Exhibit A
Scope of Work – Upper Mountain Counties Water Needs Assessment

This Scope of Work is divided into four sections as suggested in the Grand Application Instructions. Section 1 provides a description of each major task associated with the project along with a functional description of who will be completing the work and a description of the deliverables associated with the task. Section 2 lists the key personnel proposed for the project along with a brief description of their relevant project experience. Section 3 presents a detailed breakdown of the costs to complete the study and Section 4 presents the proposed Project Schedule.

Section 1 Task Summary

Introduction and Background

In 2003, the Colorado Water Conservation Board (CWCB) completed the Statewide Water Supply Initiative (SWSI). That study included estimates of water demands in the South Platte River Basin through 2030. While SWSI provided a valuable coarse assessment of water demands for the municipal, industrial, and agricultural sectors, concerns were raised by representatives of the four Upper Mountain Counties (UMC) to the South Platte River Basin Roundtable (Park, Jefferson, Clear Creek, and Gilpin) that the analysis did not properly consider the water supply demands and available water resources for that part of the basin. Specifically, Park, Clear Creek, Gilpin, and a portion of Jefferson County have been primarily populated in the foothills and mountains through subdivision lots where residences have been built relying on on-lot domestic wells serving each home and with on-lot sewage disposal systems. The water supply issues related to current and future populations relying on these on-lot systems need to be more thoroughly evaluated than what was done in SWSI. Also, UMC water providers to areas not relying on on-lot systems need to be contacted and their needs and supplies evaluated. A water provider is that entity, public or private, that is responsible for providing water to four or more residences and/or commercial user.

Given this background, we believe it is appropriate and opportune for a study to be undertaken under the auspices of HB-1177 and the South Platte Basin Roundtable to accurately identify water needs, available water supplies, and any shortages that may exist in the Upper Mountain Counties and identify projects and or actions that may be needed to address any shortages to areas on community water supplies or areas where depletions of the aquifer systems may be occurring or expected to occur. The study area is to include the mountainous areas of Jefferson County, the part of Park County east of Kenosha Pass, Gilpin, and Clear Creek Counties.

Study Objectives

The objectives of the proposed study are to:

1. Interview the UMC counties to determine current and projected populations and the status of current platted lots as to existing uses and projected uses to 2050 in the study area.

2. Interview UMC water providers for current and future water demands to 2050 including water demands related to recreation and tourism.

3. Identify existing lots (improved or unimproved) that may rely on domestic and commercial wells and estimate the water demand related to these lots based on various build-out assumptions.

4. Evaluate existing information on geology and precipitation for the mountain counties in order to estimate the amount of aquifer recharge from precipitation that is available for evaluating long term sustainable water supplies.

5. Assess the long term sustainability of the various aquifer systems in the mountain counties taking into consideration recharge and water demands related to current and future water needs.

6. Identify any water demands related to tourism resulting from future recreational projects such as ski or snow boarding areas.

Tasks

This work plan is divided into seven major tasks with multiple sub-tasks under each, addressing each of the objectives. The following is a list and description of tasks to be completed under this scope of work. The area of study will be Clear Creek County, Gilpin County, Park County east of Kenosha Pass, and the mountain part of Jefferson County.

Task 1 Interview Counties for Information Impacting Water Demand

1.1 Determine current and projected populations based on County estimates

The UMC counties will be interviewed to determine current and projected populations including the populations related to permanent and second home residences. This information will be more reliable than those obtained from the state demographer during SWSI.

1.2 Determine the number of platted lots and related zoning in each county

The counties will be interviewed to determine the status of existing platted lots in each county and zoning for them. Those that are not improved will be identified and the type of potential development for them evaluated for impact on future water demand assuming different levels of build out. This may be another way to estimate future water demands if population growth projections are not readily available. The lots that have been improved will be used to estimate current water demands based

on the use of the lots such as permanent residences, second home residences, or commercial demands. To the extent possible, the GIS's for each county will be used to assist in this task.

1.3 Quantify unplatted private property in each county

The counties will be interviewed to identify unplatted private property in each county and the zoning for these areas so that a water demand can be projected for these lands at different levels of build out. To the extent possible, the GIS's for each county will be used to assist in this task.

Task 1 Assumptions

- One meeting with each County to gather information.
- GIS data provided by the counties will be of sufficient quality to complete Task 1.
- Upper Mountain Counties assistance in setting up the meeting with each county to make sure the appropriate county representatives attend the meeting to avoid follow-up meetings.
- If Park County does not have GIS data for the study area, then simplifying assumptions based on the number of platted lots acquired from plat maps may have to be made and the work effort increased with more staff time.

