"TECHNICAL" REPORT

DESIGN REPORT

RIO GRANDE PARK AND JENNY ADAIR REGIONAL STORMWATER QUALITY FACILITIES

DRAFT

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CITY OF ASPEN
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I. GENERAL LOCATION AND DESCRIPTION

A. LOCATION

The Rio Grande Park and Jenny Adair Regional Stormwater Quality Facility sites are located in the City of Aspen, Colorado adjacent to the Roaring Fork River. See Figure 1 for the vicinity map depicting the locations of both project sites.

The Rio Grande project area is bounded on the north and east by the Roaring Fork River, on the west by North Mill Street and on the south by Rio Grande Place. The existing storm sewer facilities located within the Rio Grande project site consist of an open drainage channel to convey storm flows from a 36" storm sewer. A 48" storm sewer is located in Mill Street on the west side of the site. Both existing storm sewers convey storm flows from the north side of the City of Aspen to the Roaring Fork River.

The Jenny Adair project area is bounded on the north by the Roaring Fork River, on the east by the Rio Grande Trail, on the west by property owned by the Aspen Center for Environmental Studies and on the south by Puppy Smith Street. The existing storm sewer facilities located within the Jenny Adair project site consist of two 36" storm sewers conveying storm flows to an existing detention pond. The existing detention pond discharges to the Roaring Fork River on the north side of the site.

B. DESCRIPTION OF PROJECT SITES

The Rio Grande project site covers an area of approximately 5.5 acres consisting of an existing rugby field and park. The Jenny Adair project site covers an area of approximately 3.5 acres of open space with existing cottonwood and aspen trees and native grass.

Historic drainage patterns for both project sites show that storm flows typically flow in the northern direction, conveyed through the City of Aspen via existing storm sewers, streets and open channels, eventually flowing into the Roaring Fork River. The purpose of the two projects is to develop stormwater quality facilities to improve the quality of stormwater runoff, while enhancing the aesthetic value of the sites. The stormwater quality facilities can also be incorporated into a stormwater management plan for the City of Aspen to meet future requirements of National Pollutant Discharge Elimination System (NPDES) stormwater regulations. Both the water quality ponds and revisions to the existing storm sewers are in accordance with the Surface Drainage Master Plan for the City of Aspen (Reference 1). Mechanical pretreatment devices will be installed where storm sewers discharge to the water quality ponds to remove a portion of the sediment and suspended solids from both base flows and stormwater runoff. Upon discharge from the pretreatment devices, the storm flows will be conveyed through a series of ponds and waterways as the flows travel north. Additional water quality measures will be achieved through the use of extended detention ponds, providing increased detention time to allow for settling of materials from the storm flows.

No existing irrigation facilities are present on either the Rio Grande or Jenny Adair project sites. Existing storm sewer facilities are found on both the project sites are present, although the proposed improvements on the project sites will replace the existing facilities per the City of Aspen Master Plan.

