



CITY COUNCIL AGENDA MEMORANDUM

To: Mayor and City Council
 From: George Di Ciero, City and County Manager
 Prepared by: Nancy Arthur, Civil Engineer
 Burt Knight, City Engineer
 Kevin Standbridge, Assistant City and County Manager for Community Development
 Alan King, Public Works Director

Meeting Date	Agenda Category	Agenda Item
October 14, 2008	Special Report	13 (a)
Agenda Title		Broomfield Reservoir Progress Report

Summary

- Broomfield's Water Management Plan identified the need for new water storage reservoirs in order to meet future demand.
- One of City Council's 2005 top priorities and an ongoing priority for 2008 is to pursue a Broomfield raw water storage reservoir.
- The Reservoir is highlighted on the adjacent map.
- At the April 8, 2008, Council meeting, Council directed staff to construct the Broomfield Reservoir (Reservoir) as quickly as possible, to eliminate increased construction costs due to escalating fuel and material costs. The April 8, 2008, Council memo is included for informational purposes as Attachment 2.
- On June 24, 2008, Council requested graphics to depict the final configuration of the land surface between Sheridan Parkway and Lowell Boulevard once the construction of the Reservoir is completed. The drawings are included in Attachment 1.
- In order to address Council's concerns regarding escalating construction costs, the contract documents have been developed to bid the project as a Guaranteed Maximum Price or a Unit Price contract. The results of the bid alternatives will be presented to Council for approval.
- In September 2008, the contractors prequalified to bid on the project estimated that the cost to construct the reservoir is similar to the cost presented to Council on April 8, 2008.
- Two backhoe pits will be dug in October 2008 to allow the prequalified contractors and engineers to observe the soil conditions on the site. This will enable the contractors to provide better construction costs.
- Construction of the Reservoir is scheduled to begin in February 2009. The anticipated schedule is summarized below.



State Engineer Submittal	November 2008
Bid Project	November 2008
Council first reading of ordinance for Revenue Bond issuance	November 2008
Receive Bids	December 2008
Council second reading for Revenue Bond issuance	January 2009
Council consideration of authorization of construction contract	February 2009
Begin construction	February 2009

Prior Council Action

- Council approved the purchase of the Hoopes property in May 2005.
- Council retained MWH Americas, Inc. on February 27, 2007, to provide engineering design and a master plan for the reservoir and the surrounding area.
- Council approved donating the prairie dogs on site to a wildlife recovery program on January 8, 2008.
- Council directed staff to continue designing a 5,000 ac-ft reservoir on April 8, 2008.
- Council authorized Flatirons Constructors, Inc., to build the Sheridan Crossing on June 24, 2008.

Proposed Actions/Recommendations

- Staff plans to proceed with the fill placement as depicted in the following perspectives, and bid the proposed project in November 2008.

BACKGROUND

Broomfield Reservoir

Broomfield has developed a comprehensive water management plan over the last twenty years. There are three elements to the plan:

- Treated Water Plan,
- Reuse Water Plan, and
- Raw Water Plan.

The Plans are used as guides by Broomfield when new projects are proposed. Using the model, the Treated Water Plan projects ultimate water system requirements needed at build-out using a model based on the land uses described in Broomfield's Comprehensive Plan. The model identifies when more water needs to be purchased, the timing of treatment plant expansions, when new water storage tanks need to be in service, and when new water transmission lines are needed. It includes plans for new storage reservoirs and shows when they need to be online to meet future system demands.

Using the model, the proposed Broomfield Reservoir has been identified as a project that is needed to meet future demands by spring 2010. Future peak day demands would be served from the proposed Reservoir. Emergency water storage and additional drought protection would also be provided by the Reservoir. The Reservoir is depicted on the following graphic.



PROJECT STATUS

Broomfield retained MWH Americas, Inc., (MWH), a Broomfield based international engineering firm on February 27, 2007, to design the reservoir, including the Sheridan Parkway Crossing, and develop a master plan for the area. Since then MWH and staff have:

- Determined that a 5,000 ac-ft reservoir fits the site best and is the most economically efficient reservoir to construct;
- Developed several master plan alternatives for site uses;
- Initiated construction of the Sheridan Crossing on July 22, 2008;
- Prequalified three (3) contractors to bid on the construction of the Reservoir;
- Completed approximately 95% of the Reservoir Design;
- Developed documents to bid the project as a Guaranteed Maximum Price or a Unit Price contract. The results of the bid alternatives will be presented to council for approval;
- Obtained State Engineer input during the design of the Reservoir;
- Obtained estimates from contractors which indicated the cost to construct the Reservoir is similar to the cost presented to council on April 8, 2008; and
- Obtained comments on how to decrease the construction costs from the contractors. MWH is reviewing and incorporating the comments into the project.

MWH recommended digging some excavations to expose the soil conditions where the dam will be constructed. Two backhoe pits will be dug in October 2008 to allow MWH and the prequalified contractors to observe the soil conditions on the site. This will enable the contractors to provide better construction costs.

The Reservoir will also be used for recreational facilities. MWH has developed three different alternatives for the recreation facilities, which were presented to Council on April 8, 2008. Based on the feedback obtained from Council, staff is working with the Open Space, Trails Advisory Committee and the Park and Recreation Committee to develop a recommended plan to present to Council. It is anticipated the proposed plan will be presented to Council near the end of 2008. The April 8, 2008 Council memo is included for informational purposes as Attachment 2.

FILL PLACEMENT

Approximately four (4) million yards of excess dirt will need to be removed to construct the Reservoir. On June 24, 2008, Council requested graphics to depict the final configuration of the land surface between Sheridan Parkway and Lowell Boulevard once the construction of the Reservoir is completed.

Attachment 1 depicts the area between Lowell Boulevard and Sheridan Parkway before and after the placement of the fill.

The proposed layout of the fill has minimized impacts on the existing homes and incorporates the possible uses developed during the master planning process. As the

perspective drawings show (see Attachment 1), the proposed layout has limited visual impact on the existing houses on the east side of Lowell Boulevard.

The fill will partially block the views to the west of the undeveloped parcel at the southeast corner of the intersection of Lowell Boulevard and Sheridan Parkway owned by Pulte Homes. The fill is placed to minimize the impact to this parcel.

This fill placement is assuming that the oil and gas well located on the southwest corner of the intersection of Lowell Boulevard and Sheridan Parkway remains in place. This well was drilled in 2002 but was never put into production. Staff has been negotiating to consolidate the location of the oil and gas wells. Council input will be requested as the negotiations proceed in the near future.

FINANCIAL CONSIDERATIONS

The issuance of bonds will be needed to fund the construction of the Reservoir and to purchase water rights. The water fund will be reimbursed with future bond proceeds for the monies spent to date. The financial considerations are summarized in the following table:

Projected Funds Available	
2002 Bond Proceeds*	\$ 8,682,693
Proposed New Bond Proceeds*	41,000,000
Drought Surcharge Reserve	7,449,128
Cash Reserves Accumulated from Prior License Fee Sales	37,868,179
Total Sources of Funds	\$ 95,000,000
Expenditures to date	
Preliminary Engineering, Legal and Support Services	\$ 196,510
Land Acquisition	8,682,693
Design (MWH contract)	1,844,663
Water rights	9,202,140
Total Expended to date	\$ 19,926,006
Projected Expenditures	
Sheridan Crossing Construction	\$ 2,194,201
Reservoir Construction	\$ 66,605,799
Water Rights**	\$ 4,797,860
Mineral Rights***	\$ 1,300,000
Total projected costs	\$ 74,897,860
Total Project Expenditures	\$ 93,523,866
Balance Available for Contingency	\$ 176,134

*Bonds issued for this project will be repaid from license fees collected for new water taps.

**Staff is negotiating for the purchase of water rights.

*** There are mineral and lease rights surrounding the reservoir site. Noble Energy has a lease of those rights, claims to want to drill several wells, and has asked Broomfield to pay for the costs of directionally drilling the wells from locations that would not interfere with or endanger the reservoir. Broomfield has asserted that the costs of drilling must be paid by Noble, and that Noble is solely responsible for assuring that the reservoir is not adversely affected by any drilling or associated operations. However, staff deems it prudent to create the reserve since the drilling issues have not been resolved.

