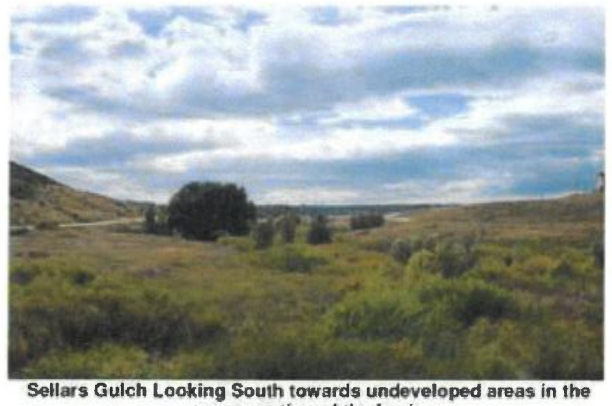
SELLARS GULCH DRAINAGEWAY MASTER PLAN
EXECUTIVE SUMMARY

Background and Objectives

The Town of Castle Rock (Town) has grown from a small, rural town of 3,900 citizens in 1980 to a community of over 40,000 citizens today. As the Town continues to grow, new buildings and paved areas such as parking lots, driveways and roads create impervious areas that prevent stormwater from naturally infiltrating into the ground. This urbanization creates additional storm runoff that can cause downstream erosion and unstable channels, and can pick up pollutants not found in natural stormwater. If this urban runoff is not controlled from both a quantity and quality perspective, it can create public safety issues from flooding, cause property damage, and have adverse impacts on downstream water quality affecting public health, recreation, vegetation, aquatic life, and wildlife.

In early 2004, the Town adopted its first Stormwater Master Plan (SWMP) to address stormwater issues in a comprehensive manner. The SWMP provided the foundation for the Town's stormwater utility, and focused on key big-picture issues such as federal regulatory requirements, a long-term capital improvement plan, program funding, and drainageway master planning. The SWMP recommended that several additional, more detailed, drainageway master planning studies be done on critical basins in the Town, and presented a prioritization schedule for completing these plans. The Sellars Gulch watershed lies in the Plum Creek basin which is a major tributary to both Chatfield Reservoir and the South Platte River Basin. Sellars Gulch is the major stream corridor running through the heart of Castle Rock and has been identified in the Downtown's Master plan as an important environmental and recreational corridor that connects the Historic Downtown District to the suburbs and Douglas County Fairgrounds south of the downtown area. Due to the aesthetic and environmental importance of this stream corridor, it was selected by the Castle Rock Stormwater Utility as a high priority master plan to complete. In addition, according to the Chatfield Watershed Authority (CWA) 2007 annual report, improvements to Sellars Gulch are one of three focused efforts within the Chatfield Watershed that will reduce non-point source pollutants to Chatfield Reservoir (CWA, 2007).



Sellars Gulch Looking South towards undeveloped areas in the upper portion of the basin

This Master Plan and FHAD are being developed for Sellars Gulch and its tributaries through the corporate limits of the Town (Study Area) as shown in **Figure ES-1**. This Master Plan will provide a current comprehensive drainage plan for areas of the watershed that are within the Study Area. The Master Plan is intended to document the hydrologic analysis, hydraulic analysis, alternative evaluations, and recommended improvements for the study area. This information will serve to establish a framework for the development of drainage and stream stability improvements that will be implemented in the future. Specifically, the Master Plan will discuss how changes to watershed runoff impacts the Sellars Gulch and tributary channels and what strategies may be employed to mitigate the impacts to stormwater conveyance, floodplain management, stream stability, and stormwater quality while preserving the natural stream corridor to the maximum extent possible. This includes minimizeing flood hazards, protecting and improveing water quality, and improveing wildife habitat while balancing the recreational needs of the Town with the environamental needs of wildlife.

The final Watershed Master Plan was submitted to the Town in December 2008. At the regular meeting of the Town Utilities Commission on December 10, 2008, approval of the Master Plan was recommended to Town Council. On January 6, 2009, Town Council passed, approved, and adopted Resolution 2008-___, a resolution approving the Sellars Gulch Drainageway Master Plan. Copies of the Utilities Commission Meeting Minutes and Council Resolution are presented on page **ES-11**.