JENNY ADAIR/RIO GRANDE PARK STORMWATER QUALITY FACILITIES

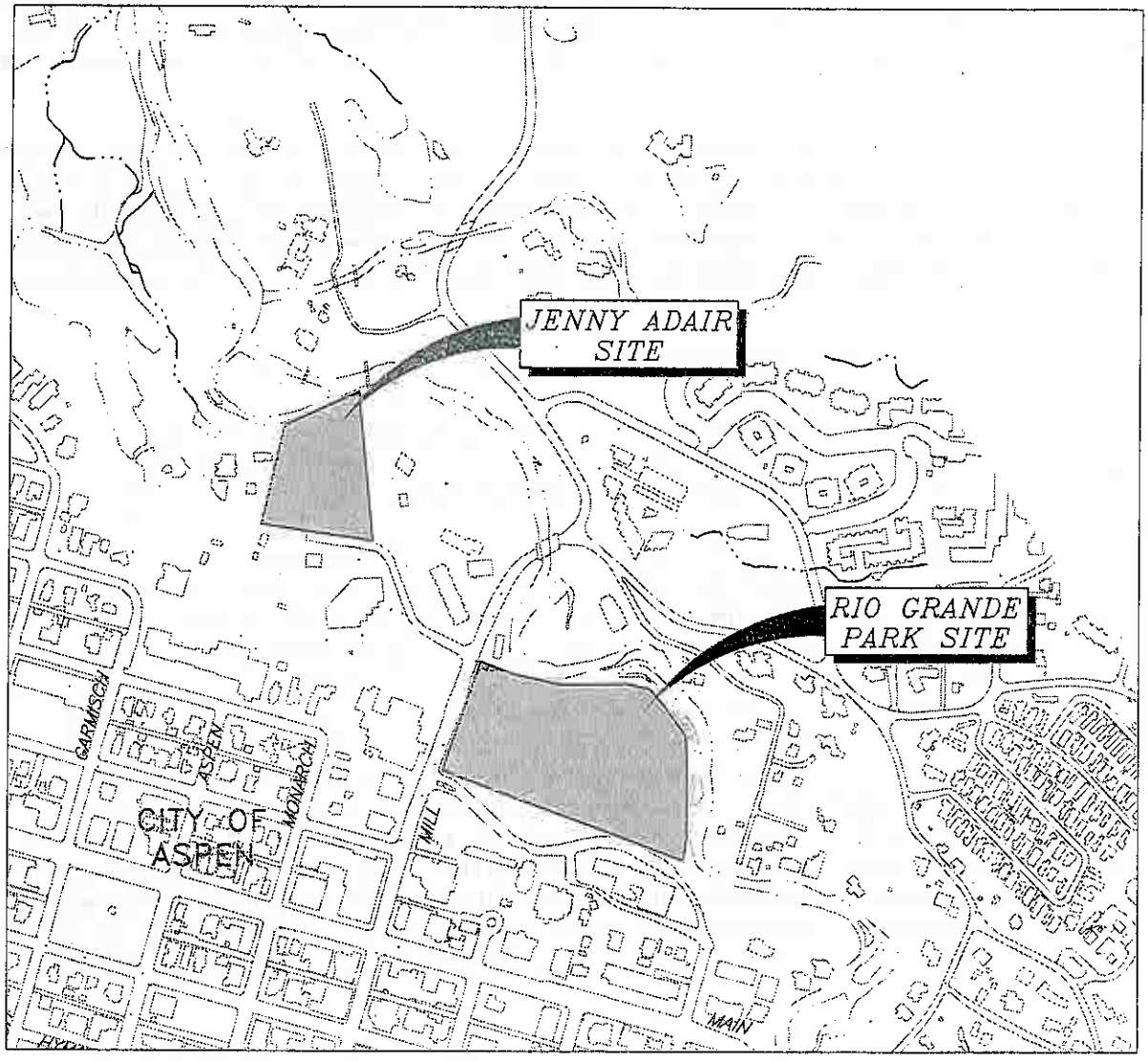

FIGURE 1
VICINITY MAP

600 300 0 600

SCALE: 1"=600'

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Based on a previous geotechnical investigation for the skateboard park on the south side of the Rio Grande Park site, soils consist of fill material with some trash overlaying native silty sand, sand and gravel. No groundwater was encountered in the borings at the time of drilling (Reference 2). No detailed soils information is available for the Jenny Adair site. Test wells placed at the Jenny Adair site indicate a shallow groundwater level with depths of 3 to 3-1/2 feet below the surface at times.

C. DEVELOPMENT REFERENCES & CONSTRAINTS

Surface Drainage Master Plan for the City of Aspen (Master Plan, Reference 1) provides the overall master drainage plan for the site. The Master Plan called out storm sewer improvements and two water quality extended detention basins to provide increased water quality for City of Aspen storm flows. The design of both the Rio Grande and Jenny Adair project sites were completed in accordance with the Master Plan. The water quality extended detention basin was designed in accordance with model criteria in the Northwest Colorado Council of Government (NWCOG) 208 Plan Update (Reference 3). Flood Insurance Rate Maps have been performed for the Roaring Fork River in the vicinity of the project sites Reference 4). Both sites lie adjacent to the identified floodplain but are not significantly affected by the floodplain.

II. DRAINAGE BASINS AND SUB-BASINS

A. MAJOR BASIN DESCRIPTION

Drainage basin and sub-basin delineation and modeling used in the design of both the project sites was obtained from the Master Plan. There are three major drainage basins that contribute storm flows to the Rio Grande project site. These include the Spar Gulch, Copper Gulch, and Vallejo Gulch major basins or Systems 1 & 2 as shown in the Master Plan. There is one major drainage basin that contributes storm flows to the Jenny Adair site, the Pioneer Gulch (System 3) drainage basin.

B. SUB-BASIN DESCRIPTION

In the Master Plan, these major drainage basins are then divided into sub-basins according to topographic characteristics and existing storm sewer facilities to be used in the CUHP hydrograph analyses and the SWMM routing analyses. Small portions of the major drainage basins do not reach either of the project sites, as the sub-basins discharge directly to the Roaring Fork River. Sub-basins that do not reach the project sites include 1, 2, 4, 8, & 25. Historic drainage patterns on both project sites will not be affected by the proposed improvements, as the storm flows will continue to flow in a northerly direction toward the Roaring Fork River. Minor revisions to storm sewer alignment will be made in accordance with the Master Plan.