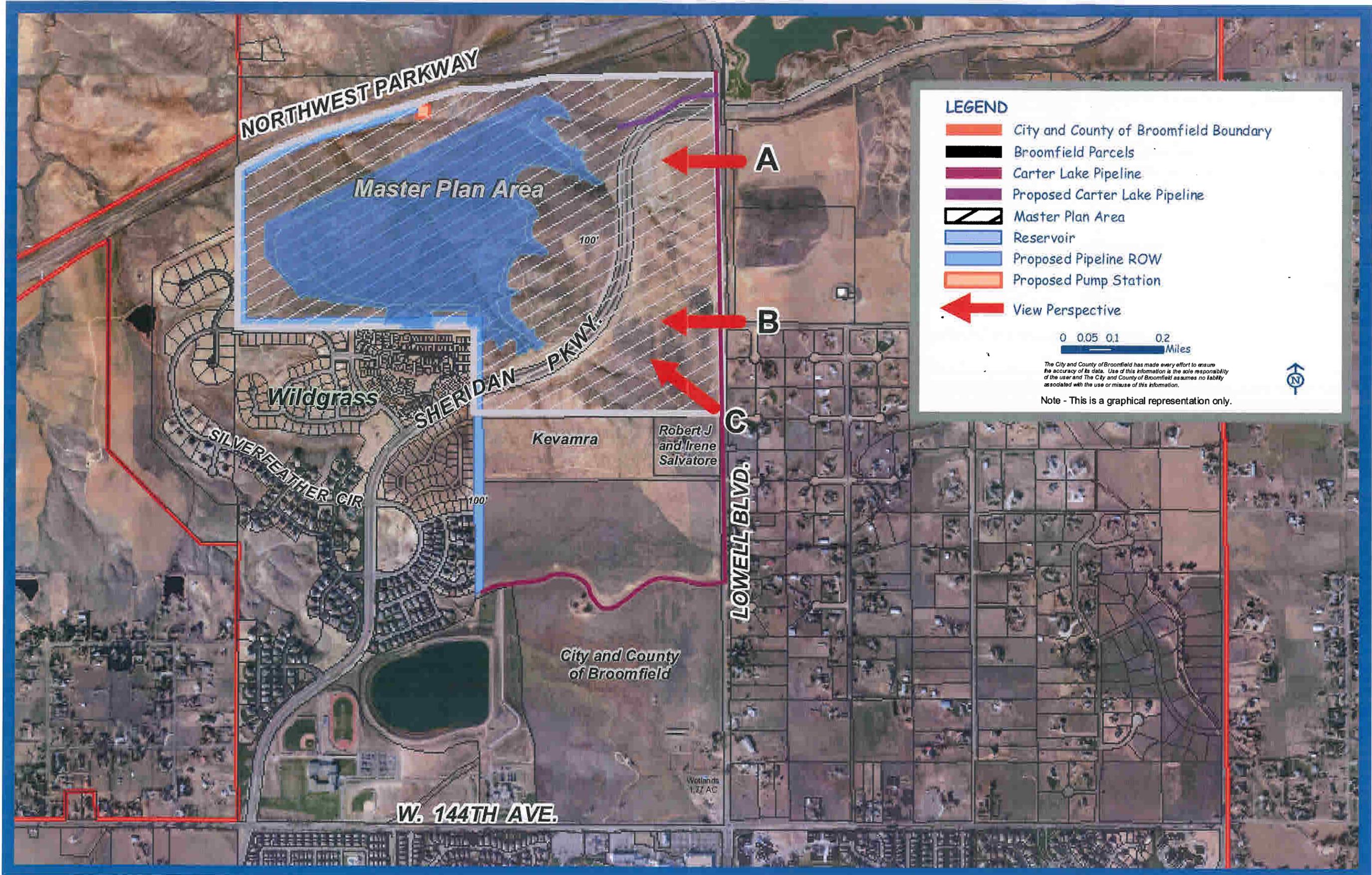
RESERVOIR SCHEDULE

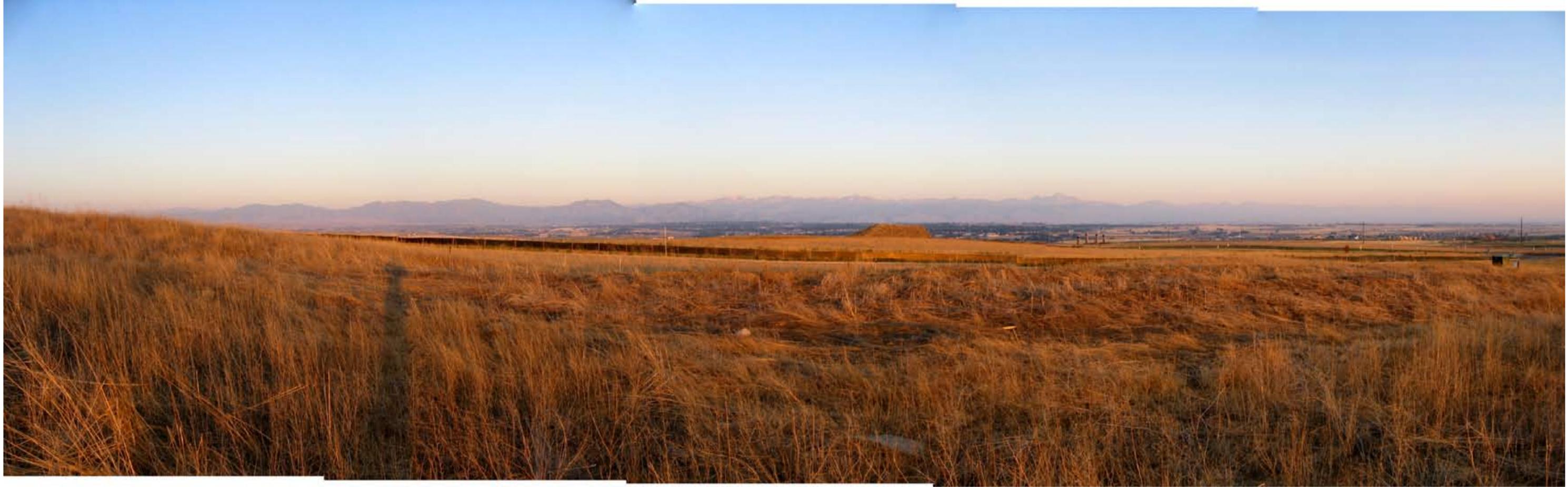
It is anticipated that construction plans will be submitted to the state engineer for review in November 2008. The state engineer has six months to review the plans, which means the latest the state can approve the project is April 2009. The following table summarizes the anticipated schedule to begin construction.

Anticipated Schedule	
State Engineer Submittal	November 2008
Bid Project	November 2008
Council first reading for revenue bond issuance	November 2008
Receive Bids	December 2008
Council second reading for revenue bond issuance	January 2009
Council consideration of authorization of construction contract	February 2009
Begin construction	February 2009

Staff and MWH have been meeting with the state engineer throughout the design of the Reservoir and believe that the state engineer will not have major revisions to the plans. Staff is proposing that the project be bid before the state engineer approves the plans, although there is a small risk that the contractor could request a change order if the state engineer requires that the plans be revised. The state engineer had no objections to dirt being moved before the plans are approved, but indicated that work on the dam cannot begin before the plans are approved.

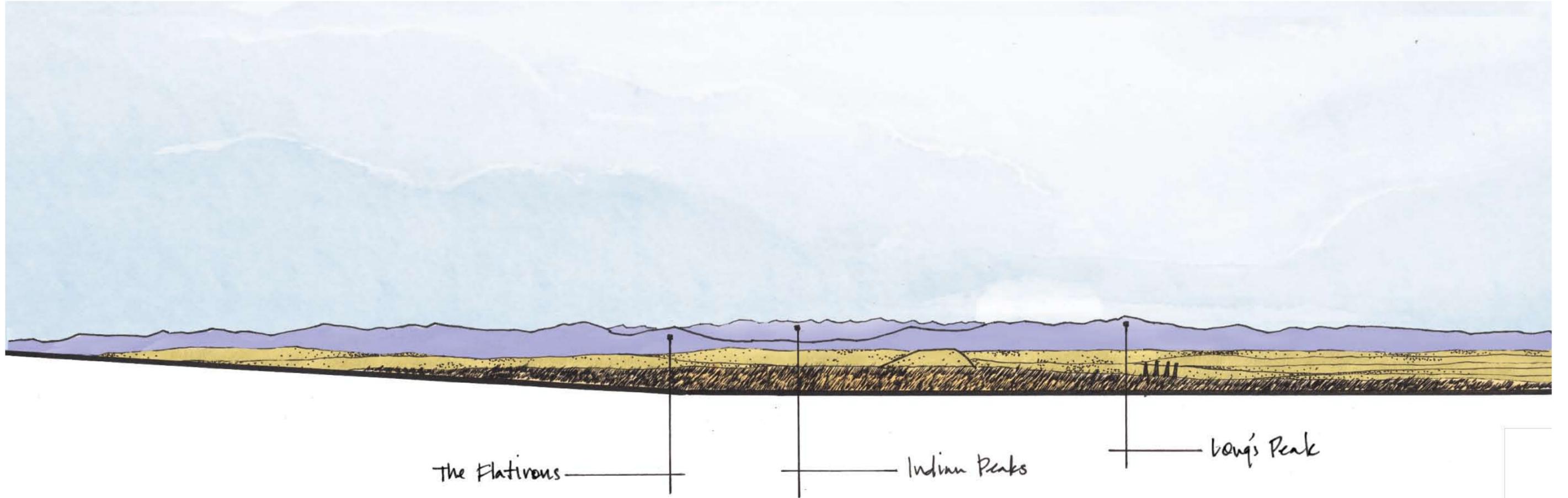
It is anticipated that bids for the overall Reservoir project will be submitted to Broomfield in December 2008. The contractor can begin hauling the 4 million yards of extra dirt, in February 2009, once Council gives the authorization for the construction to begin. This will be before the state engineer approves the project. Construction on the dam portion of the Reservoir is expected to begin in April 2009, once the state engineer approves the project.





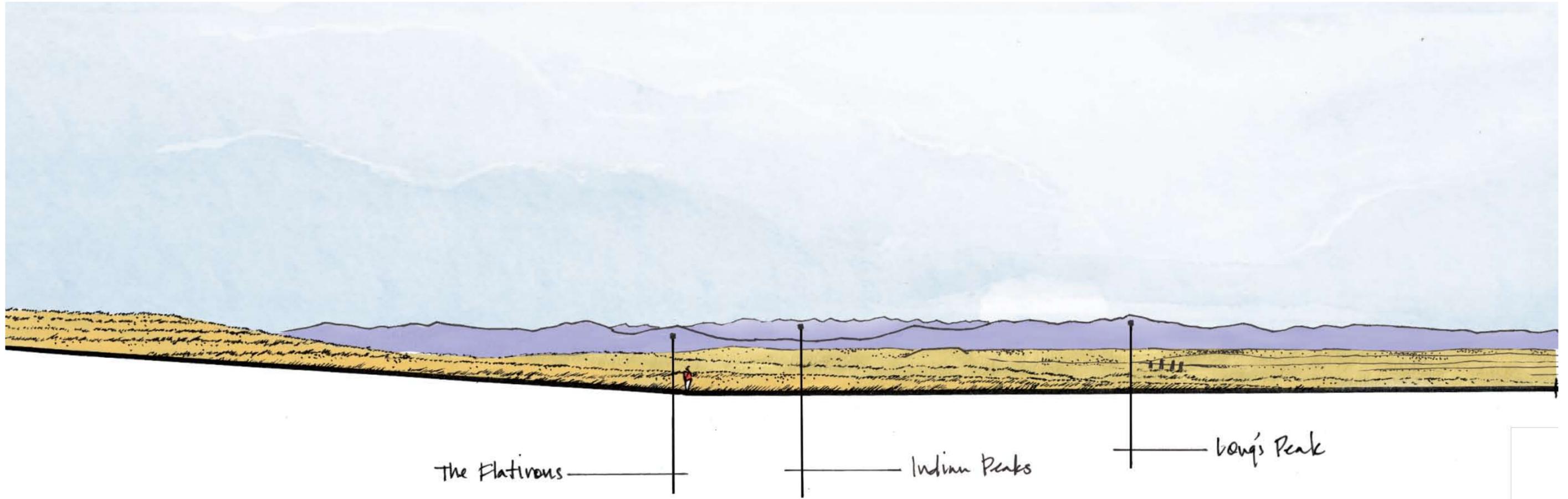
Broomfield Reservoir - Photograph from Point 'A'

Broomfield, Colorado • *August 2008*



Broomfield Reservoir - Existing View from Point 'A'

