Executive Summary

Overview

Historically, water suppliers in Park City and Snyderville Basin have relied primarily on groundwater for their municipal and industrial (M&I) water. Because of the extensive development of the groundwater sources, there is concern that there may be limited potential for additional development of the groundwater as a reliable long-term water supply. The recent drought (1999-2004) has raised further questions regarding the quantity and reliability of the existing groundwater development within the Basin. This problem is being compounded by the continuous rapid growth in the Basin, which has become a highly desirable residential and recreational community.

There is significant local interest in determining the long-range water needs of the Basin and identifying feasible options to provide additional water for future needs. Over the past several years, government agencies and several private entities have explored various options to develop additional water supplies. However, a comprehensive evaluation of the overall water needs within the Basin had not been conducted, nor had a comparison between alternative plans been examined in an objective manner.

In 2001, the U.S. Army Corps of Engineers (COE) was funded and directed by Congress to conduct a feasibility study for Park City on water supply options, titled the "Park City Water Supply Infrastructure Study". The COE completed significant work prior to Reclamation's involvement. Page 120 of the FY 2004 Energy and Water Appropriations Conference report states: "The conference agreement includes $500,000 for the Bureau of Reclamation to continue a feasibility study of water supply infrastructure improvements in Park City, Utah." Reclamation received additional funding in FY 2005 and FY 2006. This study is being conducted pursuant to the authority and with the funding provided in these appropriations.

The purpose of this Park City and Snyderville Basin Water Supply Study is to evaluate the future water needs within the rapidly growing Park City and Snyderville Basin area and to formulate, compare, and prioritize options that could be pursued to provide for the M&I water needs expected through 2050. This report presents the findings and recommendations of the study.

Projected M&I Demands

The Park City and Snyderville Basin area is experiencing some of the fastest growth in Utah. This growth has included commercial, institutional, and residential development. The entire area is experiencing an accelerated change from a regional ski resort destination to a diversified year-round vacation and living community, as well as a bedroom community for the Salt Lake Metropolitan area.

Population within the study area is projected to increase from the present (2001) approximately 24,000 to about 64,000 in 2030 and 86,000 by the year 2050. If per-capita use rates were to continue as at present, this increased population would result in an M&I demand of approximately 25,000 acre-feet per year in 2030 and 32,000 acre-feet per year by 2050. However, assuming current water conservation goals are met, the projected demands would be about 23,000 acre-feet per year in 2030 and 27,000 acre-feet per year by 2050.

As explained in Chapter 4, additional demands have been placed on the system to meet in-stream flow and wastewater dilution requirements (1,100 acre-feet per year in 2030 and 1,600 acre-feet per year in 2050), and to replace susceptible mine tunnel flows which have been relied on by Park City (2,000 acre-feet per year for both 2030 and 2050). These additional demands increase the projected water needs to 26,100 acre-feet per year in 2030 and 30,600 acre-feet per year in 2050.

Reliable Water Supply

Table ES-1 shows, by water provider, estimated annual water supplies currently available to meet M&I demands within the study area. This current long-term reliable water supply is approximately 14,000 acre-feet per year. Total current use is approximately 9,800 acre-feet, leaving a current reserve of about 4,200 acre-feet to meet fire suppression and other emergency needs. Chapter 4 presents a detailed discussion of the reasons for and the importance of this reserve. Also explained in Chapter 4 is the rationale for increasing the "reserve" need from the current 4,200 acre-feet per year to 6,500 acre-feet per year in 2030 and 7,500 acre-feet per year in 2050.

TABLE ES-1
2003 Annual Water Production Estimate
(Units: Acre-Feet per Year)

Water Supplier	Total In-Basin (AF/Yr)	2001 Actual Use (AF/Yr)
Community Water Company	281	163
Gorgoza Mutual Water Company	1,424	583
High Valley Water Company	166	75
Mountain Regional SSD	2,467	1,697
Park City Municipal Corporation	5,716	4,728
Summit Water Distribution Co.	3,340	2,065
Summit Co. Service No. 3	203	80
Timberline Special Imp. District	59	16
Others	371	427
Totals (Rounded)	**14,000**	**9,800**
	Surplus/Reserve	**4,200**

Not included in the 14,000 acre-feet per year current supply are more recently developed water supplies and expected future in-Basin water development supplies. Those already developed include the 1,600 acre-feet per year supply provided by the recently completed Lost Creek

Canyon Pipeline project and the 1,000 acre-feet per year imported by Park City from the Jordanelle Special Service District. These supplies are discussed in greater detail in Chapter 4.

