Jefferson City
Safety Rest Area Study

SUMMARY REPORT

December 2019

VISION ZERO
zero deaths · zero serious injuries
MONTANA DEPARTMENT OF TRANSPORTATION

DOWL

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Acknowledgements
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EXECUTIVE SUMMARY

The 2019 Rest Area Plan Health Index Update identified several potential concerns at the Jefferson City Safety Rest Area relating to the number of oversized vehicle parking spaces and the remaining service life for the parking areas, structures, water systems, and wastewater systems. Facility ventilation, accessibility, and site amenities were also issues identified at the site. Of the rest areas in Montana, the Jefferson City southbound and northbound sites had the 5th and 7th lowest health index scores, respectively, due to these factors. Additionally, the facilities are not compliant with Americans with Disabilities Act accessibility requirements and have continued to deteriorate in recent years. A substantial capital investment would be required to address the identified deficiencies.

Needs and Objectives

The Montana Department of Transportation has defined a need to address the existing Jefferson City Safety Rest Area northbound and southbound sites. The current facilities are open seasonally from April 15 through November 15 to the public pending the outcome of this study.

To optimize Safety Rest Area Program investment strategies, MDT sought an alternative that accomplishes the following objectives.

- Minimizes capital and long-term maintenance costs.
- Leverages federal-aid funding and reduces demands for limited state funding.
- Minimizes impacts to physical, biological, and social/cultural resources which could result in costly and time-consuming mitigation and abatement activities.
- Provides safe stopping opportunities spaced by a maximum of approximately one hour of travel time.
- Accommodates public and stakeholder feedback regarding stopping and parking opportunities.
- Aligns with existing MDT plans, policies, and asset management strategies.
- Adheres to Federal Highway Administration rules, regulations and guidance regarding the operation, maintenance and abandonment of Safety Rest Area facilities.

Public and Stakeholder Involvement

Stakeholder Interviews

Representatives from the Motor Carriers of Montana, Helena Tourism Alliance, Jefferson County Commissioners, Silver Bow County Commissioners, Jefferson County Planning, Lewis and Clark County Planning, Montana Department of Commerce, and the Montana Office of Tourism and Business Development participated in interviews conducted in May 2019. Collectively, interview participants expressed:

- Awareness of the safety benefits of truck parking areas
- Recognition of the corridor's importance for year-round commercial and tourism activities.
- Support for maintaining a truck parking area at the existing Jefferson City northbound and southbound sites to perpetuate safe stopping opportunities.
- Rejection of full closure of the Jefferson City facilities.

Alternatives

MDT considered two action alternatives to achieve identified objectives for the existing northbound and southbound Jefferson City Safety Rest Area sites.

Alternative 1: Reduction of Service

In accordance with MDT's *Safety Rest Area – Reduction of Service* memorandum, this alternative would lessen the current functionality of the existing northbound and southbound Jefferson City Safety Rest Area sites. The reduced service facilities would provide the function and features of a typical truck parking site. The alternative would entail maintaining entrance/exit ramps and parking areas; removing building facilities and foundations; filling wastewater tanks; capping associated wastewater piping; decommissioning drainfields; maintaining wells for irrigation and cleaning use; installing vaulted toilets; adding truck parking (southbound only);potential removal of picnic areas, pet amenities, and adjacent walkways; upgrading remaining sidewalks to meet Americans with Disabilities Act requirements; and reseeding reclaimed areas.

Capital and Maintenance Costs

- Initial capital costs would be higher compared to Alternative 2 ($357,000 vs. $292,000 for the northbound, and $717,000 vs $222,000 for the southbound). Long-term maintenance costs would be higher (at approximately $10,000 annually per site or $248,000 totaled over 20 years, assuming 2% inflation) compared to Alternative 2 (no long-term maintenance costs).

Funding Eligibility

- The reduction in service alternative would be eligible for federal funding because it would continue to provide safe stopping opportunities with parking and vaulted toilet services.

Environmental Risk

- No adverse permanent impacts to prime farmland, geologic resources, surface water, Total Maximum Daily Loads, wild and scenic rivers, wetlands, irrigation, floodplains and floodways, air quality, vegetation, noxious weeds, general wildlife species, threatened and endangered species, species of concern, and special status species, demographics, economic conditions, land use, recreational resources, cultural resources, noise, or visual resources are anticipated.

Spacing and Corridor Needs

- A truck parking area at Jefferson City Safety Rest Area would provide additional safe stopping opportunities.

Public/Stakeholder Feedback

- Public and stakeholder sentiment generally supports maintaining the existing Jefferson City northbound and southbound sites as truck parking areas to perpetuate MDT's investment and provide safe stopping/parking opportunities in the study area.

Alignment with MDT Plans

- Alternative 1 aligns with network evaluation guidelines outlined in the *Montana Rest Area Plan* and would provide continued investment in safe stopping opportunities as outlined in *TranPlanMT* and the *Montana Freight Plan.*

Additional Requirements

- This alternative would not be considered a form of abandonment because it would continue to provide a safe stopping opportunity with parking and vaulted toilet services. Therefore, a supplemental evaluation (justification of abandonment) would not be required to be submitted to the Federal Highway Administration.

Alternative 2: Closure

The second alternative would involve complete demolition of the northbound and southbound building facilities, parking areas, ramps, water/wastewater systems, and site amenities. Under this scenario, the entire site would be reclaimed and reseeded.

Capital and Maintenance Costs

- Initial capital costs would be lower compared to Alternative 1 ($292,000 vs. $357,000 for the northbound, and $222,000 vs. $717,000 for the southbound). Long-term maintenance costs would be eliminated.

Funding Eligibility

- The cost of safety rest area closures (abandonments) are not eligible for federal-aid funding. Consequently, this alternative would need to be conducted entirely with state funds.

Environmental Risk

- No adverse permanent impacts to prime farmland, geologic resources, surface water, Total Maximum Daily Loads, wild and scenic rivers, wetlands, irrigation, floodplains and floodways, air quality, general wildlife species, threatened and endangered species, species of concern, and special status species, demographics, economic conditions, land use, recreational resources, cultural resources, noise, or visual resources are anticipated.
- Alternative 2 has a greater environmental risk due to increased potential to encounter contaminated soils and greater likelihood of noxious weed establishment (with all other potential risks equal to Alternative 1).

Spacing and Corridor Needs

- Complete closure would reduce parking and stopping opportunities in the study area. During peak usage periods, parking options along this corridor would be reduced.

Public/Stakeholder Feedback

- Public and stakeholder sentiment generally opposes complete closure of the Jefferson City sites.

Alignment with MDT Plans

- Although closure of the Jefferson City Safety Rest Area would follow guidelines outlined in the *Montana Rest Area Plan,* it would not provide continued investment in safe stopping opportunities as stated in *TranPlanMT* and the *Montana Freight Plan.*

Additional Requirements

- Alternative 2 triggers a Federal Highway Administration requirement that MDT perform a supplemental evaluation to demonstrate adequate safety rest area services remain after the abandonment of the Jefferson City Safety Rest Area sites. It is unlikely that MDT could provide adequate justification for Alternative 2 based on truck parking and facility demands along the Interstate 15 corridor between the Helena and Butte Urban Areas.

Conclusions and Recommendations

Based on the analysis conducted for this study, Alternative 1 (reduction in service) is the preferred alternative for the following reasons:

- Existing facilities are not sufficient to address truck parking needs during peak usage periods (summer months) along this portion of the I-15 corridor.
- Alternative 1 (reduction in service) would continue to provide additional stopping opportunities along this corridor.
- Stakeholder groups expressed support for safe stopping/truck parking opportunities at the Jefferson City Rest Area site.
- Stakeholder groups rejected Alternative 2 (closure option) for the Jefferson City Rest Area site.
- Stakeholder and public comments supported the reduction of service option versus the closure option.
- Alternative 1 (reduction of service) is eligible for federal-aid funding and requires no state matching funds for site improvements.
- Alternative 2 (closure option) must be funded entirely with state funds (not federal-aid eligible).
- While maintenance costs are higher for Alternative 1 (reduction of service), the total amount of state funds required to implement Alternative 1 are comparable to Alternative 2 (closure option).
- Alternative 2 (closure option) triggers a Federal Highway Administration requirement that MDT perform a supplemental evaluation to demonstrate adequate safety rest area services will remain after the abandonment of the Jefferson City Safety Rest Area site.
- It is unlikely that MDT could provide adequate justification for Alternative 2 (closure option) based on truck parking and facility demands along this portion of the I-15 corridor.

Consequently, this study recommends implementation of Alternative 1 (reduction of service) at the Jefferson City Safety Rest Area sites.

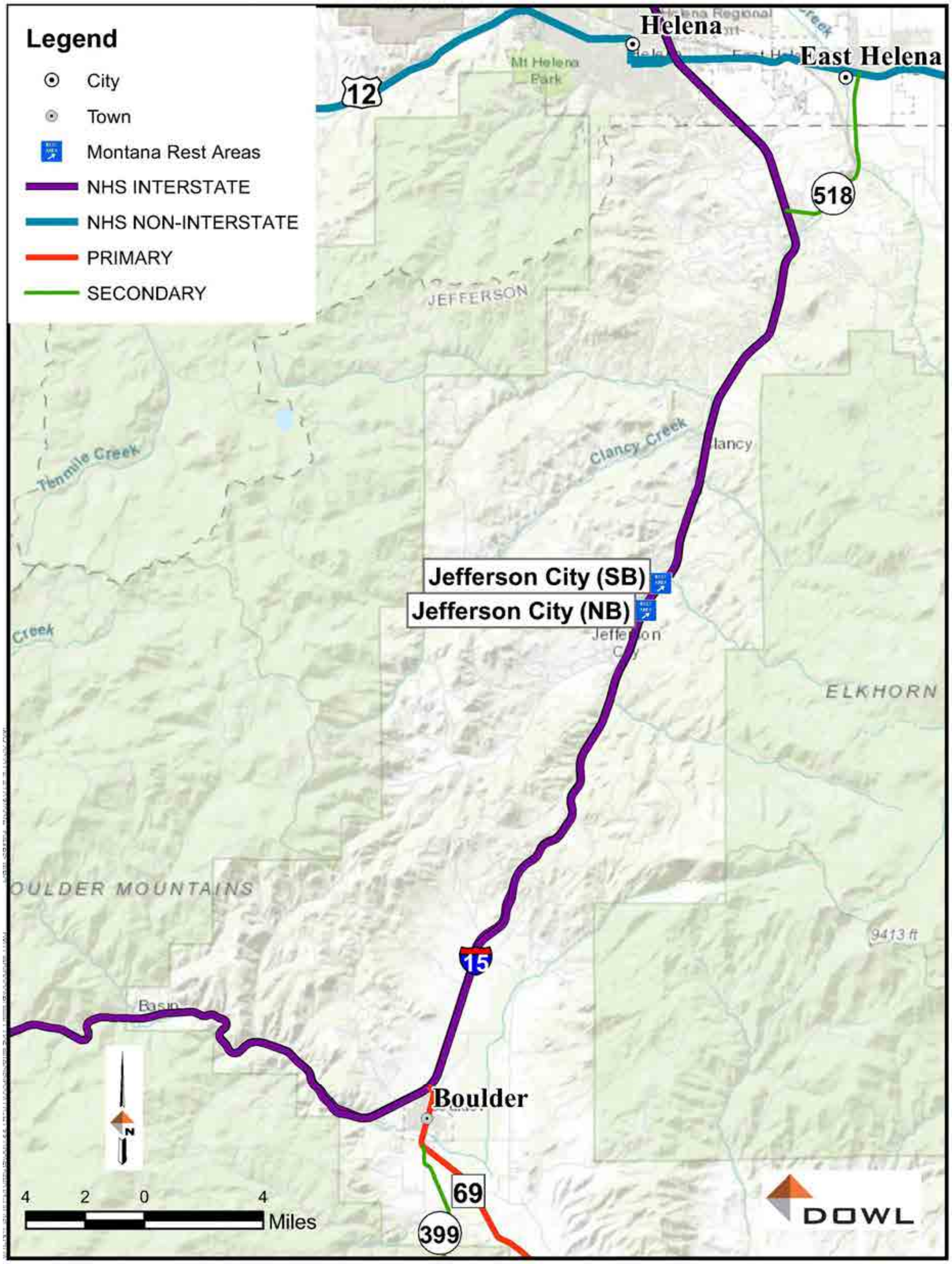
1.0 INTRODUCTION

The Montana Department of Transportation (MDT) conducted a rest area study to evaluate two alternatives for the Jefferson City Safety Rest Area: (1) reduction in service and (2) complete closure of the site. The 2019 Rest Area Plan Health Index Update identified several potential concerns at the Jefferson City Safety Rest Area relating to the number of truck parking spaces and the remaining service life for the parking areas, structures, and wastewater systems. Facility ventilation, accessibility, and site amenities were also issues identified at the sites.

Of the rest areas in Montana, the Jefferson City southbound and northbound sites had the 5th and 7th lowest health index scores, respectively, due to these factors. Additionally, the facilities are not compliant with Americans with Disabilities Act (ADA) accessibility requirements and have continued to deteriorate in recent years. A substantial capital investment would be required to address the identified deficiencies.

Figure 1 illustrates the Jefferson City Safety Rest Area location in reference to the communities of Boulder, Butte, and Helena along Interstate 15 (I-15). Network spacing criteria from the Montana Rest Area Plan characterized the Jefferson City Safety Rest Area as potentially redundant due to its proximity to Helena (approximately 15 miles to the north), Boulder (approximately 13 miles to the south), and Butte (approximately 50 miles to the south).

Figure 1: Study Area



Source: DOWL 2019

2.0 EXISTING CONDITIONS ANALYSIS

The following sections provide a summary of the Jefferson City Safety Rest Area features and characteristics to identify opportunities, constraints, and needs within the study area. The analysis is based on existing site-specific data, publicly available data, and information gathered during site visits conducted on October 19, 2017, June 1, 2018, and May 10, 2019. Photographs from the site visit are catalogued in Appendix A.