Broomfield, Colorado • August 2008



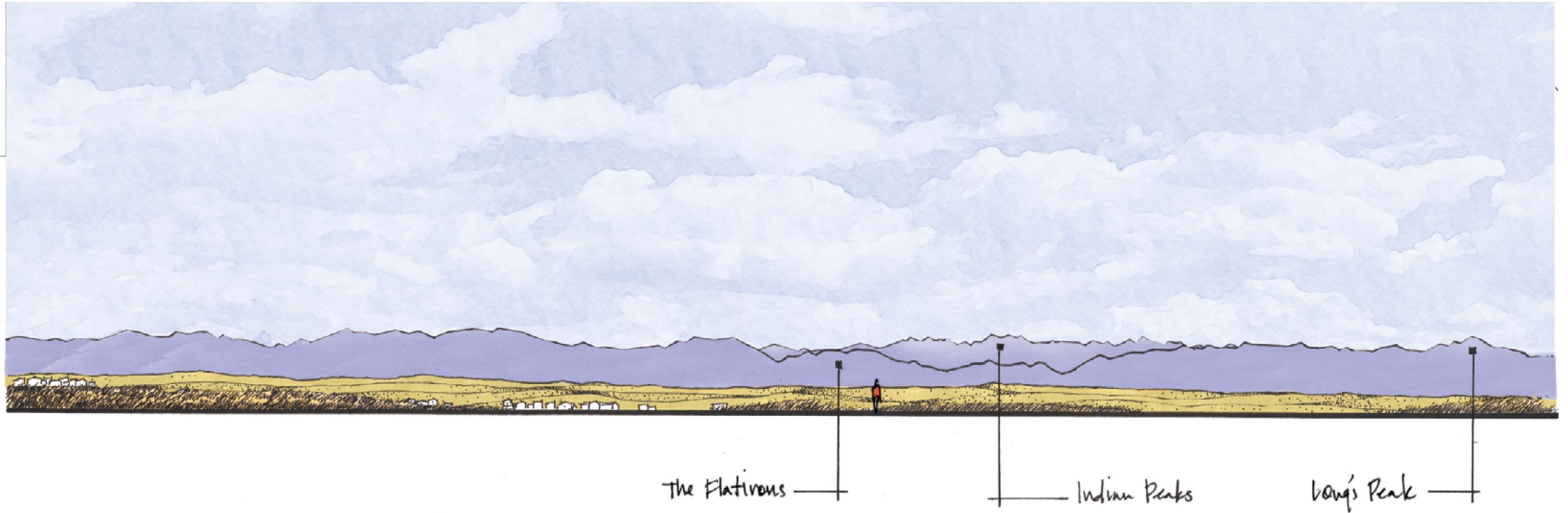
Broomfield Reservoir - Proposed View from Point 'A'

Broomfield, Colorado • August 2008



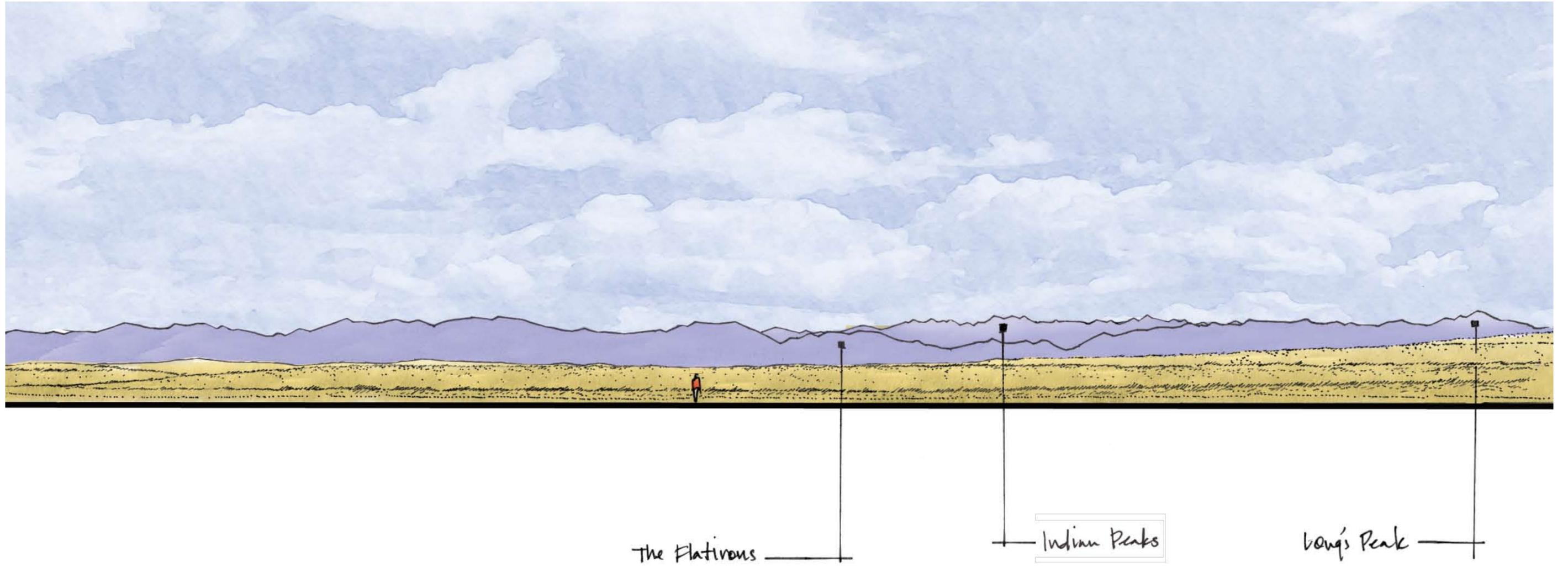
Broomfield Reservoir - Photograph from Point 'B'

Broomfield, Colorado • *August 2008*



Broomfield Reservoir - Existing View from Point 'B'

Broomfield, Colorado • August 2008



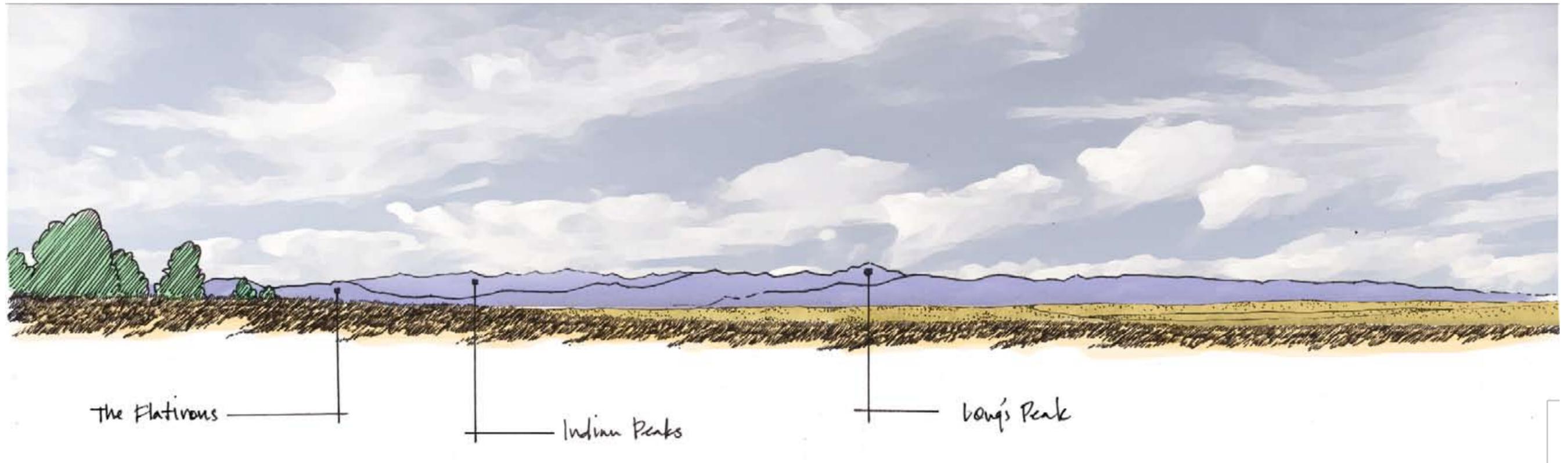
Broomfield Reservoir - Proposed View from Point 'B'

Broomfield, Colorado • August 2008



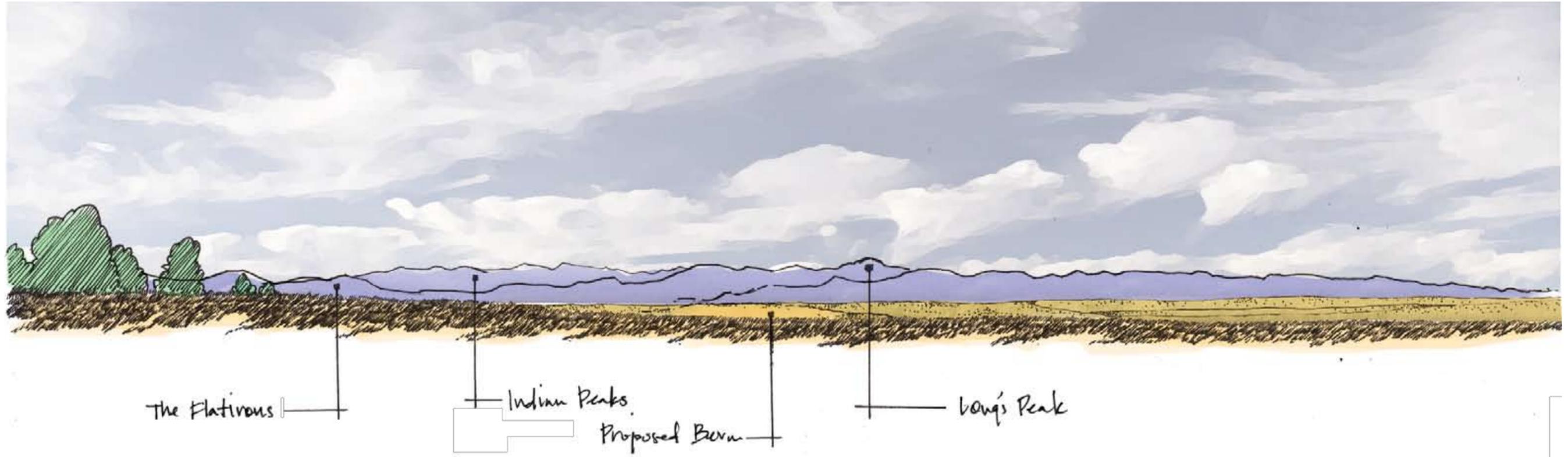
Broomfield Reservoir - Photograph from Point 'C'