Development and Key Components of the Sellars Gulch Drainageway Master Plan

The Sellars Gulch Drainageway Master Plan (Master Plan) is to be used as a tool to provide comprehensive guidance as the basin develops within the Town, and is needed to refine hydrologic/hydraulic evaluations, determine drainage, flooding and erosion problems, identify a strategy to minimize these problems, and prepare preliminary conceptual design drawings.

In addition to the above goals, a unique aspect of this master plan was to create a confluence area plan where Sellars Gulch enters East Plum Creek for recreational, environmental and aesthetic improvements key to the Town of Castle Rock's Downtown Master Plan. This plan integrates the Town's vision of incorporating recreational and aesthetic improvements to the confluence area, while balancing the need to protect the sensitive environmental habitat within the confluence area, which is essential habitat for the Preble's Meadow Jumping Mouse (PMJM). This plan includes soft surface nature trails, paved trails, entry nodes that incorporate seating, signage, and architectural gateways. A copy of the Confluence Area Master Plan is provided in Appendix D

The Master Plan was developed between the PBS&J project team, Town of Castle Rock and Douglas County staff. Public and key stakeholder input was incorporated through informational meetings, informational flyers and a Public Open House that was crucial as part of the planning process.

Description of Study Area

The Study Area generally consists of the Sellars Gulch watershed that extends from the southern most Town of Castle Rock Corporate Limits to its confluence with East Plum Creek. This study also includes two tributaries to Sellars Gulch, Un-Named Tributary to Sellars Gulch #1 (Tributary #1) and Un-Named Tributary to Sellars Gulch #2 (Tributary #2). Tributary #1 extends southwest from its confluence with Sellars Gulch just south of Crystal Valley Parkway to the southern most corporate limits of the Town of Castle Rock. Tributary #2 extends southeast from its confluence with Sellars Gulch just west of South Gilbert Street (see **Figure ES-1**). The watershed encompasses approximately 15 square miles (approximately 9,600 acres) with Tributary #1 contributing 1.1 square miles (approximately 704 acres) and Tributary #2 contributing 1.7 square miles (approximately 1,088 acres) The lower portion of the Sellars Gulch Watershed is primarily fully developed with a mixture of urban, single and multi-family residential and industrial land uses. However, the upper portions of the watershed, including the tributaries, are currently experiencing rapid development (including the Crystal Valley Ranch and Oaks Planned Communities). Recommendations for improvements are limited to areas within the Town of Castle Rock; however, recommendations for improvements were made for portions of the watershed within the Study Area that crossed into Douglas County jurisdiction.

Boulder Drops Downstream of Perry Street Bridge

Hydrology, Hydraulic, Geomorphic, and Water Quality Evaluations

Hydrologic and hydraulic evaluations were conducted to develop peak discharges and estimation of floodplain extents and flood hazard areas. Evaluations were undertaken using current Town, Douglas County, Chatfield Watershed Authority (CWA), and Urban Drainage and Flood Control District (UDFCD) criteria and standards.

Runoff values for storms ranging from 2-year to 500-year events were calculated for existing and future conditions, and then used to:

- Evaluate the existing drainage facilities;
- Determine potential drainage problems;
- Evaluate alternative drainage improvements; and
- Estimate the floodplain and floodway extents for Sellars Gulch.

Average imperviousness of the watershed was analyzed to be approximately 7.5% under current conditions, with an increase to 20% at proposed future build-out. Results of the hydrologic evaluations indicate that the peak runoff for the 100-year event is currently about 4,714 cubic feet per second (cfs) at the confluence with East Plum Creek for existing conditions. Flow within the watershed is estimated to increase to 5,118 cfs for anticipate future land use conditions within the watershed. **Table ES-1, ES-2 and ES-3** provides a summary of the estimated peak discharges at key locations within the watershed.

