WATER TREATMENT AND DISTRIBUTION DESIGN REPORT
RIVER EDGE COLORADO
GARFIELD COUNTY, COLORADO

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I. INTRODUCTION

A. BASIS

This Water Treatment and Distribution Design Report ("Report") has been prepared in support of an application for PUD Plan Review ("Rezoning") and Subdivision Review ("Preliminary Plan") for the proposed River Edge Colorado ("Project") in accordance with the requirements of the Garfield County Unified Land Use Resolution of 2008 ("ULUR"), as Amended. This Plan specifically addresses the requirements of Sections 7-105 and 7-106 of the ULUR, and along with the Raw Water Supply and Distribution Plan and the Water Supply Plan, documents that a water treatment and distribution system meeting the criteria of Sections 5-501G.11.d, 5-501G.11.f, 5-502C.13, 6-202.M, 6-301.C.7.m, and 7-106 of the ULUR is available and can be designed and constructed to serve the Project. This Report is supported by other referenced documents submitted as part of the REC rezoning and preliminary plan applications including the River Edge Colorado PUD and Subdivision Drawing Package ("Drawing Package").

Specifically, this Report provides Garfield County with evidence that provision has been made for an adequate potable treatment meeting the Colorado Department of Public Health and Environment ("CDPHE") drinking water quality standards for the Project, as part of the overall water supply, and that an adequate potable water delivery system can be designed, constructed and made available. With respect to the raw water delivery to the Project, the design of the raw water supply and distribution system is documented in the Raw Water Supply and Distribution Plan. The Water Supply Plan demonstrates that the legal supply and source for the potable and raw water systems is available.

B. PURPOSE AND SCOPE OF REPORT

The primary purpose of this Report is to provide evidence that provision has been made for adequate potable water treatment and distribution to serve the Project in accordance with Section 7-105 and 7-106 of the ULUR in accordance with the criteria of the ULUR Section cited above.

The scope of this Report is to provide a preliminary assessment and schematic treatment design program and the layout and design of a potable water system that would provide water to the individual residential lots, neighborhood center, and utility tracts within the Project. In accordance with Section 7-106.A, this Report documents that a properly sized and adequate delivery system meeting the minimum design standards in Section 7-106A.3, in consideration of the proposed raw water delivery system, can be designed, built and operated to support the development of the Project. This Report further documents that the treatment system, proposed can deliver water complying with the CDPHE drinking water standards in accordance with item 3 under Section 7-105.B of the ULUR.

C. FINDINGS

The preliminary design of the potable water treatment and distribution system has been completed under the direction and review of William S. Otero P.E. (Colorado
Registration #32163). William S. Otero P.E. has determined that the Project can be adequately served by a potable water treatment and distribution system, as shown herein and as depicted in the potable water system engineering plans shown on the Sanitary Collection and Water Supply and Distribution Plan and Profiles, Series SW01-02 in the Drawing Package, which proposed system meets generally accepted engineering standards for the distribution of potable water, and requirements of the ULUR. In addition, William S. Otero P.E. has determined that said distribution system can be adequately supplied by the treatment system described in Appendix B or alternatively by a system provided by the RFWSD.

II. PROJECT LOCATION AND DESCRIPTION

A. PROJECT LOCATION

The Project is located along State Highway 82 ("SH 82") between the City of Glenwood Springs and Town of Carbondale near the junction of County Road 110/113 ("CR 113") and SH 82. The property is located almost entirely west of the Roaring Fork Transit Authority ("RFTA") right-of-way and east the Roaring Fork River and the Roaring Fork Conservancy ("RFC") Conservation Easement (i.e., Grant of Conservation Easement dated February 3, 2000, recorded at Reception Number 559036 and survey map, recorded December 24th, 2008, recorded at Reception Number 760571 in the real property records of Garfield County, Colorado). The Project straddles Cattle Creek which is also located within the RFC Conservation Easement. A vicinity map is provided as Exhibit 1 in Appendix A1. The Project covers approximately 160 acres ("Project Site") as shown and described on the Project Site drawing [Exhibit 2(a-d), Appendix A1].

B. PROJECT DESCRIPTION

The Project is a proposal to create a walkable clustered-form of residential development with neighborhood amenities including naturalized open space and enhanced wildlife habitat, community recreation, parks, and neighborhood agriculture that is designed to serve the residents and preserve and provide reference to the rural character and agricultural roots of the Roaring Fork Valley. The Project aims to have a strong historic identity back to the days of ‘old Colorado’ when compact neighborhoods formed with a strong sense of community based on the land and surrounding landscape. The REC landscape aesthetic will be simple, informal, and place emphasis in the use of plant and landscape materials local, adaptable and appropriate to the climate and environment of the area. The Project will include approximately 366 residential units of various sizes and types including 55 affordable homes and one exclusive executive lot for a custom home. Housing types will range from attached homes to small single family attached and detached garden homes, village homes, and larger estate homes. Smaller garden homes are anticipated to be designed for younger residents that are looking for their first home in the County, while village homes and estate homes will provide move up opportunities for growing families. Densities in the Project are proposed at less than 2½ units per acre. Lot sizes will vary from over 1 acre to approximately 5,000 square feet for single family homes, and 1,700-5000 square feet of lot area for each garden home. Most of the units back to either proposed active parks or reclaimed open space to help enhance the connection to the land. The REC layout and design is depicted in the PUD
Plan, PUD01-03 Series and the Preliminary Plan PRPN01-03 Series of the Drawing Package.

The architectural theme will be complementary to the traditional architecture of the valley. Generally, exterior materials will include wood, stone, brick, stucco and cement board siding. Varied roof heights and articulation of the front elevations will be used to break up the massing and provide street-level appeal. Front porches and covered stoops are included on homes to emphasize the entry and connection to the sidewalk and street. Roofing will include dimensional shingles, metal, or other materials appropriate to the building style and that roofs will generally be pitched. Gables, wall plane and roofline articulation, bays, balconies, porches, canopies and arcades will be used in the design of various buildings. The selection of materials will minimize the exterior maintenance of the homes to help maintain a quality appearance for the long term.

The street pattern and pedestrian network are designed to facilitate community interaction. Streets have detached sidewalks with designated cross walks at major intersections and landscaped areas that create a comfortable environment for walking. On-street parking in most areas will further buffer vehicular and pedestrian uses. Internal circulation is maximized and dead-end streets are limited. Alleys are used where appropriate to enhance the streetscape and achieve a mix of housing styles. A soft trail system is used to connect open spaces and other common elements with the sidewalk network. The homes are placed close to the streets to help define the streetscape space and provide visual interest to pedestrians. Street trees and plantings are proposed to enhance the aesthetics of the street.

The community is served with a variety of recreational facilities and a neighborhood center that could include meeting room(s), fitness room, offices, kitchen, restrooms, recreational facilities, and limited community service use such as a day care facility, deli/coffee shop, or health club. Parks will provide informal recreational opportunities within the community and will likely include tot lots, playfields, and trail system. The west portion of the property is generally set aside as the naturalized area that buffers the RFC Conservation Easement along the Roaring Fork River. The soft trails around the property allow residents to enjoy the river and wetland areas without disrupting the environment in conformance with the terms of the RFC Conservation Easement. More than the minimum open space requirements will be met by the project. Nearly 50% of the Project Site is in some form of open space, common area or park. Finally, opportunities for productive and edible landscapes, including community gardens and neighborhood orchards are integrated and dispersed in between the residential land uses as gathering and focal places for residents connecting REC to its agricultural heritage.

The combination of trails, recreation areas, and open space system with the ability to engage in ‘interactive community agriculture’ on a small scale will make REC a very desirable place to live, filling a unique niche not yet met in Garfield County. This unique combination will help establish a sense of place, foster community, and engage residents with their immediate environment. It is intended this overall outdoor focus will set the tone and become a major driver of the identity of REC.
III. STANDARDS

The following standards have been utilized in analyzing and designing the proposed potable water system including a potential treatment plant. The exact standards which will be applicable and utilized will depend on the needs of the system owner/operator. At a minimum, all system design shall conform to CDPHE Design Standards.

- Design Criteria for Potable Water Systems, CDPHE Water Quality Control Division ("WQCD") dated March 31, 1997 ("CDPHE Design Standards")
- Colorado Primary Drinking Water Regulations 5 CCR 1003-1, CDPHE Water Quality Control Commission ("WQCC") dated August 9, 2010. ("CDPHE Drinking Water Standards")
- Roaring Fork Water and Sanitation District Rules and Regulations, dated 2007 ("RFWSD Rules")

IV. WATER DEMAND

Water demand represents the total water usage required within a distribution system, inclusive of residential, commercial, industrial, agricultural, and institutional needs. For any system, allowances must also be made for unmetered uses such as system operations and maintenance (i.e., flushing), unexpected leakage, fire fighting needs, construction, etc. The following sub-sections describe the methodology utilized for the estimating water demand for the Project.

The Average Day Demand ("ADD") calculated below represents the total annualized water use on a daily basis. It forms a basis for estimating Maximum or Peak Day Demand ("PDD") and Peak Hour Demand ("PHD"). The PDD is used in establishing the required water production capacity (wells or treatment plant) and represents daily use during peak periods. Water production and treatment capacity should, at a minimum, equal the PDD unless additional equalization storage to compensate for limited production capabilities is provided. The PDD was estimated based upon peak factor ratios applied to the ADD. These peak factors generally differ by use types since they most often include both indoor and outdoor water use. As a result, peak factors are normally substantially influenced by irrigation demand on hot summer days. In the case of the Project, irrigation is provided by a raw water system.