Additional in-Basin supplies, assumed to be developed annually by the year 2050, include 300 acre-feet additional groundwater and 500 acre-feet conversion of agricultural-use to municipal-use. Including these developed and anticipated future in-Basin supplies, and excluding the reserve need, the projected reliable water supplies of 9,800, 10,700, and 9,900 acre-feet per year for years 2001, 2030, and 2050, respectively, are required as shown in Table ES-2.

Projected M&I Needs

Projected M&I needs are computed by subtracting projected reliable supply from projected M&I demands. As shown in Table ES-2, the projected additional M&I needs (future development) are 15,400 acre-feet for the year 2030 and 20,700 acre-feet for 2050. A detailed discussion of the analysis behind these numbers is presented in Chapters 2 through 4.

TABLE ES-2
Snyderville Basin Projected Future M&I Needs
Units: Acre-Feet per Year

Existing and Projected M&I Needs	2001	2030	2050
Population	23,900	64,300	86,300
Calculated M&I Demand	**9,800**	**25,300**	**32,000**
Water conservation	0	(2,300)	(5,000)
Adjusted M&I Demand	**9,800**	**23,000**	**27,000**
Minimum instream flow/wastewater dilution required	0	1,100	1,600
Mine tunnel concerns – mine collapse, water quality	0	2,000	2,000
Projected Total M&I Demand	**9,800**	**26,100**	**30,600**
Calculated Current Supplies	**14,000**	**14,000**	**14,000**
Lost Creek Canyon Project	0	1,600	1,600
Jordanelle Special Service District imports	0	1,000	1,000
Increased groundwater development	0	200	300
Future agricultural conversions	0	400	500
Reserve Capacity	(4,200)	(6,500)	(7,500)
Projected Reliable Supply	**9,800**	**10,700**	**9,900**
Projected Additional M&I Needs (Future Development)	**0**	**15,400**	**20,700**

Future Development Options

Nine options were identified for developing water to meet future needs. The first three are in-Basin development options, while the remaining six are importation options. Four of the six importation options (6, 7, 8 and 9), develop the same Weber Basin Water Conservancy District (WBWCD) water supply. Therefore, only one of the four could be considered for future development.

Each of the nine Options was studied in detail to determine viability. A more detailed description of the analysis is presented in Chapter 5. Of the nine Options, six were considered viable for further evaluation as shown in bold type in Table ES-3. Also shown is the water supply that would be developed by each, for a total potential development of 20,000 acre feet per year by 2030 and 21,600 acre-feet per year by 2050.

TABLE ES-3
Development Options Summary
Units: Acre-Feet per Year

Development Options	2001	2030	2050
In-basin Development			
1 – Additional In-Basin Surface Water Storage			
2 – Conjunctive Management of Surface & Groundwater			
3 – Water Reuse	**0**	**2,000**	**3,600**
Importation			
4 – Provo River – JSSD	**0**	**500**	**500**
5 – East Canyon Pipeline	**0**	**12,500**[1]	**12,500**[1]
6 – Brown's Canyon Pipeline			
7 – Lost Creek Canyon Pipeline	**0**	**5,000**[2]	**5,000**[2]
8 – Weber River via Weber Provo Canal	**0**	***5,000***[2]	***5,000***[2]
9 – Lost Creek Canyon and Weber Provo Canal	**0**	***5,000***[2]	***5,000***[2]
Total Potential Development	**0**	**20,000**	**21,600**

[1]Additional water right approvals and potential acquisitions may be needed to yield the full 12,500 acre-foot supply.
[2]These options are dependent upon the same 5,000 acre-feet water supply as Option 7 – hence only one of the three can be developed.

Option Evaluation

Each of the six viable Options was evaluated against a set of criteria developed during the public involvement process of the study. Each criterion was generally applied on a per acre-foot basis. The study team divided the evaluation criteria into two separate categories: Economic Evaluation factors and Non-Economic Evaluation factors. Economic factors include capital cost and present value life cycle cost. Non-Economic factors include environmental, social, institutional, and system reliability.

