

CHAPTER 2: REACH DESCRIPTIONS

The focus of this report is 7 miles of the Dolores River through the Town of Rico as shown on the attached **Exhibit 2.1-Study Reaches**. The downstream study limit is at the Dolores & Montezuma County line. The stream segment studied extends about 3½ miles upstream to the southern corporate limit of Rico, continues for approximately 1½ miles through Rico, and then extends about 2 miles north of town to the new municipal well site. The Dolores River flows generally from north to south through Rico.

Within this study area, the seven-mile stretch has been subdivided into eight separate reaches that have their own character, appearance and issues. Beginning from downstream and continuing upstream, the reaches have been labeled as shown below:

Reach A:	Montezuma/Dolores County Boundary to Spruce Gulch
Reach B:	Spruce Gulch to near the corporate limits of Rico
Reach C:	Future site of the Town's Wastewater Treatment Plant
Reach D:	Town of Rico
Reach E:	Highway Bridge to the St. Louis Ponds
Reach F:	St. Louis Ponds
Reach G:	Chutes
Reach H:	Town Well

Reach D, a special reach through the Town of Rico, had previously been subdivided into 5 sub-reaches by Corey Sue Derfus of Aqua-Hab, Inc. in a report titled, "Report of Biological and Aquatic Surveys along the Dolores River Corridor at Rico," dated January 2001. These sub-reaches, originally labeled 1 through 5, are now labeled D1 through D5 for this report.

Silver Creek, a major tributary to the Upper Dolores River through the Town of Rico, has been labeled Reach I.

Exhibit 2.2 is a profile of the Dolores River, prepared for the purpose of understanding the stream slope and how it impacts stream stability. The profile begins at the County Line and extends upstream for ten miles. The horizontal axis shows river stationing which matches the river centerline stations from Exhibit 2.1. Locations of tributaries are shown on the profile. Average stream slopes for each reach have been labeled on the profile. Overall, the average stream slope through Rico is about 1.4%, which is relatively steep for a major drainageway. The high stream power of the channel has scoured away fine particles, leaving a bed of cobbles and boulders.

The following is a description and issues related to channel stability for each of the reaches:

Insert Exhibit 2.1

Insert Exhibit 2.2

Reach A: County Boundary to Spruce Gulch

This 2.61 mile reach, from Station 0+00 to 138+00, begins at the County Line where the old Highway 145 crossed over the Dolores River (“Montelores Bridge”) and the U.S. Geological Survey has an active stream gage. The reach continues upstream to the confluence of Spruce Gulch. According to the gage information, the drainage basin of the Dolores River at this point is 105 square miles.

This reach has an average slope of 1.25%, from elevation 8595 to 8422 feet. Riparian vegetation is lush, with few man-made disturbance. Other than dispersed camping, there have been few impacts to this section of the river. No major mining is evident in this reach of the river corridor.

The key to future protection of this reach of the river is to minimize encroachment into the river corridor. Future development, roadway or bridge construction should be kept out of the riverine floodplain unless mitigation measures are implemented. Horse and cattle grazing should be limited to prevent destruction of the riparian vegetation. The channel has established and equilibrium with its surroundings over geologic time, and the river is quite stable in this section. Additionally, the dense vegetation slows floodwaters and reduces channel velocities, which in turn helps to stabilize the bed and banks.



Figure 2-1: Dolores River view downstream of the bridge at the County line. Note the dense native vegetation along the channel.



Figure 2-2: USGS Gage at the Montelores Bridge downstream of Rico at the County Line.

Reach B: Spruce Gulch to Below Town

This ½-mile reach, from Station 138+00 to 166+00, begins at the confluence of Spruce Gulch and continues upstream to a proposed site for the future regional wastewater treatment plant site. This reach has an average slope of 1.25%, from elevation 8595 to 8630 feet. Riparian vegetation is lush with limited human impacts. Other than dispersed camping, there have been few impacts to this section of the river. No major mining claims are evident in this reach of the river corridor. The dense mature native vegetation has stabilized this reach of the river, and no restoration is proposed in this section. Improved overall water quality by reducing mine seeps upstream could improve fisheries in this reach. Dispersed camping has been the noticeable impact to the reach. Reach B has been slightly more impacted than Reach A by man-made disturbances.

Reach C: Below Town

This ¼-mile reach, from Station 166+00 to 180+00, is the proposed site for the future regional wastewater treatment plant site serving the Town of Rico. This reach has an average slope of 1.30%, from elevation 8630 to 8648 feet. Riparian vegetation is prominent except for disturbed areas from fisherman trails and campsites.

This reach may be significantly impacted by the construction of the wastewater treatment plant. It is possible that the plant may encroach into the floodplain. Stabilizing vegetation may be removed as a part of the construction. Channel improvements may be needed to protect the plant from flooding and channel instability.