Broomfield, Colorado • *August 2008*



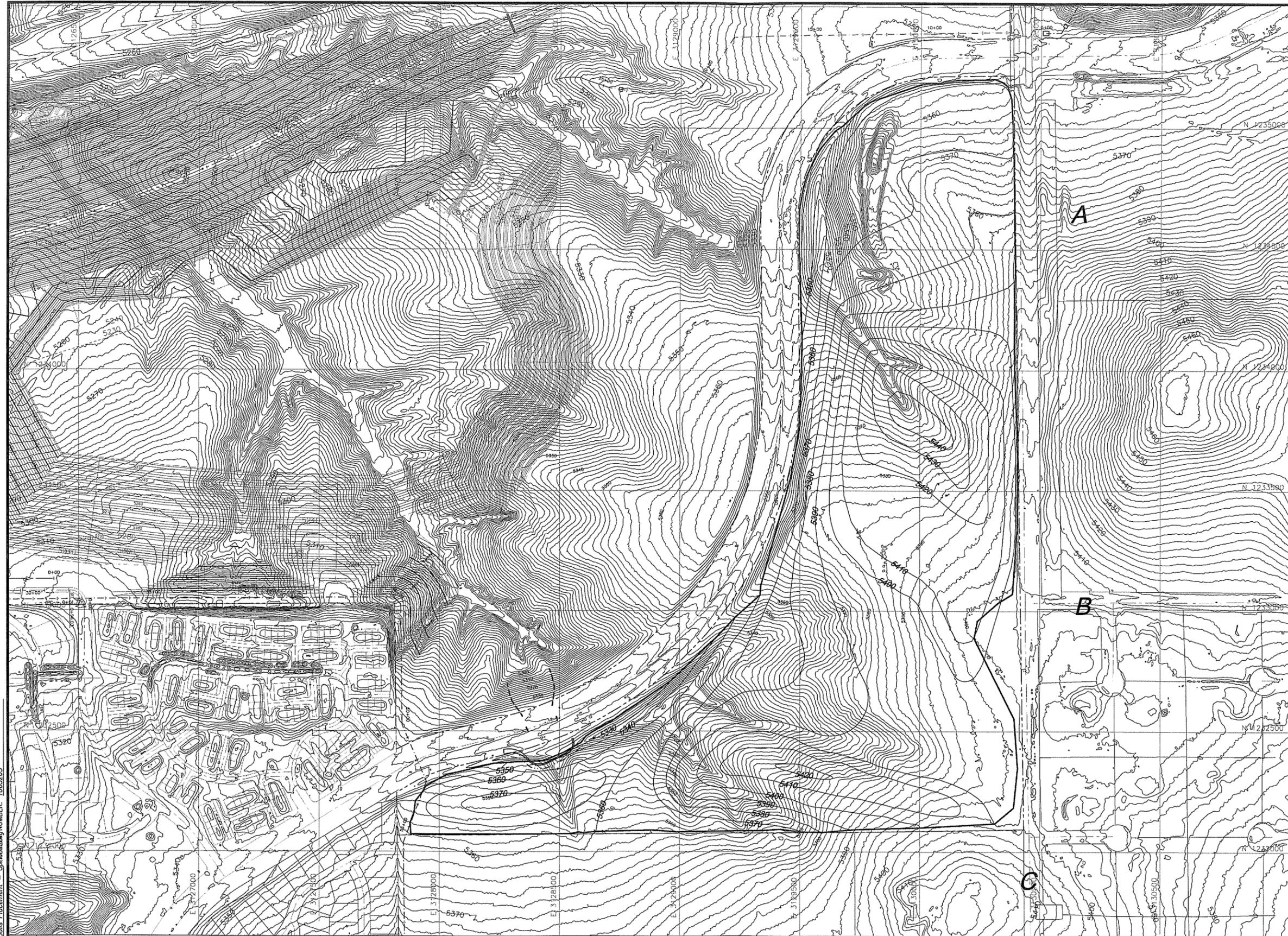
Broomfield Reservoir - Existing View from Point 'C'

Broomfield, Colorado • August 2008



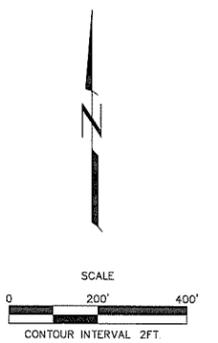
Broomfield Reservoir - Proposed View from Point 'C'

Broomfield, Colorado • August 2008



LEGEND

- EXISTING CONTOURS
- PARCEL BOUNDARY
- - - ROADWAY CENTERLINE
- - - RESERVOIR EMBANKMENT AXIS
- - - EXCAVATION LIMITS
- ELEV. 5300 NORMAL WATER LEVEL (107.6 ACRES)



**NOT FOR CONSTRUCTION
90% DESIGN**

AutoCAD FILE: Excess Soils Placement - 07/21/08.dwg; PLOT NUMBER: 1005265

REV.	DESCRIPTION OF REVISION	BY	DATE
C	90% DESIGN REVIEW	LKB	07/08
B	70% DESIGN SUBMITTAL	CCL	04/08
A	PRELIMINARY DESIGN SUBMITTAL	JMB	07/07

1801 CALIFORNIA SUITE 2900
DENVER, CO. 80202 (303)291-2222

WARNING
IF THIS BAR DOES NOT MEASURE 1 INCH THEN DRAWING IS NOT TO SCALE

DESIGNED:	D.Montgomery
DRAWN:	L.Berkness
CHECKED:	T.Arnold
REVIEWED:	
PROJECT MGR:	T.Arnold
DATE:	07/21/08

PROJECT: **BROOMFIELD RESERVOIR PROJECT**
DRAWING: **OPTION A
RESERVOIR EXCESS EXCAVATION STOCKPILE AREA
GENERAL PLAN**

REVISION:	C
DRAWING No.:	
SHEET	OF



CITY COUNCIL STUDY AGENDA MEMORANDUM

To: Mayor and City Council
 From: George Di Ciero, City and County Manager
 Prepared by: Kevin Standbridge, Assistant City and County Manager for Community Development
 Alan King, Public Works Director
 Burt Knight, City Engineer
 Nancy Arthur, Civil Engineer

Meeting Date	Agenda Category	Agenda Item																																				
April 8, 2008	Business	9 (c)																																				
Agenda Title:																																						
Broomfield Reservoir Update																																						
Summary																																						
<ul style="list-style-type: none"> Broomfield's Water Management Plan identified the need for new water storage reservoirs in order to meet future demand. One of City Council's 2005 top priorities and an ongoing priority for 2008 is to pursue a Broomfield raw water storage reservoir. MWH America's Inc (MWH), the engineer retained to design the reservoir, provided the preliminary layout of the reservoir shown on page 3. The purpose of the reservoir is to create terminal storage for Colorado Big Thompson and Windy Gap water. Master plan alternatives were presented to the Park and Recreation Advisory Committee (PRAC) and the Open Space and Trails Advisory Committee (OSTAC) in June 2007. The estimated construction cost of the reservoir increased from \$38,500,000 in 2005 to \$86,000,000 for a 6,000 ac-ft volume in 2008. The increase in costs is attributed to escalating costs in crude oil, concrete, aggregate material and steel as presented to Council in the July 24, 2007, Special Report "Increases in Construction Costs." The significant increases in the cost estimates for the reservoir are more specifically attributed to: <ul style="list-style-type: none"> Escalating fuel costs increased the excavation and construction of the embankment from \$2/cy to \$4/cy which corresponds to a \$10 million cost increase. The shortage of gravel and rock material as well as increased fuel costs contributed to an \$8.5 million increase in gravel and rip rap materials. Increased concrete costs and refining the design raised the cost of the outlet tower and spillway cost \$4 million. Contingency and construction inspection are a percentage of the construction costs and increased \$10 million in conjunction with the increased construction costs. Boyle Engineering completed a peer review of the 2007 cost estimate and engineering design. They concluded that both were valid and within expected ranges. The cost estimate will be refined in the upcoming months with input from qualified contractors. MWH has determined that a 5000 ac-ft reservoir, at an estimated construction cost of approximately \$68,800,000, is the most economical and provides the best recreational opportunities. Approximately 2,500 ac-ft of base storage is needed to provide water to the water treatment plant for the annual peak day for Broomfield's projected ultimate population. The additional +/- 2,500 ac-ft would provide recreational amenities, water for periods of drought, and flexibility in meeting Broomfield's future water demand estimates. For example, if Broomfield should decide to grow beyond the planned 83,300 population, a portion of the drought and recreational storage could be used to meet the greater peak day demands. 																																						
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Financial Considerations																																						
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<p>*Bonds issued for this project will be repaid from license fees collected from new meter taps. **Mineral rights are discussed in more detail in the project status portion of the memo.</p>																																						
Alternatives																																						
<ul style="list-style-type: none"> Construct a smaller reservoir based on the 2005 Cost Estimate of \$38,500,000. Reservoir storage of 2,500 ac-ft is required for peak water demands and any additional storage volumes increase recreational opportunities and drought protection. Construct a second pipeline from Carter Lake. This option is estimated to be more expensive than a reservoir and Broomfield would have reduced flexibility. 																																						
Proposed Actions/Recommendations																																						
<ul style="list-style-type: none"> Review by and input from the Council. Possible direction to proceed with a 5,000 ac-ft reservoir. 																																						

BACKGROUND

Water Management Plan

Broomfield has developed a comprehensive water management plan over the last twenty years. There are three elements to the plan:

- Treated Water Plan,
- Reuse Water Plan, and
- Raw Water Plan.

The Plans are used as guides by Broomfield when new projects are proposed. Using the model, the Treated Water Plan projects ultimate water system requirements needed at build-out using a model based on the land uses described in Broomfield's Comprehensive Plan. The model identifies when more water needs to be purchased, the timing of treatment plant expansions, when new water storage tanks need to be in service, and when new water transmission lines are needed. It includes plans for new storage reservoirs and shows when they need to be on line to meet future system demands.

Using the model, the proposed Broomfield Reservoir has been identified as a project that is needed to meet future demands by spring 2010. The construction of the proposed Broomfield Reservoir will eliminate the need for a second pipeline from Carter Lake. The second pipeline from Carter Lake is the alternative to the Reservoir to provide the necessary water.

Future peak day demands would be served from the proposed Broomfield Reservoir. Emergency water storage and additional drought protection would also be provided by the reservoir.

In addition to the Broomfield Reservoir, the Treated Water Plan also identifies the need for continued participation in the Windy Gap Firming Project. The Northern Colorado Water Conservation District (NCWCD), in association with other jurisdictions, is completing an environmental study for the Chimney Hollow Reservoir which is the preferred site of the Windy Gap Firming Project. The Chimney Hollow Reservoir will be necessary to permanently provide Broomfield with a firm yield of all of its Windy Gap water units to serve future needs. (Firm Yield is the estimated amount of water available from a water collection system that meets average demand during periods of drought). The Windy Gap water was purchased in 1991 as part of Rocky Flats water system replacement project.