Results of the economic factors evaluation are shown in Table ES-4, with a more detailed explanation presented in Chapter 6 (Section 6.3.2) and in the Appendix. Potential impacts were identified during the non-economic factors evaluation, however, none were considered sufficiently significant to prevent or limit development of any of the six Options.

TABLE ES-4
Economic Factors Evaluation Summary

Economic Factors	Option 3	Option 4	Option 5[1]	Option 7[1]	Option 8	Option 9
Capital Costs (new) [2] (Units 1,000)	$19,100	$2,700	$53,700 - $67,300	$25,500	$7,200	$14,400
Capital Costs (total) (Units: 1,000)	$19,850	$2,700	$69,300 - $82,900	$37,800	$7,200	$24,300
Capital Costs per acre-foot capacity[3]	$5,510	$5,400	$7,920 - $6,630	$7,560	$1,440	$2,880
Life Cycle Costs per acre-foot delivered	$179	$744	$418 - $376	$369	$460	$426

[1] Option 5 costs are shown as a range, consistent with a capacity between 8,750 acre-feet per year and 12,500 acre-feet per year, as explained in Sections 5.7.2 and 6.3.2. Also, costs for Options 5 and 7 are based on cost estimate Method 3 (see Table ES-5).
[2] Capital costs of new facilities only
[3] Based on capital costs (total) rather than capital costs (new).

Preferred Plan

Of the six options evaluated, only Options 5 and 7 are included in the preferred plan. Option 3 is not included because it is an in-Basin option, i.e. water reuse, which was assumed would be developed by local entities. Options 8 and 9 were eliminated because Option 7 is the highest ranking of the three and therefore becomes the preferred method for importing WBWCD water from Rockport Reservoir to the Snyderville Basin. Option 4 is eliminated because of high life cycle cost relative to the other options.

With the options narrowed to two, a more detailed comparison of the two was conducted from both an economic and non-economic perspective, in order to rank the options and make recommendations with regard to construction priority. This comparison is described in more detail in Chapter 6, Sections 6.3.2 and 6.3.3. A more detailed economic analysis showing four different methods of cost estimates is shown in Table ES-5.

The economic comparison shows that the life cycle cost per acre-foot delivered (See Table ES-4) is slightly lower for Option 7 than for Option 5, but are within the accuracy of the estimates. Because the cost differences between the two are considered within the margin of error of the analysis, other factors must be considered to determine a recommended priority.

TABLE ES-5
Option Cost Estimate Summary by Method

Options	Method 1[1] New Facilities Only	Method 2[2] All Facilities (USBR)	Method 3[3] All Facilities (Includes Sunk Costs)	Method 4[4] (New Facilities Contract Cost Only)
Option 5 - East Canyon Pipeline (8,750 AF capacity and water supply)				
Capital Costs				
Capital Cost (Units: 1,000)	$53,700	$76,000	$69,300	$39,900
Capital Cost per AF Capacity	$6,140	$8,690	$7,920	$4,560
Option 5 - East Canyon Pipeline (12,500 AF capacity and water supply)				
Capital Costs				
Capital Cost (Units: 1,000)	$67,300	$89,600	$82,900	$51,400
Capital Cost per AF Capacity	$5,380	$7,170	$6,630	$4,110
Option 7 - Lost Creek Canyon Pipeline (5,000 AF capacity and water supply)				
Capital Costs				
Capital Cost (Units: 1,000)	$25,500	$40,300	$37,800	$19,000
Capital Cost per AF Capacity	$5,100	$8,060	$7,560	$3,800

[1] Method 1 – Costs for new facilities only. Cost of existing facilities excluded (no sunk costs). Costs include 10% for unlisted items, 20% for contingencies, and 12% for engineering, design, and construction oversight.
[2] Method 2 – Cost of all facilities (new and existing) as if none have been constructed. Costs include 10% for unlisted items, 20% for contingencies, and 12% for engineering, design, and construction oversight.
[3] Method 3 – Cost of all facilities (new and existing). Existing facility sunk costs are added to cost of new facilities. Costs include 10% for unlisted items, 20% for contingencies, and 12% for engineering, design, and construction oversight.
[4] Method 4 – Method 1 (new facilities only) - contract of "field" costs only – which includes 10% for unlisted items but does not include 20% for contingencies, or 12% for engineering, design, and construction oversight.