A. RESIDENTIAL WATER DEMAND

Residential water demand can be calculated in a variety of ways. Garfield County and RFWSD use an approach that translates residential and commercial uses into Equivalent
Residential Units ("EQR") equal to 350 gallons per day per household, while CDPHE allows for rates to be calculated using a variety of accepted engineering approaches and standards. The approach used by Garfield County and RFWSD does not reduce water demand or peaking factors as a result of utilizing a raw water system to supply irrigation water as opposed to using the potable water system or alternative development densities. This results in excessively conservative estimates of ADD and PDD, as documented below.

Table IV.A-1 presents a comparison of residential water demand estimates using the different approaches including the consideration of a raw water system for meeting outdoor demand.

Table IV.A-1: Residential Water Demand

<table>
<thead>
<tr>
<th></th>
<th>CDPHE Demand Estimation Approach</th>
<th>RFWSD Demand Estimation Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Units (EQRs)</td>
<td>366</td>
<td>366</td>
</tr>
<tr>
<td>Persons per EQR</td>
<td>2.70</td>
<td>3.50</td>
</tr>
<tr>
<td>Population</td>
<td>988</td>
<td>1,281</td>
</tr>
<tr>
<td>Residential Flow (gpd/EQR)</td>
<td>189</td>
<td>350</td>
</tr>
<tr>
<td>Residential Use (gpcd)</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Total Residential ADD (gpd)</td>
<td>69,174</td>
<td>128,100</td>
</tr>
<tr>
<td>ADD including 10% loss (gpd)</td>
<td>76,091</td>
<td>128,100</td>
</tr>
<tr>
<td>Peak Day Factor</td>
<td>1.7</td>
<td>2.5</td>
</tr>
<tr>
<td>PDD (gpd)</td>
<td>129,355</td>
<td>320,250</td>
</tr>
</tbody>
</table>

1 Assumed to include system losses

Using the water use assumptions listed above, the residential water demand for the Project has been estimated to be 69,174 gpd, under generally accepted estimating guidelines accounting for outdoor irrigation by a raw water system, to 128,100 gpd under Garfield County and RFWSD standards. This represents the ADD for the Project associated with residential uses.

Similarly, PDD on the potable water system can be calculated for the Project using the RFWSD peak factor of 2.5 times ADD as 320,250 gpd. Alternatively, for urban systems where outdoor water use is limited, equivalent to this Project where outdoor water use is provided via a raw water system, peak factors are normally reduced to 1.5-1.7 times ADD. The resulting PDD under this approach yields a demand of 129,355.

B. NON-RESIDENTIAL WATER DEMAND

Residential water demand can be calculated in a variety of ways. Garfield County and RFWSD use an approach that translates residential and commercial uses into Equivalent Residential Units ("EQR") equal to 350 gallons per day per household, while CDPHE allows for rates to be calculated using a variety of accepted engineering approaches and standards. The approach used by Garfield County and RFWSD does not reduce the water demand or peaking factors as a result of using a raw water system to supply irrigation
water. Generally in all methodologies, the water demand for a non-residential building is estimated based on the square footage of the building itself.

Table IV.B-1 presents a comparison of non-residential water demand estimates using the different approaches.

Table IV.B-1: Non-Residential Water Demand

<table>
<thead>
<tr>
<th></th>
<th>CDPHE Demand Estimation Approach</th>
<th>RFWSD Demand Estimation Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Residential Area (sq. ft.)</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Non-Residential Use (EQRs/1,000 sq. ft.)</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Non-Residential Flow (gpd/EQR)</td>
<td>189</td>
<td>350</td>
</tr>
<tr>
<td>Total Non-Residential ADD (gpd)</td>
<td>1,701</td>
<td>3,150</td>
</tr>
<tr>
<td>ADD including 10% loss (gpd)</td>
<td>1,871</td>
<td>3,150</td>
</tr>
<tr>
<td>Peak Day Factor</td>
<td>1.7</td>
<td>2.5</td>
</tr>
<tr>
<td>PDD (gpd)</td>
<td>3,181</td>
<td>7,875</td>
</tr>
</tbody>
</table>

1 Assumed to include system losses

Using the water use assumptions listed above, the non-residential water demand for the Project has been estimated to be 1,871 gpd, under generally accepted engineering estimating guidelines accounting for outdoor irrigation by a raw water system, to 3,150 gpd under Garfield County and RFWSD standards. This represents the ADD for the Project associated with non-residential uses.

Similarly, PDD on the potable water system can be calculated for the Project using the RFWSD peak factor of 2.5 times ADD as 7,875 gpd. Alternatively, for urban systems where outdoor water use is limited, equivalent to this Project where outdoor water use is provided via a raw water system, peak factors are normally reduced to 1.5-1.7 times ADD. The resulting PDD under this approach yields a demand of 3,181.

C. TOTAL WATER DEMAND

Based on the foregoing the total water demand (or ADD) for the Project ranges from 77,962 to 131,250 gpd. PDD estimates range from 132,536 to 328,125 gpd. PHD estimates also range from 187,108 to 525,000 on a gpd basis. The system will be sized in accordance with appropriate parameters depending on the proposed operator and the applicable standards.

D. FIRE FLOW PROTECTION

1. GENERAL

The ability of the distribution system to provide adequate flow during fires is typically evaluated based on fire flow requirements established by the ISO. The ISO is an association of insurance companies that compiles data that are used to establish insurance premiums and fire protection policies for both residential and commercial buildings. ISO typically estimates fire flow requirements at
several locations within a community. The ISO locations are selected according to their relative representation of the higher fire flow requirements across the community. Accordingly, only fire flow requirements for a small portion of the community are actually estimated by ISO.

ISO last updated the fire flow analysis for the Carbondale and Rural Fire Protection District in 2003. At that time, the District went from a Class 5/9 district to a Class 5. According to the ISO testing results, the resulting class change lowered insurance premiums in the District. The water distribution system will enhance fire protection capabilities, but is unlikely to drive down insurance premiums at this location.

2. ISO METHODOLOGY

To determine the required fire flow rate, ISO uses the Fire Suppression Rating Schedule. A fire flow requirement is the flow required to fight a fire at a certain location. Generally, each location is rated based on the building in the area with the largest rated fire flow requirement.

Estimates for fire flow requirements for commercial buildings are based on a complex formula considering land use, building construction, size, occupancy characteristics, spacing between buildings, and the existence of individual building fire protection systems, such as sprinklers. Generally, the water system must be capable of delivering a fire flow up to a maximum of 3,500 gpm and still maintain 20 psi throughout the rest of the service area to obtain the best overall insurance rating.

In contrast, fire flow requirements for residential areas are relatively simple to estimate using ISO guidelines. For one or two family homes, not exceeding two stories in height, the following fire flows are applicable: (1) >100 feet between buildings, 500 gpm; (2) 31-100 feet between buildings, 750 gpm; (3) 11-30 feet between buildings, 1,000 gpm; and (4) <11 feet between buildings, 1,500 gpm.

3. ESTIMATED FIRE FLOW REQUIREMENTS

a) Residential

Due to the urban/suburban nature of the Project, most, if not all homes are separated by at least 30 feet. Therefore, based on the ISO standards, the required fire flow for residential property should be between 1,000 and 1,500 gpm. Based on the Project, it is anticipated, for the purpose of this study, that a general fire flow requirement of 1,500 gpm will be required under the ISO guidelines.

b) Non-Residential

To estimate the amount of water needed to fight a fire in an individual, non-sprinklered building, ISO uses the formula:
\[ NFF_i = (C_i)(O_i)(1.0+(X+P)_i) \]

Where:

- \( NFF_i \) = the needed fire flow in gallons per minute (gpm)
- \( C_i \) = a factor related to the type of construction
- \( O_i \) = a factor related to the type of occupancy
- \( X \) = a factor related to the exposure buildings
- \( P \) = a factor related to the communication between buildings

To calculate the needed fire flow of a building, 8140 Partners assumed the predominant type (class) of construction, size (effective area) of the building, predominant type (class) of occupancy, exposure from the property, and the factor for communication to another building. A 25% savings is assumed where a building will be sprinklered.

The Project includes utility buildings and a neighborhood center. The neighborhood center is the largest and most fire prone class of building and therefore demands the greatest fire flow. Based on a preliminary estimate, fire flow demands associated with the proposed non-residential buildings are less than 2,000 gpm.

V. WATER SOURCE, AND WATER QUALITY AND TREATMENT

This section of the design report identifies the proposed source of the water for the potable water system and the treatment program or system necessary to ensure the water supply meets the applicable CDPHE drinking water standards. The potable water treatment systems necessary to meet CDPHE drinking water standards depend on the source that will be utilized to supply the potable water system, as detailed in this section.