2.1 Network Spacing and Demand

Spacing

The Montana Rest Area Plan recommends approximately one hour of travel time between safety rest areas. This generally equates to a distance of approximately 70 miles on Interstate facilities. Table 1 and Figure 2 provide a summary of spacing distances between safety rest areas, truck parking areas, urban areas, and other key locations in the vicinity of the Jefferson City Safety Rest Area. The analysis considers spacing only along the Interstate 15 corridor from the Helena to Butte urban areas. Boulder is not a designated urban area; however, is included in the analysis as a key stopping location along this portion of the I-15 corridor with at least one commercial establishment with 24-hour services. Currently, the Jefferson City Safety Rest Area operates as a seasonal facility.

Table 1: Jefferson City Safety Rest Area Spacing Analysis

Beginning Location	Ending Location		
	Helena (Urban Area)	Jefferson City Rest Area	Boulder (Other)
Jefferson City Rest Area	15 miles		
Boulder (Other)	28 miles	13 miles	
Butte (Urban Area)	65 miles	50 miles	37 miles

Figure 2: Jefferson City Safety Rest Area Spacing Analysis

Source: DOWL 2019

Key findings regarding spacing between stopping opportunities are summarized below.

- The distance from the existing Jefferson City Safety Rest Area to Helena and Butte is 15 and 50 miles respectively, indicating the Jefferson City Safety Rest Area is a redundant stopping point along Interstate 15 per the 2014 MDT Rest Area Plan.

Parking Demand

The American Association of State Highway and Transportation Officials (AASHTO) *Guide for Development of Rest Areas on Major Arterials and Freeways* (1999) provides recommendations for estimating safety rest area usage based on national trends. MDT initiated a research project with the Western Transportation Institute (WTI) to develop guidelines that more accurately reflect conditions specific to Montana. The project culminated in completion of the *Rest Area Use: Data Acquisition and Usage Estimation Report* (2011). The goal of the WTI report was to investigate some of the variables thought to affect safety rest area usage and identify patterns at select study sites for application at all state-maintained safety rest areas in the absence of site-specific data.

Using these publications as a foundation, MDT developed a modified demand methodology in the *Montana Rest Area Plan* (2014) to reflect site-specific door count data in place of assumed stopping percentages to identify peak-hour visitation at MDT safety rest areas. In 2019, MDT further evaluated demand calculations in an effort to improve accuracy. It was determined that annual peak door count did not best represent daily patron usage. This effort found that 90th percentile door count data provided a better representation of patron usage for parking demand calculations[1].

Similar to the 2019 Rest Area Health Index update, this study uses the most current traffic volumes and door count data to calculate updated parking demands at the Jefferson City Safety Rest Area. Following the methodology outlined in the *Montana Rest Area Plan*, Table 2 presents a summary of the parking demand analysis conducted for the study area. Parking demand calculations are provided in Appendix B.

Table 2: Parking Demand Analysis

Parking Spaces		Jefferson City Safety Rest Area (NB)	Jefferson City Safety Rest Area (SB)
Passenger Vehicles	2018 Supply	11	9
	2018 Demand	1	1
	2018 Deficiency/Surplus	**10**	**8**
Truck	2018 Supply	8	0*
	2018 Demand	4	4
	2018 Deficiency/Surplus	**4**	**- 4**

Source: DOWL 2019. Demand calculations for Jefferson City. *The 2019 Rest Area Plan Health Index Update notes 4 truck parking spaces at the southbound site; however, the current truck parking area is not a standard configuration that allows for adequate turning movements; therefore, zero spaces were used for this analysis.

[1] 2019 Rest Area Plan Health Index Update, Parking Demand Calculations used 2016 traffic volume and door count data.

According to the calculations, the Jefferson City Safety Rest Area does not have adequate truck parking on the southbound site with a deficiency of four truck parking stalls.

2.2 Water Rights and Water Systems

Water Rights

The northbound rest area has an onsite well which is used at the facility for a potable water and irrigation water supply. MDT filed and received an exempt groundwater well water right with a priority date of June 26th, 2019 for the seasonal water use at the northbound facility. The water right is limited to a maximum flow rate of 30 gpm and maximum volume of 2.25 ac-ft. The groundwater right on file with the State of Montana Department of Natural Resources and Conservation (DNRC) is number 41I 30128693.

The water right for the southbound rest area is a seasonal well groundwater right for both institutional (domestic) and irrigation use. The groundwater right on file with the DNRC is number 41I 96195-00 with a priority date of October 18, 1995. The water right is seasonal, with a maximum flow rate of 35 gallons per minute (gpm) and an annual maximum volume of 5.52 acre-feet. Table 3 further describes the water rights at the northbound and southbound facilities, also included in Appendix C.

Table 3: Rest Area Water Right

Location	Water Right Number	Owner	Purpose	Quantity	Timeframe
Northbound	41I 30128693	Montana Department of Transportation	Other Purpose	30 gpm / 2.25 ac-ft	April 1 to November 30
Southbound	41I 96195-00	Montana Department of Transportation	Institutional	35 gpm / 0.52 ac-ft	May 15 to October 15
			Lawn and Garden	35 gpm / 5.0 ac-ft	May 15 to October 15

Source: State of Montana Department of Natural Resources and Conservation, Water Right Query System.

Water Supply and Well Data

Both the northbound and southbound sites are considered transient, non-community public water supply system (PWS) as they serve 25 or more persons per day, although the same persons are not regularly served for at least six months a year. The northbound and southbound sites are located in a heavily dredged section of the Prickly Pear Creek drainage.

Northbound (PWSID# MT0001952)

The northbound site does not have a well log on file with Montana's Groundwater Information Center (GWIC). The Source Water Delineation and Assessment Report (SWDAR), prepared by CDM June 2010, states that the facility's previous SWDAR identified the well as a 6-inch well installed in 1971 and cased to 50 feet below the ground surface (bgs), with a total depth of 65 feet bgs. The well is located approximately 20 feet southeast of the facility building. The SWDAR (2010) identifies the well source water in an unconfined aquifer within the fractured bedrock underlying heavily dredged gravel/boulders.

At a site visit by DOWL on October 19, 2017, the groundwater surface in the well was measured using a water level measuring probe at approximately 20.7 feet bgs. Additionally, the well casing was observed to be rusted and red stains were present on the plumbing fixtures. The well pump and pressure tanks were approximately two to three years old at the time of the site visit.

During the rest area's operational season, the water supply source is sampled for coliform and e-coli monthly and nitrate-nitrites annually. According to Montana Department of Environmental Quality (MDEQ) Drinking Water Watch, six (6) violations occurred in the last five years. Of these, two were related to positive tests for the presents of coliform, and the other violations were related to system monitoring/reporting requirements. The measured nitrate+nitrite levels have been below the state maximum contamination level (MCL) of 10 parts per million (ppm).

Overall, the northbound water supply well is in fair condition and could be used for irrigation purposes only. If MDT were to perpetuate the well for public use, MDEQ may require an updated water supply plan and additional treatment based on the depth to groundwater and possible surface/groundwater connection. If the well is relocated, it would need to be reconstructed to current MDEQ public water supply standards.

The SWDAR (2010) and water quality testing results for the northbound facility are included in Appendix C.

Southbound (PWSID# MT0002591)
The existing water supply well at the southbound site was installed in 1995 (GWIC # 153901). According to the well log, the well is completed to a depth of 245 feet bgs with a bentonite seal to 20 feet bgs, 6-inch steel casing to 50 feet bgs, 4-inch screen from 120 to 245 feet bgs, and a water surface elevation 40 feet bgs. The SWDAR prepared by Territorial Landworks Inc. in May 2012 identified the well source water in a confined/semi-confined aquifer with in fractured bedrock 40 to 245 feet bgs.

At a site visit by DOWL on June 1, 2018, the well casing was observed to be rusted and red stains were present on the plumbing fixtures. The well pump and pressure tanks were approximately two to three years old at the time of the site visit.

During the rest area's operational season, the water supply source is sampled for coliform and e-coli monthly and nitrate-nitrites annually. According to MDEQ Drinking Water Watch, two (2) violations occurred in the last five years which were related to system monitoring/reporting requirements. The measured nitrate+nitrite levels have been below the state maximum contamination level (MCL) of 10 ppm.

Overall, the southbound water supply well is in good condition and could be used for consumption and irrigation purposes. If MDT were to make improvements to the water system, MDEQ may require an updated SWDAR and additional treatment based on site conditions. If the well is relocated, it will need to be reconstructed to current MDEQ public water supply standards.

The well log, SWDAR (2012), and water quality test results for the southbound facility are included in Appendix C.

2.3 Public Wastewater Systems

The northbound and southbound rest area sites each use a conventional gravity septic and drainfield system for wastewater treatment. There are no records on file with the Jefferson County Health Department related to the wastewater system; therefore, it is assumed the systems were installed in 1972 with the facility construction. Originally the systems treated

wastewater from the restrooms and a RV septic dump station; however, the septic dump station has been abandoned. MDT Maintenance staff indicated that the systems function as intended with the only system maintenance of pumping of septic tanks up to two times per year.
The wastewater treatment systems each consist of a dual compartment septic tank and a gravity drainfield of five laterals 100 feet in length. Based on the site soil conditions, heavily dredged gravel/boulders, each wastewater system is estimated to have a design system capacity of 1,200 gallons per day (gpd).

five laterals at 100 ft = 500 lf of laterals
Assume 3.0 ft wide trench; 3.0 ft x 500 ft = 1,500 ft^2 drainfield trench
Assume application rate of 0.8 gpd/ft^2; 0.8 gpd/ft^2 x 1,500 ft^2 = **1,200 gpd**

The 2019 MDT Rest Area Plan Health Index Update used the Modified WTI Method to calculate the estimated rest area usage for the northbound and southbound sites based on average annual daily traffic counts. As described in the Parking Demand section 2.1 above, supplemental door counts were provided for the Jefferson City facilities which tend to be a more representative of the actual facility usage. From the door count data, the average summer rest area usage is estimated at 116 and 103 people per day for the northbound and southbound facilities respectively. To determine the theoretical existing peak seasonal wastewater loading at the facilities, a 2.5 peaking factor (average day to peak day) and an estimated water usage of 1.5 gallons per user were applied using the higher usage rate.

116 people per day x 1.5 gallons per user x 2.5 peaking factor = **435 gallons per day**

At the above estimated existing system design capacity and estimated peak seasonal flow, the existing systems are operating within their design hydraulic capacity. To determine the actual rest area wastewater loading, the facility's historical peak door counts, or water usage meter records should be analyzed to more accurately represent the facility system usage.

Northbound
The northbound wastewater treatment system is located approximately 350 feet northeast of the rest area facility. The transport pipe from the building to the septic tank has three cleanouts with broken or missing caps. The septic tank and drainfield are located in a depressed ground surface area which has the possibility for surface water ponding. State Highway 282 is located between the septic system and Prickly Pear Creek, approximately 150 feet east of the of the septic system.

Southbound
The southbound wastewater treatment system is located approximately 200 feet northeast of the rest area facility. The septic tank and drainfield are in an area where the ground surface is slightly depressed which may lead to the influence of surface water on the wastewater system. A surface water pond with seasonal standing water is located approximately 100 feet northwest of the wastewater system.

Summary
Overall, the wastewater systems at both rest area facilities are in fair condition with no major operational concerns based on the existing facility usage. The wastewater systems are beyond a typical system's useful life as they are estimated to be 47 years old at the time of this evaluation (1972 to 2019). Due to the age of the wastewater system, and projected growth of the I-15 corridor, the wastewater system would need to be replaced if the rest area facilities were to be improved or expanded in the future.

If MDT were to perpetuate the pubic wastewater systems at these sites in the future, the following issues must be addressed:

- With rest area improvements along the interstate's corridor, MDT has observed increased water usage on newly constructed and improved rest areas. Any improvement to the facility should incorporate an estimated usage design flow of 2.5 gallons per user.
- Improvements to the rest area wastewater system should incorporate a projected growth rate for sizing the system with a 20-year design life.
- If the rest areas were to be improved or expanded the wastewater systems should be reconstructed to the current MDEQ regulations. Below is a list of wastewater system siting requirements which may be challenging at the Jefferson City rest area sites:
  - 100-foot setback to drinking water wells.
  - 500-foot mixing zone.
  - 100-foot setback from surface water.
  - 100-foot setback from 100-year floodplain.
  - 25-foot setback to stormwater pond/ditch.
- A 100% replacement drainfield area, without reductions for level of treatment or gravel-less trenches, is required for all new or expanded subsurface absorption systems.
- A non-degradation analysis for nitrate sensitivity and phosphorous breakthrough would be necessary at each site. The proximity to surface water, groundwater, site soil conditions, and typical high nitrate concentrations in rest area wastewater streams may make it difficult to pass MDEQ's non-degradation analysis if the facilities are improved or expanded.

Preliminary wastewater system sizing calculations are attached in Appendix D.

2.4 Building Structure

The Jefferson City northbound and southbound buildings were originally constructed in 1972. In 2019, the estimated remaining service life of the structures is three years based on a 50-year design life. Record drawings for the safety rest area structures are provided in Appendix E for reference. The following statements reflect visual observations from the October 2017, June 2018, and May 2019 site visits.

