

TOWN OF CRESTED BUTTE FLOOD PLAN

SPRING 2008

Snow pack and runoff monitoring

The primary function of snow pack and runoff monitoring is to gauge the threat of flooding based upon evaluation of the amount of water in the drainage basin(s) relative to historical data in the basin. Current and historic data is available largely through the NRCS (National Resource Conservation Service) website and historic records. The website records current precipitation and water content at specific sites in major drainage basins. The primary site of interest to the Town of Crested Butte is the Butte site which is located in the vicinity. The sites transmit data daily through satellite uploads. The website is accessed at http://www.wcc.nrcs.usda.gov/cgi-bin/past_up.pl .

In combination with stream flow levels, which are available through real-time sites on line from the USGS (United States Geological Survey), and weather data both historically and forecasts, threat evaluations can be made. The stream level data can be accessed online at <http://waterdata.usgs.gov/co/nwis/rt> . There are no real time gauges on Coal Creek however gauges in the vicinity of the First street bridge and the Maroon Street bridge have some historic data and are useful for monitoring the current flows.

The amount of water still in the basin and the forecasts relative to temperature and precipitation as rain go into evaluating the long term and immediate threat of higher than normal run off situations that could lead to flooding. Typically in Crested Butte snow pack melts in the heat of the day in the Coal Creek drainage and is retarded as the night cools the area. High water usually occurs somewhere between 10:30 and 12:30 p.m. as water works its way down out of the basin. Long term threats are gauged by extreme amounts of water in the basin as the season extends into longer days and the likelihood of warmer days and nights. Short term threats are evaluated by the current creek levels and weather that either is warmer than normal and does not cool down at night or a significant rain event that adds to the existing flows.

The evaluation of threat determines the course of actions in the short term and long term. To expend too much effort and resources on a minimal threat could prove to be a waste of capital and time that could go to other essential government or private issues. On the other hand to not mount the appropriate response to an emerging threat could cause undue damage to property and potentially life. The appropriate balance between “chicken little” and “head in sand” is important.

Primary responsibilities:

Coal Creek gauge maintenance – C.B. Public Works – Brad Cadwell (349-0736)

Weather monitoring – C. B. Waste water – Taylor Davis (349-5530)

Gauge reading – C. B. Marshals office and Planning – Tom Martin (349-5231)
and Bob Gillie (349-5338)

Monitoring and forecast/planning-Scott Morrill, Gunnison County Emergency
Services (641-2481).

Bob Gillie, Town of Crested Butte (349-5338)

John Scott, US Department of Natural Resources (641-0494)

Threats

There are basically three types of threats that need to be planned for.

The first is the threat of watercourses overtopping their banks and flooding by virtue of excess water trying to flee the basin and inundating areas that in normal years are dry during runoff cycles. This is a function of the capacity of the stream channel versus the amount of water trying to move through the channel and shall be referred to as capacity issues.

The second threat is debris caused flooding. In Coal Creek this is caused largely by trees and wood being washed down stream and lodging on bank obstructions and bridges. In other areas debris might even include houses and structures. Debris once lodged tends to attract other debris in the water course that exacerbates the situation. The situation is that debris tends to constrict the capacity of the creek and lead to inundation in areas upstream of the debris clog.

The third threat is bank failure. Erosion of banks can have negative effects because of the change to stream dynamics that can occur. Material can fall into the channel and change the hydrology of the watercourse. Either creating eddies or altering the current flows to erode new areas. The danger is in the erosion of public or private property and the cutting of new channels and threatens structures.

The risk of erosion and flooding by whatever catalyst has the potential to cause not only damage to property on a localized basis but also disruption of services if the flooding occurs on a larger scale and interferes with the distribution of goods and services. An example might be the closure of highways by incidents outside of this jurisdiction. Planning and response to this type of incident are very much a regional issue that will be addressed by a consortium of government agencies.

Property Owners bear the primary responsibility for protection of their own properties and are encouraged to properly plan by developing a family emergency preparedness plan. Many helpful tips are on the FEMA (Federal Emergency management Agency) website (www.fema.gov.areyouready/flood.shtm). There are a wide spectrum of actions

to prepare for in the event a flood occurs from how to protect utilities and important papers and heirlooms to evacuation plan considerations for you and your pets.

Coal Creek Characteristics

The nature of Coal Creek within the Town varies depending on its location in Town. The west section where it enters town is defined largely by natural banks stabilized with vegetation and some historic stacked rock walls on the north side down to 1st Street. The south bank is a mixture of new retaining walls and natural willow stabilized walls. Historically this area has not been an area of large concern for capacity issues due to the high flow velocity that increases the capacity of the stream. From 1st street north east down to 3rd street the creek is very much channelized with the banks being defined by stacked rock, mortared rock, gabion, and concrete retaining walls. This section is a high velocity scour zone. In the past creek bottom material has been scoured from the section and moved downstream thus effectively increasing the creek capacity at times. The material picked up in this channelized section is deposited largely downstream of where Gothic Avenue crosses the creek. From Gothic Avenue to Butte Avenue material may be dropped in this deposition zone and the main channel of the creek may vary from year to year within the floodway banks. The channel is typically wider and shallower and banks if stabilized are done with rip-rap and natural willow vegetation.