Table ES-1: Peak Discharges at Key Locations along Sellars Gulch

Location	2-year Peak Discharge (cfs)		10-year Peak Discharge (cfs)		100-year Peak Discharge (cfs)	
	Existing	Future	Existing	Future	Existing	Future
Confluence W/ East Plum Creek	164	422	839	1,075	4,714	5,118
@ Wilcox Street	163	420	839	1,038	4,707	5,114
@ Perry Street	163	420	839	1,038	4,707	5,114
@ UPRR Bridge	163	420	839	1,038	4,707	5,114
@ Confluence W/ Un-Named Tributary #2	163	420	839	1,038	4,707	5,114
@ Plum Creek Parkway	41	98	798	871	4,451	4,896
@ Haystack Road	14	88	785	856	4,364	4,807
@ Crystal Valley Parkway	14	68	727	785	3,939	4,392
Confluence W/ Un-Named Tributary #1	8	68	721	731	3,939	4,373
@ Upstream Limits of Study	8	11	688	694	3,572	3,583

Table ES-2: Peak Discharges at Key Locations along Un-Named Tributary to Sellars Gulch #1

Location	2-year Peak Discharge (cfs)		10-year Peak Discharge (cfs)		100-year Peak Discharge (cfs)	
	Existing	Future	Existing	Future	Existing	Future
Confluence W/ Sellars Gulch	1	35	20	56	134	547
@ East Loop Road (North)	3	370	157	770	725	1,746
@ Entrance to Regional Detention Pond	3	370	157	770	725	1,746
@ East Loop Road (South)	1	130	47	246	247	618
@ Upstream Limits of Study	1	64	27	136	146	358

Table ES-3: Peak Discharges at Key Locations along Un-Named Tributary to Sellars Gulch #2

Location	2-year Peak Discharge (cfs)		10-year Peak Discharge (cfs)		100-year Peak Discharge (cfs)	
	Existing	Future	Existing	Future	Existing	Future
Confluence W/ Sellars Gulch	77	319	331	774	1,343	2,019
@ South Gilbert Street Bridge	77	319	331	774	1,343	2,019
@ Oman Street Bridge	16	310	266	687	1,054	1,664
@ Memmen Open Space Bridge	16	310	266	687	1,054	1,664
@ Valley Road	10	151	194	411	722	1,121
@ Private Driveway	2	49	45	125	165	313
@ Upstream Limits of Study	2	49	45	125	165	313

Hydraulics for the drainageway were evaluated for both existing and future conditions for the 10-year and 100-year frequency events utilizing results from the hydrologic analysis, and took into account all existing bridges, culverts, ponds and grade control structures. The results of the hydraulic evaluations are consistent with current Federal Emergency Management Agency (FEMA) regulatory information. However, two main areas differ significantly from the existing FIS. Area 1 is along Sellars Gulch between stations 218+00 and 225+00 caused by inadequate conveyance through Haystack Road. Area 2 is along Sellars Gulch between stations 160+00 and 185+00 and is caused by inadequate conveyance and culvert structures through the reach. Through both of these areas, the floodplain created for this project is larger than the floodplain in the effective FIS. Although no structures are directly inundated, several structures are surrounded by flooding and the flooding affects soccer fields and other non-vital infrastructure, which could cause additional maintenance costs in the future. It is recommended that these areas be re-mapped in the future.

Geomorphology, the study of the characteristics, origin, and development of landforms within and around the stream study limits, was evaluated for Sellars Gulch Study Area and documented in the Stream Stability and Wetlands Analysis Report found in **Appendix C**. The assessment was conducted to establish the current condition of Sellars Gulch in terms of geomorphic and sediment transport processes, and included bank stability, bed stability, sediment deposition, the role of riparian vegetation, and human influences. This assessment was then used to estimate how the drainage system is likely to respond to future changes in watershed hydrology and stream sediment supply due to development in the watershed. This was used to model a stable stream system based on proposed future land use. A grade of 0.53% is recommended as the equilibrium slope for grade controls to stabilize Sellars Gulch within the Study Area. However, due to the soil types and unstable nature of the majority of the Sellars Gulch corridor, some degradation and erosion can be