- The buildings were generally in sound structural condition. Minor cracking and separation occur in the exposed portion of the exterior foundation stem walls.
- Exterior siding and roof were in relatively good condition. Observations from inside the buildings indicate no discernable signs of leaks.
- At each site, ceramic tiles on the restroom floors were worn, cracked, and in poor condition.
- At each site, the timber framework along the base of the interior plumbing chase shows signs of water damage. In some areas, there was evidence of previously leaking interior plumbing that has been repaired.
- Restrooms at both the southbound and northbound sites generally appeared clean and maintained; however, existing ventilation features do not adequately address noticeable odors.
- Asbestos was not found in any of the suspect materials sampled and analyzed during the May 2019 investigation.
- Lead paint was not detected on identified painted building components tested at each rest stop area; however, was detected on the blue parking curbs in the handicap parking stalls at each site.

2.5 Ramps and Parking Areas

The following section summarizes visual observations of the Interstate 15 entrance/exit ramps and parking areas to identify the general condition of the pavement surface and other associated site features. A copy of the record drawings showing the original construction alignments, profiles and layouts for the ramps and parking areas is provided in Appendix E for reference.

Pavement Section

Original pavement sections of the northbound and southbound ramps and parking areas were not included with the record drawings that were provided by MDT. Therefore, the existing pavement thicknesses were not identified.

Ramps and parking areas were originally constructed between 1971 and 1972. Data provided by MDT shows that the ramps and parking areas underwent either reconstruction or rehabilitation upgrades in 1998. As of 2019, the service life of the pavement has been exceeded by 1 year based on a 20-year design life since the last rehabilitation.

The Jefferson City Safety Rest Area has been operating as a seasonal facility. Further investigative testing may be warranted to more accurately assess the existing pavement sections. Testing could include coring samples to verify depths and materials of the existing pavement section as well as verification of subgrade soils to better evaluate remaining pavement service life.

Surface Condition

Based on visual observation, the surface of the pavement appeared to be in relatively good condition with only some minor signs of wearing surface aggregate loss. Significant rutting and cracking did not appear to be evident in the pavement areas. The overall structural integrity of the pavement is not included as a part of this existing conditions assessment.

The original northbound and southbound parking areas were constructed with isolated paved areas for trailer dump sites. The paved areas still exist, but the sanitary disposal stations appear to have been abandoned during the 1981 rest area “handicap renovation” improvements and are no longer in service. No signs of pavement distress were identified in the areas of the original disposal stations.

If minor pavement rehabilitation is considered for future improvements, any existing cracks would need to be sealed before rehabilitation occurs.

Drainage Patterns

Ponding water and poor drainage can have a negative impact on pavement conditions. Pavement exposed to ponding water deteriorates at a faster rate and becomes brittle. As a result, small fractures occur in the surface and become vulnerable to repeated exposure to moisture, debris, and vehicle forces. As the deterioration worsens, larger cracks appear and allow the foundation to become susceptible to the damaging effects of water. The following section summarizes visual observations of general drainage patterns for the ramps and parking areas.

Northbound

Record drawings indicate the northbound parking area has positive longitudinal grade for the length of the site, which is consistent with observations during the site visit. The longitudinal grade through the parking area is approximately -1.2% (south to north) per the record drawings. The passenger vehicle parking area is constructed with pin down curb adjacent to sidewalk that is at-grade with the pavement surface. Surface water runoff from the normal crown pavement section collects along the face of the pin down curb and flows northerly until it crosses the sidewalk at a location where the pin down curb has been removed. If the parking area is to be perpetuated with future improvements, consideration should be made to remove the existing pin down curb and adjacent sidewalk, and replace it with standard curb, gutter and sidewalk. A curb cut would likely be needed to provide an outlet for water that collects along the gutter and conveyed through the passenger vehicle parking area. The northbound exit and entrance ramps have positive cross slopes that allow for adequate pavement surface drainage.

Southbound

Record drawings indicate the southbound parking area has positive longitudinal grade, which is also consistent with observations during the site visit. The longitudinal grade through the parking area is approximately -1.3% (south to north) per the record drawings. The passenger vehicle parking area is constructed with pin down curb next to sidewalk that is at-grade with the pavement surface. Surface water runoff from the normal crown pavement section collects along the face of the pin down curb and flows northerly to a point where it collects in the northeast corners of the passenger vehicle parking areas. There is no existing dedicated outlet location for the surface water to discharge. The runoff eventually dissipates through the gaps in the pin down curb joints where it flows across the sidewalk and away from the pavement surface. If the parking area will be perpetuated with future improvements, this analysis recommends considering removing the existing pin down curb and adjacent sidewalk and replacement with standard curb, gutter and sidewalk. A curb cut would likely be needed to provide an outlet for the water that is collected and conveyed by the curb and gutter through the passenger vehicle parking area. The southbound exit and entrance ramps have positive cross slopes that allow for adequate pavement surface drainage.

Curbing

Both the northbound and southbound rest area sites were constructed with pin-down curb along the eastern edge of the passenger vehicle parking areas creating a separation between the parking areas and the adjacent sidewalk. A majority of the pin-down curb for each site is deteriorating and becoming dislodged. Sections of the pin down curb have also been removed to provide access to the adjacent sidewalk, as there are no existing curb ramps at the sites due to the sidewalk being at-grade with the parking pavement surface.

The median curbing at the northbound site creates turning constraints for parked trucks, especially at the northernmost median area. Additionally, the proximity of the pin down curb that borders the exhibit area “bulb out” along the eastern edge of the parking area compounds the pinch point for turning trucks. Visual observations indicate that the median curb and pin down curb in this location are frequently hit and traversed by turning trucks. If the parking area will be perpetuated with future improvements, consideration should be made to remove the median curbing (and pave the existing medians) to potentially improve turning restrictions for parked trucks and to also allow for easier snow plowing during winter months, if applicable.

Striping

The striping appeared to be in relatively good condition as observed on the May 2019 site visit. The truck parking stall widths at the northbound site are generally striped less than the standard 15-foot width per the MDT Traffic Manual. If the northbound parking area will be perpetuated with future improvements, consideration should be made to stripe the truck stalls to meet the standard 15-foot width. There were no truck stall markings at the southbound site since this site was designed for trucks to park along the outside edge of the pavement where the pavement width accommodates parked trucks and through vehicle movements. The passenger vehicle parking stall widths for both the northbound and southbound sites generally met the standard 10-foot criteria. ADA parking requirements are addressed separately in Section 2.7.

Signage

Ramp and parking area signage range from good to fair condition. At both sites, the “Wrong Way” and “Do Not Enter” signs were installed in 2014. The majority of the other road signs along the sites were installed between 1996 and 1998. The signs are generally in good condition with some signs of wear.

2.6 Site Amenities

The following section summarizes the general condition of exterior site amenities observed during the May 2019 site visits. Record drawings showing the original construction of the picnic shelters, exhibit cases, and picnic tables are provided in Appendix E for reference.

Picnic Areas

Picnic facilities at both sites include roofed picnic shelters containing table/bench units with either concrete bases and tops, or wood bases and plank tops served by adjacent concrete walkways.

Concrete picnic tables were generally in sound structural condition. The concrete table and bench supports did not show evidence of significant cracking. The wood plank table tops and bench seats were chained down to the concrete slabs. The paint on a majority of the wood planks were showing significant signs of chipping and peeling with signs of aging or water damage.

Metal shelter roofs appeared to be in general good condition. Picnic shelters were in sound structural condition; however, some of the base plate and side plate roof post connections were rusty and showing signs of deterioration. Picnic shelter construction consists of a four-inch concrete slab with two-foot square by three-foot deep footings for the roof posts. Some cracking was observed in the concrete slabs; however, slabs were in good/fair condition.

Informational Signage

Signage was generally in fair condition with some cases in poor condition, including informational and historical site markers. These features exhibited chipping/peeling paint, faded/worn marker text, damaged display cases, and rusting post connections.

Pet Areas

Both sites have an unfenced pet area designated by signage. Pet areas are generally located along the ramps within drainage swales. Moving pet areas to new locations may be warranted should MDT choose to maintain the sites as truck parking areas. New pet area locations may allow the opportunity to provide a greater buffer between the pet area sites, traffic movements, and environmentally sensitive areas.

Benches

The southbound site provides one freestanding bench not associated with picnic areas. The metal connections of the wooden benches generally were in sound structural condition. However, vertical timber posts were faded, and the paint was chipping and peeling. The wood slats were beginning to splinter and are in need of replacement. No freestanding benches were located at the northbound site.

Light Fixtures

Exterior pole-mounted light fixtures are a combination of the original mercury vapor luminaires (southbound only) or recently upgraded LED luminaires, (northbound only) on 30-foot poles. The 30-foot-high poles were generally located along the edges of the parking area; poles and luminaires were in good condition. The operational condition of the lights is not included as part of this existing conditions assessment.

2.7 Accessibility

The following section summarizes exterior feature compliance with ADA and associated implementing guidelines and standards. Accessibility of building facilities is not included, as these are anticipated to be demolished under both action alternatives considered for this study. Appendix F includes measurements and mapping showing measurement locations.

Pedestrian Ramps

The asphalt pavement parking areas and sidewalks at the northbound and southbound sites are at the same vertical elevations; therefore, there are no pedestrian ramps transitioning from the parking area to pedestrian access routes. Additionally, there are no pedestrian ramps leading to site facilities.

Accessible Parking Spaces

Section 208.2 of the 2010 ADA Standards requires at least one accessible parking space for parking areas providing up to 25 total parking spaces. For every six or fraction of six accessible parking spaces, at least one must be a van parking space. Field observations identified the following characteristics.

- The northbound rest area has 13 total passenger vehicle spaces, including two accessible parking space, one of which is accessible van parking space, in compliance with Section 208.2 of the 2010 ADA Standards. The accessible van parking space is not compliant due to access aisle running slope in excess of the 4% maximum allowable slope. The other accessible parking space is compliant according to the 2010 ADA Standards.
- The southbound rest area has 10 total passenger vehicle spaces, one of which is one accessible van parking space, in compliance with Section 208.2 of the 2010 ADA Standards. The parking space and access aisle slopes and cross-slopes exceed the maximum 2% slope requirement for an accessible parking stall.

Picnic Areas

Both northbound and southbound sites provide two picnic shelters each containing two concrete table/bench and two wood table/bench units with adjacent pedestrian access routes. Only one of the four picnic table/bench units located within each picnic shelter serves adjacent pedestrian access routes. The remaining three picnic table/bench units do not provide sufficient clear space to navigate; therefore, are not included in this assessment.

According to the final rule on outdoor developed areas (36 CFR part 1191, Appendix C, Section F245), for sites providing more than two picnic areas, 20 percent (and not less than two) must be accessible. Picnic areas are considered non-accessible due to inadequate clear space on all usable sides of the table/bench by not providing wheelchair space with knee and toe clearance.

Benches

One freestanding bench constructed with wooden 4-inch by 4-inch legs and wooden slat seats is provided at the southbound site. These features are not compliant with requirements outlined in the 2010 ADA Standards for the following reasons.

- Bench seat size does not meet the minimum standard.
- Bench seat height does not meet the minimum standard.

Pedestrian Access Routes

Concrete sidewalks traverse the northbound and southbound sites providing access to building facilities and picnic areas. Concrete walkways are spalling in some locations and significant heaving and uplifting occurs along numerous stretches of walkways creating vertical discontinuities and trip hazards at both sites.

Measurements reflect the most direct access route to the building pad and picnic shelters at approximately 20-foot intervals. The assessment included the following:

- Of the 25 access route measurements collected at the northbound site, 14 are noncompliant due to trip hazards, vertical slopes, cross slopes, and insufficient clear width due to narrow sections or overgrown vegetation.
- Of the 26 access route measurements collected at the southbound site, 22 are noncompliant due to trip hazards, vertical slopes, cross slopes, and insufficient clear width due to narrow sections or overgrown vegetation.

In May of 2019, MDT completed concrete patching and grinding along the pedestrian routes to remove vertical surface discontinuities; however, the majority of the pedestrian access routes are considered non-compliant.

2.8 Safety Rest Area Maintenance

MDT Maintenance staff indicated that the majority of historical maintenance efforts have been related to preparation work for seasonal opening. Pre-season maintenance efforts have typically included painting, tree trimming, cleaning roof gutters, septic tank pumping, and overall site cleanup to address fallen tree limbs, animal waste, and garbage.

In addition to MDT Maintenance effort, contracted services provide custodial and upkeep assistance at rest areas and truck parking areas in order to maintain clean and safe stopping opportunities. Table 4 presents contracted services annual costs at the Jefferson City Safety Rest Area and several truck parking areas throughout the state.

Table 4: Jefferson City and Truck Parking Contracted Maintenance Costs

Site		Dates Open	Annual Cost	
Safety Rest Area	Jefferson City	April 15 – Nov 15	$20,800	
Truck Parking Area	Lyons Creek	Year Round	$29,500	Average $16,300
	Livingston East	Year Round	$12,300	
	Rock Creek	Year Round	$12,600	
	Alberton	Year Round	$12,600	
	Red Rocks	Year Round	$14,600	
	Locate	April 1 – Nov 30	$16,600	

2.9 Environmental Conditions

The following sections summarize existing environmental resource information within the study area gathered from previously published documents, websites, GIS data, and field site visits. The following environmental resources may pose potential constraints for future reduction in service or site closure.

- **Physical Resources**: Soil Resources and Prime Farmland, Geologic Resources, Surface Waters, Total Maximum Daily Loads, Wild and Scenic Rivers, Wetlands, Irrigation, Floodplains and Floodways, Air Quality, Hazardous Substances
- **Biological Resources**: Vegetation, Noxious Weeds, General Wildlife Species, Threatened and Endangered Species, Species of Concern, and Special Status Species
- **Social and Cultural Resources**: Demographics, Economic Conditions, Land Use, Recreational Resources, Cultural Resources, Noise, Visual Resources

Appendices G through N provide supporting environmental data.

Physical Resources

Soil Resources and Prime Farmland

The Natural Resources Conservation Service (NRCS) Web Soil Survey for both sites indicate the majority of soils are comprised of primarily alluvium material derived from granite, coarse-loamy residuum weathered from granite, and fine-loamy alluvium. All the soils identified within the sites are designated as either farmland of statewide importance or farmland of local importance; however, the majority of these soils have been previously developed.

