



CITY OF CHICO MEMORANDUM

TO: TRAILS CREW DATE: 4/4/11
FROM: DAN EFSEAFF FILE:
SUBJECT: 2011 MIDDLE TRAIL PROJECT WORK (SEGMENT 6)

I. Introduction

This document provides detailed planning information to support trail improvement work as part of the Middle Trail Improvement project. The project will rehabilitate 6,040 linear feet of the Middle Trail with sustainable design features and restore erosion damaged areas. The completed project will provide a more user friendly trail for park visitors and restore the natural resources and beauty lost to erosion. The grant proposal has more detailed information about the overall goals of the project. This document is focused on developing detailed information to support the implementation of the project.

This document identifies for each segment, the following:

- Problems,
- Attributes,
- Considerations/data needed
- Goals (for that segment)
- Remedies/Specific actions (overall philosophy of trail section, then specific features), and
- Monitoring approaches (similar for all, and discussed in a separate section).

II. Goals and Objectives

The project will rehabilitate 6,040 linear feet of the Middle Trail with sustainable design features and restore erosion damaged areas. The completed project will provide a more user friendly trail for park visitors and restore the natural resources and beauty lost to erosion. The project will use a variety of trail building design and techniques and will make the trail more sustainable, protective of resources, and maintain its multi-use purpose. Each section will have specific objectives that are tied into its particular attributes or problems.

III. Site Description

Project is focused on a section of the Middle Trail in Upper Bidwell Park from where it crosses the drainage near Monkey Face Parking Lot E to approximately 6,000 feet east. The Middle Trail continues for another 2.5 miles. We divided up the section from Parking Lot E to the new trail work (starting at the "Toilet Bowl") into 6 segments. The segments define areas of trail between drainages.

IV. CONCEPTUAL SITE MODEL

Evidence of damage to resources along the Middle Trail is unfortunately easy to observe:

- Soils are very thin in places and many areas have eroded to rock. Users have widened trail tread to over 8 feet wide and multiple trails further degrade the system.
- Significant sections of the entire Middle Trail from Parking Lot E to the B-Trail, has suggestive evidence (a consistent ridge, a 8-10 wide swath that does not contain large rocks, a band of rocks piled on the downhill edge) that a bulldozer had created a jeep trail or fire break (we are collecting supporting evidence... work done in the late 1950's to 1970's perhaps?).
- Areas of the trail have steep topography, thin and narrow particle distribution (rounded gravel or cobbles mixed with soil).
- Trails were not designed and minimal trail work has been completed.
- User-caused widening occurs when visitors either avoid areas with drainage problems (water or mud) or eroded rocky areas or steep segments.
- Furthermore, erosion is exacerbated by very long, sometime steep stretches (most of the trail has long stretches (over 300 feet) where there are no outlets for water), which turn into mini-creeks after rain events.
- The loss of soil also causes subsurface water to become exposed further widening trails (both across and down the trail) and creating seeps.
- Because of the low resiliency of the soils to recovery and resistance to damage, erosion on the Middle Trail represents a permanent damage to resources.
- At the same time, there are some discrepancies between users that enjoy the rugged nature of the trail and others that seek a more user friendly trail. Visitor's mode of travel (hiking, biking, horse riding, and trail running) also creates different expectations.

Because of the slopes and shallow soils, water management is paramount for sustainable, enjoyable trails. To address these issues and create a single track, multiuse trail that is sustainable the trail work will:

- Reroute fall line sections and utilize the half rule (trails should not exceed half the grade of the hillside).
- Maintain an overall average grade of 10% or less, and utilize constructed trail techniques in steeper sections.
- Construct or design frequent grade reversals (also known as a rolling dip, where a climbing trail drops subtly, before rising again). IMBA recommends most trails benefit from grade reversals every 20-25 feet. Such features shed water off the trail and prevent focusing water.
- Rebuild cross grade trails with an approximate 5% outslope (exceptions would be tight turns or where more elaborate structures are needed).

