

An asset naming convention will be developed based on the defined hierarchy structure for the wastewater facilities. As part of the asset naming convention and hierarchy development effort, a list of locations (geographical codes), functions (equipment groups), and asset types/classes (class codes) will be developed. It is anticipated that the City will provide exports of current lists of locations, functions, and asset types/classes to use as a starting point. The City will provide the current asset registry list created for the Water Reclamation Facility to be used as a guideline. When developing the naming convention character length, revisions to the asset ID for replacing, abandoning, or removing an asset will be considered. Consultant will provide suggested attributes to be maintained for the various asset types/classes identified for the water and wastewater facilities. It is anticipated that the City would update the GIS schema as needed to accommodate the additional data fields to store the attribute information for the water and wastewater facility assets.

**Task 1203 – Asset Registry Development for Selected Wastewater Facilities**

The City has selected the following facilities for the development of asset registries (1) Elk Vale Lift Station, (2) St. Patrick Street Odor Control Station, (3) St. Patrick Street Siphon, (4) Air Release Valve on the Elk Vale Force Main, (5) Rapid Canyon Sanitary District Flow Meter. Assets included in the registry will be based on the agreed upon equipment level defined in Task 1201.

Task 500 includes a review of wastewater facility information and a compilation of an inventory list. Facility components identified in that task, along with available sources of asset lists from existing systems (Tyler Technologies (MUNIS), Cityworks, SCADA tags), as-built plans, and condition assessments will be used to develop an initial list of assets for the selected wastewater facilities. During the Facility Site Tours (Task 505), the consultant will conduct a walk-through of the selected wastewater facilities to identify and document the assets. When possible, Consultant will document additional attribute data (name plate data) that is visible.
Using the available asset lists from the various systems, Consultant will make a best effort to relate assets listed in the multiple systems to provide a reference between the asset IDs in each system. Consultant will develop an asset list in an Excel spreadsheet format or ArcGIS compatible format that includes the following data for each asset: hierarchy levels, original asset IDs (as applicable), new asset ID, short description, location (geographical codes), function (equipment groups), asset type/class (class codes), and attribute data (if collected).

**Task 1204 – Hierarchy Structure and Asset Registry Development for Water Facilities**

Following the hierarchy structure developed for wastewater lift stations in Task 1202, Consultant will develop a similar hierarchy structure and asset naming convention for water facilities. The City has selected the following facilities for the development of asset registries (1) North Rapid Booster Station, (2) Well 9 at Meadowbrook Golf Course, (3) Enchantment No. 1 Pressure Reducing Valve, (4) Enchantment No. 1 Air Release Valve, (5) Enchantment No. 2 Pressure Sustaining Valve, (6) Red Rock Reservoir, (7) Northridge Spheroid, and (8) Ellsworth Master Water Meter Facility. Assets included in the registry will be based on the agreed upon equipment level defined in Task 1201. The same steps described in Tasks 1202 and 1203 will be followed to develop the asset registry for the selected water facilities.

**Task 1205 – Technical Memorandum and Training Workshop**

Consultant will prepare and submit a technical memorandum that summarizes the recommended hierarchy structure for water and wastewater facilities, asset naming convention, suggested attributes to be maintained, and process used to develop the asset registries. An Excel spreadsheet or ArcGIS compatible format will be submitted with the technical memorandum with a list of assets and associated information for the selected water and wastewater facilities.

Consultant will conduct a workshop to review the selected water and wastewater facility asset registry and provide training to City staff on the hierarchy structure, asset naming convention, and asset identification to advance development at other water and wastewater facilities.

It is anticipated that the City will make all updates/revisions needed in the systems used (Tyler Technologies, ESRI’s ArcGIS, Cityworks, and SCADA tags, as applicable) based on the asset data provided. Consultant can participate in discussions of possible interfaces/data sharing opportunities between the various systems; however, the City will be responsible to perform any interface needs. It is anticipated that the City would perform all efforts to update and relate existing records to new asset records. The City will enter all data into Tyler. B&V will provide data in a format compatible with what the City has already used within Tyler. Except for those facilities identified within this scope that the Consultant will complete.
### Exhibit B
Rapid City, South Dakota
Wastewater Utility System Master Plan Update and Model Recalibration
Fee Estimate Summary

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**TOTALS** | **$ 1,042,893** | **$ 81,371** | **$ 180,638** | **$ 81,310** | **$ 1,386,212** |
### Project Team Members - Black & Veatch

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### Project Team Members - FMG Engineering

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
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<tr>
<td>Allen Foster</td>
<td>Technical Advisor</td>
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<td>$176</td>
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<td>Jason Pettyjohn</td>
<td>Civil Engineer - Senior</td>
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<td>$131</td>
<td>$123</td>
<td>$127</td>
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<tr>
<td>Variable</td>
<td>Civil Engineer - Mid</td>
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<td>$111</td>
<td>$115</td>
<td>$118</td>
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<tr>
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<td>Civil Engineer - Junior</td>
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<td>$96</td>
<td>$99</td>
<td>$102</td>
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<td>CAD Technician</td>
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<td>$97</td>
<td>$100</td>
<td>$103</td>
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<td>GIS Specialist</td>
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<td>$100</td>
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<td>GPS Survey Lead</td>
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<td>$97</td>
<td>$100</td>
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<tr>
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<td>Survey Crew</td>
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<td>$74</td>
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<td>Project Support Admin</td>
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### Project Expenses

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<th>Expense</th>
<th>Rate</th>
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<tr>
<td>Direct Project Expenses</td>
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<tr>
<td>Engineer's Subconsultants</td>
<td>At-Cost; No Markup</td>
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<tr>
<td>Vehicle Mileage</td>
<td>US Federal Government Rate</td>
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<tr>
<td>Technology Costs</td>
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</tr>
<tr>
<td>Travel Costs</td>
<td>At-Cost; No Markup</td>
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</tbody>
</table>