A. WATER SUPPLY SOURCE

In order to design a water distribution system, it is appropriate to first consider the likely sources. These potential sources include the use of existing or development of alluvial wells and surface water diversions. More specifically, if the potable water supply will be provided by the RFWSD, alluvial wells located in the Aspen Glen and Coryell Ranch subdivision and surface diversions from the Roaring Fork River using the Robertson Ditch Rose Ranch Enlargement, Posy Pump and Pipeline (Iron Bridge Subdivision), or the RBC Roaring Fork Diversion (River Edge Colorado) water rights would be utilized. However, if the Project is served by a privately-operated and self-sufficient public system, the potable water supply will come from surface diversions from the Roaring Fork River using the RBC Roaring Fork Diversion (River Edge Colorado).
Resource Engineering, Inc. notes, as documented in the Water Supply Report, the yield of the physical water supply from the RFWSD alluvial wells and from the Roaring Fork River are adequate to supply the distribution system and meet peak demands with adequate storage. Resource Engineering, Inc also notes that these sources are not affected by dry year hydrologic conditions.

As documented in the Resources Engineering Report in Appendix B of the Water Supply Report, the legal water supply for the potable water system is based on the water court decrees in Case No. 01CW187, 07CW164 (pending) and 08CW198 (pending). In Case No. 01CW187, a legal water supply for 349.55 EQR's and 3 acres of irrigation was adjudicated. The decree utilizes a portion of Basalt Water Contract Decree ("BWCD") for diversion at the RFWSD Aspen Glen Well Nos. 1-7, Coryell Ranch Well Nos. 1-14, and the Coryell Ranch Roaring Fork Diversion. The pending decree in Case No. 07CW164 provides for an additional 850.45 EQR's and 4 acres of irrigation. Points of diversion for include RFWSD at the Robertson Ditch, Posy Pump and Pipeline, RBC Well Field, and the RBC Roaring Fork Diversion. The pending decree in Case No. 08CW198 provides for the 349.55 EQRs and 3 acres of irrigation to be diverted at the additional points of diversion identified in Case No. 07CW164. River Edge Colorado has amended BWCD Contract No. 381 for a total of 74.9 acre feet per year sufficient for all three water court decrees. The current Project demands 375 of the 1200 EQRs available through the adjudicated or pending decrees.

B. WATER QUALITY AND TREATMENT

The source and identity of the provider of the water supply for the potable water system will ultimately determine what treatment systems are utilized or may be necessary to achieve CDPHE drinking water standards. Two options have been identified for the treatment and distribution of the potable water. The first option is to join the RFWSD and have the District serve the Project. The second option is to develop a privately-operated and self-sufficient public system system. Both options can adequately serve the Project and meet the required CDPHE drinking water quality standards. At the time this Report was prepared, discussions were continuing with the RFWSD to determine if the District could reasonably and cost effectively serve the Project with potable water treatment and delivery. CI will determine how best to serve the Project with potable water meeting the CDPHE drinking water standards based on the criteria outlined in the CDPHE Design Standards and CDPHE Drinking Water Standards. This includes the requirement to show "capacity" under the State guidelines (New Water System Capacity Planning Manual, CDPHE WQCC). Capacity has three components: technical, managerial, and financial. Adequate capability in all three areas is necessary for a system to demonstrate capacity.

- Technical Capacity is the physical and operational ability of a water system to meet the federal Safe Drinking Water Act ("SDWA") requirements. It refers to the physical components of the water system, including the adequacy of source water and the adequacy of treatment, storage, and distribution infrastructure. It also refers to the ability of system personnel to adequately operate and maintain the system and use required technical knowledge.
Managerial Capacity is the ability of a water system to conduct its affairs in a manner enabling the system to achieve and maintain compliance with SDWA requirements. Managerial capacity refers to the system’s institutional and administrative capabilities.

Financial Capacity refers to a water system’s ability to acquire and manage sufficient financial resources to allow the system to achieve and maintain compliance with SDWA requirements.

In accordance with Section 7-106.A.2.a of the ULUR, connection to an existing central water distribution system is required where a property is located within 400 feet of a central water system and the system is available and adequate to serve the proposed development, and connection is practicable and feasible. Adequate as defined by the ULUR means that the water supply system is sufficient to meet applicable minimum requirements. Feasible as defined by the ULUR means that the water connection is appropriate, suitable, capable of being accomplished given physical and natural constraints and otherwise unconstrained by hazards, topography and site limitations. Available and practicable are undefined by the ULUR, and therefore subject to standard dictionary definitions. The Project Site is located within the service area for the RFWSD but is not located within 400 feet of any of the District’s potable water supply mains or potable water system distribution or treatment components. Therefore, the Project is not required to connect to the District system for purposes of obtaining potable water supply, treatment, or distribution.

C. NON-RFWSD WATER TREATMENT ALTERNATIVE

Appendix B discusses the capacity and design related details for a privately-operated and self-sufficient public system alternative to the expansion of the RFWSD facilities to supply the Project with potable water meeting CDPHE drinking water quality standards. Appendix B includes a suggested framework for treatment consistent with these standards and anticipated water quality parameters associated with the proposed surface water source. Based on a preliminary review of readily available water quality data for the Roaring Fork River and its tributaries between Carbondale and Glenwood, 8140 Partners, LLC has not identified any parameters that would indicate a specific concern in establishing a treatment system to treat surface water to drinking water quality standards. Extensive sampling will need to be completed within the river reach over the next one to two years to identify the final treatment technologies and overall treatment train to be employed. Generally, accepted treatment technologies are anticipated to be utilized based on the preliminary data in accordance with the treatment schematic provided in Appendix B. As documented in Appendix B, it is technically feasible to design and construct a water treatment plant utilizing the proposed surface water source to serve the Project in accordance with CDPHE capacity guidelines and design standards.

Proposed as an privately-operated and self-sufficient public system, the water treatment and distribution system serving REC would be constructed, owned and operated by the River Edge Colorado Property Owners Association ("POA") as a component of the overall infrastructure. Under the proposed REC PUD, the POA is also responsible for a raw water treatment and delivery system, roads, parks, recreation
center, trails, and may be responsible for a sanitary sewer treatment and collection system as discussed in the Sanitary Sewage Disposal Plan. As a result, the POA will ultimately be a relatively robust organization with employees, billing systems, maintenance facilities, etc. with the long term capability or capacity to operate a water treatment plant and delivery system. The system would include a minimum of 370 residential and commercial taps and might be expanded to include additional areas to the north and east as described above.

With respect to the treatment works and delivery, the startup is the most critical from an operations standpoint. The treatment facility and distribution system are typically designed for some selected buildout condition which may represent either a final or phased buildout condition. Regardless, the interim operations must be carefully monitored to ensure water quality standards are met at the point of delivery since residual storage times in tanks and pipelines can be substantially greater than desired since the volumes of overall storage constructed are designed to serve a substantially larger population than would utilize the system in the early periods of operation. In addition, until a sufficient number of rate payers are available within the POA, CI would be responsible to ensure the operation and maintenance of the treatment and distribution facilities are fully funded. Temporary advantages may be available from inclusion within the RFWSD since REC would represent only a fraction of the overall flows initially, but the operational disadvantages associated with a new treatment and distribution system may clearly be overcome through focused management of the system and adequate operational funding and any inefficiency should be overcome in a short period of time.

The treatments plant and storage would likely be designed using a "modular" technology to allow the system to be constructed and expanded in accordance with demand over the development period. No one can accurately determine exactly what the buildout period will be at REC since this depends on a broad range of economic variables. By utilizing a "modular" approach, system efficiencies can be maximized and operational costs minimized to the benefit of the REC residents. Currently, the buildout of REC is projected to occur over a period of 6-7 years. This means that even if the system were to be constructed at full capacity initially, desired operational efficiency levels would be achieved within about 4 years. Efficiencies might be achievable within 2 years and easily maintainable into the future utilizing a "modular" technology and phased storage.

Members of CI have direct experience managing independent water treatment and distribution facilities and site personnel through the start up phases. Further, they have access to advanced and patented water treatment technologies that could be utilized at this site under the oversight of highly skilled technical personnel. Between both the facility design and construction program proposed and CI member entities' success in the design, construction, startup, operation, and maintenance of similar facilities in other communities, it is anticipated that the design, construction and management of a privately-operated and self-sufficient public system at REC is fully manageable by CI and its affiliates immediately and into the future at reasonable cost to the residents at REC.
Appendix C discusses the permitting requirements associated with the system. Permits would need to be obtained from Garfield County, CDPHE, and the US. Army Corp of Engineers ("USCOE"). The assessment in Appendix C identifies no specific obstacles to successfully permitting the non-RFWSD potable water system.

D. RFWSD WATER TREATMENT ALTERNATIVE

The RFWSD has proposed serving the Project utilizing their existing alluvial well field located in the Aspen Glen and Coryell Ranch subdivision and surface diversions from the Roaring Fork River using the RBC Roaring Fork Diversion or equivalent. Treatment would be handled through the District’s existing system through any necessary expansions or a new treatment plant if surface water were to be utilized. The current alluvial well treatment system meets CDPHE requirements and expansions to meet the demands associated with the Project would involve system and operational modifications to accommodate the additional water volumes. These expansions would include increasing the sizes of the pumps at the wells, increasing the capacity of the chlorination process, and upsizing critical delivery lines from wells to main lines.

If surface water treatment were necessary, it would likely take a form similar to that proposed for the new potable water supply treatment discussed below. As a result, it is anticipated that water quality requirements under either RFWSD alternative could be relatively easily achieved. There are no known technical obstacles to the expansion of the existing facilities or construction of a new facility to meet CDPHE drinking water quality standards.