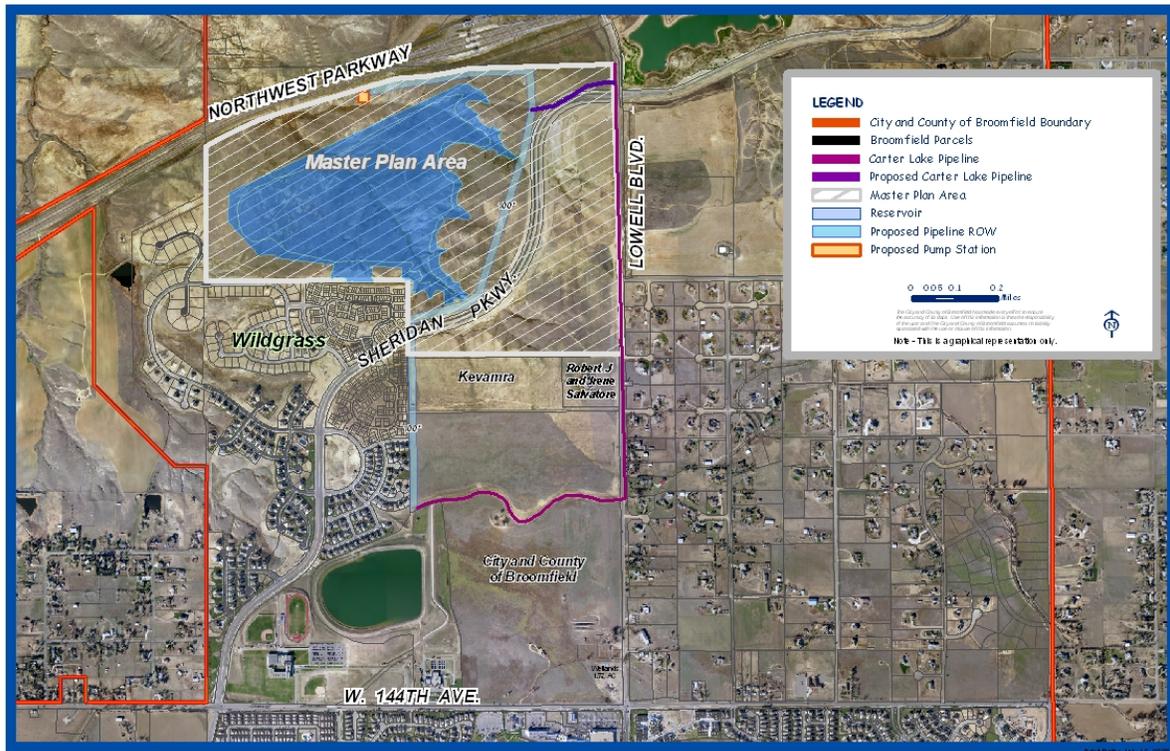
Currently it is estimated that the Chimney Hollow Reservoir will be operational by 2016. This date could change depending on the Federal environmental permitting process.

PROJECT STATUS

Broomfield retained MWH Americas, Inc. (MWH, a Broomfield based international engineering firm) in February 27, 2007, to design the reservoir and complete a master plan for the reservoir and surrounding area. Since then MWH has developed:

- Updated cost estimates for the reservoir using the proposed 6,000 ac-ft size,
- Reservoir sizing analysis based on cost and impacts to the surrounding property,
- Several master plan alternatives.

The Master Plan Area and a preliminary layout for the reservoir are shown on the following aerial photograph.



Updated Cost Estimates

In 2005, staff requested assistance in preparation of cost estimates from three engineering firms experienced in the design of reservoirs, including MWH. The 2005 estimated construction cost of \$38,500,000 for a 6,000 ac-ft reservoir presented to Council, was based on the Reservoir Feasibility Study prepared in 2001 and from the three firms' recommendations based on their review of the study.

MWH has updated the cost estimates which were presented in 2005 for the reservoir based on current and projected costs and refined quantities. This analysis indicates that construction costs have increased significantly from the cost estimate developed in 2005. The following table summarizes the cost estimates prepared in the last 3 years.

Broomfield Reservoir Cost Estimate					
Reservoir water storage capacity in acre feet	6000	5000	6000	4000	5000
	2005 Estimated Cost	2007 Estimated Costs	2008 Estimated Costs	2008 Estimated Cost	2008 Estimated Costs
Pre-construction costs					
Land acquisition	\$ 8,682,693	\$ 8,682,693	\$ 8,682,693	\$ 8,682,693	\$ 8,682,693
Preliminary Engineering	\$ 51,540	\$ 51,540	\$ 51,540	\$ 51,540	\$ 51,540
Environmental Site Assessment	\$ 38,884	\$ 38,884	\$ 38,884	\$ 38,884	\$ 38,884
Legal services	\$ 106,914	\$ 106,914	\$ 106,914	\$ 106,914	\$ 106,914
Value engineering			\$ 9,950	\$ 9,950	\$ 9,950
Mineral Rights*					
Design engineering	\$ 2,015,777	\$ 1,844,663	\$ 1,844,663	\$ 1,844,663	\$ 1,844,663
Pre-construction Total	\$ 10,895,808	\$ 10,724,694	\$ 10,734,644	\$ 10,734,644	\$ 10,734,644
Reservoir Construction Costs					
Mobilization	\$ 2,617,893	\$ 2,062,305	\$ 3,193,641	\$ 2,185,778	\$ 2,531,926
Site Prep	\$ 667,800	\$ 589,750	\$ 610,391	\$ 610,391	\$ 610,391
Foundation	\$ 3,089,900	\$ 1,737,600	\$ 3,239,757	\$ 1,501,677	\$ 1,798,416
Embankment/Excavation	\$ 9,055,050	\$ 17,284,400	\$ 18,650,120	\$ 14,937,611	\$ 17,889,354
Gravel Filter/Drain Material	\$ 7,626,912	\$ 6,566,000	\$ 12,490,380	\$ 5,674,501	\$ 6,795,810
Slope Protection - Riprap	\$ 2,502,024	\$ 3,265,000	\$ 6,163,425	\$ 2,821,695	\$ 3,379,275
Outlet Tower/Pipe	\$ 1,647,240	\$ 4,929,000	\$ 5,449,275	\$ 4,259,765	\$ 5,101,515
Pump Station/Pipe	\$ 1,590,000	\$ 4,750,000	\$ 6,624,000	\$ 6,624,000	\$ 6,624,000
Subtotal	\$ 28,796,819	\$ 41,184,055	\$ 56,420,990	\$ 38,615,419	\$ 44,730,687
Underpass			\$ 3,105,000	\$ 3,105,000	\$ 3,105,000
Contingency	\$ 6,544,732	\$ 13,178,898	\$ 19,048,317	\$ 13,350,534	\$ 15,307,420
Construction Inspection	\$ 2,266,048		\$ 7,165,466	\$ 4,904,158	\$ 5,680,797
Permits	\$ 795,000				
Construction Total	\$ 38,402,598	\$ 54,362,953	\$ 85,739,772	\$ 59,975,111	\$ 68,823,904
Preconstruction and Construction Total	\$ 49,298,406	\$ 65,087,647	\$ 93,369,416	\$ 67,604,755	\$ 76,453,548

*Staff is in discussions with the owner of the mineral rights, who have indicated a desire to develop those rights, in an attempt to facilitate the owner's potential development of those rights in a way that would be compatible with the construction and use of the reservoir. The cost to Broomfield associated with the development of the rights is not known at this time. The mineral rights owner has requested that Broomfield contribute to any extra cost of development which is attributable to the construction of the reservoir. Broomfield has made no commitment to do so.

Broomfield has seen dramatic increases in construction costs. The July 24, 2007, Special Report "Increases in Construction Costs" presented to Council provided background on the cost increases. Similar cost increases have been seen in Colorado on large scale construction projects. These increases are attributed to escalating costs in crude oil, concrete, aggregate material and steel.

The significant cost increases for the reservoir are attributed to:

- Escalating fuel costs increased the excavation/embankment cost from \$2/cy to \$4/cy which corresponds to a \$10 million cost increase.
- The shortage of gravel and rock material, as well as increased fuel costs, contributed to an \$8.5 million increase in gravel and rip rap materials.
- Increased concrete costs and refining the outlet configuration raised the cost of the outlet tower and spillway cost \$4 million.
- Increased steel costs and refining the pipeline alignment raised the cost of pump station and pipeline approximately \$5 million.
- Sheridan Parkway between Wildgrass and Lowell Boulevard was constructed in late 2006 after the 2005 cost estimate was developed. An underpass constructed below Sheridan Boulevard will minimize the disruption of the traffic while dirt is moved. The underpass will provide pedestrian access following construction.
- Contingency and construction inspection are determined as a percentage of the construction costs and increased \$10 million in conjunction with the increased construction costs.

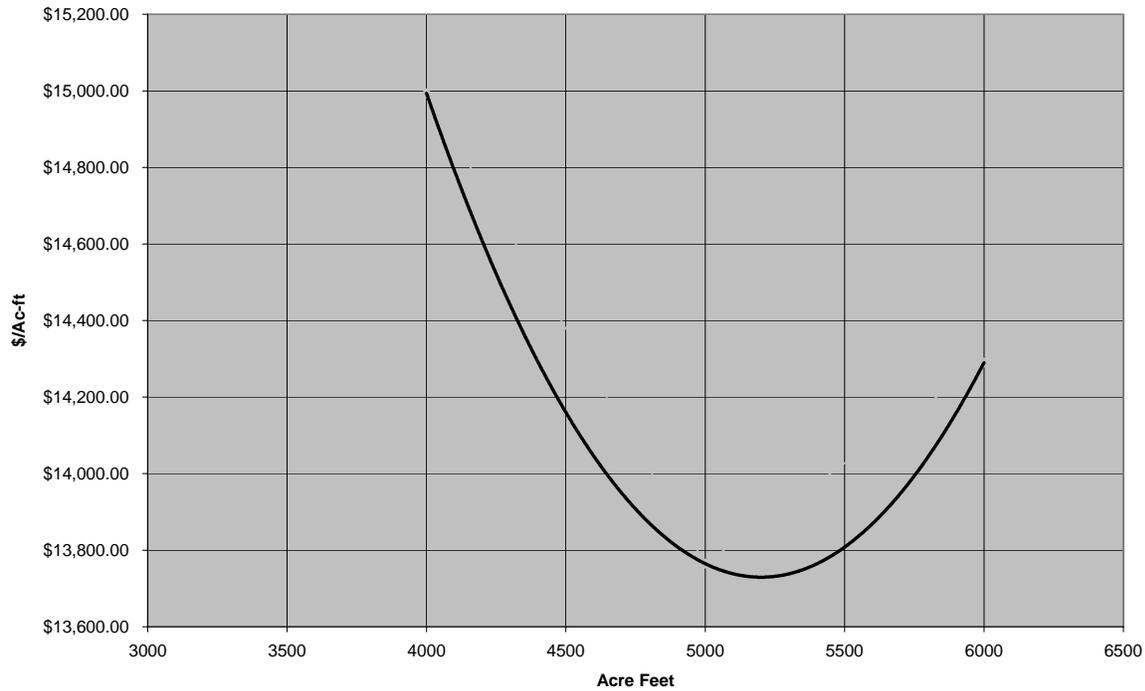
Reservoir Sizing Analysis

With the dramatic increases in construction cost, staff and MWH have reviewed different size alternatives for the reservoir and also revisited the construction costs of a second pipeline from Carter Lake. MWH's review included cost estimates, how well the proposed size of the reservoir would fit the site, how much excess material is created, and the impact to adjoining property.