Incorporating these features above will better integrate the trail into the landscape; and make it safer, more efficient and playful. The changes should help the trail focus compaction on the trail (and not the landscape), minimize social trails and widening.

A. Segment 6 – (2235 ft)

- Segment Distance: 2235 ft
- Uses and Restrictions: Multi-user, challenging trail.
- Grade/Slopes
 - Average: 7.1%
 - Maximum: 22.6%
- Cross Slope:
 - Typical:
 - Maximum:
- Soil mapping units:
 - Xerothents, shallow-typic Haploxeralfs complex, 2-15 % slopes (687) – western 2/3 of segment, and
 - Xerothents, shallow-typic Haploxeralfs-rock outcrop, cliffs complex, 15-30% slopes (622) - last 1/3 of segment.
- Trail Width: typical 2 ft, Maximum >8ft.
- Surface: Widely variable (firm and stable to loose and unstable),
- Obstructions Hazards: Rocks, ruts, roots. Typical 8” or less, most severe >16”.

1. Problems

- Long straight segments (>500 feet, and possibly 1000 feet or more) with most of the water captured by the trail, dozer berm evident.
- Trail surface (cobbles, loose material on slopes and washes; slopes), visitor behavior, and water causing widening of exposed rock sections.
- Ash/sandstone substrate is friable and evolving to a thru cut (no outslope, or sheet flow).
- Severely rutted in places (about 2 ft below grade).
- Trail captures water from drainage (about 2025 ft).
- Maximum slope >20%
- Trail width: generally about 2 ft. Ruts and avoidance of exposed rock cause visitors to effectively use only 6-12 inches in places. Erosion and visitor use has widened the trail to over 8 feet in others.

2. Attributes

- Interesting crossing (0 ft) creates opportunity for different skills trail.
- Existing grade controls in place and functioning adequately at beginning of segment.
- Shade in areas, some portions follow bench edge.
- Blue oak regeneration (1415 ft), consider caging to limit deer browse.
- Rock surface (1500-1639 ft).

3. Considerations

- Archeological resources.
- Power lines
- Other trail connections in area.
- Butte County Checkerbloom
- Sightline issues (only a couple of locations, i.e. the “notch”).

4. Objectives

- Repair long segments with water running down trail predominately utilizing trail meander, grade reversals and rolling dips.
- Minimize the use of structures except for crossings.
- Utilize soil from dozer berm that runs along part of the trail.
- Maintain areas of shade.
- Realign drainages to better reflect undisturbed patterns.
- Establish a revised trail along the haul route (the access trail from Parking Lot F is approximately 215 feet to Lower Trail and 538 ft to Middle Trail).

5. Specific actions

The completion of this trail work will require good field judgment as the project progresses. However, identification of problems and remedies will help communicate the issues to the field crew (Table 1) and give us a good basis for comparison and performance once the work is completed. This segment is broken up into sections and the distance begins from the west, the cumulative length is provided, but each section starts from zero.

Table 1. Segment 6 Problems and Remedies.

Sec.	Distance (ft)	Problem / Feature	Remedy
6A (0-116 ft) – Bottom of drainage to Parking Lot (F) Trail Marker			
	0-48	Erosion evident (fines missing), loose rock, multi-threaded trail and widening (over 15 feet wide at top). Slope over 10 % over 20 ft.	Will armor crossing with next phase. Create an S curve (meander trail), consider beginner and sporty route. Do not bring up to grade, but add some rock dispersers on eroded slope. Utilize rock pattern into new trail tread.
	49-116	Erosion evident in trail from up hill. Some water captured by trail to Alligator Hole. Typical width 5.5 ft.	Increase meander trail, start curve toward blue oak 7 m then toward existing trail marker. Use will is likely to develop inslope curve, design trail to shed water on both ends before curve starts (knick outslope or rolling grade reversal).
6B (116 - 341 ft) Parking Lot F trail to top of hill after 5 Blue Oaks			
	0-225	Fall line trail (slope is >50% of the hill slope), and maximum slope is about 15%. Loose material on tread (cobble), erosion evident with minimal outlets. Trail incised 1 foot (near 2 nd blue oak). Typical width 6 ft. Water bars at 24, 138, and 183 ft. Water running down the trail in this section originates from >674 ft above.	Exaggerate curves to lessen slope, fix trail to water bars (convert to grade control structures) and blue oaks along trail (#1- 59, #2 - 132, #3-184, #4- 195 ft). Fill to grade to reduce incision (especially at oaks). Shed water before curves (outslope on transitions), armor outside of curves (inslope or assume will become banked). Move trail toward 5th blue oak (225 ft). Calculation for reference (if 115 ft long at average of 12%, the new trail needs to be 138 ft long to make it 10%, add 23 feet).
6C (341- 744 ft) After 5 Blue Oaks to Red Bud Trail Marker			
	0-143	Section muddy in places, wide 9 -11 ft. Berm evident in places, very long	Install rock gateway near transition to western section. Set up 6-8 meanders