Task 1 Deliverables

- Population estimates for current and 2050 conditions for permanent, semi-permanent, and transitory populations.
- The number of platted lots and type of zoning for them will be provided along with any GIS mapping of these lots.
- The unplatted private property will be identified, related zoning, and GIS mapping of these areas provided.

Task 2 Interview water providers for information on current and projected water demands

2.1 Determine information available from towns and water providers

Since towns and water providers have information on water demands related to a central water delivery system and not areas relying on individual on-lot wells, these entities must be surveyed to determine if they have information on current and projected water demands to the year 2050 including those related to recreation and tourism. The counties can assist in identifying the towns and water providers within their individual counties that need to be surveyed. These water providers will be surveyed to determine if they have a water conservation plan filed with the Colorado Water Conservation Board's Office of Water Conservation. If these entities have GIS maps for their respective service areas, they will be included as a GIS overlay on the county GIS base maps.

2.2 Determine information available from the WQCD on public water providers within each county

If information is not completely available from the towns and water providers, the Water Quality Control Division (WQCD) will be contacted for water use information reports from public water providers in each county to supplement any missing data on current water supply demands. Growth projections from Task 1 can be used to estimate future demands for these water providers.

2.3 Obtain DWR well file data and evaluate for information on central water providers

The Division of Water Resources (DWR) well file data should be obtained and if possible, a GIS overlay prepared for use in mapping existing commercial and municipal wells on the GIS base maps. This information may identify other water providers that should be interviewed.

Task 2 Assumptions

- Upper Mountain Counties assistance in identifying water providers to interview and to provide contact information for water provider personnel to interview.
- Conference calls with up to 20 water providers located within the Upper Mountain Counties.
- One meeting at the WQCD to review reports.
- One meeting with DWR to obtain GIS data or well location database for inclusion in a GIS data set.

Task 2 Deliverables

- A GIS map of commercial or municipal water wells for each county.
- Identification of the sources of water for water providers including surface water and ground water sources.
- Estimates of current and 2050 water demands for the water providers.

Task 3 – Water Demands for Areas Relying on Domestic and Commercial Wells will be Estimated

3.1 Estimate the water demand for existing platted lots relying on commercial and domestic wells

Based on the information from Task 1, the water demands for platted lots relying on wells will be provided based on the type of well permit expected to be available from DWR for the lot, i.e. commercial, household use only (HUO) or domestic with the majority expected to be HUO type wells. Those subdivisions with small lots where the spacing requirements between a well and a septic tank or leach field may prevent the construction of a residence without combining lots will have to be taken into consideration in this task. The annual water demand will be assumed to be 0.30 acre-foot for a

permanent residence (268 gallons per day) with a HUO well and 1.0 acre-foot for a domestic well, which are granted for tracts of land greater than 35 acres. Commercial wells with meters will be surveyed to assist in estimating water demands for commercial uses. Different levels of build out for unimproved platted lots will have to be assumed in order to provide a range of water demands to 2050. A GIS map of water demand for these areas may be helpful to show areas of more dense development and related water demand.

3.2 Estimate the water demand for unplatted private property in each county that would rely on domestic or commercial wells

Using the information from Task 1, estimate the water demand for unplatted property in each county based on the current zoning to project water demands for these areas. The same assumptions set forth in Task 3.1 will be used to estimate annual water demand. Different levels of build out will have to be assumed in order to provide a range of water demands to 2050. A GIS map of water demand for these areas may be helpful in depicting areas with more dense development and related water demand.

Task 3 Assumptions

- Discussion with some water providers about water demand in the study area may result in a lower requirement for a permanent residence and if so, this value may be used.

Task 3 Deliverables

- Estimates of water demands for existing platted lots with GIS mapping.
- Estimates of water demands for unplatted private property with GIS mapping.

Task 4 – Recharge of Aquifer Systems will be Estimated

4.1 Long term annual precipitation available over the four counties will be obtained

The information from the National Weather Service and NOAA on long-term annual precipitation and seasonal precipitation for the four counties will be obtained and GIS maps if available acquired.

4.2 Geologic mapping of the various aquifer systems will be obtained

The available geologic maps for the four counties will be obtained using information available from the USGS, CGS, and DWR file information. These maps will be combined into a GIS geologic overlay in order to assist in estimating recharge to the aquifer systems.

4.3 Annual recharge to aquifer systems will be estimated

The information available from the USGS study in the Turkey Creek watershed in Jefferson County (Water Resources Investigations Report 03-4034) will be used to estimate recharge to aquifer systems based on the geology and annual precipitation. The aquifer systems are those defined in the above report and include metamorphic, intrusive, fault-zone, and Pikes Peak Granite. To the extent that the alluvial aquifers

are mapped, this study will attempt to determine if there are any potential long term water supply concerns based on the location of known alluvial wells from the DWR data base. These estimates will be shown on GIS overlay maps for the four counties.