MWH identified that the most efficient size reservoir to construct is approximately 5,000 ac-ft. With a 5,000 ac-ft reservoir, approximately 2,500 ac-ft is needed for the "peaking function" to meet the additional peak day demand as Broomfield grows. That 2,500 ac-ft replaces the need for a second pipeline since a second pipeline from Carter Lake would also provide water to the Water Treatment Facility for peak day demands. The second block of 2,500 ac-ft is for drought needs and recreational amenities. While the Windy Gap Firming Project at Chimney Hollow is being constructed, a portion of the peaking storage and the drought storage component would be for interim Windy Gap firming.

As the following graphic shows, the 5000 ac-ft reservoir is the most economical reservoir when evaluated by \$/ac-ft.

Cost per Acre Foot



The 5,000 ac-ft sizing fits the site well, generates a manageable amount of excess dirt, and provides the greatest recreational opportunities. Estimated construction cost for the 5,000 ac-ft reservoir is approximately \$68,800,000. Please refer to the following table for the detailed estimate.

Detailed Cost Estimate 5000 Ac-ft					
Item	Units	Unit Cost	Quantity	2007 Cost Estimate*	2008 Cost Estimate
Mobilization				\$ 2,062,305	\$ 2,531,926
Site Prep	acre	\$ 3,370	175	\$ 589,750	\$ 610,391
Foundation	ls	\$ 1	1737600	\$ 1,737,600	\$ 1,798,416
Embankment/Excavation	cy	\$ 4	4321100	\$ 17,284,400	\$ 17,889,354
Gravel Filter/Drain Material	cy	\$ 35	187600	\$ 6,566,000	\$ 6,795,810
Slope Protection - Riprap	cy	\$ 50	65300	\$ 3,265,000	\$ 3,379,275
Outlet Tower/Pipe	ls	\$ 4,929,000	1	\$ 4,929,000	\$ 5,101,515
Pump Station/Pipe	ls	\$ 4,750,000	1	\$ 4,750,000	\$ 6,624,000
Subtotal				\$ 41,184,055	\$ 44,730,687
Underpass					\$ 3,105,000
Contingency				\$ 13,178,898	\$ 15,307,420
Construction Inspection					\$ 5,680,797
Total				\$ 54,362,953	\$ 68,823,904

*2007 dollar values increased by 3.5% to account for inflation, inclusion of the Sheridan Underpass, and increased costs of the pump station based on recent construction bids.

The acres available for amenities for the given reservoir sizes are summarized below:

Acres for Amenities			
Item	Reservoir Size in Acre Feet		
	6000 Af	5000 Af	2500 Af
Acres needed for Reservoir	75	75	75
Acres for amenities*	25	35	0
Total Acres	100	110	75
Reference			
Size of Hoopes property in Acres (West of Lowell and north of Kevamra parcel)	325	325	325

*The water level in the proposed 5,000 and 6000 ac-ft Reservoir will fluctuate approximately 20 feet during peak water usage when Broomfield is fully developed. The water level may fluctuate more during times of droughts.

The estimated cost of the studied options in 2008 dollars as well as the financial implications of the increased cost of the reservoir is summarized below:

Options Evaluated				
	2nd Pipeline From Carter Lake	4,000 ac-ft Reservoir	Recommended 5,000 ac-ft Reservoir	6,000 ac-ft Reservoir
Estimated Construction Cost				
Reservoir		\$60,000,000	\$68,800,000 (a)	\$86,000,000
Pipeline from Carter Lake (Broomfield's Share)	\$73,000,000			
Associated Costs				
Land Cost		\$8,682,693	\$8,682,693	\$8,682,693
Water Cost	\$14,000,000	\$14,000,000	\$14,000,000	\$14,000,000
Additional Water Cost	\$17,000,000			
Mineral Rights		(b)	(b)	(b)
Total	\$104,000,000	\$81,486,218	\$91,732,718	\$106,630,380
Impact on Water License Fees (c)				
Ultimate Water License Fee per Tap Equivalent in 2020	\$42,144	\$37,262	\$40,992	\$41,504

(a)MWH 2007 estimate was \$54,400,000. This number was increased to approximately \$68,800,000 to account for inflation and to include construction of an underpass under Sheridan Parkway, which will be needed for construction activities, and other items not included in the MWH estimate.

(b)Staff is in discussions with the owner of the mineral rights, who have indicated a desire to develop those rights, in an attempt to facilitate the owner's potential development of those rights in a way that would be compatible with the construction and use of the reservoir. The cost to Broomfield associated with the development of the rights is not known at this time. The mineral rights owner has requested that Broomfield contribute to any extra cost of development which is attributable to the construction of the reservoir. Broomfield has made no commitment to do so.

(c)Water license fees will pay for the cost of this reservoir. The current water license fee is \$22,524. The ultimate license fee rate presented to Council in January 2008 was projected at \$40,992 in 2020. This fee rate included construction of a 5000 ac-ft Reservoir.

Staff also identified the need to purchase additional Colorado Big Thompson water shares (Firm Water) to meet demand until the Broomfield Reservoir is completed. The estimate cost for the water is approximately \$14,000,000. If a second pipeline is constructed instead of a reservoir, an additional \$17,000,000 (\$31,000,000 total) of water shares would need to be purchased in order to provide water during the extended period of time needed to permit and construct a second pipeline.

The financial projections presented to Council in January 2008 indicated fees would ultimately increase to \$40,992 per Tap Equivalent (TE) in 2020 to repay the debt to construct the major water system components. The \$40,992 fee rate includes constructing a 5,000 ac-ft Reservoir at the current construction cost estimate of approximately \$68,800,000.

Peer Review

After receiving MWH's revised cost estimate, Broomfield retained Boyle Engineering (Boyle) to review the cost estimate and the preliminary design documents. Boyle designed the Dry Creek Reservoir for the Little Thompson Water District and Central Weld Country Water District. The Dry Creek Reservoir is similar in size to the proposed Broomfield Reservoir and was constructed in 2007. Boyle's average of high and low values for the construction of a 5,000 ac-ft reservoir is \$55,500,000. MWH's estimate of \$54,400,000 is in a similar range.

MWH's estimate was increased to approximately \$68,800,000 to:

- account for inflation;
- include construction of a Sheridan Parkway underpass which is needed for construction activities; and
- increase costs for the pump station/pipeline to reflect recent construction prices.

Boyle indicated that the state engineer may require a thicker sand filter through the middle of the dam to control seepage. This could increase the cost of the reservoir by as much as \$5,000,000. MWH is developing an analysis to present to the state engineer arguing that a thicker filter will not be needed.

Impacts on Surrounding Property - Approximately three million cubic yards of excess excavated dirt will need to be disposed of to construct a 5,000 ac-ft Reservoir. It will take approximately 200,000 scraper trips to move this amount of material.

The excavated material will cover the area north of the community ditch (not including the Kevamra/Salvatore properties) at an average depth of approximately five feet. Shaping of the disposed material will be defined further in the reservoir design and development of the master plan with the intent to create varied land forms.

Water Fluctuations - The water level in the proposed 5,000 ac-ft Reservoir could fluctuate approximately 20 feet during peak water usage when Broomfield is fully developed. The total depth of the water in the Reservoir would be approximately 50 feet. Approximately 30 feet of water would remain in the Reservoir during the peak water usage periods. A smaller-sized reservoir, such as 4,000 ac-ft, would experience greater fluctuation.

Updated Alternative Summary

The table on the following page updates the information that was presented to Council when MWH was retained in February 2007.

Broomfield Local Water Summary Table

Project	Estimated Cost	Funding Year	Description	Comments	Options Explored
Broomfield Local Reservoir	<p>Construction: \$68,800,000</p> <p>Additional Water Rights: \$14,000,000</p> <p>Total Cost: \$82,800,000</p> <p>Total New Bond Debt: \$41,000,000</p>	2004 and 2008	Construct 5,000 ac-ft reservoir at West 152 nd Ave. and Lowell Blvd.	<p>1. Provides firming of 1500 ac-ft of Windy Gap water which provides an interim firm water supply until the Windy Gap Firming Project is completed in 2016.</p> <p>2. Provides raw water delivery capacity to meet peak day water use demands. The existing Carter Lake pipeline is at delivery capacity.</p> <p>3. Provides emergency drought protection by storing excess water that can be used during droughts.</p> <p>4. Allows flexibility for increases in the ultimate population identified in the Comprehensive Plan.</p>	<p>Construct a different size local reservoir. A smaller reservoir costs more per ac-ft and doesn't provide as much drought protection or flexibility for future growth. A larger reservoir will cost more per ac-ft and requires a higher embankment which has a greater impact on the site.</p> <p>Share Reservoir with other participants. Existing reservoir planning streamlines the permitting process since only CBT and Windy Gap will be stored. Other participants with non-CBT/WG water would delay the current schedule in order for federal permitting to occur. Minimal interest was expressed by Erie.</p>
Second Pipeline from Carter Lake	<p>Construction: \$73,000,000</p> <p>Additional Water Rights \$31,000,000</p> <p>Total Cost: \$104,000,000</p> <p>Total New Bond Debt: \$50,000,000</p>	After 2008	Construct a second pipeline from Carter Lake to Broomfield to meet peak day water use demands based on the 2005 Broomfield Comprehensive Plan.	<p>1. Provides raw water delivery capacity to meet peak day water use demands. The existing Carter Lake pipeline is at delivery capacity.</p> <p>2. Project would be completed by multiple agency involvement with Northern Water in the lead.</p> <p>3. The construction cost assumes Erie will participate in the construction of the Pipeline. If Erie does not participate, then Broomfield would have to pay for the cost of the pipe from Boulder to Broomfield, which would significantly increase the cost of the pipeline.</p>	<p>Develop more capacity in existing pipeline. Capacity has been maximized with the addition of two on-line pump stations.</p> <p>Purchase excess line capacity from other entities. No other entity has identified excess capacity.</p>

Master Plan

An integral part of the reservoir design is the Master Plan for the uses of the reservoir and its surrounding site. To consider alternatives for use of the area, three use levels (passive, moderate and active) were developed for the reservoir and surrounding areas. Preliminary layouts and representative images are presented in Attachment 1 for the different recreation levels.

Preliminary cost estimates for each level are:

- Passive - \$2,000,000;
- Moderate - \$5,000,000; and
- Active - \$10,000,000.

The reservoir cost estimate does not include the amenities. The reservoir will be constructed to allow the amenities to be added based on the selected master plan. The amenities are anticipated to be funded by the Capital Improvement Fund or other sources as sources are budgeted.