Geologic Resources

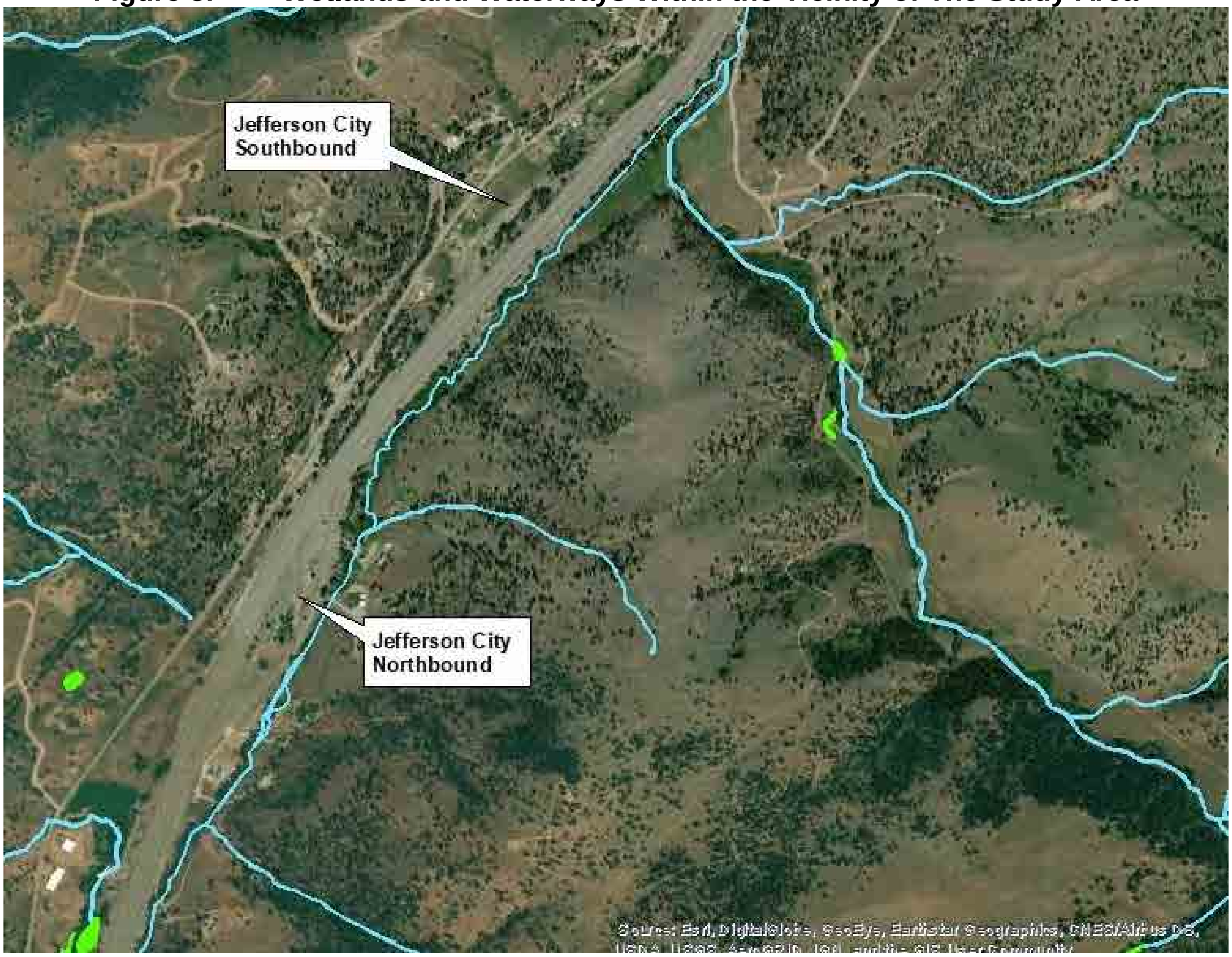
Montana geological maps show surficial sedimentary deposits (Qs) make up both sites. These deposits include alluvium, fan, and terrace gravels; gravel deposits on pediment surfaces; landslide and travertine deposits (Pleistocene and Holocene); and till, glacial lake, and outwash deposits (Pleistocene). Surficial soils consist of sand, loam, gravel, and clay associated with granite and alluvium formation.

According to Montana Bureau of Mines and Geology mapping, no faults are mapped within or near the two sites. The sites are located within a Seismic Hazard Zone that is prone to strong ground motion; however, very few earthquakes have been documented in the area.

Surface Waters

One surface water, Prickly Pear Creek, occurs in the proximity of the northbound site (Figure 3). Prickly Pear Creek is a small, perennial riverine flowing northeast/southwest. Prickly Pear Creek eventually conveys to Lake Helena and the Missouri River, and is therefore, considered a jurisdictional water under the Clean Water Act (i.e., within the U.S. Army Corps of Engineers regulatory jurisdiction). Additionally, a small spring fed pond is located at the southbound site.

Figure 3: Wetlands and Waterways Within the Vicinity of The Study Area



Source: U.S. Fish, Wildlife and Parks NWI Mapping 2019; https://www.fws.gov/wetlands/data/mapper.html

Total Maximum Daily Loads (TMDL)

The northbound and southbound sites are located within the Lake Helena Watershed Planning Area. MDEQ lists Prickly Pear Creek in this area (MT41I006_050) as impaired and not fully supporting drinking water, aquatic life, and cold-water fisheries. Additionally, the segment is listed as partially supporting agricultural uses. This segment of Prickly Pear Creek is impaired by sediment, cadmium, lead, and zinc. Roadway runoff and placement are primary contributors of sediment pollution in this segment. Other contributors include local grazing and placer mining activity. Metal sources in Prickly Pear Creek are expected to be from upstream and tributary streams and historic mining activities in the drainage area. TMDLs have not been completed; however, TMDLs are planned to be written for sediment, cadmium, lead, and zinc. Refer to Appendix I for the *Lake Helena Watershed Planning Area Final Report.*

Wild and Scenic Rivers
There are no wild or scenic rivers within or adjacent to the northbound or southbound sites. The closest wild and scenic river is the Flathead River, approximately 120 miles northwest of the southbound site.

Wetlands
The United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping displays no wetlands at the sites. A potential small fringe, emergent wetland was identified around the small spring fed pond at the southbound site. The assessment did not include a wetland delineation or hydric soil/wetland boundary determination. Montana Natural Heritage Program (MTNHP) mapping includes forested riparian vegetation at the northbound site.

Irrigation
Based on aerial imagery, no irrigation ditches, canals, or other infrastructure were identified within or adjacent to either site.

Floodplains and Floodways
Federal Emergency Management Agency (FEMA) shows no floodplain mapping for this area.

Air Quality
The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants, including carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM10 and PM2.5), sulfur dioxide, and lead. The EPA designates communities that do not meet NAAQS as “non-attainment areas”. The northbound and southbound sites are not located in a non-attainment area for any criteria pollutants. Additionally, there are no nearby non-attainment areas.

Hazardous Substances
Based on available MDEQ information, there are no underground storage tank (UST) sites, petroleum release fund claims, hazardous waste handler sites, abandoned or inactive mine sites, or open cut permits within or directly adjacent to the two sites. The National Pipeline Mapping System shows one pipeline designated as a gas transmission pipeline approximately 427 feet west of the southbound site. The pipeline travels north/south adjacent to I-15. The pipeline is designated as part of the East Helena-Boulder Line in the Northwestern Energy GT&S system and is owned by Northwestern Corporation (Figure 4).

Figure 4: East Helena – Boulder Gas Line

Source: National Pipeline Mapping System 2019; https://www.npms.phmsa.dot.gov/.

The hazardous materials assessment collected and tested building samples at both sites to determine the presence of asbestos-containing materials. Testing used polarized light microscopic (PLM) techniques with dispersion staining for identification of mineral forms of asbestos. Of the 10 representative samples collected at each site on May 10, 2019, no materials contain asbestos quantities.

The assessment also inspected painted and glazed surfaces for the presence of lead-containing materials using an x-ray fluorescence spectrum analyzer. Results indicate that only the blue painted parking curbs located in handicap parking stalls surfaces meet or exceed the federal threshold level of 1.0 milligram per square centimeter (mg/cm2).

Biological Resources

Vegetation

The Jefferson City Safety Rest Area is located within the Elkhorn Mountains-Boulder Batholith ecoregion of the Middle Rockies. This ecoregion is located on the Continental Divide and is composed of forested mountains and hills. Vegetation in the region is primarily subalpine fir and Douglas-fir forests.

Both sites are located within the Upper Prickly Pear Creek watershed. MTNHP mapping shows both sites are located on land cover designated as Human Land Use – Developed – Interstate. Land cover designations adjacent to the site include the following:

- Grassland Systems – Montane Grassland – Rocky Mountain Lower Montane, Foothill, and Valley Grassland
- Forest and Woodland Systems – Conifer-dominated forest and woodland (xeric-mesic) – Rocky Mountain Ponderosa Pine Woodland and Savanna
- Shrubland, Steppe and Savanna Systems – Sagebrush Steppe – Big Sagebrush Steppe
- Human Land Use – Developed – Low Intensity Residential
- Human Land Use – Developed – Open Space

Observed plant species at both sites include mature cottonwoods (*Populus sp.*), cottonwood saplings, smooth brome (*Bromus inermis*), common dandelion (*Taraxacum officinale*), ponderosa pine (*Pinus ponderosa*), common mullein (V*erbascum thapsus*), and Kentucky bluegrass (*Poa pratensis*). Vegetation directly surrounding the building structures includes landscape grasses and some ornamental plants.

Noxious Weeds
The Jefferson County Weed Management Plan 2016 (Appendix L) lists spotted knapweed (*Centaurea stoebe or maculosa*), leafy spurage (*Euphorbia esula*), houndstongue (*Cynoglossum officinale*), hoary alyssum (*Berteroa incana*), and Canada thistle (*Cirsium arvense*) as the most abundant noxious weed species in the county. Noxious weeds likely exist along the I-15 corridor bordering the sites.

General Wildlife Species
Mammals
Prickly Pear Creek, the surrounding riparian corridor, and the surrounding mountains provide suitable habitat for mammal species. According to the MTNHP database, mammal species include, but are not limited to, bobcat (*Lynx rufus*), elk (*Cerbus canadensis*), mountain lion (*Puma concolor*), coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), montane vole (*Microtus montanus),* beaver (*Castor canadensis*), northern river otter (*Lontra canadensis*), black bear (*Ursus americanus*), and red squirrel (*Tamiasciurus hudsonicus*).

Amphibians and Reptiles
Amphibian species known to occur within the study area and vicinity include, but are not limited to, the Columbia spotted frog (*Rana luteiventris*), the long-toed salamander (*Ambystoma macrodactylum*), and western toad (*Anaxyrus boreas*). Reptile species such as common garter snake (*Thamnophis sirtalis*), gopher snake (*Pituophis catenifer*), northern rubber boa (*Charina bottae*), painted turtle (*Chrysemys picta*), and terrestrial garter snake (*Thamnophis elegans*) are likely to occur at both sites.

Birds
Prickly Pear Creek provides suitable riparian habitat for bird species in the study vicinity. More than 130 species of birds are documented with the potential to occur within the sites. These species include representative songbirds, birds of prey, waterfowl, owls, and shorebirds.

Fisheries
The closest surface water that supports fisheries is Prickly Pear Creek, approximately 160 feet east of the northbound site. According to Montana Fish, Wildlife, and Parks (FWP) Montana Fisheries Information System (MTFISH) database, the stretch of the creek near the site

supports multiple fish species including brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), longnose sucker (*Catostomus catostomus*), mottled sculpin (*Cottus baidrii*), rainbow trout (*Oncorhynchus mykiss*), and white sucker (*Catostomus commersonii*).

Threatened and Endangered Species

USFWS Information for Planning and Consultation (IPaC) lists three threatened species as potentially occurring within the vicinity of the northbound and southbound sites. These species include Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), and North American wolverine (*Gulo gulo luscus*).

MTNHP shows Canada lynx as potentially occurring within the vicinity of the Jefferson City Safety Rest Area. However, suitable habitat for these species is not found within the rest area limits. Additionally, no suitable habitat for grizzly bear and North American wolverine were identified within the rest area limits.

Species of Concern and Special Status Species

Four Montana species of concern/special status species are documented within the vicinity of the northbound and southbound sites. These species include westslope cutthroat trout (*Oncorhynchus clarkia lewisi*), Clark's nutcracker (*Nucifraga columbiana*), hoary bat (*Lasiurus cinereus*), and wolverine (*Gulo gulo*).

MTNHP shows Clark's nutcracker and westslope cutthroat trout have been observed within the study vicinity. Prickly Pear Creek may provide suitable habitat for westslope cutthroat trout. The sites may provide foraging habitat for the hoary bat. No suitable habitat for Clark's nutcracker or wolverine were identified. The MTNHP Environmental Summary Report can be found in Appendix M.

Bald eagles are protected under the Bald and Golden Eagle Protection Act. The Montana FWP Bald Eagle Nest Database recorded no Bald or Golden Eagle nests within the vicinity of either rest area. Additionally, no suitable habitat exists within the vicinity of the sites. The nearest recorded Bald Eagle nest is located approximately 18 miles south of the northbound site.

According to the Montana Sage Grouse Habitat Conservation Map, neither site is located within sage grouse core habitat, connectivity habitat, or general habitat.

Social and Cultural Resources

Demographics

According to U.S. Census Bureau population estimates, Jefferson County has seen a slight population increase in the last seven years from 11,406 in 2010 to 11,625 in 2017. Montana Department of Commerce population projections predict the population in Jefferson County will decrease to 10,192 by 2060.