1. Flooding threat due to capacity issues

Flood mapping - Coal Creek has been studied on at least one occasion and mapped to determine where there may be capacity issues within the Town. Engineering programs are used to evaluate the drainage basin, in this case Coal Creek, and determine what flows are possible from the area. The standard for establishing flows is the 100 year flood. In other words there is a 1% chance that these flows will be encountered in any one year.

The last study of this nature in the Town proper was done by RBD Engineering in 1992 at the request of the Town. FEMA flood zone maps that are used to determine flood insurance rates attempt to reflect much the same data in terms of where flooding is more likely (zone A) and where it is not likely (zone C). The latest FEMA map dates from 1985. Although this map is still used for flood rate determinations the 1992 is a more valid study for planning purposes. Many improvements to the stream course have been made since 1984 and even more have been made since 1992 so the latest mapping RBD mapping is very much a worst case scenario.

Some additional mapping has been done on the east end of Town during annexation proceedings on the Verzuh parcel. By definition any areas that might be prone to flooding in a 100 year flood were excluded from development within Town.

The best available information indicates that the most likely place for flooding from capacity issues is in block 29, between 1st and 2nd, Elk Avenue to Sopris. Several bridges

or decks in this area that were identified as possible obstructions have or will be removed or raised. This area was identified as the choke point in the creek where flows are likely to be restricted and water could back up upstream causing flooding.

Action Plan

Depending upon the threat assessment materials for a possible diversion structure or containment structure will be stockpiled up front of any possible action. Those materials needed will include the following.

Sand bags – currently there are roughly 9000 bags in stock. Nine thousand bags would create over 1100 feet of a one foot high barrier, 500 linear feet of a two foot high barrier, etc.

Sand – each bag takes approximately .45 cu. ft. of sand, 9000 bags would require 150 cu. yds of sand.

Reinforced visqueen – this can be used within the sandbag dike or to waterproof the barrier or on buildings to help make them water resistant in certain circumstances.

Jersey barriers – These are concrete traffic dividers, they may be useful if a water diversion needs to be turned.

ADS pipe – it may be possible to utilize stabilized ADS culvert pipe to move water from one location to another and minimize the amount of sand bags required.

Forklift pallets for transporting bags

The equipment required for flood response includes:

- equipment to fill bags
- equipment with forks to move pallets – skid steer, backhoe, loader
- trailer to transport pallets.

Given the threat assessment bags would be stockpiled in the vicinity of the likely problem areas. A number of bags would be stockpiled on forklift pallets so they could be easily moved to problem areas as they arise. Bags would be filled through the resources of the Town and a volunteer effort in advance of being needed.

Phase 1 – Containment

The initial plan would be to try and contain the flow within the existing stream banks by raising the level of the existing banks with sand bags. This would probably happen in block 29 but the rest of the creek would have to be monitored for potential problem sites.

Phase 2 – Diversion

If the volume in the creek was such that by maintaining capacity problems were occurring by backing water further upstream or by not being able to handle the increased flows without problems downstream it might be necessary to divert some water around the constrained area. The most likely diversion spot is the creek section behind the Powerhouse and by the Old Town Hall on Second Street.

The plan would be to create a diversion structure down the alley to the east by lining the alley with sandbags or a combination of sandbags and flexible culvert. The diversion would be built prior to the sandbag containment structure on the creek was breached to bleed off water into the diversion.

At 2nd Street the diversion would be turned 90 degrees north with jersey barriers and sandbags and taken across Elk Avenue where the water would be put back in the creek behind the Timberline restaurant where the creek capacity increases.

Phase 3 – Secondary Diversion

If the volume of the creek or the diversion exceeds the ability to put it back in the creek at 2nd as planned in phase 2 then some of the water could be diverted onto the street grid. A significant amount of water can be handled within the curbs of the normal street in Town. Some water could be diverted down 2nd Street, some could be bled off down Elk and some potentially could go toward Sopris if it got high enough. The flows would have to be monitored and adjusted to keep the flows within the paved portions of the street and off of private property. Detours would have to be enforced to allow access to all properties during phases one and two. If Second Street comes into play then the Butte Avenue bridge could be opened to traffic to access homes east of Second Street and north of the creek.