The use levels and images included in Attachment 1 were presented to the Parks and Recreation Advisory Committee (PRAC) and Open, Space and Trails Advisory Committee (OSTAC) in June 2007. Both committees selected individual items from all levels rather than selecting a specific level approach. Attachment 1 also provides examples of the proposed uses. The following table summarizes PRAC/OSTAC's recommendations:

Item	PRAC	OSTAC	Comments
Balloon Launching	No (Passive)	No (Passive)	
Swimming	Yes (Active)	Yes (Active)	Only opportunity for open water swimming in Broomfield
Boating	Electric and non-motorized (Active)	Non-motorized (Moderate)	
Education/Interpretation	Outdoor with Shelter (Passive)	Outdoor with low scale building (Passive and Moderate)	Similar to Chatfield with multiple levels of structures
Picnic	Yes (Include all types)	Yes (Include all types)	
Arboretum	Yes (Passive)	Yes (Passive)	
Restroom	Yes (Moderate)	Yes (Moderate)	
BMX Bicycle Track	Yes (Moderate)	Yes (Moderate)	Close to Sheridan
Dog Park	Yes (Moderate)	Yes (Moderate)	On leash use only
Camping	Yes (Moderate)	No (Passive)	
Fairgrounds	No (Passive)	No (Passive)	
Archery	No (Passive)	Yes (Moderate)	
Outdoor Volleyball	Yes (Moderate)	Yes (Moderate)	
Golf Course	No (Passive)	No (Passive)	

At this stage of the design the modest differences in recommendations will not significantly affect the overall design. Staff will continue to work with the committees to address the differences.

Attachment 2 lists other Colorado reservoirs' sizes and uses. It is estimated the Broomfield Reservoir will have a surface area of approximately 100 acres. Reservoirs similar in size in Colorado allow boats without gas motors and activities that provide minimal human contact with the water.

FINANCIAL CONSIDERATIONS

The Water Fund contains sufficient funds for the design of the Broomfield Reservoir and accompanying master plan; however, the issuance of bonds will be needed to fund the construction and to purchase water rights. The fund will be reimbursed with future bond proceeds for the monies spent to date. The financial considerations are summarized in the following table:

Projected Funds Available	
2002 Bond Proceeds*	\$ 8,682,693
Proposed New Bond Proceeds*	41,000,000
Drought Surcharge Reserve	7,449,128
Cash Reserves Accumulated from Prior License Fee Sales	37,868,179
Total Sources of Funds	\$ 95,000,000
Expenditures to date	
Preliminary Engineering, Legal and Support Services	\$ 196,510
Land Acquisition	8,682,693
Design (MWH contract)	1,844,663
Total Expended to date	\$ 10,723,866
Projected Expenditures	
Construction	\$ 68,800,000
Water Rights**	14,000,000
Mineral Rights***	***
Total projected costs	\$ 82,800,000
Total Project Expenditures	\$ 93,523,866
Balance Available for Contingency	\$ 1,476,134

*Bonds issued for this project will be repaid from license fees collected for new water taps.

**Staff is negotiating for the purchase of water rights.

***Staff is in discussions with the owner of the mineral rights, who have indicated a desire to develop those rights, in an attempt to facilitate the owner's potential development of those rights in a way that would be compatible with the construction and use of the reservoir. The cost to Broomfield associated with the development of the rights is not known at this time. The mineral rights owner has requested that Broomfield contribute to any extra cost of development which is attributable to the construction of the reservoir. Broomfield has made no commitment to do so.

COMPREHENSIVE AND FINANCIAL PLAN IMPLEMENTATION

Broomfield's Long Range Financial Plan, first approved by Council on October 26, 2004, identifies the construction of the Broomfield Reservoir in the Water Master Plan Projects section of the Plan.

The Broomfield Reservoir provides the water needed to meet the projected growth in the Comprehensive Plan.

The Broomfield Reservoir also protects existing neighborhoods, establishes an identifiable City and County edge or boundary, and increases the diversity of recreation opportunities encouraged in the Comprehensive Plan.

COUNCIL PRIORITIES

The proposed reservoir helps to accomplish City Council's on-going 2008 priority to progress with the Water Storage Reservoir.

PROJECT SCHEDULE

It is anticipated that the master plan process for the reservoir area and engineering design will be completed by mid 2008. Additional refinement and discussions will occur with committees and Council to finalize the master plan. Construction of the Broomfield Reservoir is anticipated to begin in August/September 2008. Construction will begin after the State Engineer approves the construction drawings for the Reservoir. It can take up to six months for the State Engineer to approve the project. Staff anticipates the Reservoir will be operational in 2010.

ALTERNATIVES

- Downsize the Reservoir based on the 2005 estimated cost of \$40,000,000. A 2,500 ac-ft. reservoir could be constructed for \$40,000,000. This would only satisfy the projected peak day water demand requirements needed at build-out based on the 2005 Broomfield Comprehensive Plan. It would not provide drought protection or flexibility to increase Broomfield's ultimate population should Council choose to do so. Also, the recreational amenities would be limited because the reservoir would be close to empty during the peak use periods.
- Participate in construction of a second pipeline from Carter Lake. Broomfield's portion of the second pipeline would be sized to serve the 2005 Broomfield Comprehensive Plan build-out population. Broomfield's cost participation in the second pipeline is estimated at \$73,000,000. An additional \$31,000,000 in water purchases is needed with this option to meet demand until the Windy Gap Reservoir is constructed for a total of \$104,000,000.

PROPOSED ACTIONS / RECOMMENDATION

- Review by and input from the Council.
- Possible direction to proceed with a 5,000 ac-ft. reservoir.

Broomfield Reservoir - Image Matrix

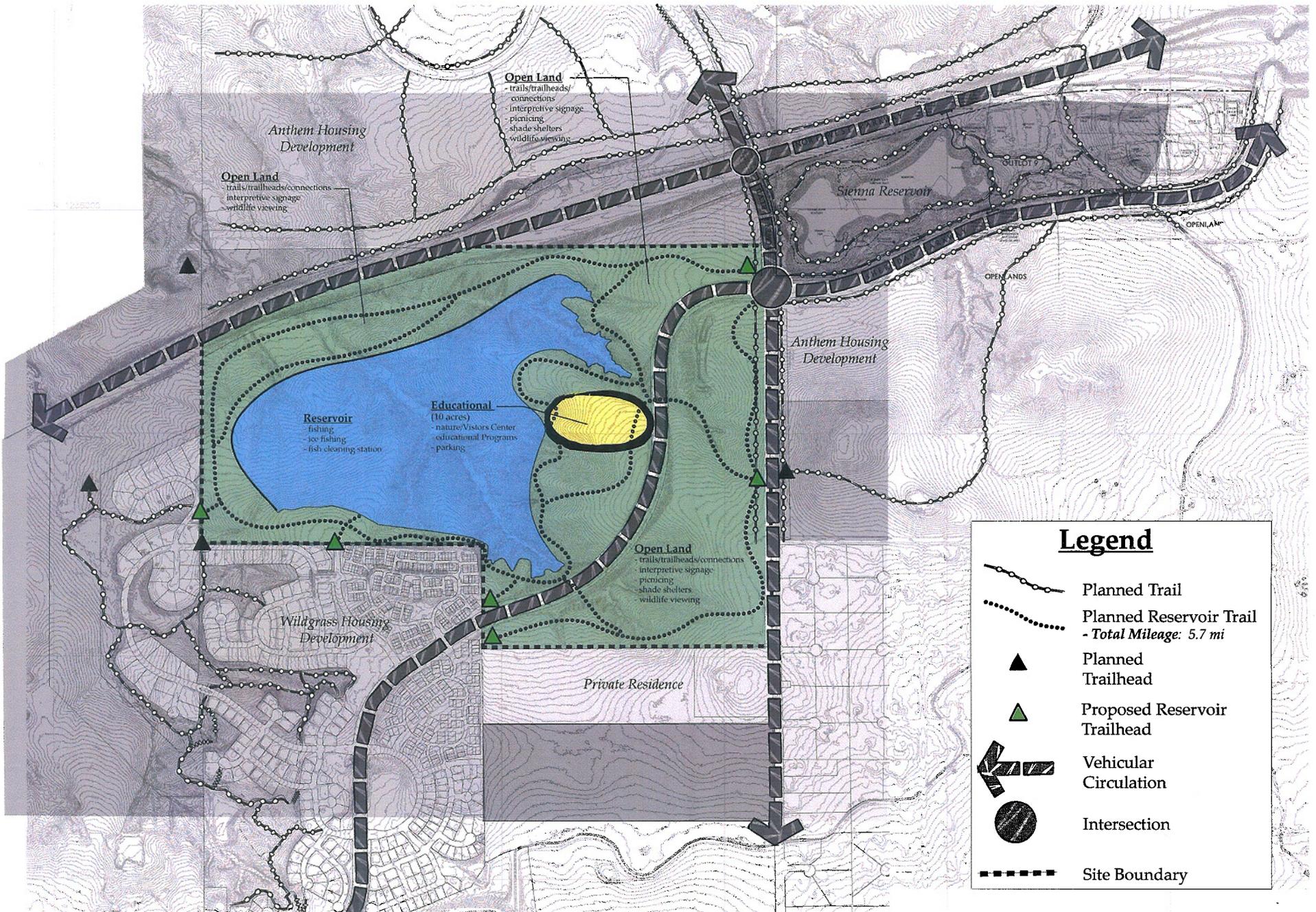
Broomfield, CO ~ June 20, 2007 ~ Design Concepts

	<i>Passive</i>	<i>Moderate</i>	<i>Active</i>
Balloon Launch	NONE	 <i>Open Area with Parking</i>	 <i>Open Area with Parking</i>
Swimming	NONE	 <i>Minimal Contact</i>	 <i>Full Immersion</i>
Education/ Interpretation	 <i>Kiosks</i>	 <i>Outdoor</i>	 <i>Indoor Center</i>
Picnic	 <i>Open Tables</i>	 <i>Small Group</i>	 <i>Large Group</i>
Arboretum	 <i>Signs/Labels - Self Directed</i>	 <i>Non-Staffed</i>	 <i>Fully Staffed</i>

Broomfield Reservoir - Image Matrix

Broomfield, CO ~ June 20, 2007 ~ Design Concepts

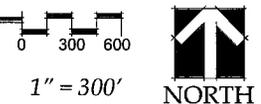
	<i>Passive</i>	<i>Moderate</i>	<i>Active</i>
Restroom	 <p><i>Portable in Enclosure</i></p>	 <p><i>Vault/</i></p>	 <p><i>Fully Plumbed</i></p>
BMX	NONE	 <p><i>Practice Track</i></p>	 <p><i>Competition Track</i></p>
Dog Park	NONE	 <p><i>Dogs Allowed On-Leash</i></p>	 <p><i>Designated Off-Leash Area</i></p>
Camping	NONE	 <p><i>Informal</i></p>	 <p><i>Full Service (Hook-Ups)</i></p>
Fairgrounds	NONE	NONE	 <p><i>Variable Potential</i></p>