Appendix C discusses the permitting requirements associated with the system. Permits would need to be obtained from Garfield County, CDPHE, and the USCOE. The assessment in Appendix C identifies no specific obstacles to successfully permit the RFWSD potable water system. RFWSD has also provided a will serve letter (Appendix C).

VI. PRESSURE AND DISTRIBUTION

The following section describes the tank and distribution system proposed to serve the Project. Preliminary tank information is provided in Appendix B and the water system plan and profiles are provided on the Sanitary Collection and Water Supply and Distribution Plan and Profiles, Series SW01-02 in the Drawing Package.

A. STORAGE TANK ANALYSIS

1. MAINTAINING SYSTEM PRESSURE

Since water pressure decreases with increased elevation, the topography of the land greatly influences the water pressure and the resulting design of the distribution system. Existing elevations within the Project range from approximately 5,980 to 6,040 feet above mean sea level. Due to the limited difference in elevations within the Project area, it was determined to be unimportant at the preliminary phase of design to develop a more detailed understanding of the topography and resulting pressures by creating a graphical representation.
General waterworks practice suggests that every public water distribution system should be capable of maintaining a minimum pressure of 35 psi during the peak hour demand period at ground elevation in all regions of the service area. National fire protection standards also dictate that during a maximum day flow period, combined with a coincidental fire flow, a minimum of 20 psi should be maintained throughout the system. The CDPHE and Garfield County have also established a minimum water system pressure requirement of 20 psi under all operating conditions. This standard helps to avoid potential cross-connections and negative pressures (vacuum) that could occur at service connections in higher elevations during fire flow needs or other significant demand events. The piping network should also be capable of refilling total peak hourly storage fluctuation volume in approximately 6-8 hours during the minimum (nighttime) demand period on the maximum day.

General waterworks practice also suggests that the maximum desirable pressure in a water main be in the vicinity of 100 psi, and generally not be greater than 130 psi. Though not ideal, systems can be designed with pressures greater than 100 psi, without any adverse effects. The use of pressure reducing valves (PRVs) can be used to reduce the pressure in a water main or in a service connection, and bring it down to a more desirable pressure.

The tank site is subject to location and extent review per C.R.S. 30-28-110. The proposed tank site has an approximate base elevation of 6,200 to 6,240. This is approximately 200 feet above the Project Site elevations. Based on the proposed elevation differences and preliminary calculations, it is apparent that water system pressure requirements can easily be met for the Project.

a) **Recommended Storage Requirements**

There are several methodologies for calculating storage requirements depending on the nature of the system and whether or not the storage tanks proposed as part of the Project are part of a larger system with water storage that could be used to balance flows throughout a larger area.

Storage will be provided in the water distribution system to:

- Dampen hourly demand fluctuations that otherwise would be met by the supply sources, thereby reducing operating costs.
- Meet required fire flow, thus reducing pumping capacity (and costs) at supply sources, as well as reducing piping capacity requirements.
- Provide a volume of water for emergencies in case of pipeline breaks, mechanical equipment malfunctions, or power failures.
In distribution systems that provide adequate storage, water supply pumping facilities should be sized for a flow rate equal to maximum day demands. When system demands are greater than maximum day demands (i.e., during peak hour demand conditions), these additional demands are met by active storage (equalization storage). In addition to hourly fluctuation storage, storage facilities are also sized to provide fire protection volume and emergency volume.

The basis for these storage requirements is summarized below:

- **Equalization Storage** – the total volume required to meet hourly demands that exceed the maximum day demands. This volume is generally stated as a percentage of the maximum day demand based on existing system records or general guidelines developed from similar systems.

- **Fire Protection Storage** – the total volume of water to provide fire flows. To determine this volume, the largest fire flow required by the ISO is typically selected along with the appropriate duration (i.e., two hours) for each zone.

- **Emergency Storage** – the volume of storage allocated in case of a power failure, pipeline break, or equipment malfunction. In most cases, if a community has an adequate emergency standby power source at its water supplies and pumping stations, emergency storage is considered to be a lower priority requirement.

When planning level estimates are being developed, a common rule is to use one times the average daily flow.

Distribution system storage facilities are considered adequate if the existing active storage volume meets equalization, fire protection and emergency requirements for the community. Active storage is determined by local topography and represents the volume of water in storage that provides a minimum acceptable pressure (i.e., 35 psi during peak hour and/or 20 psi during fires or emergencies) at the highest service elevation in the distribution system. To determine equalization storage, a minimum normal system operational pressure of 35 psi was adopted for this analysis. For fire flow volume, the minimum pressure requirement is 20 psi during a fire flow event, based on ISO guidelines.

In addition to having adequate storage in a water system, it is important that the water system have adequate pumping and piping capacity to refill the system storage at night. Generally, total equalization volume for peak hour fluctuations must be refilled within approximately eight hours during the nighttime period following maximum day demand period.
2. **STORAGE TANK SIZING**

The size of the storage tank required for the proposed water distribution system falls within a range of values. RFWSD has multiple options as to the configuration of the distribution system that could influence the size of the storage required. An independent system would meet an alternative set of storage requirements since existing water storage facilities could not be utilized to help balance flows. The two alternatives for storage tank sizing are discussed below.

**a) Storage Requirements without Connecting to RFWSD**

If CI creates a privately-operated and self-sufficient public system (i.e., not relying on RFWSD for system pressures, water supply, etc.), the storage tank must be capable of providing for the three types of storage discussed above. The total water storage would also be required to meet the minimum water storage requirements of the CDPHE Design Criteria.

The Project has an estimated population at buildout projected at 988 persons. For purposes of this Report, total daily population was estimated at 1000 persons to include the uses at the neighborhood center and other ancillary facilities. Based on a population of 1000 persons, the total storage requirement, before fire flow, would be estimated at a minimum one day capacity of 0.2 MG or if meters were not employed 300 gallons per person or 0.286 MG to meet CDPHE requirements. These requirements may be reduced when the source and treatment facilities have sufficient capacity with standby power capability to supplement peak demands of the system or if separate irrigation water systems are provided.

In consideration of the three components of storage required including fire flow requirements, the projected required minimum storage for the Project is the total of the following:

- **Equalization Storage**: The equalization storage component for the Project was estimated based on the maximum daily flow. Accordingly, 25 percent of the maximum day demand was used to determine the equalization storage volume. Peak day demand is generally greater in lower density subdivisions than higher density subdivisions and urban areas and has a strong relationship to irrigation water demand. In the case of REC, irrigation is supplied by a raw water delivery system and outdoor irrigation will not be permitted from the potable system at REC. Therefore, peak daily demand was estimated at 1.7 times average daily demand which is consistent with factors applied in more urbanized areas with limited outdoor demand. The resulting equalization storage is 0.033 MG.
Fire Flow Storage: The largest estimated ISO required fire flow in the Project is 2,500 gpm, but as discussed earlier, the maximum fire flow that will be used in this evaluation is 2,000 gpm per the ISO guidelines for fire flow and the proposed non-residential building types and sizes, and building separations. Therefore, total fire flow capacity is 0.240 MG.

Emergency Storage: Since this is only a planning level estimate, the emergency storage component was based on one times the average daily flow as provided for by CDPHE. Average daily flow is estimated at 70 gpcd since irrigation water supply is being provided by a raw water system and water meters will be utilized. Therefore, the emergency storage component is 0.078 MG.

The total estimated tank capacity required to serve the Project as a privately-operated and self-sufficient public system is approximately 0.350 to 0.400 MG which could be reduced further with adequate standby power capability to supplement peak demands of the system and reduce equalization storage.

b) Storage Requirements with Connection to RFWSD

If the distribution system serving the Project is connected to the RFWSD system, CI should be able to construct a storage tank with less volume. The three components of the storage tank still apply; however, the fire flow component can be much smaller because the RFWSD will provide a portion of the fire flow protection as part of the designed connections to the existing tanks and equalization storage may be potentially eliminated as a result of multiple sources and adequate standby power capability depending on exactly how the District determines to connect the system and what improvements are necessary to fully serve the property.

Equalization Storage: The equalization storage component for the Project was estimated based on the maximum daily flow. Accordingly, 25 percent of the maximum day demand was used to determine the equalization storage volume. Therefore, the future equalization storage volume requirement is about 0.082 MG, but could be unnecessary. RFWSD uses a peaking factor of 2.5, which is likely excessive since the Project will be supplied with a raw water system for all outdoor irrigation.

Fire Flow Storage: If the RFWSD will provide fire flow protection to the Project through the RFWSD system, the amount of storage allocated for fire flow protection could be smaller since other existing system tanks could help to
meet fire flow demands. Thus, the fire flow storage component in this scenario is estimated to be 1,250 gpm for two hours, or 0.150 MG based on ISO standards for residential neighborhoods since excess demands resulting from the non-residential building types and sizes, and limited building separations could be otherwise provided or supplemented through the RFWSD connections. The maximum fire flow required under the RFWSD standard is 2,500 gpm or the equivalent of 0.300 MG.

- Emergency Storage: Since this is only a planning level estimate, the emergency storage component was based on one times the average daily flow. Therefore, the emergency storage component is 0.131 MG based on CDPHE standards. However, based on the RFWSD standard of 350 gpd per EQR, and maximum daily flow of 2 times average daily flow, this storage volume could be as high as 0.262 MG.