The authors of the USGS study in the Turkey Creek watershed will be consulted to see if they can assist in properly using the report to estimate recharge for various aquifer systems, specifically Cliff Bossong and Jonathan Saul Caine. It may be necessary to conduct some random sampling of fractures in outcrop areas to compare with the fractures found in the Turkey Creek watershed study. Other experts involved in the study such as Mike Wireman with the EPA, Ed Weeks with the USGS, and Peter Barkmann with the CGS should be consulted or used as an advisory committee.

Return flows from on-lot sewage disposal systems will be estimated using information available from DWR and the Colorado School of Mines studies. In addition, any localized impacts upon runoff and related recharge to aquifer systems due to land use activities need to be evaluated and if necessary, mitigation activities such as retention basins proposed.

Task 4 Assumptions

- It is assumed that for Task 4.1 data will be available in the form of a map that indicated long-term average precipitation and that this information will not be recreated using historic data.

- Existing geologic maps for the study area will be used and at the smallest scale uniformly available.

- The USGS Report (Water Resources Investigations Report 03-4034) estimates long term recharge (1949 to 1999) for four types of aquifer systems; metamorphic, intrusive, fault-zone, and Pikes Peak granite, and this recharge estimates will be used for similar rock types in the study area.

- The counties will identify areas where impervious surfaces have impacted runoff and possibly recharge.

Task 4 Deliverables

- Annual and seasonal precipitation estimates for the four counties with GIS overlays.

- Geologic mapping for the four counties along with GIS overlays.

- Estimates of long term annual recharge to the various aquifer systems for the four counties along with GIS overlays.

- Mitigation activities such as detention basins to increase recharge in areas where land use patterns from impervious surfaces have impacted runoff and related recharge to the aquifer systems.

Task 5 – Long Term Sustainability of the Aquifer Systems will be Evaluated

5.1 Ground water level data will be evaluated for any long term trends

The available ground water level data that may be available will be acquired to determine if any water level trends are apparent. The information from Jefferson County staff, Roy Laws, will be acquired along with any other data such as from DWR and the USGS.

5.2 Areas with known aquifer water supply concerns will be identified

The counties, towns, and water providers will be surveyed for known aquifer water supply concerns such as water quantity, water quality, infrastructure, or water level concerns. This information will be evaluated for impact on the long term sustainability of the aquifer systems.

5.3 Long term physical sustainability of various aquifer systems will be evaluated

The estimated annual depletions for various aquifer systems based on water demand estimates for various periods up to 2050 will be compared with estimates of long term annual recharge. Areas where aquifer levels may be expected to decline will be identified and these areas mapped using a GIS overlay. Areas with aquifers in a sustainable condition will be also identified and these areas mapped using a GIS overlay. Sustainability is defined for this study as the ability to use the aquifer systems to meet current and future needs without mining of the aquifers and without significant degradation of the quality of the ground water.

Task 5 Assumptions

- One meeting with Roy Laws, DWR, and USGS to acquire water level data.
- One phone interview with each county, town, and water provider to discuss water supply concerns will be conducted with approximately 30 entities.

Task 5 Deliverables

- Areas with known ground water level declines will be shown on GIS maps.
- Areas with known aquifer supply concerns will be shown on GIS maps.
- GIS Maps showing aquifer systems with long term sustainable conditions and aquifer systems with long term unsustainable conditions.

Task 6 – Water Needs for Future Recreation and Tourism Demands will be Estimated

The counties will be surveyed for possible new recreation or tourism related water demands (consumptive) that may develop in the future such as new ski areas or snow boarding areas. The water supply for these possible new projects will be assumed to be provided by the developer of the project and this task is to identify associated water demands that may occur that would impact the surrounding area.

Task 6 Assumptions

- One interview of each county's appropriate planning official will be conducted to identify possible new recreation or tourism related water demand.

Task 6 Deliverables

- A description and location of possible new recreation and tourism projects.
- An estimate of the water requirements related to these projects that could impact the surrounding area from demands for restrooms, restaurants, and gas stations.

Task 7 – Draft and Final Report

A draft and final report will be provided to the Upper Mountain Counties summarizing Tasks 1-6. One meeting will be held with the Upper Mountain Counties to discuss the draft report contents and received comments. An additional meeting will be held with the Upper Mountain Counties after the final report is completed to prepare a presentation on the results to the South Platte Roundtable. A presentation that summarizes the report that could be utilized in public meetings will be created for the Upper Mountain Counties

Task 7 Assumptions

- Draft and final report will be provided in electronic format with 8 hard copy reports produced for the Upper Mountain Counties.