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Sec.	Distance (ft)	Problem / Feature	Remedy
		stretch of water on trail. Slope relatively mild 3-5%, cross grade about 10%. Rock density >3 inches.	mostly across existing grade. Remove (bring to grade) or route trail across berm. Reroute of trail toward trees. Also install rolling dips and grade reversals every 20 to 40 ft. Establish grade reversal at transition to next section (6").
	165-205	Muddy area water collects in trail, widening evident.	Reroute trail uphill to avoid.
	145	Trail to Parking Lot G.	Intersect trail so that water is not captured by cross trail.
	250-266		Retain large rocks in trail, add outslope and better tread. Drop in rocks. Contour trail.
	277-318	Shade just off trail to South.	Hug trail to canopy, avoiding small oaks. Accentuate reroute as a grade reversal.
	348		Dip trail to south for positive drainage.
	372-403	Red Bud trail comes in.	Rock in trail provide good erosion resistant surface, retain (can allow water to run down trail until 348 drainage). Build up to east of marker to shed water off of section. Put in a "sweet strip" of trail (12") to define the downhill edge.
6D (744- 1145 ft) Red Bud Trail Marker to the "Shelf" (Power Line section)			
	61-120 (under power lines)	Trail incising through solidified ash (thru-cut). Extremely long section does not drain water. Tread loose. Up to 13% slope. Typical width 5 ft with some narrowing to 3 ft but up to 10 ft.	Install meanders on the power line climb section, which should change direction every 40 to possibly 60 feet. The trail should cross the berm and be more undulating to shed water. Install grade reversals in key locations where it cannot be accomplished with elevation changes or at transitions.
	283-365	Variable substrate, exposed more erosion resistant (than ash) rock (283), rutted soil (with ash exposed at 283-312), more ash exposed (312-365); End of power line (365);	Install rolling dips and grade reversals every 10 -40 ft, outslope where appropriate. Fill in area, outslope, meander trail (283-315).
	365-401	Shelf.	Install a subtle grade reversal at shelf (raised just 1-2"). Create a narrow, band of sweet spot trail to define edge. Maintain rocky section.
6E (1145- 1483 ft) the "Shelf" to the Rock (roll-y section)			
	0 – 338	Trail alignment generally good with a few relatively minor problems. Typical width 3.5 ft. Rock density low in trail (1-2 every 3 feet, most 3-6" occasionally >12" by 3-4" high).	Shed water above most severe headcut (1735 ft), reroute (more swoopy and up and down), outslope in places; 2-3 rolling dips to tree (control point). Utilize natural crests (1865, 1944 ft) and install rolling dips using existing terrain. For example: exposed rock (26) potential drainage control, consider raised trail at blue oak (54), utilize crest (97), dip (143), crest (172), dump water before curve (205), dip (211), outslope, bring to grade, and reduce berm (roughly 211-220), crest (256). Good place to install enclosure fencing on half of trees in nice stand (261).
	305 – 338		Exaggerate curve, dump (raised tread) before bump meander to south.