III. DRAINAGE DESIGN CRITERIA

A. HYDROLOGIC CRITERIA

The hydrologic analysis performed in the Master Plan provided a majority of the hydrologic information used in this design. The Master Plan utilized the Colorado Urban Hydrographic Procedure (CUHP) to determine design discharges from sub-basins and hydrograph routing was done with the Urban Drainage Stormwater Management Model (UDSWMM). The NWCOG criteria for extended detention basin design is based on providing storage for the runoff from a 24-hour storm of 0.5 inches. The smallest storm included in the Master Plan was a 2-year storm with a rainfall depth of 0.74 inches. An additional CUHP/UDSWMM model was developed for a 2-hour

storm with a rainfall depth of 0.5 inches to provide runoff volumes for detention pond sizing. A 2-hour storm was used in lieu of a 24-hour storm because the CUHP/UDSWMM models included in the Master Plan are based on 2-hour duration storms. This results in slightly conservative estimates of storm runoff volume.

B. HYDRAULIC CRITERIA

Storm sewers tributary to the site are designed for the 10-year storm in accordance with the Master Plan. Water quality extended detention basins are designed to provide storage volume for the runoff from a 2-hour storm of 0.5 inches with release over a 24-hour period. Mechanical pretreatment units are provided to treat the peak runoff for the water quality design storm plus base flow with the exception of the east side of the Jenny Adair site which can provide treatment for the 10-year storm runoff. For other locations, the 10-year discharge is too high to provide mechanical pretreatment for and diversion manholes are provided to limit the flow to the pretreatment unit to the design rate. Spillways at outfalls to the Roaring Fork River are designed for the 100-year peak flow. A summary of design discharges at key design points is provided in the following table.

Summary of Discharges at Design Points

Location	D.A. (Ac.)	Q_{wq} Inflow (cfs)	Q_{wq} Outflow (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Q_{Base} (cfs)
Rio Grande Park (East Side)	725	17	1.09	74	174	2 (Summer) 3 (Winter)
Rio Grande Park (W. Side - Mill St.)	136	15	0.63	49	157	1 (Summer) 0 (Winter)
Jenny Adair (South Side - 54" Storm Sewer)	381	44	NA	134	449	5 max.
Jenny Adair (East Side - 36" Storm Sewer)	10.5	3.3	NA	9.3	21.3	0
Rio Grande Park Outfall	870	NA	NA	117	331	3
Jenny Adair Outfall	10.5	NA	1.99	154	470	5

Note: Base flows provided by City of Aspen

IV. DRAINAGE FACILITY DESIGN

A. GENERAL CONCEPT

The Rio Grande Park project consists of mechanical pretreatment facilities and a series of ponds that serve as water quality treatment facilities. Storm flows reach the Rio Grande project site through existing storm sewer facilities within System 1 & 2. As storm flows near the project site, a diversion manhole at Mill St. directs storm flows to a 24" and a 42" pipe. The 24" storm sewer discharges to a mechanical pretreatment unit designed to trap contaminants in the storm flows prior to reaching the detention ponds. A water quality outlet structure is provided on the east side of the Rugby Field to restrict the discharge to allowable rates. The required water quality storage volume is provided in Pond 7 adjacent to and on the north side of the Rugby Field. The outlet structure consists of a perforated plate to restrict the discharge during small storms and a mechanical device (HydroSlide) to allow release of base flows at the desired rates. The 42" storm sewer conveys flows in excess of the water quality design storm and discharges to the north side of the soccer field.

On the east side of the site, stormwater enters from an existing storm 36" storm sewer near the project site. A diversion manhole conveys base flows and the water quality storm through a mechanical pretreatment unit which discharges to Pond 1. Flows in excess of the design capacity of the mechanical pretreatment unit flow directly to Pond 1 without flowing through the unit. From Pond 1, stormwater flow from the east side is conveyed through 3 additional ponds. At Pond 4, a water quality outlet is provided with the required water quality storage volume provided in Ponds 2, 3 and 4. The discharge from Pond 4 flows to Ponds 5 and 6 where it combines with discharge from Pond 7 before being discharged to the Roaring Fork River. An emergency spillway is located on the east side of the project site to directly discharge increased flows into the Roaring Fork River.

The Jenny Adair project site is a simpler version of the Rio Grande project site with a single water quality pond. Storm flows reach the Jenny Adair site on the east side through an existing 36" pipe that will be retrofitted with a mechanical water quality pretreatment unit. Storm flows from the west side are conveyed to the project site through a 54" storm sewer to be constructed from the intersection of Francis Street and Garmisch Street. A mechanical pretreatment is provided prior to discharge to the site. A water quality outlet is provided before final discharge to the Roaring Fork River. An emergency spillway is provided on the north side of the pond.