The total estimated tank capacity required to serve the Project if connected to the RFWSD potable water system is approximately 0.363 - 0.562 MG which could be reduced further with adequate standby power capability to supplement peak demands of the system and reduce equalization storage.

B. DISTRIBUTION SYSTEM DESIGN AND SIZING

The following details the preliminary design of the distribution system. The preliminary plan and profiles are provided on the Sanitary Collection and Water Supply and Distribution Plan and Profiles, Series SW01-02 in the Drawing Package.

1. GENERAL

A water distribution system's network of piping must be able to deliver water for consumption and fire flow needs in all areas of the proposed distribution system. The system was designed in consideration of both potential service options and can provide water distribution under the various potential RFWSD interconnection options as well as a privately-operated and self-sufficient public system.

For this preliminary assessment of pipe sizing and layout the following conditions were evaluated:

- Maximum Day Demand Plus Fire Flow – This analysis evaluated the distribution system's ability to meet maximum day demands with a coincidental fire flow. The minimum acceptable residual pressure was 20 psi.

- Peak Hour Demand – This analysis evaluated the distribution system's ability to meet peak hour demands. The minimum acceptable residual pressure was 35 psi. Although not assessed
at present, pressure reducing valves (PRV’s) may be required to reduce system pressures in some of the lower elevation areas of the service area.

- Nighttime Refill – This analysis evaluated the distribution system’s ability to refill the storage tank overnight after a day of maximum demands under both a RFWSD and privately-operated and self-sufficient public system. Under the RFWSD use of the alluvial wells or supplemental water from a surface water treatment plant on the Project Site, the tanks will always be refilled in accordance with RFWSD and CDPHE standards. Under the privately-operated and self-sufficient public system described in Appendix B, as long as the WTP pumps water into the system at a minimum rate equal to the peak day demand over 24 hours, the tanks should always be refilled. If, however, the WTP is operated at fewer hours per day, the pumping rate would need to be increased depending on the operation schedule.

2. PIPING SYSTEM SIZING

Under fire flow conditions, small diameter mains can only convey flow for a limited distance before the friction between the wall of the pipe and the water result in less than adequate flows and pressures at the hydrant. Therefore, standard water works practice suggests a minimum pipe diameter of 8-inches be used in systems designed for fire flow purposes. However, as a result of the sprawling nature of the road network, a minimum pipe size of 10 to 12-inches in diameter has been assumed along the primary roads when laying out the proposed water distribution system.

It is important to note that the proposed water system piping layout maximizes the use of pipe loops to minimize pipe diameters. Also, the smaller pipe diameters help to maximize pipe velocities thereby enhancing water quality.

3. INTERCONNECTIONS WITH RFWSD

If the Project is served by the RFWSD, it is expected that the Project could include one to two interconnections with the RFWSD. Interconnections would likely be located near CR 109 immediately southeast of the RFWSD Wastewater Treatment Plant (“WWTP”) or between the Project and Aspen Glen Tank immediately south of the Project. The primary purpose of an interconnection would be to provide supply redundancy in an emergency if a surface water treatment plant is built on the Project Site or to provide primary supply to the Project if the RFWSD determine that their alluvial wells have adequate capacity to serve the Project.
4. SERVICE CONNECTIONS AND METERING

For each home or building that will connect to the distribution system, a new service connection would be required. The service connection would extend from the water main valve box in the street, to the building's plumbing. To account for consumer water use, a meter would be installed at the service connection of each building. Remote meter readers are typically employed, which allow drive-by meter reads.

Typically, service connections are conducted at the expense of the home owner or business with a meter provided by the water utility.

VII. MANAGEMENT COST AND FINANCING

A. NON-RFWSD WATER SYSTEM

Under this treatment alternative, the distribution and treatment facilities to be utilized by the Project would be owned and operated by the POA. Under the proposed REC PUD, the POA is also responsible for a raw water treatment and delivery system, roads, parks, recreation center, trails, and may be responsible for a sanitary sewer treatment and collection system as discussed in the Sewage Disposal Plan. As a result, the POA will ultimately be a relatively robust organization with employees, billing systems, maintenance facilities, etc. with the long term capability and capacity to operate a treatment plant. The system would include a minimum of 370 residential and commercial taps and might be expanded to include additional areas to the north and east as described above. Management of the POA would include both full time and contract staff trained and licensed for the aspect of the system for which they are responsible.

During the startup period, the POA would be primarily funded and controlled by CI. Members of CI have direct experience managing independent water supply facilities and site personnel through project startup and beyond. Further, they have access to advanced and patented water treatment technologies that could be utilized at this site under the oversight of highly skilled technical personnel. CI member entities' have success in the design, construction, startup, operation, and maintenance of similar facilities. As a result, it is anticipated that the design, construction and management of a water treatment and distribution system at REC is fully manageable by CI and its affiliates and ultimately by the structures established under the POA. However, alternative special districts structures may also be pursued.

B. RFWSD WATER SYSTEM

The RFWSD was established on May 5, 1994 for the distribution and supply of water for domestic and other uses, for the collection and treatment of sewage from district customers, and for the maintenance, repair and replacement of all mains, hydrants, valves and necessary service facilities owned by the district.

Currently the RFWSD provides water and sewer service to Aspen Glen, Coryell Ranch, Midland Point, and Iron Bridge developments. The RFWSD operating budget is funded
through service fees and property tax revenue. The mill levy for 2010 is 3.7905. This is a reduction from last year’s mill levy of 4.111. The total tax revenue for 2009 was $238,744. The Project Site is located within the RFWSD Service Plan boundary approved by the Garfield Board of County Commissioners.

It is anticipated based on their history of successful operation, RFWSD has the wherewithal to provide administrative, management, operations and maintenance services to the potable water system if agreement can be reached with the RFWSD to provide service.

C. FINANCING

A cost analysis and estimate will be provided for the infrastructure improvements under separate cover in conformance with Section 6-301C.8.r.(3) of the ULUR at the time of and in association with each Subdivision Application for Final Plat. The cost estimate shall include estimates for those facilities identified in the Development Agreement as necessary to support the development of the lots being proposed for creation within the boundaries of the Final Plat being submitted for review. Based on the preliminary design submitted for review in association with the current Rezoning and Preliminary Plan and supported by this Report, preliminary costs have been developed and reviewed by 8140 Partners, LLC. These costs have been determined to be reasonable and support the feasibility of constructing a cost effective potable water treatment and distribution system for the Project. Preliminary cost estimates are viewed by CI as proprietary information.

CI is responsible for financing and constructing all treatment and distribution facilities identified as part of the treatment and distribution system to serve the Project or as may otherwise be specifically required under any agreement with the RFWSD. CI will finance the treatment and distribution facilities using traditional financing mechanisms. CI is further required to secure all such facilities with the Garfield County or RFWSD, as is appropriate under the ULUR at time of Final Plat.
APPENDIX B: POTABLE WATER SYSTEM ASSESSMENT

INTRODUCTION

The information presented in this Assessment has been prepared by William S. Otero P.E. (Colorado Registration #32163) to provide evidence that the Project can be adequately served by either the RFWSD or a privately-operated public system.

SURFACE WATER TREATMENT PLANT ALTERNATIVE

The source of the water supply for the potable water system and provider will ultimately determine what treatment systems are utilized or may be necessary to achieve CDPHE drinking water standards. Two ownership alternatives have been identified for the treatment and distribution of the potable water. The first alternative is to join the RFWSD and have the District serve the Project. The second option is to develop a privately-operated and self-sufficient public water treatment and distribution system owned and operated by the River Edge Colorado Property Owners Association ("POA"). Both options can adequately serve the Project and meet the required Colorado Department of Public Health and the Environment ("CDPHE") drinking water quality standards. At the time this Report was prepared, discussions were continuing with the RFWSD to determine if the RFWSD could reasonably and cost-effectively serve the Project with potable water. CI will determine how best to serve the Project with potable water meeting the CDPHE drinking water standards based on CDPHE criteria.

PRIVATELY-OPERATED PUBLIC WATER TREATMENT ALTERNATIVE

The diversion and treatment facilities under this alternative would be newly constructed facilities located on the Project Site (see Attachment 1, Exhibit A) and approved as part of this REC rezoning and subdivision application. Based on our review of all readily available water quality data, it is expected that the treatment process would likely follow a very traditional treatment program and utilize industry accepted equipment (i.e. off the shelf) to meet CDPHE water quality standards. In general, CI would be responsible for constructing and operating the distribution and treatment facilities necessary to provide potable water service to the Project (see Table 1 for estimated demands), including (1) a new Water Treatment Plant ("WTP") within Water and Wastewater Utility Tract (Tract AO or AR), and (2) water lines to appropriate CDPHE standards. The design of these distribution facilities located within the Project is discussed in the Water Treatment and Distribution Design Report.
### Table 1: Project Water Demands

<table>
<thead>
<tr>
<th>Demand Estimation</th>
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<tbody>
<tr>
<td>Residential Units (EQRs)</td>
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<tr>
<td>Persons per EQR</td>
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<tr>
<td>Population</td>
</tr>
<tr>
<td>Residential Flow (gpd/EQR)</td>
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<tr>
<td>Residential Use (gpcd)</td>
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<tr>
<td>Total Residential ADD (gpd)</td>
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<tr>
<td>Non-Residential Area (sq. ft.)</td>
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<tr>
<td>Non-Residential Use (EQRs/1,000 sq. ft.)</td>
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<tr>
<td>Non-Residential Flow (gpd/EQR)</td>
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<tr>
<td>Total Non-Residential ADD (gpd)</td>
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<tr>
<td>ADD including 10% loss (gpd)</td>
</tr>
<tr>
<td>Peak Day Factor</td>
</tr>
<tr>
<td>PDD (gpd)</td>
</tr>
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</table>

**Point of Diversion**

Under this privately-operated treatment alternative, the point of diversion (Case Nos. 07CW164 (pending) and 08CW198 (pending)) for the Project will be located on the east bank of the Roaring Fork River (RBC Roaring Fork Diversion) as shown on Attachment 1, Exhibit C. Pending further field investigations, it is anticipated that the actual diversion of water will occur through a bank of either vertical or horizontal wells. In order to provide effective water diversion, it is necessary for the well field to be installed within an alluvial aquifer consisting of primarily cobbles/gravels and a saturated thickness greater than 30 feet. The number and type of wells necessary for diversion will be determined at Final Design through pump tests performed on the aquifer. The use of wells versus an above ground surface diversion provides advantages to the treatment process by stabilizing some of the seasonal variations in temperature and turbidity (i.e. filtration).