This analysis does not assess the presence of Environmental Justice populations because any options proposed for the Jefferson City Safety Rest Area would have no new effects on the adjacent surrounding area.

Economic Conditions

The Jefferson County economic base includes educational services, health care and social assistance, retail trade, construction, professional/scientific/management/administrative/waste services, arts/entertainment/recreation/accommodation/food services, and other services except public administration. According to the U.S. Census Bureau, in 2017 Jefferson County has a slightly higher unemployment rate of 5.7% compared to Montana's unemployment rate of 4.8%.

Land Use

Property maps for Jefferson County show land surrounding both sites as privately owned. No lands under federal or state jurisdiction, other than Prickly Pear Creek, were identified within the direct vicinity. A small plot of Bureau of Land Management (BLM) land is located approximately 0.5-mile northeast of the northbound site. Land use is primarily agriculture, with some commercial and residential uses.

Recreational Resources

There are no state or federal public lands, public parks, or recreational fields, within or immediately surrounding either site. Fishing may occur on Prickly Pear Creek; however, the segment in the direct vicinity of the northbound site does not provide fishing access and is unlikely to be a popular recreational site.

No properties using National Land and Water Conservation Fund Act (LWCFA) Section 6(f) grants are located within or adjacent to the northbound and southbound sites.

Cultural Resources

Given that all potential alternatives are expected to remain within the previously-disturbed sites, a cultural resources investigation is not warranted. The structures associated with both sites were built in 1972 and are less than 50 years old. Additionally, no National Register of Historic Places sites are located within the vicinity of the study area.

Noise

The closest noise-sensitive receptor is a residence approximately 300 feet northwest of the southbound site. The sites are located in a rural residential area and multiple residences are located within 0.25 mile of both sites.

Visual Resources

Immediate views at both sites include the paved parking area and building structures surround rural residential land at the southbound site and a small riparian complex on Prickly Pear Creek at the northbound site. Views of Interstate 15 are also directly visible from both sites. Views at both sites include agricultural fields, shrubland, and conifer/grass covered hillslopes. Distant views include the Elkhorn Mountains to the east and the Boulder Hills to the west.

3.0 PUBLIC AND STAKEHOLDER INVOLVEMENT

MDT invited stakeholders and members of the public to participate in the planning process by providing input on stopping opportunities in the study area. Specific outreach methods are described in the following sections. Additional information is provided in Appendix O.

3.1 Study Websites and Study Posters

MDT hosted a website at https://www.mdt.mt.gov/pubinvolve/jeffersoncity/ to provide information about the safety rest area study. The website provided information about how to submit comments, study contacts, a list of frequently asked questions (FAQs), and the study schedule. Related links provided access to the Montana Rest Area Plan and the online Montana Rest Area Map. The website also provided draft documents for public review and comment.

At the beginning of the study period and during the public review period, MDT placed posters in locations throughout the study area. Posters illustrated the rest area study location, explained the study focus, and provided links to the study website and comment form. Posters locations are listed in Table 5.

Table 5: Public Review Poster Locations

Locations	
• Boulder Town Pump • Dearborn Rest Area (NB and SB) • Divide Rest Area (NB and SB)	• Jefferson City Rest Area (NB and SB) • Monroe's High County Travel Plaza • Rocker Truck Stop/Town Pump

3.2 Team Meetings

MDT subject matter experts met regularly during the study to discuss progress, methods, results, draft documents, public input, and other issues or concerns. The study team served in an advisory capacity and reviewed study documentation before publication. A full list of team members may be found in the acknowledgments section of this report. Meeting minutes are included in Appendix O.

3.3 Survey Summaries

The study team reviewed responses from the Montanan's Views on Highway Maintenance, and 2017 TranPlanMT surveys to identify information about user perceptions of rest area facilities within the study vicinity and statewide. Key findings relating to the Jefferson City Safety Rest Area study are summarized below. Additional survey information is provided in Appendix N.

Montanans' Views on Highway Maintenance: Winter 2016-2017

- The majority of respondents rated rest area maintenance as either excellent or good, while roughly two out of ten rated rest area maintenance as either fair or poor. The Butte District ratings were found to be nearly comparable to the total; however, the poor category was slightly higher at 4.7% compared to 3% total. The somewhat higher poor rating for the Butte District suggests the need to address older facilities such as the Jefferson City site.
- The majority of respondents also view rest area maintenance as very important to somewhat important. While roughly one of ten respondents viewed rest area maintenance as somewhat unimportant to very unimportant.
- Collectively, these results suggest public support for maintaining a high level of maintenance activities at the Jefferson City site.

2017 TranPlanMT: Stakeholder and Public Survey

- Improving rest areas received an average priority ranking, which was much lower relative to other improvement options presented in the survey. Rest areas were also ranked fourth out of seven categories for improvement cuts should funding decline.
- Together, these results suggest public support for maintaining some level of service at the Jefferson City site while supporting MDT's consideration of reduction in service.

3.4 Stakeholder Interviews

Team members contacted 14 stakeholder representatives to request input on the study. Of these, representatives from the Motor Carriers of Montana, Helena Tourism Alliance, Jefferson County Commissioners, Silver Bow County Commissioners, Jefferson County Planning, Lewis and Clark County Planning, Montana Department of Commerce, and the Montana Office of

Tourism and Business Development participated in interviews in May 2019. Members of the study team asked stakeholder representatives to provide input on stopping opportunities in the study area and opinions on the two alternatives considered for this study (reduction in service to a truck parking area or complete site closure).

Collectively, interview participants expressed:

- an awareness of the safety benefits of truck parking areas;
- support for maintaining a truck parking area at the existing Jefferson City northbound and southbound sites to perpetuate safe stopping opportunities; and
- rejection of full closure of the Jefferson City facilities.

Additional interview information is provided in Appendix O.

3.5 Written Comments

The study website and posted flyers encouraged members of the public to submit comments on the study. Examples of these efforts are included in Appendix O.

A total of one written comment was received during the review period for the draft study which extended from December 1 to December 31, 2019. Written comments are contained in Appendix O and are organized by the date received.

In conclusion, public and stakeholder involvement generally support MDT's consideration of a reduction in service at the Jefferson City Safety Rest Area (i.e., conversion from a full-service safety rest area to a truck parking area with a vaulted toilet). Survey results do not support complete closure of the safety rest area.

4.0 NEEDS AND OBJECTIVES

MDT has defined a need to address the existing Jefferson City Safety Rest Area northbound and southbound sites. The current facilities are open seasonally from April 15 through November 15 to the public pending the outcome of this study.

To optimize Safety Rest Area Program investment strategies, MDT sought an alternative that accomplishes the following objectives.

- Minimizes capital and long-term maintenance costs.
- Leverages federal-aid funding and reduces demands for limited state funding.
- Minimizes impacts to physical, biological, and social/cultural resources which could result in costly and time-consuming mitigation and abatement activities.
- Provides safe stopping opportunities spaced by a maximum of approximately one hour of travel time.
- Accommodates public and stakeholder feedback regarding stopping and parking opportunities.
- Aligns with existing MDT plans, policies, and asset management strategies.
- Adheres to FHWA rules, regulations and guidance regarding the operation, maintenance and abandonment of Rest Area facilities.

5.0 ALTERNATIVES

5.1 Alternative Identification

MDT considered two action alternatives to achieve identified objectives for the existing northbound and southbound Jefferson City Safety Rest Area sites.

Alternative 1: Reduction of Service

In accordance with MDT's *Safety Rest Area – Reduction of Service* memorandum, this alternative would lessen the current functionality of the existing northbound and southbound Jefferson City Safety Rest Area sites. The reduced service facilities would provide the function and features of a typical truck parking site.

To reduce capital and long-term maintenance costs, the premise of this alternative is to maintain and/or rehabilitate existing site features only to the degree consistent with similar truck parking facilities across the state and, as required, to meet safety and regulatory requirements. Additional improvements to the northbound and southbound sites could be considered at the time MDT pursues a future project but are not reflected in this study. This alternative includes the following primary elements.

Maintain entrance/exit ramps and parking areas.
Existing pavement would remain in service to provide access to truck and passenger vehicle parking areas. MDT would remove the raised median islands (northbound site only) to facilitate winter maintenance and apply a chip seal treatment to the entire surface to preserve/maintain pavement areas. Truck parking at the southbound site does not function to the current standard found at state-maintained rest and truck parking areas. MDT would reconstruct the southbound parking area to allow for WB-67 turning movements and provide similar truck parking to the northbound site. A typical site layout of the increased truck parking at the southbound site is included in Appendix P.

Remove building facilities and foundations.
MDT would demolish and remove the existing building structures and concrete foundations.

Abandon wastewater tanks.
MDT would remove the lids on the existing underground wastewater tanks and fill the tanks with gravel to eliminate future risk of collapse.

Cap associated wastewater piping and decommission drainfields.
MDT would cap existing wastewater transport piping approximately five to ten feet from building structures and abandon existing drainfields in place.

Maintain wells for irrigation and cleaning use (not as a public water source).
MDT would maintain the existing water wells to serve irrigation and cleaning needs at the sites. MDT would not provide potable water for public use.

Install vaulted toilets.
MDT would install vaulted toilets and new holding tanks, which would require periodic pumping.

Remove picnic areas, pet amenities, and adjacent walkways.
Although the existing picnic shelters are structurally sound, MDT does not typically provide picnic and pet amenities at truck parking areas. For consistency with the level of service

provided at similar sites across the state, MDT may remove these amenities and adjacent walkways.

Upgrade remaining walkways to meet ADA requirements.
To comply with ADA requirements, MDT would remove existing sidewalks and pedestrian access routes. The sidewalks adjacent to parking areas and vaulted toilets would be replaced to meet ADA requirements.

Reseed reclaimed areas.
MDT would reclaim and reseed all locations no longer in service (e.g., areas formerly occupied by building structures, picnic shelters, and walkways). Revised record drawings would show all abandoned site features, including piping and drainfield locations.

Alternative 2: Closure

The second alternative would involve complete demolition of the northbound and southbound building facilities, parking areas, ramps, water/wastewater systems, and site amenities. Under this scenario, the entire site would be reclaimed and reseeded. It is anticipated that some paving work and shoulder shaping would be required to reconstruct asphalt wedges along the outside shoulder of the I-15 mainline where ramp pavement would be removed by saw cutting during the demolition process. Revised record drawings would show all abandoned site features, including piping and drainfield locations.

Alternatives Eliminated from Consideration

MDT determined that the no-action alternative is not viable. Water and wastewater systems have exceeded their design service life. Needed improvements to wastewater systems would be difficult for the reasons outlined in Section 2.3 and improvements to the water system would be necessary to bring the system into compliance with current regulations and requirements for public water supply systems. Additionally, the facilities are not compliant with ADA accessibility requirements and have continued to deteriorate in recent years. A substantial capital investment would be required to address the identified deficiencies. Of the rest areas in Montana, the Jefferson City southbound and northbound sites have the 5th and 7th lowest health index scores as of 2019, respectively, due to these factors.

MDT also determined that rehabilitation of the existing safety rest area is not a viable alternative due to spacing redundancy in the corridor, risks and costs associated with upgrading the water and wastewater systems, restrictive site constraints, and safety rest area program funding constraints.

5.2 Screening

In consideration of MDT's *Safety Rest Area – Reduction of Service* memorandum, the study team identified the following seven screening criteria to evaluate the action alternatives.

Capital and Maintenance Costs

MDT must weigh initial capital costs associated with demolition and site improvements with long-term maintenance costs associated with perpetuating service at the Jefferson City sites. The analysis in Appendix P details the estimated capital cost for each alternative and the anticipated long-term maintenance costs inflated over the 2039 planning horizon. Costs are presented in 2019 dollars and represent individual totals for the northbound and southbound sites.

Alternative 1 (Reduction in Service):
Initial capital costs would be higher compared to Alternative 2

Site	Alternative 1 Estimated Capital Cost	Estimated Long-term Maintenance
✓ **Jefferson City NB**	$357,000	$248,000
✓ **Jefferson City SB**	$717,000	$248,000

Long-term maintenance costs were estimated from the Interstate truck parking areas presented in Table 4. A 25% contingency for MDT Maintenance effort was incorporated in the average. (approximately $10,000 annually at each site or $248,000 totaled over 20 years, assuming 2% inflation).

Alternative 2 (Closure):
Initial capital costs would be lower compared to Alternative 1.

Site	Alternative 2 Estimated Capital Cost	Estimated Long-term Maintenance
✓ **Jefferson City NB**	$292,000	$0
✓ **Jefferson City SB**	$222,000	$0

Long-term maintenance costs would be eliminated under this alternative.

Funding Eligibility

Certain MDT activities are typically eligible for federal funding (such as capital improvements to highway infrastructure), whereas others must be funded from state sources (such as maintenance costs). As outlined in the FHWA non-regulatory supplement (NS 23 CFR 752), the cost of interstate safety rest area abandonment is not eligible for federal-aid funding. Accordingly, the closure alternative would be ineligible for federal funding and would need to be entirely supported by state funds. The reduction in service alternative would be eligible for federal funding because it would continue to provide a safe stopping opportunity with parking and vaulted toilet services.

Environmental Risk

MDT desires to avoid or minimize environmental resource impacts resulting from a future project at the Jefferson City sites. Associated mitigation and abatement activities can result in increased costs, schedule delays, and elevated project risk for MDT. Potential risks and associated screening outcomes are discussed below.