B. SPECIFIC DETAILS

The storm flows to be experienced by both of the project sites were analyzed in the City of Aspen Master Plan. Water quality detention is achieved through the use of wet ponds that must accommodate both the base flow volume, as well as the water quality volume. Therefore, the ponds must also have discharge regulation of the base and water quality flows. Constant flow regulating devices are used in both of the project sites to allow for a constant base flow under varied headwater conditions. The devices are mechanical orifices that open or close in response to a positive or negative change in head. This will allow base flow conveyance through the project sites at the specified rate. Water quality orifices are used to regulate water quality discharge flows. The water quality orifices and flow regulating devices are constructed within a vault out of view from the visitors at the project sites. Additional outlet design was required to ensure emergency relief to the project sites. Emergency weirs are designed to accommodate the 10-year and 100-year storm runoff events.

The water quality of stormwater runoff can be negatively impacted by development within the urbanized sector. This development can lead to increased stormwater flows as well as degraded water quality from the introduction of many different contaminants. Engineered systems are

designed to mitigate increased flows and capture a majority of the contaminants prior to discharge into a natural stream.

Several samples have been collected for stormwater runoff and the Roaring Fork River. The following table summarizes the location and results of the samples as well as the expected concentrations of these contaminants for typical land uses.

Sample Site	Flow Condition	BOD mg/l	TSS mg/l	F.Coli #/100 ml	Tot. Cu mg/l	Tot Zn mg/l	Oil & Grease mg/l	Tot. N mg/l	Tot.P mg/l
Cemetery Lane (River 9/24 sample)	Dry Weather	1.2	3	-	-	-	-	-	-
Recycling Center on ACED (9/24 sample)	Dry Weather	1.2	2	-	-	-	-	-	-
Recycling Center on W. Side (9/24 sample)	Dry Weather	1.4	4	-	-	-	-	-	-
Mill St. Outfall (9/24 sample)	Dry Weather	0.8	3	-	-	-	-	-	-
Jenny Adair Outfall	Dry Weather	0.4	3	-	-	-	-	-	-
Mill St. Outfall (5/12 sample)	Snowbell		1140	-	-	-	-	-	-
Mill St. Outfall (6/20 sample)	Storm/ Rainfall	-	132	6300	79.4	457	8.8	0.63	0.94
Typical Conc. Residential/ Commercial)	-	33-17	225-240	-	29-43	180-240	-	3.3-3.4	0.42-0.65

A portion of the engineering system designed to mitigate these pollutants is an Extended Detention Basin, a type of structural BMP. The expected contaminant removal range for this BMP is summarized in the table below:

Type of BMP	BOD mg/l	T.S. mg/l	Bacteria F.Coli. #/100 ml	Tot. Cu mg/l	Tot Zn mg/l	Oil & Grease mg/l	Tot.N mg/l	Tot.P mg/l
Extended Detention Basin	-	55-75	-	-	30-60	-	10-20	45-55

Additional water quality treatment of the stormwater runoff flows will be provided from a mechanical pretreatment device. The pretreatment device target settleable solids, T.S., oil & grease, phosphorus and some heavy metals with goals of total suspended solids removal of approximately 80%.

The proposed facilities will require operation and maintenance to function properly over time. Mechanical pretreatment units will require removal of solids approximately once or twice per year. Typically, this includes pumping material with a vacuum truck. The material will be in a slurry form when removed and liquids are typically disposed of at a treatment facility. Solid portions are typically dried and tested prior to disposal. If not hazardous, the materials can be incorporated into fill material. If hazardous, the material must be disposed of at a suitable landfill or other facility.

V. CONCLUSIONS

The proposed design of these two project sites is in compliance with the Master Plan and will provide enhancement of stormwater quality conveyed through the sites. Pond 1 at the Rio Grande Park site functions as a forebay to collect sediment at the upstream end of the facility. Pond 1 will likely require removal of sediment at 3 to 4 year intervals. It should be noted that maintenance intervals are estimated and can vary based on the presence of other best management practices within the basins, frequency of street cleaning and variability of storms over a period of time.

VI. REFERENCES

1. Surface Drainage Master Plan for the City of Aspen, WRC Engineering, Inc., November 2001.

2. Subsoil Investigation, Proposed Skateboard Park, Aspen, Colorado, HP Geotech, Inc. March 2000.

3. Regional 208 Plan Update, Model Water Quality Protection Standards, Northwest Colorado Council of Governments, 2002.

4. Flood Insurance Rate Maps, Pitkin County, Colorado and Incorporated Areas, Panels 203 and 204 of 325, Federal Emergency Management Agency, 1987.