The well field pumps will transfer the raw water from the wells to the surface water treatment plant through a 12-inch supply line (minimum). Larger seasonal fluctuations in demands are not anticipated due to the likelihood of higher unit occupancy and all Project irrigation is provided through a separate raw water system.

**Treatment Process**

As shown on the Process Flow Diagram (PFD) (see Attachment 1, Exhibit B), the most likely form of primary treatment would be a "pressurized" membrane filtration system sized to process water at an average flow rate of approximately 100 gallons per minute (gpm) based on the PDD presented above. When considering what membrane filtration technology to select, flow rate is only one of many considerations. The type of the membrane selected depends primarily on the difference in quality between the inflow (influent) and the required quality standards for the outflow (effluent). Based on available Roaring Fork River quality data and the process described, the most critical...
parameters to consider include: water temperature, hardness, salinity, and turbidity. In addition, the selected filtration technology must be cost effective to operate (i.e. reasonable replacement costs for filters) and provide consistent water quality throughout the year. Note members of CI have access to advanced and patented membrane filtration technologies. The technologies have been well tested and their expertise on the subject from design through operations is extensive.

Prior to the membrane filtration component described above, the pre-treatment component(s) would assist in establishing the proper water chemistry for efficient filtering. The proper water chemistry is critical to most filter-based treatment processes. If the water chemistry is not correct, the filter will either foul or discharge water that is unacceptable from a water quality standpoint. Based on available information, strictly controlling pH, water temperature, hardness and dissolved solids prior to filtering will be the key to establishing and maintaining an efficient treatment process. Therefore, maintaining consistent water chemistry when the inflow (influent) chemistry is variable will be the primary focus/objective of the pre-treatment component of the WTP. Note members of CI have access to advanced and patented water treatment technologies that may be utilized as an alternative to the presented pre-treatment process. The advanced treatment technology being considered is less dependent on water chemistry, while still providing protection for the membrane filter.

Once filtered, the water would be chlorinated and sufficient contact time be provided to allow the disinfection time to work prior to distribution and storage. The connection point(s) to the overall distribution system are presented on Attachment 1, Exhibit A. Equalization, fire and emergency storage will be accommodated in an approximately 350,000 gallon storage tank located offsite east of the Project.

Phasing

The presented PFD is relatively standard for preliminary assessment. However, the site conditions (discussed further below) and pace of Project build-out can clearly impact the treatment efficiency of the WTP and require further consideration in WTP selection. Based on the WTP design requirements, the WTP would likely be designed using a "modular" technology to allow the WTP to be constructed and expanded in accordance with demand over the development period. By utilizing a "modular" technology, system efficiencies can be maximized and operational costs minimized to the benefit of the REC residents. Currently, the build-out of REC is projected to occur over a period of 6-7 years. This means that even if the WTP were to be constructed at full capacity initially, the WTP would hit the acceptable operational efficiency levels within 4 years. Utilizing a "modular" technology, high efficiencies might be achievable within 2 years and might be easily maintainable into the future as the WTP is expanded to serve the subsequent phases of development.

Pre-Design Testing

Based on our review of readily available water quality data for the Roaring Fork River and tributaries between Carbondale and Glenwood, we have not identified any parameters that would indicate a specific concern in establishing a treatment system to
treat surface water to drinking water quality standards. However, prior to final design the Roaring Fork River would be tested for the following parameters to assist in treatment process selection (at a minimum): water temperature, pH, turbidity, hardness, dissolved solids, total suspended solids, organics, and E.Coli. Due to differential changes throughout the year, this testing will be performed at the selected diversion site (RBC Surface Diversion) over a minimum period of 8 to 12 months. Each of these parameters provides necessary information to assist in process selection and depending on the filtration technologies being considered, the frequency of the testing will vary from monthly to quarterly.

System Operation

Under this privately-operated alternative, it will be very critical that the process selected be capable of meeting the demands throughout the year with little fluctuation in water quality. In addition, because this WTP will be the foundation for water service, the plant will need to be fully automated to allow for continuous monitoring and control. When starting up a new WTP the most critical phases are those prior to system build-out. The treatment and distribution facilities are typically designed for some selected build-out condition. Therefore, the interim operations must be carefully monitored to ensure water quality requirements are met since facilities are normally designed and constructed to serve a substantially larger population than would utilize the system in the early periods of operation. In addition, until a sufficient number of rate payers are available within the POA, CI would be responsible for ensuring the operation and maintenance of the distribution and treatment facilities are fully funded.

RFWSI TREATMENT PLANT DESCRIPTION

Based on preliminary information provided by the RFWSD, the District has determined that a redundant source of water on the north end of their District to support future growth is required. Their primary focus was locating wells that could meet the anticipated future demand (primarily for growth on the north end of the expanded service area). However, based on comprehensive investigations performed by Resource Engineering it was determined that wells appropriate to meet the expansion in demand were not available at the north end of their expanded service area. Therefore, a surface water diversion and associated treatment facility was deemed reasonable and appropriate to serve as the redundant source of water supply.

Point of Diversion

Under this treatment alternative, potable water supply will be provided by the RFWSD, alluvial wells located in the Aspen Glen and Coryell Ranch subdivision and surface diversions from the Roaring Fork River using the Robertson Ditch Rose Ranch Enlargement, Posy Pump and Pipeline (Iron Bridge Subdivision), or the RBC Roaring Fork Diversion (River Edge Colorado) water rights would be utilized (Case Nos. 01CW187, 07CW164 (pending) and 08CW198 (pending). In order for RFWSD to provide water service from these points, except for the RBC Roaring Fork Diversion, connection to the existing distribution system located all south and east of the Project would require over
5,000 feet of main extensions which point may not serve the Project without the inclusion of a surface water treatment plant.

Based on current negotiations (see Attachment 2, Exhibit A), the RFWSD would require a 12-inch (at a minimum) mains be constructed by CI along the east side of Highway 82 from the Project to the "fill line" of the existing Aspen Glen water storage tank (approximately 10,000 linear feet) and east across the Roaring Fork River to existing 10-inch mains near the Iron Bridge development (approximately 3,000 linear feet). Note, the eastern connection is not required if the WTP is constructed. Therefore, for purposes of this discussion, CI would be required to construct both the Highway 82 main and the WTP in order to gain water service.

Treatment Process

The District performed an "Planning Consideration" level assessment of five primary treatment schemes to consider for possible surface water treatment processes capable of providing expanded service at an estimated 1,400 EQRs or a PDD of approximately 740,000 gpd for the former Sanders Ranch property. Based on this information, treatment schemes are available for consideration to treat surface water to meet the District's needs at the level of development assumed, but a more extensive sampling program of the Roaring Fork River to gain additional and necessary water quality information required prior to selecting a treatment process.

System Operations

As stated, the WTP would be owned and operated by the RFWSD as a component of their overall water distribution system. Based on current negotiations, the WTP could be located on either REC or RFWSD property. The timing and phasing of the WTP relative to the overall District water system would be at the sole discretion of the RFWSD.