Physical Resources
Alternative 1 (Reduction in Service):

- No adverse permanent impacts to prime farmland, geologic resources, surface water, TMDLs, wild and scenic rivers, wetlands, irrigation, floodplains and floodways, and air quality are anticipated.
- Contaminated soils may exist within the MDT right-of-way at each site. Ground-disturbing activities are necessary at this location and include removal of the building facilities and wastewater infrastructure. Encounters with contaminated soils would likely be minimal. However, contractors will need to follow safe handling procedures and

identify appropriate disposal methods if contaminated soil (or soil residue) is encountered.
- The presence of lead-based paint on blue parking curbs would require proper handling and disposal during building demolition.
- The screening outcome is **neutral** (○) due to the limited risk potential of encountering contaminated soils (with all other potential risks equal to Alternative 2).

Alternative 2 (Closure):
- No adverse permanent impacts to prime farmland, geologic resources, surface water, TMDLs, wild and scenic rivers, wetlands, irrigation, floodplains and floodways, and air quality are anticipated.
- Contaminated soils may occur within MDT right-of-way at each site. Ground-disturbing activities are necessary at this site and include complete demolition of the rest area site, thus resulting in a greater risk of encountering contaminated soils. Contractors will need to follow safe handling procedures and identify appropriate disposal methods if contaminated soil (or soil residue) is encountered.
- The presence of lead-based paint on blue parking curbs would require proper handling and disposal during building demolition.
- The screening outcome is **negative** (**-**) due to the greater potential for encountering contaminated soils (with all other potential risks equal to Alternative 1).

Biological Resources

Alternative 1 (Reduction in Service):
- No adverse permanent impacts to vegetation, noxious weeds, general wildlife species, threatened and endangered species, species of concern, and special status species are anticipated.
- The screening outcome is **neutral** (○) due to the limited likelihood of noxious weed establishment (with all other potential risks equal to Alternative 2).

Alternative 2 (Closure):
- No adverse permanent impacts to general wildlife species, threatened and endangered species, species of concern, and special status species are anticipated.
- Ground-disturbing activities to the entire site may increase the spread of noxious invasive weeds if native seeding does not establish.
- The screening outcome is **negative** (**-**) due to the greater likelihood of noxious weed establishment (with all other potential risks equal to Alternative 1).

Social and Cultural Resources

Alternative 1 (Reduction in Service):
- No adverse permanent impacts to demographics, economic conditions, land use, recreational resources, cultural resources, noise, or visual resources are anticipated.
- The screening outcome is **neutral** (○) due to limited risks associated with social and cultural resources (equal to Alternative 2).

Alternative 2 (Closure):

- No adverse permanent impacts to demographics, economic conditions, land use, recreational resources, cultural resources, noise, or visual resources are anticipated.
- The screening outcome is **neutral** (○) due to equal risks associated with social and cultural resources (equal to Alternative 1).

Spacing and Corridor Needs

The Jefferson City Safety Rest Area is redundant along I-15 due to its proximity to the Helena, Boulder, and Butte sites.

Alternative 1 (Reduction in Service):

- A truck parking area at Jefferson City would provide additional safe stopping opportunities and positively impact existing facilities in the study area. Accordingly, the screening outcome is **positive** (✚).

Alternative 2 (Closure):

- Complete closure would reduce parking and safe stopping opportunities in the study area. During peak usage periods, some parking needs along this portion of the I-15 corridor (Helena to Butte) would be unmet. Accordingly, the screening outcome is **negative** (-).

Public/Stakeholder Feedback

This screening criterion considers feedback provided through the MDT 2017 TranPlanMT Survey, stakeholder interviews conducted for the Jefferson City Safety Rest Area study, and public comments provided by mail, email, and telephone.

Alternative 1 (Reduction in Service):

- Public and stakeholder sentiment generally supports maintaining the existing Jefferson City northbound and southbound sites as truck parking areas to perpetuate MDT's investment and provide safe stopping/parking opportunities in the study area. Accordingly, the screening outcome is **positive** (✚).

Alternative 2 (Closure):

- Public and stakeholder sentiment generally opposes complete closure of the sites. Accordingly, the screening outcome is **negative** (-).

Alignment with MDT Plans

A number of MDT plans provide guidance and outline goals, strategies, and best practices for MDT's safety rest areas.

The *Montana Rest Area Plan* outlines a series of guidelines to aid the Statewide Rest Area Prioritization Plan Committee and MDT Districts in managing rest area infrastructure and making investment decisions. The process for considering reduction of service decisions is further defined in the MDT *Safety Rest Area – Reduction of Service* memorandum.

TranPlanMT, the statewide long-range transportation, recognizes the value that safety rest areas offer in providing safe stopping opportunities for motorists along Montana's highways. TranPlanMT defines a safety strategy to: "**Continue improvements to the safety rest area program to provide safe stopping locations for the traveling public.**"

The *Montana Freight Plan* discusses rest area conditions, trends, performance, and forecasts. Given continued public and freight movement demand for safe, clean, and functional rest and parking areas, the plan outlines MDT's intention to evaluate current and future availability of services to provide safe stopping opportunities where needed.

Alternative 1 (Reduction in Service):

- Alternative 1 would reduce service in accordance with network evaluation guidelines outlined in the *Montana Rest Area Plan* and provide continued investment in safe stopping opportunities as stated in *TranPlanMT* and the *Montana Freight Plan.* Accordingly, the screening outcome is **positive** (✚).

Alternative 2 (Closure):

- Although closure of the Jefferson City Safety Rest Area would follow guidelines outlined in the *Montana Rest Area Plan*, it would not provide continued investment in safe stopping opportunities as stated in *TranPlanMT* and the *Montana Freight Plan*. Accordingly, the screening outcome is **negative** (-).

Additional Requirements

In 1992, FHWA issued a non-regulatory supplement (NS 23 CFR 752) addressing abandonment of Interstate rest areas. It noted the following pertinent points. The full text of the supplement is provided in Appendix Q.

- A state may abandon an Interstate rest area provided there is a well-documented evaluation demonstrating that the rest areas to remain are adequate in both number and size to satisfy the needs of the traveling public.
- Recognizing the possibility that, in some instances, the driver or rider in a truck may have need for these facilities, exceptions which would permit rest areas for trucks without handicapped provisions should not be granted.
- The question of whether or not parking areas in rest areas, which lack other facilities, should continue to be available for use is an operational consideration and thus a state decision. The decision should be made on an individual basis depending on the circumstances. Retention could be a safety benefit. On the other hand, if activities in these sites are or become nuisances, closure may be the only acceptable solution.
- If it is agreed there is a reasonable expectation that the site will be used for highway purposes at some time in the future, no further action is required. If, however, it is determined the site will never be used for such purposes disposal of the excess property to comply with OMB Circular A-102, Attachment N, Section 3, Real Property, will be necessary.
- A state may be permitted to retain the land on which an abandoned rest area is situated. Any use of an abandoned rest area should not be of a permanent nature so that it could revert to rest area usage if a future need should develop.
- The abandoned, but not disposed of, rest areas should be properly maintained and any activities occurring at the closed rest area, whether lawfully or by trespassers, should not be detrimental to the operation of the Interstate system.

Alternative 1 (Reduction in Service):

- This alternative would not be considered a form of abandonment as it would continue to provide a safe stopping opportunity with parking and vaulted toilet services. The screening outcome is **positive** (✚) because supplemental evaluation would not be required.

Alternative 2 (Closure):

- This alternative would be considered a form of abandonment as it would eliminate all services. An evaluation would need to be submitted demonstrating adequate remaining safety rest areas within the study area. MDT would need to maintain or dispose of the property, as appropriate. The screening outcome is **negative** (**-**) because supplemental evaluation would be required.

Summary of Screening Results

Table 6 on the following page summarizes costs, funding eligibility, and other screening outcomes for the evaluated action alternatives.

Table 6 Notes:

- All costs represent individual totals for the northbound and southbound sites.
- A ✚ symbol indicates a **positive screening outcome**. The alternative is considered desirable due to:
    - anticipated lack of adverse environmental impacts and lower risk of environmental mitigation/abatement;
    - ability to meet corridor needs;
    - positive public/stakeholder feedback;
    - alignment with MDT plans; and
    - no additional FHWA requirements.
- A ○ symbol indicates a **neutral screening outcome**. The screening criterion does not assist MDT in selecting between the two action alternatives, resulting in no effect on the screening result.
- A **-** symbol indicates a **negative screening outcome**. The alternative is considered less desirable due to:
    - anticipated adverse environmental impacts and/or higher risk of environmental mitigation/abatement;
    - inability to meet corridor needs;
    - negative public/stakeholder feedback;
    - conflict with MDT plans; and
    - additional FHWA requirements.

Table 6: Screening Summary

Screening Criteria			Action Alternative 1 Reduction in Service	Action Alternative 2 Closure
A	Costs	*Capital*	**$357,000 (NB)** **$717,000 (SB)**	**$292,000 (NB)** **$222,000 (SB)**
		Maintenance	Annual cost of **$10,000** and cumulative cost of **$248,000** through 2039 per site.	**$0**
B	Funding Eligibility	*Federal*	**$357,000 (NB), $717,000 (SB)** – eligible for federal funding per NS 23 CFR 752	**$0** – not eligible for federal funding per NS 23 CFR 752
		State	Long-term maintenance (annual cost of **$10,000** and cumulative cost of **$248,000** through 2039 per site, assuming 2% inflation)	Demolition/reclamation costs **$292,000 (NB)** **$222,000 (SB)**
C	Environmental Risk	*Physical Resources*	○ Limited risk potential to encounter contaminated soils (with all other potential risks equal to Alternative 2).	– Greater potential to encounter contaminated soils (with all other potential risks equal to Alternative 1).
		Biological Resources	○ Limited likelihood of noxious weed establishment (with all other potential risks equal to Alternative 2).	– Greater likelihood of noxious weed establishment (with all other potential risks equal to Alternative 1).
		Social/ Cultural Resources	○ Limited risks associated with social and cultural resources	○ Limited risks associated with social and cultural resources
D	**Spacing and Corridor Needs**		+ Would provide safe stopping opportunities and augment parking facilities in the study area.	– Would reduce parking and stopping opportunities in the study area.
E	**Public/Stakeholder Feedback**		+ Public/stakeholder support for maintaining the existing Jefferson City sites as truck parking areas.	– Public/stakeholder opposition to complete closure of the sites.
F	**Alignment with MDT Plans**		+ Would provide continued investment in safe stopping opportunities.	– Would not provide continued investment in safe stopping opportunities.
G	**Additional Requirements**		+ Supplemental evaluation would not be required.	– Supplemental evaluation would be required.

6.0 CONCLUSIONS AND NEXT STEPS

Based on the analysis conducted for this study, Alternative 1 (reduction in service) is the preferred alternative for the following reasons:

- Existing facilities are not sufficient to address truck parking needs during peak usage periods (summer months) along this portion of the I-15 corridor.
- Alternative 1 would provide additional stopping opportunities along this portion of the I-15 corridor.
- Stakeholder groups expressed support for safe stopping/truck parking opportunities at the Jefferson City Rest Area site.
- Stakeholder groups rejected Alternative 2 (closure option) for the Jefferson City Rest Area site.
- Stakeholder and public comments supported the reduction of service option (vs. the closure option).
- Alternative 1 (reduction in services) is eligible for federal-aid funding and requires no state matching funds.
- Alternative 2 (closure option) must be funded entirely with state funds (not federal-aid eligible).
- While maintenance costs are higher for Alternative 1 (reduction of service), the total amount of state funds required to implement Alternative 1 are comparable to Alternative 2 (closure option).
- Alternative 2 (closure option) triggers an FHWA requirement that MDT perform a supplemental evaluation to demonstrate adequate safety rest area services will remain after the abandonment of the Jefferson City Area site.
- It is unlikely that MDT could provide adequate justification for Alternative 2 (closure option) based on truck parking and facility demands along the I-15 corridor between the Helena and Butte Urban Areas.

Consequently, this study recommends implementation of Action Alternative 1 (reduction in service) at the Jefferson City Safety Rest Area sites

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Appendix A:
Photo Log

Jefferson City
Safety Rest Area Study

This photo log illustrates conditions observed during a site visits conducted on October 19, 2017, June 1, 2018 and May 10, 2019, at the Jefferson City Safety Rest Area northbound and southbound sites. Photo categories include water/irrigation systems; public wastewater systems; building structure; environmental conditions; ramps and parking areas; site amenities; and accessibility. This photo log does not provide a comprehensive account of all conditions within the study area. Conditions were visually inspected; no testing of the site was conducted during collection of these photos.

Contents

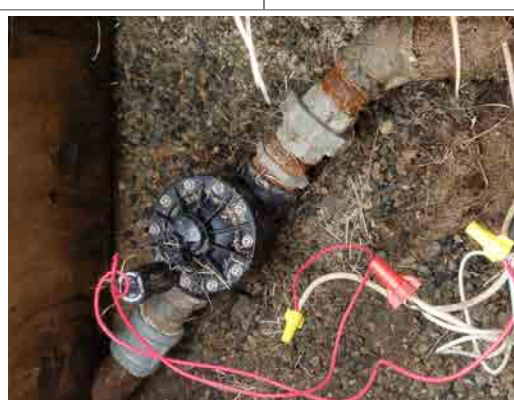
Water/Irrigation Systems

PHOTO 1: NORTHBOUND WELL

PHOTO 2: NORTHBOUND MECHANICAL ROOM

PHOTO 3: SOUTHBOUND WELL

PHOTO 4: SOUTHBOUND MECHANICAL ROOM



PAGEPHOTO 5: NORTHBOUND IRRIGATION SYSTEM

Public Wastewater Systems

	
PHOTO 6: NORTHBOUND septic tank exhibiting no cracking or spalling of concrete.	PHOTO 7: NORTHBOUND septic tank exhibiting no cracking or spalling of concrete.
	
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PHOTO 14: SOUTHBOUND SEPTIC CLEAN OUT	PHOTO 15: SOUTHBOUND SEPTIC TANK LID #2

PHOTO 16: SOUTHBOUND DRAINFIELD

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PHOTO 22: NORTHBOUND men's toilet.