Figure 2-3: This riverside pasture area could be the site of the future wastewater treatment plant serving the Town of Rico.

Reach D1: Town Lower Reach – Rico Boy and Santa Cruz Mines

This 0.3-mile reach, from Station 180+00 to 196+50, is the lower area of the Town of Rico. This river reach has an average slope of 1.30%, from elevation 8648 to 8670 feet. This reach has been disturbed by mine tailings, roads and development. Encroachment into the floodplain, construction of berms and levees, and destruction of riparian vegetation has destabilized the reach of the river, and there is evidence of lateral channel migration during floods. Bare cobble bars are evidence of channel erosion and deposition zones.

The most significant impact results from the mine tailings piles from the Rico Boy and Santa Cruz mines. Although engineered caps have been constructed on these piles, they encroach into the floodplain causing more stress on the channel bed and banks during floods. Restoration may be helpful in this reach to remove berms and other encroachments, restore vegetation along the channel banks and add boulder clusters for trout habitat.



Figure 2-4: Access road to the river between Reaches D1 and D2. Manmade impacts are evident in this reach of the river.

Reach D2: Town Lower Reach – Pasadena Smelter

This 1000-foot reach, from Station 196+50 to 207+00, is the lower area of the Town of Rico. This river reach has an average slope of 1.30%, from elevation 8670 to 8680 feet. This reach has been disturbed by mine tailings, roads and development. Encroachment into the floodplain, construction of berms and levees, and destruction of riparian vegetation has destabilized the reach of the river, and there is evidence of lateral channel migration during floods. Bare cobble bars are evidence of channel erosion and deposition zones.

The most significant impact is the encroachment into the historic river corridor from the former Pasadena Smelter. Although the site has been reclaimed, the soil mound has encroached into and artificially constricted the floodplain, causing more stress on the channel bed and banks during floods. Major restoration would be helpful in this reach to remove encroachments, divert and deflect the channel around bends, restore vegetation along the channel banks, and add boulder clusters for trout habitat.

Reach D3: Town Bridge and Columbia Tailings Cap

This half-mile reach, from Station 207+00 to 230+00, is the largest identified reach within the heart of the Town of Rico. This river reach has an average slope of 1.30%, from elevation 8680 to 8710 feet. The reach is disturbed with a town bridge, roads, development and capped mine tailings. However, it does contain some quality wetland areas that should be protected.



Figure 2-5: This section of the channel is not natural and has been “engineered” to be stable during a flood event. However, this alteration often propagates instability downstream.

The most significant impact is the encroachment into the historic river corridor from the Columbia Tailings Cap. This site was reclaimed under a Voluntary Clean-up program, however, the cap has not been effective at eliminating mine seeps into the river. The tailings, cap and stabilizing bank riprap have encroached into the floodplain, causing more stress on the channel bed and banks during floods. This encroachment and lack of vegetation deflects the river’s energy to the opposite bank and causes the river to become more unstable. Restoration would be helpful in this reach to push the tailings piles and other encroachments outside the historic floodplain and to restore vegetation along the channel banks.

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Reach D4: Downstream of Silver Creek

This quarter mile reach, from Iron Draw on the west bank to Silver Creek on the east bank (Station 230+00 to 244+00), is a uniquely steep section of the Dolores River. Silver Creek has created an alluvial fan at its outfall into the Dolores River, which has steepened this section of the river. Silver Creek is a very powerful drainageway during flooding and has carried and deposited significant amount of material at the confluence. Therefore, the Dolores River is significantly steeper (average slope of 3.64%) where it is flowing through this depositional landform. Other factors affecting stability through this reach of the Dolores River is the residential development on the east bank. A steep slope coupled with a loss of riparian vegetation has made this an unstable section of river. Bank erosion is evident in this area.



Figure 2-6: All stabilizing riparian vegetation has been removed in front of this development.

Several structures have been constructed within the 100-year floodplain in this reach. These buildings are subject to inherent flood hazards. To mitigate the hazard, the buildings can either be relocated, or hard controls may be required along the river to anchor the channel in its current alignment.

Reach D5: Highway Bridge to Silver Creek

This quarter mile reach, from Silver Creek to the Highway 145 Bridge (Station 244+00 to 257+50), contains some instability problems and some development pressure. The alluvial fan created by Silver Creek and located in the reach immediately downstream, has flattened this section of the Dolores River upstream compared with both upstream and downstream sections. The average channel slope through this reach is 1.88%, which is steep for most rivers, but comparatively on the upper Dolores River is a milder slope. This flattening of the channel bed reduces stream power and causes deposition of bed load cobbles. Deposition causes the river to shift laterally during a flood, which makes the river unstable. However, man-made berms to protect structures in the floodplain have been constructed in an effort to limit channel migration and minimize overbank flooding. These berms remove stabilizing riparian vegetation and concentrate the river's stream power into the channel, further exacerbating channel instability.