EVIDENCE OF TECHNICAL, MANAGERIAL AND FINANCIAL CAPACITY

As stated above, CI will determine how best to serve the Project with potable water meeting the CDPHE drinking water standards based on the criteria outlined in the CDPHE Design Standards and CDPHE Drinking Water Standards. This includes the requirement to show capacity under the State guidelines (New Water System Capacity Planning Manual, CDPHE WQCC). Capacity has three components (as discussed further in the main Report): technical, managerial, and financial. Adequate capability in all three areas is necessary for a system to demonstrate capacity, as defined by CDPHE. Showing evidence of technical, managerial and financial capacity is required under both ownership alternatives for the construction of a new WTP. Based on the information provided within the main Report and herein, the evidence of technical, managerial and financial capacity can and will be provided under either operational alternative.
ATTACHMENT 1: PRIVATELY-OPERATED TREATMENT SCHEMATICS
# River Edge Colorado

## Project Water Demand Calculations

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<tr>
<th>Water Diversion/Surface Water Treatment</th>
<th>REC Private Potable Water and Sewer System Standards</th>
<th>RFWSD Potable Water and Sewer System Standards</th>
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<tr>
<td>Residential Demand (gpd) - 375 EQRs x 350 gal/EQR</td>
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<td>REC Supply/Treatment Capacity (gpd)</td>
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### Outdoor Water Demand

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<td>Residential Demand (gpd)</td>
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<td>Commercial Demand (gpd)</td>
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### Total Water Demand

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<th>RFWSD Potable Water and Sewer System Standards</th>
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<td>Residential (EQR)</td>
<td>366</td>
<td>366</td>
</tr>
<tr>
<td>Person per EQR</td>
<td>2.70</td>
<td>3.50</td>
</tr>
<tr>
<td>Residential (Population)</td>
<td>988</td>
<td>1,281</td>
</tr>
<tr>
<td>Residential Use (gpd/EQR)</td>
<td>189</td>
<td>350</td>
</tr>
<tr>
<td>Residential Use (gpcd)</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Residential Demand (gpd)</td>
<td>69,174</td>
<td>128,100</td>
</tr>
<tr>
<td>Commercial (Sq. Ft.)</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Commercial Use (0.3 EQR/1,000 sq.ft.)</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Commercial Use (gpd/EQR)</td>
<td>189</td>
<td>350</td>
</tr>
<tr>
<td>Commercial Demand (gpd)</td>
<td>1,701</td>
<td>3,150</td>
</tr>
<tr>
<td>Average Demand w/ UAW (gpd)</td>
<td>77,963</td>
<td>131,250</td>
</tr>
<tr>
<td>Peak Day Factor</td>
<td>1.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Peak Day Demand (gpd)</td>
<td>132,536</td>
<td>328,125</td>
</tr>
</tbody>
</table>

### Fire Flows

<table>
<thead>
<tr>
<th></th>
<th>REC Private Potable Water and Sewer System Standards</th>
<th>RFWSD Potable Water and Sewer System Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate (gpm)</td>
<td>2,000</td>
<td>2,500</td>
</tr>
<tr>
<td>Duration (Hours)</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Total (Gallons)</td>
<td>240,000</td>
<td>300,000</td>
</tr>
</tbody>
</table>

### Water Storage

<table>
<thead>
<tr>
<th></th>
<th>REC Private Potable Water and Sewer System Standards</th>
<th>RFWSD Potable Water and Sewer System Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC Total (Gallons)</td>
<td>351,097</td>
<td>562,500</td>
</tr>
<tr>
<td>RFWSD Net (Gallons)</td>
<td>N/A</td>
<td>442,500</td>
</tr>
</tbody>
</table>

### Water Pressure & Options

<table>
<thead>
<tr>
<th></th>
<th>Tank Elevation - 6220</th>
<th>Tank Elevation - 6200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5998 - 6034</td>
<td>5998 - 6034</td>
</tr>
<tr>
<td></td>
<td>96 - 81</td>
<td>87 - 72</td>
</tr>
</tbody>
</table>

**Notes:**
1 - UAW: Unaccounted for water
2 - RFWSD Water Standards include UAW
3 - REC UAW is 10%
SURFACE WATER TREATMENT PLANT

PROCESS FLOW DIAGRAM (EXHIBIT B)

Notes:

1. Coagulation and flocculation may be replaced with patented centrifuge technology produced from Blue Planet.
2. Treatment process considerations for Final Design include the following (at a minimum): water temperature, hardness, dissolved solids, suspended solids, organics, and disinfection byproducts. Due to differential and seasonal considerations, these process considerations will be tested on the Roaring Fork River at the location selected diversion site over a minimum of 8 to 12 months.
ATTACHMENT 2: RFWSD CONNECTION SCHEMATIC
Exhibit:
Date: 01/14/2011

Owner/Developer:
7999 HWY 82
Carbondale, CO 81623
Phone No: 970.456.5325

Title:
Surface Water Treatment Schematic (RFWSD) Alternative

Prepared by:
8140 Partners, LLC

01/14/2011
APPENDIX A: VICINITY MAP AND PROJECT SITE
Title:
PROJECT SITE LOCATION AND DESCRIPTION
(2 OF 4)

Prepared by:
8140 Partners, LLC

Date:
12/01/10

Exhibit:
2(b) App. A-4
APPENDIX C: PERMITTING ANALYSIS
I have been engaged by Carbondale Investments, LLC ("CI"), to assist with water rights and land use matters related to the proposed development of the River Edge Project. I am a shareholder of the law firm Brownstein Hyatt Farber & Schreck, LLP and have been practicing in the areas of water, land use and environmental law for more than 25 years. I am familiar with the requirements for obtaining state approvals for the location and design of domestic wastewater treatment facilities and for public water supply systems, as well as the requirements for obtaining a permit for the discharge of dredged and fill material into waters of the United States under Section 404 (33 U.S.C. §1344), and have handled such matters as part of my law practice. Based on my experience and familiarity with the proposed River Edge Project, I am not aware of any legal prohibitions to CI pursuing approvals for water and sewer systems, either as independent systems or as part of the Roaring Fork Water and Sanitation District. I have summarized the requirements for these processes below.

I. Site Location and Design Approval Requirements for a Domestic Wastewater Treatment Plant.

Colorado Regulation 22 governs site location and design approval. The Department of Public Health and Environment's Water Quality Control Commission implements the regulation. The regulation applies to the construction of domestic wastewater treatment works, including wastewater treatment plants, with a capacity of 2,000 gallons per day or greater. 5 CCR 1002-22.1(2).

A. Site Location Approval.

Application procedures for the construction of a new domestic wastewater treatment works are explained in section 22.4 of the regulations. The applicant must submit approved forms and a comprehensive engineering report to certain local authorities, as well as to the Division. 22.4(1).

The engineering report must address the applicant's ability to manage and operate the facility for the life of the project, as well as the proposed site location, the service area including existing and projected populations, anticipated water quality impacts and anticipated effluent quality, loading and capacity, evidence that the proposed location will not be affected by floodplain or other natural hazards,
operational staffing needs, legal arrangements showing control of the site, management capabilities, the financial system developed to provide necessary capital, implementation plans and construction schedules, and various other related issues. 22.4(1)(b)(i-xiv). Additionally, prior to submitting the application the applicant must consider how its effluent will affect local water quality, and should discuss the development of Preliminary Effluent Limits (PELs) with the Division. 22.4(1)(b)(iii).

i. Consolidation Analysis.

A significant aspect of the site approval process is the consolidation analysis. 22.4(1)(b)(v); 22.3(1)(c). Pursuant to the regulations, the Division is required to "encourage the consolidation of wastewater treatment works whenever feasible." In making this determination as part of the site location application, the Division will consider various factors including the economic viability of consolidation.

If it is demonstrated to the satisfaction of the Division that any one of the following would make consolidation infeasible, no further analysis of consolidation is required.

- Water Conservation – If consolidation would impair water conservation efforts of the new or existing affected treatment works;
- Water Rights Utilization – If consolidation would alter the discharge of effluent in a manner that would impair the water rights of one of the parties to the consolidation;
- Stream Flow – If consolidation would alter flows in a stream or stream segment or transfer a sufficient amount of water to another stream or stream segment so as to result in (1) overwhelming adverse environmental effects on either stream, or (2) the lowering of the effluent limits of other treatment works so as to cause the need to install additional, advanced secondary or tertiary treatment processes;
- Water Quality – Where consolidation has the potential to degrade the surface and/or groundwater quality; or
- Economics – Unless one of the above factors results in a determination that consolidation is not feasible, the applicant must submit a comparative analysis of the cost of consolidating versus the cost of constructing separate facilities. All costs, including land acquisition, capital construction, and debt retirement expenses, among others, must be considered. If the cost of consolidation exceeds the cost of separate plant construction by more than 30%, no further analysis of consolidation is required.

If, after considering the above factors consolidation is still an option, the Division will also consider the following factors. If any of these would make consolidation infeasible, no further analysis of consolidation is required.

- Distance – If the distance to the closest existing/ proposed wastewater treatment works is less than five miles, an analysis of the cost-effectiveness of consolidation must be included. If the distance is five miles or greater, no further analysis is required.
- Threatened or Endangered Species – If threatened/endangered species inhabit or utilize the only site that could serve as a consolidated treatment works or through which interceptor lines must pass, no further analysis is required.
- Local Plans – If a local water quality management plan anticipates multiple treatment works, then no further analysis is required.
- Service Area – If the service area of a proposed facility is within the service areas of a district or municipality providing wastewater treatment service, the applicant must explain why the district or municipality is not the applicant.

B. Design Approval.

The design approval process is detailed in Section 22.11(1) and (2). For new domestic wastewater treatment plants, design review is a two step process. After receipt of site location approval, the
applicant must submit a “Process Design Report” (PDR) to the Water Quality Control Division. The Division will review the Report and will issue a written approval of the PDR once it is determined that the PDR meets all regulatory requirements.

After receipt of PDR approval, the applicant is required to submit the "Final Design – Plans and Specifications." The information must be entirely consistent with the PDR. The Division reviews the Final Design plans and issues written approval of the Design, which represents approval for construction.

Finally, after the facility is constructed, the applicant's professional engineer must certify at the completion of construction that the treatment works was constructed according to plans and specifications as approved by the Division.