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Sec.	Distance (ft)	Problem / Feature	Remedy
6F (1483 – 1760 ft) Rock and the Notch			
	0 – 160	Rock is erosion resistant but users and subsurface/surface runoff causing erosion of extremely thin soils on margins. Up to 12% grade. Typical width ___ ft. Loose rock obstacles 1-2" some 4-6". Water originates from next section east (at 133 in 6G for a total of 358 ft long). Trail intersection (74).	<p>Potential drainage area (30-57) if water is directed there.</p> <p>Create grade reversals with rock dispersers at identified locations: bottom of slope (57-61), mound near blue oak (162). Utilize berm soil to allow for drainage (108-132 good zone to drain trail)</p> <p>Install a 2-3 rock gateways (about 36") at 61 (N), 94 (S), 108 (S) to narrow tread path. Keep rock exposed, but place some rock on edge to disperse energy, fix path.</p>
	161 – 277	Up to 14% slope, multithread, loose, receives water from trail above, headcut and deep rut (>18" below grade) (261). Cobble and rock on trail loose pebbles. Section levels at top and rocks less exposed. Trail 5.5 wide.	<p>Add 2-3 meanders up slope, add subtle kinks to trail, utilize path taking advantage of topography. Dump water on outside curves (disperse water onto rock shelf), install rock dispersers.</p> <p>At notch rock and drop bump</p>
6G (1760 – 2200 ft) The Notch to Toilet Bowl Entrance			
		Water is captured by trail and dropped into next section causing erosion problems. Typical width 28". Water captured on trail, minimal erosion in this section, but problems down below. Trail variable with amount of rock embedded in tread (mostly larger rock).	<p>Allow no water from top area to escape to the notch. Raise trail above existing location (move to North 3.5 -4 ft). Fill grade. Make more serpentine. Accentuate dip and crest pattern to shed water and make tread watershed smaller. For example: dip down hill (26); crest at blue oak (48 – use caution; Butte County Checkerbloom in area); dip (70); blue oak crest bring to grade (90); minimize damage to native grass (96); outslope, slight dip (106); augment crest at coyote brush (130), minor dip to south blue oak (5 m south) crest (187).</p>
	236-258	The ledge. Water captured from above, multithread.	<p>Swing trail to south (1.5 m) for approach (195), dip swing out at 214. Narrow <12" ramp to ledge (236), Above ledge install dispersers, make route line up with travel, preserve rock ledge, but make a narrow landing and trail up to next section. Leave user options on rock, but decommission area where tree is down now.</p> <p>Install grade reversal above ledge (252-256 ft) to keep water in main channel (to grade to north, 4-6 inches tall) and extend off (taper) trail. Make orientation parallel to ledge (tires can cross it perpendicularly) and curve to drainage downhill.</p>
	258-318	Loose rock (mostly 1-3" and pebbles), incised trail and about 12 " head-cut,	<p>Install grade reversals to keep cross flow of water:</p>

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Sec.	Distance (ft)	Problem / Feature	Remedy
		water on trail and erosion. About 24" inch wide trail.	- Bring trail to grade at blue oak (265 ft). -At blue oak (270). -Set up 2 nd one (281) with rock armor on face (angled to allow rolling, much like nearby rocks). -at top blue oak (310) make minor one about 3-4 inches) to keep water out of section).
	318 – 440	Loose rock, start of long section of water in trail. End. Entrance to toilet bowl.	Meander trail to south, then across existing trail to north (large rock); cross trail (362), then utilize gateways east of existing trail (371 and 385 ft). Utilize gateway to east on top of curve (build up grade to keep water out of curve) (416), decommission and roughen alternative trail to west and newly abandoned sections. Funnel from width of toilet bowl to about 4 feet. Near entrance maintain width, outslope before.