PHOTO 23: NORTHBOUND men's room, broken tile.

PHOTO 24: NORTHBOUND men's room, ventilation.

PHOTO 25: NORTHBOUND women's toilet.

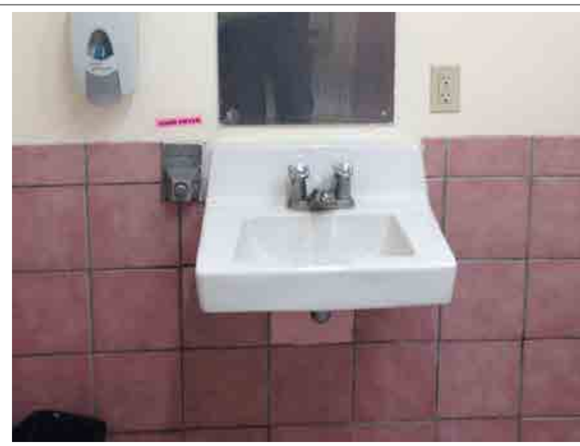

PHOTO 26: NORTHBOUND women's sink.

PHOTO 27: SOUTHBOUND front of rest area building structure.

PHOTO 28: SOUTHBOUND rear of rest area building structure.

PHOTO 29: SOUTHBOUND nonfunctioning drinking fountain.

PHOTO 30: SOUTHBOUND men's room, sink.

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PHOTO 44: NORTHBOUND transverse cracking in parking area.

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PHOTO 70: NORTHBOUND pedestrian access route to building with numerous trip hazards.

PHOTO 71: NORTHBOUND single accessible picnic table at each of the picnic shelters.

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PHOTO 73: SOUTHBOUND noncompliant pedestrian ramp.

PHOTO 74: SOUTHBOUND pedestrian access route to building with numerous trip hazards.

PHOTO 75: SOUTHBOUND single accessible picnic table at each of the picnic shelters.

PHOTO 76: SOUTHBOUND pedestrian access route to building with numerous trip hazards repaired.

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Appendix B:
Parking Demand Calculations

Jefferson City
Safety Rest Area Study

Jefferson City (North) Rest Area - Summer Average Door Count					
	Description	Variable	Existing (2018) DAY	Existing (2018) NIGHT	Notes
DATA	Summer Average Door Count	ADD	231	231	ADD = ADP*2
	Summer Average Daily People	ADP	116	116	Summer Patron Count data provided by MDT
	Average Annual Daily Traffic	AADT	5,157	5,157	Average of Traffic Count Site 22-2-014
	Average Annual Daily Traffic (Trucks)	$AADT_t$	1109	1109	Average of Traffic Count Site 22-2-014 (Vehicle Class types 4-13) * AADT
	Peak Hour Volume	PHV	414	169	Average of Traffic Count Site 22-2-014
	Peak Day Peak Hour People	PHP	9	4	PHP = PDP * (PHV / AADT)
	Peak Day Peak Hour Vehicles Stopping at Rest Area	PHV_p	6	3	$PHV_p = PHP_p / UV$
	Percentage of Cars in the Mainline Traffic Stream During Daytime/Nighttime Periods	$D_{c\%}$	81.76%	81.76%	Average of Traffic Count Site 22-2-014 (Vehicle Class types 1-3)
	Percentage of Trucks in the Mainline Traffic Stream During Daytime/Nighttime Periods	$D_{t\%}$	15.05%	43.00%	Guideline #3 Day = $(AADT_t / AADT) * 0.7$ Night = $(AADT_t / AADT) * 2.0$
	Number of Cars Stopping at Rest Area	D_c	6	3	$D_c = D_{c\%} * PHV_p$
	Number of Trucks Stopping at Rest Area	D_t	1	2	$D_t = D_{t\%} * PHV_p$
	Total Vehicles Stopping at Rest Area During Peak Hour (Factored)	D_2	7	5	$D_2 = D_c + D_t$
	Average Dwell Time for Cars (Minutes)	VHS_c	11	NA	Research from Divide (Southbound) Rest Area
	Average Dwell Time for Trucks (Minutes)	VHS_t	38	202	
	Restroom Users Per Vehicle	UV	1.5	1.5	Guideline #9
RECOMMENDED PARKING SPACES	Parking Spaces for Cars (Day Controls)	N_c	1	NA	$N_c = (PHV_p * D_{c\%} * VHS_c) / 60$
	Parking Spaces for Trucks (Night Controls)	N_t	NA	4	$N_t = (PHV_p * D_{t\%} * VHS_t) / 60$

[1] Compound Annual Growth Rate = 1.0%

Jefferson City (South) Rest Area - Summer Average Door Count					
	Description	Variable	Existing (2018) DAY	Existing (2018) NIGHT	Notes
DATA	Summer Average Door Count	ADD	206	206	ADD = ADP*2
	Summer Average Daily People	ADP	103	103	Summer Patron Count data provided by MDT
	Average Annual Daily Traffic	AADT	5,157	5,157	Average of Traffic Count Site 22-2-014
	Average Annual Daily Traffic (Trucks)	$AADT_t$	1109	1109	Average of Traffic Count Site 22-2-014 (Vehicle Class types 4-13) * AADT
	Peak Hour Volume	PHV	414	169	Average of Traffic Count Site 22-2-014
	Peak Day Peak Hour People	PHP	8	3	PHP = PDP * (PHV / AADT)
	Peak Day Peak Hour Vehicles Stopping at Rest Area	PHV_p	6	2	$PHV_p = PHP_p / UV$
	Percentage of Cars in the Mainline Traffic Stream During Daytime/Nighttime Periods	$D_{c\%}$	80.92%	80.92%	Average of Traffic Count Site 22-2-014 (Vehicle Class types 1-3)
	Percentage of Trucks in the Mainline Traffic Stream During Daytime/Nighttime Periods	$D_{t\%}$	15.05%	43.00%	Guideline #3 Day = $(AADT_t / AADT) * 0.7$ Night = $(AADT_t / AADT) * 2.0$
	Number of Cars Stopping at Rest Area	D_c	5	2	$D_c = D_{c\%} * PHV_p$
	Number of Trucks Stopping at Rest Area	D_t	1	1	$D_t = D_{t\%} * PHV_p$
	Total Vehicles Stopping at Rest Area During Peak Hour (Factored)	D_2	6	3	$D_2 = D_c + D_t$
	Average Dwell Time for Cars (Minutes)	VHS_c	11	NA	Research from Divide (Southbound) Rest Area
	Average Dwell Time for Trucks (Minutes)	VHS_t	38	202	
	Restroom Users Per Vehicle	UV	1.5	1.5	Guideline #9
RECOMMENDED PARKING SPACES	Parking Spaces for Cars (Day Controls)	N_c	1	NA	$N_c = (PHV_p * D_{c\%} * VHS_c) / 60$
	Parking Spaces for Trucks (Night Controls)	N_t	NA	4	$N_t = (PHV_p * D_{t\%} * VHS_t) / 60$

[1] Compound Annual Growth Rate = 1.0%

Montana Department of Transportation
22-2-014 Weekly Volume Report - Mon 09/24/2018 - Sun 09/30/2018

Location ID:	22-2-014	**Type:**	SPOT
Located On:	INTERSTATE 15		
Direction	2-WAY		
Community:	-	**Period:**	Mon 09/24/2018 - Sun 09/30/2018
AADT:	5157		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM			61	60				61
1:00 AM			58	19				39
2:00 AM			34	27				31
3:00 AM			54	43				49
4:00 AM			43	71				57
5:00 AM			135	133				134
6:00 AM			253	257				255
7:00 AM			496	524				510
8:00 AM			496	490				493
9:00 AM			427	474				451
10:00 AM			496	427				462
11:00 AM			474	442				458
12:00 PM		437	532					485
1:00 PM		498	513					506
2:00 PM		482	567					525
3:00 PM		478	563					521
4:00 PM		628	603					616
5:00 PM		657	662					660
6:00 PM		428	464					446
7:00 PM		328	293					311
8:00 PM		228	262					245
9:00 PM		167	186					177
10:00 PM		97	108					103
11:00 PM		74	75					75
Total	**0**	**4502**	**7855**	**2967**	**0**	**0**	**0**	
24HrTotal			7529	7795				7662
AM Pk Hr			7:00					
AM Peak			496					496
PM Pk Hr			5:00					
PM Peak			662					662
% Peak Hr			8.43%					8.00%
% Peak Hr			8.73%	8.49%				8.61%

Sept	Tues	Wed	Thurs
Axel	0.732	0.72	0.74
Seasonal	0.947	0.928	0.886

	Axel A	Seasonal	
255	0.73	0.91	169
616	0.73	0.92	414

Factors By Day and Month for 1/1/2018 - 12/31/2018
Criteria: Type = I-SECTION

Axle Factors								
Group	Month	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
RI	Jan	0.729	0.718	0.684	0.664	0.682	0.72	0.715
	Feb	0.729	0.701	0.663	0.663	0.682	0.729	0.71
	Mar	0.762	0.712	0.681	0.682	0.71	0.755	0.744
	Apr	0.781	0.728	0.69	0.687	0.704	0.747	0.75
	May	0.793	0.774	0.721	0.708	0.736	0.784	0.776
	Jun	0.815	0.775	0.741	0.739	0.762	0.796	0.795
	Jul	0.831	0.794	0.762	0.758	0.787	0.809	0.807
	Aug	0.829	0.79	0.752	0.749	0.772	0.81	0.806
	Sep	0.8	0.78	0.732	0.72	0.74	0.78	0.784
	Oct	0.782	0.742	0.698	0.696	0.727	0.768	0.753
	Nov	0.773	0.722	0.7	0.711	0.706	0.749	0.746
	Dec	0.752	0.718	0.686	0.707	0.708	0.753	0.748

Seasonal Factors								
Group	Month	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
RI	Jan	1.516	1.498	1.438	1.464	1.412	1.313	1.435
	Feb	1.708	1.557	1.448	1.382	1.389	1.26	1.519
	Mar	1.254	1.333	1.246	1.157	1.092	1.006	1.159
	Apr	1.069	1.181	1.128	1.089	1.098	0.996	1.075
	May	0.933	0.934	1.012	0.986	0.895	0.79	0.929
	Jun	0.797	0.858	0.883	0.833	0.776	0.719	0.823
	Jul	0.708	0.779	0.8	0.823	0.728	0.682	0.754
	Aug	0.734	0.801	0.822	0.801	0.757	0.679	0.754
	Sep	0.909	0.889	0.947	0.928	0.886	0.787	0.876
	Oct	0.996	1.04	1.083	1.058	0.953	0.838	1.023
	Nov	1.09	1.204	1.178	1.095	1.177	1.083	1.181
	Dec	1.44	1.538	1.48	1.246	1.203	1.075	1.213

Montana Department Of Transportation

Volume by Class - by Hour for 1/1/2017 - 12/31/2017

District: | **Station:** 22-2-007 | **Route:** | **ADT:** 3424

County: JEFFERSON | **Roadbed:** ML | **Located On:** INTERSTATE 15 | **# Of Days:** 3

City: - | **Collection Type:** Class | **Frequency:** ANNUAL OR MULTI-YEAR | **Lane Dir:** 2-WAY

					Single Unit Trucks			Single Trailer Truck			Multi-Trailer Trucks					
Hour	**M-cycle**	**Car**	**Pickup**	**Bus**	**SU 2A-6T**	**SU 3 Axles**	**SU 4+Axles**	**STT 3-4 Axles**	**STT 5 Axles**	**STT 6+ Axles**	**MTT 5 Axles**	**MTT 6 Axles**	**MTT 7+ Axles**	**Total Trks**	**Unclassified**	**Total**
12-1am	0	21	18	0	2	0	0	0	10	0	0	1	11	24	2	63
1-2am	1	28	10	3	1	1	0	0	10	0	0	2	5	22	1	61
2-3am	0	15	5	1	0	1	0	1	15	2	0	2	5	27	1	47
3-4am	0	10	10	0	2	1	0	2	10	0	1	3	5	24	1	44
4-5am	0	13	7	2	3	1	0	4	18	1	0	3	16	48	1	68
5-6am	0	63	38	0	1	1	0	4	23	1	0	1	12	43	5	144
6-7am	1	161	106	1	8	0	0	4	27	2	0	0	11	53	3	321
7-8am	1	313	181	5	7	1	0	9	23	7	2	4	9	67	4	562
8-9am	3	294	234	6	7	5	0	8	45	4	4	2	20	101	6	632
9-10am	2	286	237	8	13	2	0	5	49	2	5	0	15	99	8	624
10-11am	3	285	230	8	9	5	1	9	48	1	0	0	13	94	5	612
11-12am	4	326	224	7	11	3	1	15	43	4	1	1	16	102	2	656
12-1pm	2	299	253	8	16	5	0	16	78	10	3	1	21	158	1	712
1-2pm	4	371	251	6	13	7	0	12	54	11	1	2	21	127	3	753
2-3pm	4	358	252	6	6	7	0	11	59	9	1	1	21	121	5	735
3-4pm	1	414	243	9	6	2	0	12	62	10	0	1	22	124	4	782
4-5pm	2	443	295	8	14	5	0	12	55	5	2	1	15	117	2	857
5-6pm	1	408	249	7	9	2	0	6	55	7	2	0	27	115	4	773
6-7pm	6	272	187	0	5	3	1	10	54	5	3	0	13	94	5	559
7-8pm	0	186	99	1	6	1	0	8	57	2	3	0	14	92	8	377
8-9pm	0	147	97	0	1	1	0	8	34	5	1	1	16	67	5	311
9-10pm	3	115	65	0	2	1	0	2	35	3	0	0	15	58	6	241
10-11pm	3	65	43	2	0	3	0	0	19	4	0	4	15	47	6	158
11-12pm	0	30	22	0	0	0	0	4	18	1	0	3	11	37	4	89
Total #:	**41**	**4,923**	**3,356**	**88**	**142**	**58**	**3**	**162**	**901**	**96**	**29**	**33**	**349**	**1,861**	**92**	**10,181**
Total %:	**0.40%**	**48.35%**	**32.96%**	**0.86%**	**1.39%**	**0.57%**	**0.03%**	**1.59%**	**8.85%**	**0.94%**	**0.28%**	**0.32%**	**3.43%**	**18.28%**	**0.90%**	
Avg:	**1.71**	**205.13**	**139.83**	**3.67**	**5.92**	**2.42**	**0.13**	**6.75**	**37.54**	**4.00**	**1.21**	**1.38**	**14.54**	**77.54**	**3.83**	

Lane numbers increase towards the center of the road, where lane 1 is the curb.
For example: on a 3 lane road, lane 1 is the curb, lane 2 the middle lane,
and lane 3 the closest to the median strip.