II. Discharge Permit Requirements for a Domestic Wastewater Treatment Plant.

Domestic Wastewater Treatment Facilities that discharge to surface water must comply with Colorado effluent discharge permit and monitoring requirements. The nature of the permit process will depend on whether the treatment plant discharges to classified or unclassified waters. As part of the application, the owner must certify to which type of water it will discharge, that the hydraulic design capacity of the facility is less than one million gallons per day, that no pre-treatment plan is required, among other things.

The permit contains specific effluent limitations for various pollutants, such as TSS, pH, E/Coli, phosphorus, and others. Limits are based on statewide limits, but site-specific limitations may be developed on a case-by-case basis.

The permit also contains monitoring, sampling and reporting requirements.

III. State Requirements for Public Water Supply System.

The Colorado Water Quality Control Division has developed design criteria for public drinking water facilities. The approval of a new facility is based upon the Division's determination that the facility will be able to meet Colorado's Primary Drinking Water Regulations. 5 CCR 1003-1.

Approval of a Public Water System is not dissimilar from the approval of a wastewater treatment works. Initially, the party seeking to construct a new system must submit an application to the Division. The application must be signed by the responsible party, and must be submitted no less than 45 days prior to the planned construction start date. The Division will approve, conditionally approve, or deny the application. It may also seek further information.

The application must include, with a professional engineer's seal, a final copy of the technical specification and blue prints for the facility. Detailed plans must fully comply with the requirements enumerated in the state's "Design Criteria for Potable Water Systems."

The application must also include a final design report that fully explains the scope of the project, the raw water's characteristics, and the various alternatives considered. Ultimately, the system must be constructed in accordance with the approved plans. Any changes that are not deemed "minor" require the submission of revised plans and specifications that must be approved by the Division. In addition, a new system must submit a detailed description of the treatment process that will be employed and the unit's designed loading rates.

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1 The Division has published a comprehensive Design Criteria handbook, available online at: http://www.cdphe.state.co.us/wq/engineering/pdf/DesignCriteriaPotableWaterSystem.pdf
The County and Local health and planning departments must approve all water treatment facilities. It is the applicant's responsibility to secure these approvals prior to applying to the Division for an approval to construct.

Other items that must be addressed or included in the application:

- **Flood Plain Certificate** – waterworks cannot be located within the plain of a 100-year flood event. All new water systems must submit a 100-year flood plain certification signed by a professional engineer.
- **Inventory Form** – the form includes information regarding the approximate number of people served by the system, owner and operator names and information, and types of treatment that will be used.
- **Chemical analysis** – one copy of a raw water chemical analysis from a certified lab must be submitted. The test must include results for nitrate, nitrite, sodium, temperature, pH, alkalinity, calcium, total dissolved solids, and certain organic and inorganic chemicals.
- **Lead and Copper assessment** – new systems must include a chemical analysis for lead and copper.
- **Managerial Plan** – A comprehensive management plan must be submitted. It must describe all aspects of how the facility will be run, including such aspects as the facility's sampling and analysis program, staffing and training needs, safety, and the legal basis for the facility's existence.
- **Financial Plan** – The financial plan must include, at a minimum, the expected costs for operating the system and the fee structure for at least five years.

The Design Criteria also address requirements relating to the construction of an Infiltration Gallery. Once the gallery construction is completed, a microscopic particulate analysis will be performed on the product water. Infiltration galleries determined to be influenced by surface water must meet all surface water filtration requirements.²

Design requirements pertaining to infiltration galleries include:

- Galleries should not be constructed within the 100 year flood plain, or if it is necessary to do so they should be protected from a 100 year event;
- Galleries should not be constructed in close proximity to a waterway to avoid intrusion of surface water; and
- Infiltration lines should be under the control of the water purveyor to prevent entrance to the system from unauthorized persons.

A number of other requirements are enumerated in the Design Criteria, as well.

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² Colorado's surface water treatment rule applies to all Community Water Systems serving 10,000 people or more. The rule includes a variety of treatment, monitoring, recordkeeping, and public notice requirements.

The federal Clean Water Act forbids the discharge of any dredge or fill material into navigable waters unless authorized by a permit issued by the United States Army Corps of Engineers pursuant to Section 404 of the Clean Water Act ("404 permit"). The Roaring Fork District has proposed that, as a condition of inclusion, CI must install a sewer pipe across the Roaring Fork River to the District’s existing wastewater plant and install a water line across the River to connect to the water system within the Iron Bridge development. Since the construction of pipelines across the River will invariably involve dredging of, and discharges into, the River, a 404 permit will be required.

The Corps of Engineers is authorized to issue two basic types of 404 permits: a nationwide permit; and an individual permit. Nationwide permits authorize categories of activities that are recognized to cause minimal adverse environmental effects. All told, the Corps has issued 50 nationwide permits.

If a party determines its actions fall within the terms of a nationwide permit, generally the party must notify the Corps District Engineer of its intent to commence construction under the nationwide 404 permit. The District Engineer will review the pre-construction notification to determine if the activity falls within the permit's terms. The District Engineer, after considering comments from federal and state agencies, will authorize or deny the project. The District Engineer may also require modifications of the project or mitigation for the project's impacts.

In the alternative, individual 404 permits are issued for projects that do not fit within nationwide permits following a case-by-case evaluation of the projects. The individual permitting process is generally considered to be much more comprehensive, time consuming, and expensive than use of a general permit. Under the 404(b)(1) Guidelines adopted by the Corps and the EPA, Applicants for an individual permit must demonstrate that the discharge of dredged or fill material would not significantly degrade the nation's waters and that there are no practicable alternatives less damaging to the aquatic environment. Applicants must also describe steps taken to minimize impacts to water bodies and wetlands and provide appropriate and practicable mitigation, such as restoring or creating wetlands, for any remaining, unavoidable impacts. The application itself is a voluminous document that includes a comprehensive project plan for review by the Corps, a purpose and need analysis, an avoidance, minimization and public interest analysis and a mitigation plan. The cost for compiling this information is significant. To issue an individual permit, the Corps would have to prepare an Environmental Assessment, or potentially an Environmental Impact Statement, which would further protract the permitting process by six months to a number of years.

Following submission to the Corps, an application for an individual permit will be subject to public comment and a public hearing, and generally entails significant interactions with both the Corps and the EPA.

In order to avoid the significant delay generally associated with pursuit of an individual 404 permit, CI, or the Roaring Fork District, would likely pursue the use of nationwide permits 7, 12 or 29 to construct the pipelines across the River.

Nationwide Permit 7 authorizes discharges of dredged or fill material related to the construction or modification of outfall structures and associated intake structures where effluent from the outfall is authorized by a discharge permit. CI may rely upon this permit for its intake structure in the event it constructs a surface water treatment plant, and for a sewage treatment plant outfall which will be permitted through the CDPHE.

Nationwide Permit 19 authorizes activities for the construction, maintenance, repair and removal of utility lines, including water and sewer lines, and associated facilities where the activity does not result in the loss of greater than 1/2 acre of waters of the United States. And Nationwide Permit 29 authorizes discharge of dredged or fill material associated with the construction of residential subdivisions.
including “attendant features”, which may include the construction of utility. To be eligible for permit coverage, the discharge must not cause the loss of greater than ½ acre of the river, and loss of no more than 300 linear feet of stream bed.

While these nationwide permits may be available to authorize a pipeline crossing of the River, the fact that two crossings may be required as a condition of inclusion into the Roaring Fork District could result in greater than a ½ acre of disturbance in waters of the United States, thus precluding reliance on Permit 12. Each permit requires that the activity authorized be a "single and complete project," and that the same nationwide permit cannot be used more than once for the same "single and complete project."

Federal regulations define a "single and complete project" as "the total project proposed or accomplished by one owner/developer." 33 C.F.R. § 330.2(i). The regulation further explains that "if construction of a residential development affects several different areas of a [river], the cumulative total of all filled areas should be the basis for deciding whether or not the project will be covered by the Nationwide General Permit." Id. Therefore, the impact of both crossings and any other activities in the River or adjoining wetlands must be considered in the aggregate when determining whether or not a nationwide permit may be used. To the extent the pipeline crossings result in dredging or discharges that exceed the nationwide permit acreage limit, the Project will likely have to pursue an individual permit.
March 14, 2011

Rockwood Shepard  
Project Executive  
Carbondale Investments, LLC  
243 Crescent Lane  
Glenwood Springs, CO 81601

Re: Roaring Fork Water and Sanitation District (the "District"): Willingness and Ability to Serve the River Edge Project

Dear Mr. Shepard:

In connection with the PUD/Preliminary Plan applications for the 160-acre River Edge Project (the "Project") pending before Garfield County, this letter confirms that the District is willing and able to serve the Project with adequate potable water and wastewater service for up to 375 EQRs of demand, upon the satisfaction of the following pre-conditions to such service: the execution by Carbondale and the District of a mutually-agreeable pre-inclusion agreement setting forth the terms and conditions necessary for the inclusion of the Project into the District and the connection of the sewer and water facilities within the Project to the District’s facilities; and Carbondale’s fulfillment of all of its requirements under such an agreement, which are anticipated to include, among other things, the transfer or dedication of adequate water rights to the District, the installation and dedication to the District of potable water lines and related potable water infrastructure meeting District standards, the construction of a sewage collection system meeting District standards, and the financing of an expansion of the District’s existing wastewater treatment plant.

Sincerely,

[Signature]

Joey Petzko, District Manager  
Roaring Fork Water and Sanitation District