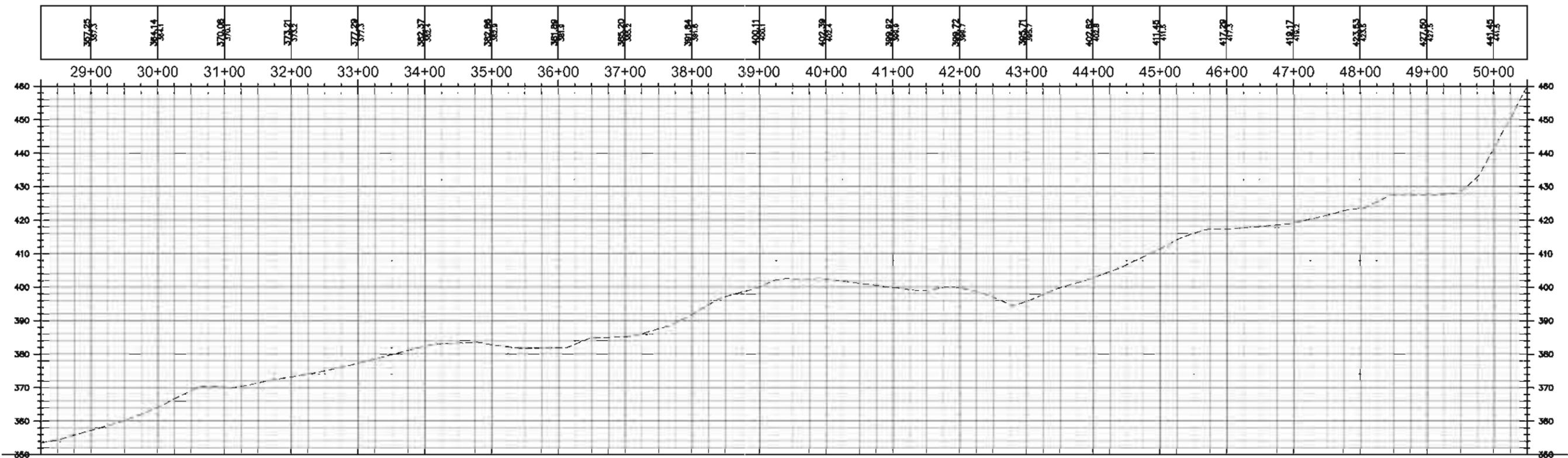
V. Implementation Considerations and Timeline

- Haul routes and rehabilitation plans for those areas.
- Plan is to complete 3,000 ft in the spring and fall trail sessions. We will start with sections 6C-6G; then complete 6A and 6B,
- Signage up (by May) announcing the work and that sections of the Middle Trail may be closed in the summer and early fall months.
- The Park and Natural Resource Manager (PNM) will establish trail routing in sensitive areas and will approve alignments in all others before work proceeds.
- Materials:
 - Rock: harvested from appropriate park locations and imported river rock.
 - Gravel: Crushed basalt estimated amount (5-10 cu. yards):
 - Erosion control material (Straw, wattles, natural materials, etc):
 - Native seed:
- Equipment:
 - Hand tools associated with trail work (shovels, Pulaski's, picks, McLeod's, pry bar, hand pruners/lopers, hammers, wheel barrows, etc.).
 - Mechanized: Canycom, rubber tracked
 - Measurements and marking: spray paint, flagging, pin flags, clinometer, tape measure, level, etc.

VI. Success Criteria, Monitoring, and Reporting

Parks staff will conduct an assessment of the trail once the work is complete. The assessment will evaluate grades/slope, evidence of erosion/deposition, trail width, and tread. The Parks division will seek input from trail users once the work is completed and has created a survey. The goal of the survey is to provide input for future work. In addition, we have collected before and after photos at the transition between sections and at other key locations (explained in a separate memo).

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6/16/2011



Completed, Approved Plan, Record Drawing Path: S:\gwinthum\romney\middle trail profile.mxd - 6. Fri, May 20 2011 - 1:19:56pm.

Drawing Number

Title:

Designed:	Approved:	Revision	Date	By
Drawn By:	Date:			
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CITY OF CHICO
CAPITAL PROJECTS SERVICES DEPARTMENT



Section 6
PLAN AND PROFILE

Project Number:	Drawing Number
Scale: 1" = 80'	Sheet 1 of 1



0 200 400 800 Feet