As shown in Table ES-5, the capital cost for Option 7 is lower than the capital cost for Option 5. Also, Option 7 capital cost per acre-foot capacity for Methods 1 and 4 is less than costs for Option 5. However, Option 7 capital cost per acre-foot capacity for Methods 2 and 3 is inside the range of costs for Option 5. Cost differences between the two Options are so close that they are considered within the margin of error of the analysis, and therefore, do not indicate a conclusive preference of one over the other.

The non-economic comparison, as mentioned above, found no potential impact that would prevent or limit development of either of the two Options. However, some could have significant impact on the timing and risk of development.

Park City and other areas within the Snyderville Basin have an immediate need for additional water supplies, making timing of permanent water deliveries critically important. The available supplies are already behind the projected demand curve (Figures 4.1 and 6.1). Based on the information presented in Chapter 5, and the analysis presented in Chapter 6, the non-economic factors comparison of the two Options ranks Option 7 ahead of Option 5. Considering both the economic and non-economic factors, Option 7 is ranked first for the following reasons:

- A primary reason for the congressional legislation was to find a permanent solution to Park City's immediate and critical need for 2,500 acre feet of water per year. Option 7 is the least costly, would require only 2½ miles of additional pipeline, and would require the shortest time to implement for Park City's need.
- Option 7 is a smaller project and has a lower new facility project capital cost, i.e. $25,500,000 instead of $67,300,000, which makes obtaining funding easier and faster.
- Option 7 can be implemented in less time and with less risk.
- Option 7 has fewer easements, water rights, and land use permit issues to resolve.
- Option 7 has water delivery agreements in place.
- A majority of the infrastructure for Option 7 is already constructed.
- Environmental compliance is expected to take less time because Option 7 is a smaller project with fewer expected adverse impacts.
- Option 7 has a lower capital contract cost per acre-foot capacity, although both projects are relatively close and are considered within the margin of error of the cost estimates.

The East Canyon Pipeline Project, however, is also needed and should move forward immediately and as expeditiously as possible to meet the future, rapidly growing, water needs in the other areas of the Snyderville Basin.

Table ES-6 shows the priority ranking and the quantities of water recommended for development under each option.

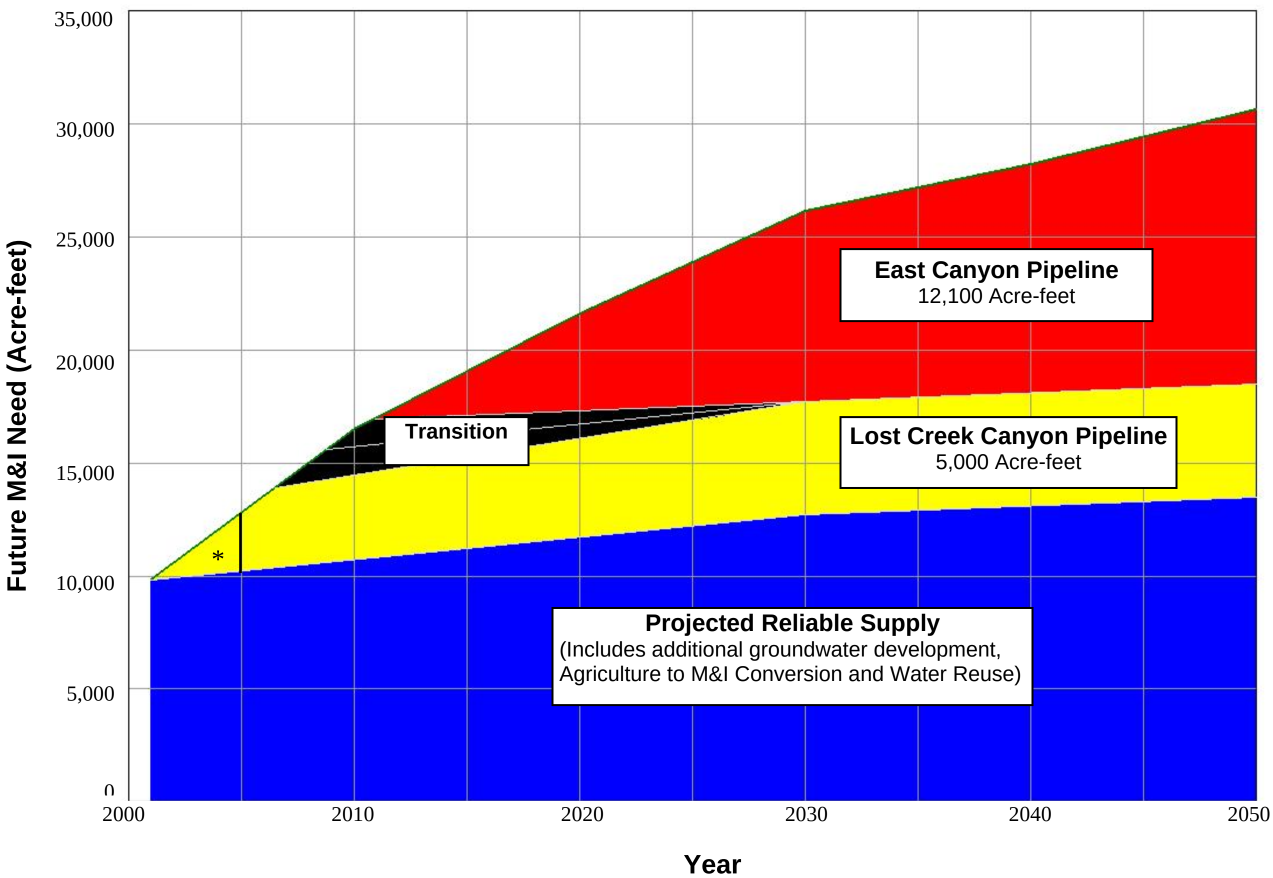
TABLE ES-6
Preferred Plan
Development Option Priority and Needs
Units: Acre-Feet per Year