Primary Responsibility

Monitoring and planning – See snow pack and runoff monitoring

Construction – Public Works (349-0736)

Volunteer effort – Molly Minneman (349-5338)

2. Flooding threat due to debris

Debris issues tend to be related to wood hanging up on bridges or irregularities in the creek. Logs and sticks move frequently out of the upper basin during high water events. Some debris is related to beaver dams or deadfall. The floating wood tends to hang up on bridges when clearances are reduced by high water. In the past there have been two areas of particular concern although the entire creek should be carefully monitored. Those two areas are the First Street bridge and the bridges on Elk and 2nd Street in the core. The First Street bridge has very little free board or clearance at high water. The Elk and 2nd Street Bridges are double box culvert bridges with center obstructions that tend to hang up debris.

Action plan

Debris issues are difficult to forecast and must be reacted to as they occur. Monitoring of the creek and specifically the bridges is key to reacting appropriately. Once debris is identified the size and position of the debris determines the immediate danger and response. Large debris which is crossways of the current must be dealt with immediately. Small debris parallel with the flow may not be an immediate threat.

The course of action requires that the debris be removed from the stream or in some cases dislodged and allowed to continue its journey down stream. The obstruction and its position determine the methodology. Those tools which should be on hand include:

1. A backhoe or track hoe with thumb
2. pikes (long sticks with a hook and sharp point)
3. Grappling hooks – large multiple hooked device attached to ropes
4. Flood lights and generator if necessary for night work
5. Safety equipment including ropes, harnesses, life jackets, throw bags, etc.
6. Chain saw.

Necessary equipment should be pre-positioned in the core area, most likely in the 1st and Elk Avenue parking lot. A list of operators will be placed on standby 24 hours per day during the threat time. The area will have to be secured to eliminate danger to the public during the removal phase. Barricades will be pre-positioned in the core.

Primary responsibility

Monitoring – Marshals office (349-5231) and building/planning office (349-5338).

Debris removal – Public Works (349-0736) and Recreation Department (349-5338)

Site Security and safety officer – Marshals office (349-5231 or 641-8000)

3. Flooding threat due to bank failure

Bank Failure is most likely in those sections of the creek where there are no improved creek walls which are primarily on north of Maroon Avenue. Also stacked rock walls in the vicinity of 1st street should be monitored. Those walls on the outside curve of the stream course are much more prone to erosion and failure. Banks should be monitored constantly during high water to identify problem areas.

The primary cure for bank failure would be to place rip-rap in the failing section. Rip rap is hard surface rocks or concrete. The ideal size is a diameter of 16 to 24 inches. The rip-rap would likely be placed against the failing bank to protect and armor the bank against the force of the current. This would likely be done by a backhoe or track hoe with a thumb attachment. An evaluation of the specific site should be done to determine the most effective placement. In some cases a jetty like structure upstream could be useful to divert water away from a specific area keeping in mind where the water is being diverted to.

Action plan

Monitor the creek frequently to identify possible problem areas. Identify sources of rip-rap and segregate useful pieces. Possible sources of rip-rap for the 2008 flood season are rocks generated during last years gravel pit stabilization at the Town ranch and concrete pavement sections which are to be removed as part of the “2008 4-way stop re-alignment

project”. Depending on the threat assessment either load the rip-rap into available trucks for movement or place rip rap in the vicinity of likely failure locations. Identify both public and private equipment that could be useful in the activity and per-position them where needed. Secure access to private property, if required, either through contact of property owners or through emergency declaration.

In some instances sandbags can be useful in stabilization activities as well.

Necessary equipment and tools include:

1. Dump trucks
2. Wheel loader
3. Back hoe or track hoe preferably with thumb
4. Emergency lighting and generator if necessary

Primary responsibility

Monitoring – Marshals office (349-5231) and Building/planning offices (349-5338)

Bank Stabilization – Public Works (349-0736) and Recreation department (349-5338)

Additional Issues and Responsibilities

Private Access issues – It may become necessary to access private property to protect life as well as both public and private property. Whether this can be done by permission or decree needs to be investigated

Primary Responsibility – Town Attorney/ Town Manager (349-5338)

Waste Water infiltration – Flooding and a high water table creates the possibility of excess flows into the waste water treatment plant. The ability to process waste water in an effective manner could be affected. It is likely that underground sewer pipe integrity can not be addressed in any substantial manner and that some infiltration is normal and cannot be fixed. Water infiltration into manholes or in the vicinity of the waste water treatment plant can be affected and advanced planning should take place.

Primary Responsibility – Sewer and Water Department – Taylor Davis (349-5793)

Drinking water issues – The water treatment plant is not in any danger of flooding or inundation. The primary concerns relative to drinking water may be the quality of the water and keeping the intake on Coal Creek from blocking or getting negatively impacted by the high water.

Primary Responsibility – Sewer and Water Department – Dave Jelinek (349-0886)