Task 7 Deliverables

- Draft and final report in electronic and hard copy format.
- Presentations summarizing results of study

Section 2 Key Personnel

Relevant project experience for the key personnel proposed for the Upper Mountain Counties Water Needs Assessment are presented in this section.

Hal Simpson, P.E. – Technical Director

Hal Simpson currently is a consulting engineer in water resources management. He retired following 34 years of service to the State of Colorado with the last 15 years as State Engineer and Director of the Division of Water Resources. He was appointed State Engineer on August 7, 1992. As State Engineer, Mr. Simpson was responsible for the direction and management of the Division of Water Resources, which has a staff of 265 FTE and a budget of approximately $23 million. The Division is responsible for distribution and administration of water in accordance with statutes and interstate compacts; the implementation of a statewide dam safety program; the permitting of the use of ground water and construction of wells; the collection and dissemination of data on water use and stream flow; and conducting various studies concerning water resources and the availability of water supplies. The State Engineer is Colorado's commissioner on five interstate compacts and is responsible for assuring compliance with these compacts. The State Engineer is also the Executive Director of

the Colorado Ground Water Commission and is the Secretary of the Board of Examiners for Water Well and Pump Installation Contractors.

CDM Project Staff

Kelly DiNatale, P.E. – Project Director

Mr. DiNatale has 26 years of experience in the planning, design, construction, and operations and maintenance of raw water supply, water quality, watershed protection, reservoir management, water treatment, and wastewater treatment facilities. He has directed and managed local, regional and statewide water supply planning efforts. Mr. DiNatale served as Technical Director for the Colorado Statewide Water Supply Initiative (SWSI).

Nicole Rowan, P.E. – Project Manager

Ms. Rowan has over 12 year experience and is a senior project manager who focuses on water supply, watershed management and natural resources projects. She is the project manager for the Statewide Water Supply Initiative (SWSI) and for CDM's current contract with Colorado Department of Natural Resources (DNR) to provide technical support to the Interbasin Project Compact process.

Michael Smith – Senior Hydrologist

Mr. Smith has more than 27 years of experience directing and conducting environmental investigations for waste disposal and remediation, mining, and water resources projects. His experience includes a diversity of hydrogeologic field investigations, monitoring network design and implementation, computer simulation of groundwater and vadose zone systems, solute and nonaqueous phase liquid (NAPL) transport, and extensive interaction with regulatory agencies.

Gordon McCurry – Senior Hydrogeologist

Dr. McCurry has more than 20 years of experience in groundwater hydrology relating to water resources evaluation and aquifer remediation. His experience includes the investigation, characterization, and modeling of aquifer systems for projects nationwide. Dr. McCurry's areas of technical expertise include numerical simulation of groundwater flow and contaminant transport, wellhead protection, aquifer hydraulics testing and analysis, stream/aquifer interactions, design of groundwater remediation systems, and regulatory compliance.

Robbie Parsons – GIS Specialist

Mr. Parsons has 21 years of experience as an environmental specialist/GIS specialist performing complex GIS and database analysis. He has extensive experience in the area of systems management including hardware and software setup. Additionally, he is involved in several implementation and development tasks related to GIS involving private sector and federal government projects.

Mark McCluskey, P.E. – Project Engineer

Mr. McCluskey is an environmental engineer who specializes in water resources. His expertise includes hydrologic modeling. Mr. McCluskey's software experience includes MODFLOW, MODFLOW SURFACT, UCODE, PEST, DYNFLOW, Groundwater Vistas, ArcInfo, ArcGIS, HEC-RAS, Fortran, VBA, SHAPE, @RISK, EPAnet, LINDO, MathCAD, MINITAB, and Kypipe.

Matt Bliss – Engineer

Mr. Bliss is a water resources engineer experienced with groundwater and surface water planning and modeling. He has collaborated on several groundwater models, groundwater sustainability studies, and surface water planning studies including water rights evaluations.

Section 3 Budget

A detailed breakdown of the estimated labor, other direct costs, and subconsultants for the proposed project is presented in the following matrix.

Payment

Payment will be made based on actual expenditures and invoicing by the water activity sponsor. The request for payment must include a description of the work accomplished by major task, and estimate of the percent completion for individual tasks and the entire water activity in relation to the percentage of budget spent, identification of any major issues and proposed or implemented corrective actions. The last 5 percent of the entire water activity budget will be withheld until final project/water activity documentation is completed.

All products, data, and information developed as a result of this grant must be provided to CWCB in hard copy and electronic format as part of the project documentation.

Insert Budget

Insert Budget

Section 4 Project Schedule

The proposed project schedule is presented in the graphic below. The schedule is presented as months from contract inception. It is anticipated that the project will be completed within six months.

Insert Project Schedule