		2030	2050
Priority	**Development Option**		
1	Option 7 - Lost Creek Canyon Pipeline	5,000	5,000
2	Option 5 - East Canyon Pipeline	8,400	12,100
	Total Developed	**13,400**	**17,100**

Figure ES-1 shows a recommended timeline for implementing the preferred plan. As shown in the figure, the Lost Creek Canyon Pipeline project would meet M&I needs in the immediate and near future with the East Canyon Pipeline project meeting later needs. The figure also shows a "transition" or "over-lap" period when both projects could meet growth needs in the Basin at the same time. This would likely occur as the Lost Creek Canyon Pipeline project water is near full utilization and the East Canyon Pipeline project has been constructed and is operational. Factors which could govern the size of the over-lap would include how quickly the East Canyon Pipeline project can be constructed, the location of need within the Basin, and which water supply is the most marketable in terms of cost of water, proximity to growth areas, customer service, etc.

Table ES-7 is a study summary which shows existing and projected needs, current water supply, and the preferred plan for meeting those projected needs.

Figure ES-1
Preferred Plan Implementation



*Area to the left of the vertical line (2005) indicates M&I demands in excess of projected reliable supply. In order to meet the M&I demands, reserve capacity is being used.

TABLE ES-7
Study Summary
Units: Acre-Feet per Year

Existing and Projected Needs	2001	2030	2050
Population	23,900	64,300	86,300
Calculated M&I Demand	**9,800**	**25,300**	**32,000**
Water conservation	0	(2,300)	(5,000)
Adjusted M&I Demand	**9,800**	**23,000**	**27,000**
Minimum in-stream flow/wastewater dilution requirement	0	1,100	1,600
Mine tunnel concerns – mine collapse, water quality	0	2,000	2,000
Projected M&I Demand	**9,800**	**26,100**	**30,600**
Calculated Current Supplies	**14,000**	**14,000**	**14,000**
Lost Creek Canyon project	0	1,600	1,600
Jordanelle Special Service District imports	0	1,000	1,000
Increased groundwater development	0	200	300
Future agricultural conversions	0	400	500
Reserve Capacity	(4,200)	(6,500)	(7,500)
Projected Reliable Supply	**9,800**	**10,700**	**9,900**
Projected Future M&I Needs (Future Development)	**0**	**15,400**	**20,700**
Future Water Reuse (Developed by Others)	0	2,000	3,600
Projected Additional M&I Needs (Preferred Plan)	**0**	**13,400**	**17,100**
Preferred Plan			
Lost Creek Canyon Pipeline	--	5,000	5,000
East Canyon Pipeline	--	8,400	12,100
Total Future Development	**--**	**13,400**	**17,100**