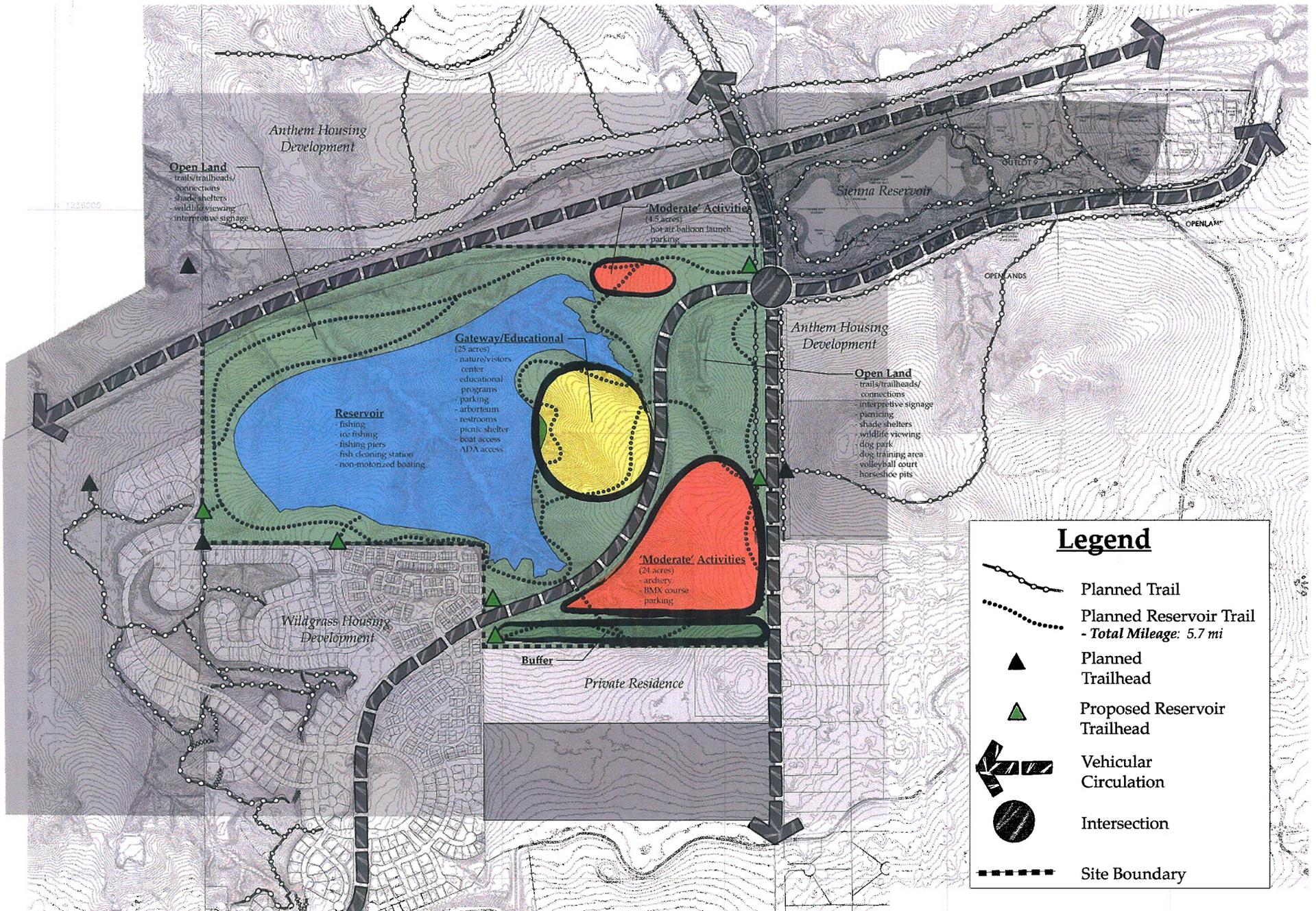


Broomfield Reservoir - Land Use 'Passive' Recreation

Design Development • Broomfield, Colorado • June 20, 2007

DESIGN DC CONCEPTS

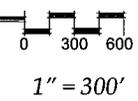


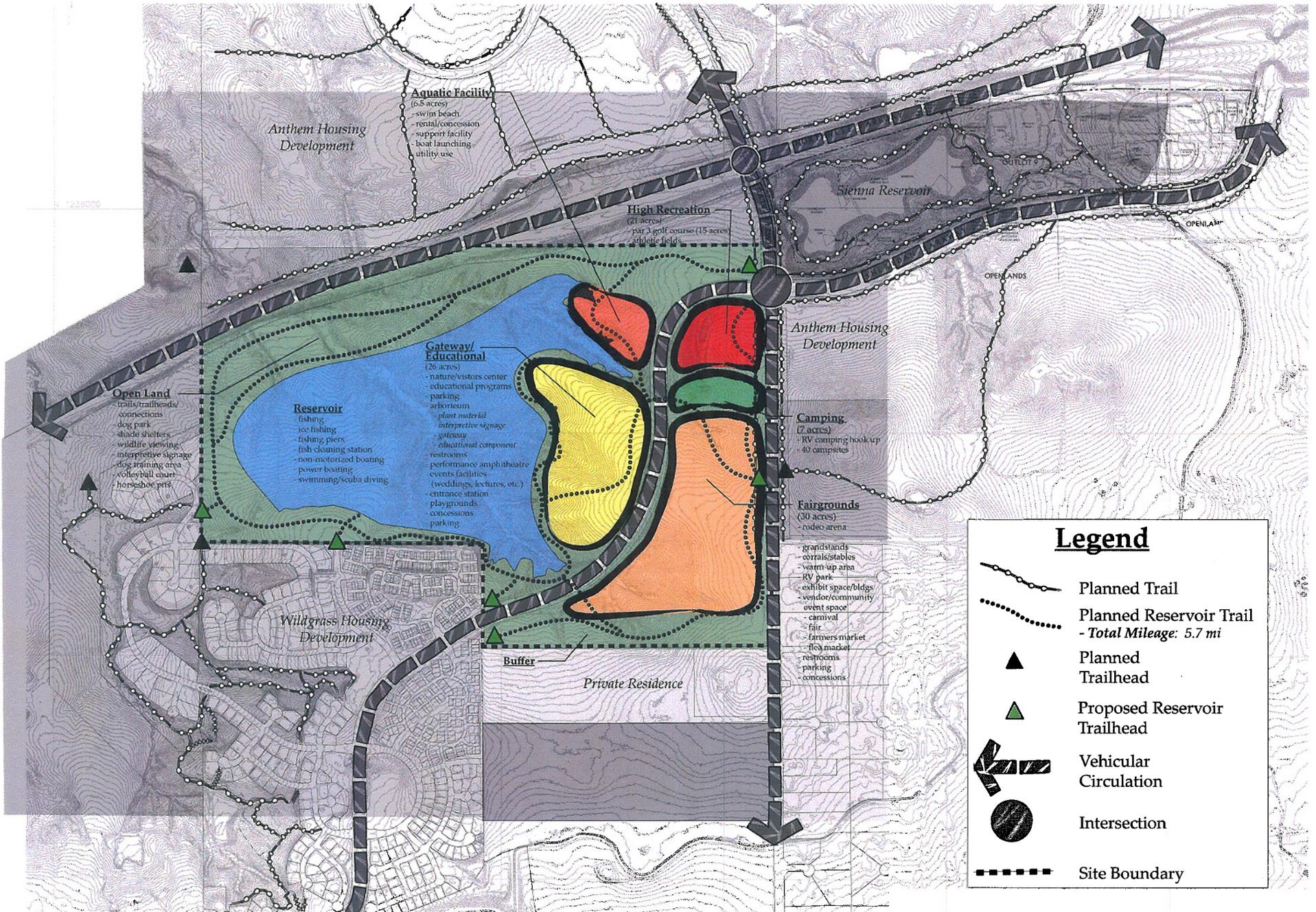


Broomfield Reservoir - Land Use 'Moderate' Recreation

Design Development • Broomfield, Colorado • June 20, 2007

DESIGN CONCEPTS

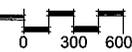




Broomfield Reservoir - Land Use 'Active' Recreation

Design Development • Broomfield, Colorado • June 20, 2007

DESIGN CONCEPTS



1" = 300'



LOCAL RESERVOIRS AND LAKES															
Subject	Aurora Reservoir	Barr Lake	Boulder Reservoir	Blunn Reservoir	Boyd Lake	Carter Lake	Chatfield	Crystal Creek Reservoir	Flatiron Reservoir	Horsetooth Reservoir	North Catamount Reservoir	Quincy Reservoir	South Catamount Reservoir	Standley Lake	Union Reservoir
Agency	City of Aurora	Colorado State Parks	City of Boulder	City of Arvada	Colorado State Parks	NCWCD	Colorado State Parks	City of Colo. Spgs	Larimer County	Larimer County Parks	City of Colo. Spgs	City of Aurora	City of Colo. Spgs	City of Westminster	City of Longmont
Location	Aurora	Brighton	Boulder	Arvada	Loveland	Loveland	Littleton	West of Colorado Springs	West of Loveland	Fort Collins	West of Colorado Springs	Aurora	West of Colorado Springs	Westminster	Longmont
Land Acres	820	1,900	700	180	1,700	1,100	1,500	136	47	1,900	210	150	120	1,000	736
Acre Feet of Water Storage	52,000	32,000	13,500	5,000	52,500	112,250	235,000	3,500	750	152,000	12,030	4,600	2,600	42,000	12,750
Recreation Amenities															
Biking	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Boating - non motorized includes canoeing, kayaking, windsurfing	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Boating - electric motor	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Boating - gas motor		X	X		X	X	X			X				X	X
Campsites - Developed					X	X	X		X	X				X	
Campsites - Undeveloped						X			X					X	X
Concessions			X		X	X	X			X					X
Dog beach							X								X
Educational Programs		X					X								
Fishing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Horseback Riding		X					X			X					
Hunting		X			X										
Ice Fishing		X			X										
Jet Skiing			X		X	X	X			X					
Marina/Boat Moorings	X		X			X	X			X				X	
Nature center		X			X		X							X	
Picnic shelters	X				X	X	X	X		X	X	X	X		
Picnic tables	X		X		X	X	X			X	X	X	X	X	
Playground	X				X										X
Restrooms	X		X		X									X	X
Rock climbing						X				X					
Sailing			X		X	X	X			X				X	
Scuba diving	X					X									
Swimming	X		X		X	X	X			X				X	
Trails	X		X	X	X	X	X	X		X	X	X	X	X	
Water skiing					X	X	X			X					
Wildlife viewing	X	X	X			X	X	X			X	X	X	X	
Winter Sports - Snow shoeing, cross country skiing		X			X		X			X					