Residential structures have been constructed within the 100-year floodplain in this reach. These buildings are subject to inherent flood hazards. To mitigate the hazard, the buildings can either be relocated, or hard controls may be required along the river to anchor the channel in its current alignment.



Figure 2-7: Several residential structures have been constructed within the river floodplain.



Figure 2-8: Broken concrete, rubble and dirt have been bermed up to protect these houses from flood hazards. Berms adjacent to the river destroy riparian vegetation and concentrate stream power on the channel during a flood thereby reducing stability.

Reach E: Highway Bridge to St. Louis Ponds

This 1,500-foot reach, from the Highway 145 Bridge (Station 257+50) to the St. Louis Ponds (Station 272+50) has been specifically noted because it was likely a wetland area in the past, prior to the placement of fill for the access roadway along the east bank of the river. This river encroachment has eliminated the overbank floodplain and limited the ability of the wetland area to perform its natural functions. Since the stream reach upstream is steep with high stream power, this flatter reach at an average 1.88% was likely a natural area for deposition. However, with the encroachment of the access road, deposition occurs further downstream within Town, in Reach D.5, causing channel instability adjacent to development. Removing the encroachment associated with the access road by utilizing a different access roadway higher up the mountain would improve channel stability through Town and promote additional wetland and riparian vegetation areas.

Reach F: St. Louis Ponds

This reach is highly impacted by mining on the east bank, and is nearly natural along the west bank. The channel slope varies from 1.88% to 3.44% along this 4,000-foot reach, from Station 272+50 to 312+00. The reach is adjacent to the series of St. Louis Settling Ponds along the east bank which were constructed for treatment of the St. Louis Mine adit discharge. The intention is that the settling ponds function in series. , Mine seepage is treated before releasing to the stream system. However, seeps have been noted along the channel indicating there is a direct hydraulic connection between the ponds and the river.

Encroachment of the ponds and the stabilizing bank riprap into the historic river floodplain corridor is the most significant impact to this reach. This encroachment causes more stress on the channel bed and banks during floods. The lack of vegetation channelizes the river giving it the characteristic of a chute rather than a natural stream channel with wetland pockets. Restoration of a portion of the historic floodplain by minimizing the number of settling ponds would improve the natural functions of the river corridor.



Figure 2-9: View downstream toward Rico along the Dolores River. The St. Louis settling ponds (left) are isolated from the river by lining the channel bank with riprap.

Reach G: Chutes

This 4,200-foot reach, from Station 312+00 to 354+00, is an extremely steep section of the river with a slope of over 7% and little access. The Dolores River flows from a calm wetland area upstream through a narrow rock outcrop pinch point. The channel is deeply incised with steep banks and large boulders. This is an area of dangerous whitewater with little recreational opportunity and no development.

The area is significant to the Town of Rico because flood hydraulics will mobilize the cobbles and bed material in the channel. Therefore, there should be an area below the “Chutes” to calm the water before it reaches town. Otherwise, deposition, erosion and lateral channel migration will occur adjacent to development, putting structures at risk to river hazards.



Figure 2-10: The Chutes above the Town of Rico mobilize cobbles and bed material, which deposit in the flatter areas around town.

Reach H: Town Well

This reach of the river over 2 miles upstream of the Town of Rico is a natural and stable section of the Dolores River. This 2,200-foot reach, from Station 354+00 to 376+00, has the mildest slope of the entire study area. There is little development pressure and encroachment into the river floodplain. The wetlands are abundant and healthy. The channel slope in this area is very shallow at 0.25% causing much of the suspended sediment and bed load to drop out in depositional areas.

The new Town Well, drilled along the west side of the highway, is an attempt to improve water quality. Currently, the Town relies upon an infiltration gallery in Silver Creek for water which is subject to mine discharges and avalanches. Transferring the Town’s water right upstream to this location may have an impact on minimum stream flows established by the Colorado Water Conservation Board for the 2.4 miles of the Dolores River above Silver Creek.



Figure 2-11: This natural section of river two miles above Rico is a pristine reach. Water quality is generally good and wetlands are abundant.

Reach I: Silver Creek

Silver Creek, an east tributary of the Dolores River, is important to the Town of Rico and has many issues affecting the town. There has been significant mining in the Silver Creek watershed which has impacted water quality. The stream is also highly unstable and can flood the town during peak snowmelt and rainfall events. Avalanches can fill the channel creating a dam, which can break and flood the town. A section of the creek once collapsed into a mine shaft.

Silver Creek is highly unstable due to the high and flooding potential. Development has encroached into the floodplain which increases the flood hazard potential of the adjacent buildings. Berms have been constructed to control flooding, but these berms are not FEMA compliant and may not withstand a significant flood.



Figure 2-12: Silver Creek is a roaring creek that can move a tremendous amount of rock , mud and debris during a flood event.