Montana Department Of Transportation

Volume by Class - by Hour for 1/1/2017 - 12/31/2017

District:		**Station:** 22-2-007_NB	**Route:**	**ADT:**	1623
County: JEFFERSON		**Roadbed:** ML	**Located On:** INTERSTATE 15	**# Of Days:**	3
City: -		**Collection Type:** Class	**Frequency:** ANNUAL OR MULTI-YEAR	**Lane Dir:** NB	

					Single Unit Trucks			Single Trailer Truck			Multi-Trailer Trucks					
Hour	**M-cycle**	**Car**	**Pickup**	**Bus**	**SU 2A-6T**	**SU 3 Axles**	**SU 4+Axles**	**STT 3-4 Axles**	**STT 5 Axles**	**STT 6+ Axles**	**MTT 5 Axles**	**MTT 6 Axles**	**MTT 7+ Axles**	**Total Trks**	**Unclassified**	**Total**
12-1am	0	15	8	0	2	0	0	0	5	0	0	1	5	13	0	36
1-2am	1	14	5	0	1	1	0	0	8	0	0	0	2	12	1	32
2-3am	0	8	3	0	0	1	0	1	3	0	0	0	2	7	0	18
3-4am	0	6	4	0	2	1	0	2	3	0	0	3	4	15	0	25
4-5am	0	8	5	0	2	1	0	1	4	0	0	1	3	12	0	25
5-6am	0	27	12	0	1	0	0	2	6	0	0	0	1	10	1	49
6-7am	0	66	45	0	0	0	0	0	7	0	0	0	6	13	1	124
7-8am	1	136	74	2	4	1	0	2	10	3	1	3	4	30	1	241
8-9am	1	148	105	4	3	4	0	4	26	3	0	1	10	55	0	309
9-10am	2	140	95	4	10	2	0	1	27	1	1	0	11	57	2	294
10-11am	1	151	91	5	2	3	1	1	22	1	0	0	5	40	2	283
11-12am	2	160	91	2	2	1	0	6	20	1	0	0	8	40	0	293
12-1pm	1	155	103	6	6	5	0	2	40	4	0	0	11	74	1	333
1-2pm	3	181	95	2	3	4	0	5	34	7	1	1	11	68	2	347
2-3pm	0	184	99	2	3	2	0	2	37	3	1	1	11	62	0	345
3-4pm	0	207	94	7	2	0	0	4	33	2	0	0	7	55	1	356
4-5pm	0	277	105	4	3	2	0	4	30	2	1	1	6	53	0	435
5-6pm	0	244	103	5	4	0	0	3	30	2	2	0	12	58	3	405
6-7pm	2	152	82	0	1	1	1	3	28	1	3	0	5	43	1	279
7-8pm	0	111	40	0	4	1	0	3	23	2	3	0	4	40	0	191
8-9pm	0	100	38	0	0	1	0	3	24	0	1	1	12	42	0	180
9-10pm	2	62	28	0	1	1	0	1	19	1	0	0	5	28	0	120
10-11pm	0	41	21	0	0	0	0	0	13	1	0	4	7	25	0	87
11-12pm	0	18	10	0	0	0	0	2	4	0	0	2	9	17	1	45
Total #:	**16**	**2,611**	**1,356**	**43**	**56**	**32**	**2**	**52**	**456**	**34**	**14**	**19**	**161**	**869**	**17**	**4,852**
Total %:	**0.33%**	**53.81%**	**27.95%**	**0.89%**	**1.15%**	**0.66%**	**0.04%**	**1.07%**	**9.40%**	**0.70%**	**0.29%**	**0.39%**	**3.32%**	**17.91%**	**0.35%**	
Avg:	**0.67**	**108.79**	**56.50**	**1.79**	**2.33**	**1.33**	**0.08**	**2.17**	**19.00**	**1.42**	**0.58**	**0.79**	**6.71**	**36.21**	**0.71**	

Lane numbers increase towards the center of the road, where lane 1 is the curb.
For example: on a 3 lane road, lane 1 is the curb, lane 2 the middle lane,
and lane 3 the closest to the median strip.

Montana Department Of Transportation

Volume by Class - by Hour for 1/1/2017 - 12/31/2017

District:

Station: 22-2-007_SB

Route:

ADT: 1801

County: JEFFERSON

Roadbed: ML

Located On: INTERSTATE 15

 # Of Days: 3

City: -

Collection Type: Class

Frequency: ANNUAL OR MULTI-YEAR

Lane Dir: SB

					Single Unit Trucks			Single Trailer Truck			Multi-Trailer Trucks					
Hour	**M-cycle**	**Car**	**Pickup**	**Bus**	**SU 2A-6T**	**SU 3 Axles**	**SU 4+Axles**	**STT 3-4 Axles**	**STT 5 Axles**	**STT 6+ Axles**	**MTT 5 Axles**	**MTT 6 Axles**	**MTT 7+ Axles**	**Total Trks**	**Unclassified**	**Total**
12-1am	0	6	10	0	0	0	0	0	5	0	0	0	6	11	2	27
1-2am	0	14	5	3	0	0	0	0	2	0	0	2	3	10	0	29
2-3am	0	7	2	1	0	0	0	0	12	2	0	2	3	20	1	29
3-4am	0	4	6	0	0	0	0	0	7	0	1	0	1	9	1	19
4-5am	0	5	2	2	1	0	0	3	14	1	0	2	13	36	1	43
5-6am	0	36	26	0	0	1	0	2	17	1	0	1	11	33	4	95
6-7am	1	95	61	1	8	0	0	4	20	2	0	0	5	40	2	197
7-8am	0	177	107	3	3	0	0	7	13	4	1	1	5	37	3	321
8-9am	2	146	129	2	4	1	0	4	19	1	4	1	10	46	6	323
9-10am	0	146	142	4	3	0	0	4	22	1	4	0	4	42	6	330
10-11am	2	134	139	3	7	2	0	8	26	0	0	0	8	54	3	329
11-12am	2	166	133	5	9	2	1	9	23	3	1	1	8	62	2	363
12-1pm	1	144	150	2	10	0	0	14	38	6	3	1	10	84	0	379
1-2pm	1	190	156	4	10	3	0	7	20	4	0	1	10	59	1	406
2-3pm	4	174	153	4	3	5	0	9	22	6	0	0	10	59	5	390
3-4pm	1	207	149	2	4	2	0	8	29	8	0	1	15	69	3	426
4-5pm	2	166	190	4	11	3	0	8	25	3	1	0	9	64	2	422
5-6pm	1	164	146	2	5	2	0	3	25	5	0	0	15	57	1	368
6-7pm	4	120	105	0	4	2	0	7	26	4	0	0	8	51	4	280
7-8pm	0	75	59	1	2	0	0	5	34	0	0	0	10	52	8	186
8-9pm	0	47	59	0	1	0	0	5	10	5	0	0	4	25	5	131
9-10pm	1	53	37	0	1	0	0	1	16	2	0	0	10	30	6	121
10-11pm	3	24	22	2	0	3	0	0	6	3	0	0	8	22	6	71
11-12pm	0	12	12	0	0	0	0	2	14	1	0	1	2	20	3	44
Total #:	**25**	**2,312**	**2,000**	**45**	**86**	**26**	**1**	**110**	**445**	**62**	**15**	**14**	**188**	**992**	**75**	**5,329**
Total %:	**0.47%**	**43.39%**	**37.53%**	**0.84%**	**1.61%**	**0.49%**	**0.02%**	**2.06%**	**8.35%**	**1.16%**	**0.28%**	**0.26%**	**3.53%**	**18.62%**	**1.41%**	
Avg:	**1.04**	**96.33**	**83.33**	**1.88**	**3.58**	**1.08**	**0.04**	**4.58**	**18.54**	**2.58**	**0.63**	**0.58**	**7.83**	**41.33**	**3.13**	

Lane numbers increase towards the center of the road, where lane 1 is the curb.
For example: on a 3 lane road, lane 1 is the curb, lane 2 the middle lane,
and lane 3 the closest to the median strip.

Appendix C: Water Right, Well Log Reports, and SWDAR

Jefferson City
Safety Rest Area Study

STATE OF MONTANA

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

1424 9TH AVENUE P.O.BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41I 30128693 GROUND WATER CERTIFICATE

Version: 1 -- ORIGINAL RIGHT

Version Status: ACTIVE

Owners:
MONTANA, STATE OF DEPT OF TRANSPORTATION
ATTN: ENVIRONMENTAL SERVICES
2701 PROSPECT AVE
HELENA, MT 59601-9746

Priority Date: JUNE 26, 2019 at 10:42 A.M.

Enforceable Priority Date: JUNE 26, 2019 at 10:42 A.M.

Purpose (use): OTHER PURPOSE

Maximum Flow Rate: 30.00 GPM

Maximum Volume: 2.25 AC-FT

Source Name: GROUNDWATER

Source Type: GROUNDWATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		SWNWNE	32	8N	3W	JEFFERSON

Period of Diversion: APRIL 1 TO NOVEMBER 30 **Flow Rate:** 30.00 GPM

Diversion Means: WELL

Well Depth: 66.00 FEET

Purpose (Use): OTHER PURPOSE **Purpose Clarification:** REST AREA

Volume: 2.25 AC-FT

Period of Use: APRIL 1 to NOVEMBER 30

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			SWNWNE	32	8N	3W	JEFFERSON

THE PLACE OF USE IS THE NORTHBOUND REST AREA OFF I-15 1 MILE NORTH OF JEFFERSON CITY.

STATE OF MONTANA
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
1424 9TH AVENUE P.O.BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41I 96195-00 GROUND WATER CERTIFICATE
Version: 1 -- ORIGINAL RIGHT
Version Status: ACTIVE

Owners:
MONTANA, STATE OF DEPT OF TRANSPORTATION
REAL ESTATE SERVICES SECTION
PO BOX 201001
HELENA, MT 59620-1001

Priority Date: OCTOBER 18, 1995 at 12:30 P.M.

Enforceable Priority Date: OCTOBER 18, 1995 at 12:30 P.M.

Purpose (use): INSTITUTIONAL
LAWN AND GARDEN

Maximum Flow Rate: 35.00 GPM

Maximum Volume: 5.52 AC-FT

Maximum Acres: 2.00

Source Name: GROUNDWATER

Source Type: GROUNDWATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		NENE	29	8N	4W	JEFFERSON

Period of Diversion: MAY 1 TO OCTOBER 15
Diversion Means: WELL
Well Depth: 245.00 FEET
Static Water Level: 40.00 FEET
Casing Diameter: 4.63 INCHES
Pump Size: 2.00 HP

Purpose (Use): INSTITUTIONAL **Purpose Clarification:** REST AREA

Volume: 0.52 AC-FT

Period of Use: MAY 1 to OCTOBER 15

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			NENE	29	8N	4W	JEFFERSON

Purpose (Use): LAWN AND GARDEN

Volume: 5.00 AC-FT

Period of Use: MAY 1 to OCTOBER 15

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1	2.00		NENE	29	8N	4W	JEFFERSON
Total:	2.00						

SOUTH JEFFERSON CITY REST AREA -- I-15

NA

FILE

GROUND WATER CERTIFICATE

*41I *

96195

00

Current File Location: **NEW STORAGE**
As of : **1/1/1999**

Status: **IN**

Box Bar Code: **94427**

File Bar Code: **90708**

9/15/2014

FORM NO. 604 R5/93

STATE OF MONTANA
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
1520 EAST SIXTH AVENUE P.O. BOX 202301 HELENA, MONTANA 59620-2301

Certificate of Water Right

UPON FINDING THE REQUIREMENTS OF SECTION 85-2-301 MCA HAVE BEEN MET, THIS CERTIFICATE OF WATER RIGHT IS ISSUED TO:

MONTANA, STATE OF DEPT OF TRANSPORTATION
PO BOX 3068
BUTTE MT 59702

CERTIFICATE OF WATER RIGHT NUMBER: 96195-411

PRIORITY DATE: OCTOBER 18, 1995 AT 12:30 P.M.

SOURCE: GROUNDWATER

DIVERSION: MEANS: WELL

PERIOD OF DIVERSION: 05/01-10/15
NENE SEC. 29 TWP. 08N RGE. 04W JEFFERSON CO

TOTAL FLOW RATE: 35.00 GPM

TOTAL VOLUME: 5.52 ACRE FEET PER YEAR

USE: 35.00 GPM UP TO 5.00 AC-FT (05/01-10/15)
FOR LAWN AND GARDEN ON 2.00 ACRES

UP TO .52 AC-FT (05/01-10/15)
FOR REST AREA

PLACE OF USE: NENE SEC. 29 TWP. 08N RGE. 04W JEFFERSON CO
FOR LAWN AND GARDEN ON 2.00 ACRES

NENE SEC. 29 TWP. 08N RGE. 04W JEFFERSON CO
FOR REST AREA

SOUTH JEFFERSON CITY REST AREA -- I-15

** PRIOR RIGHTS:
THIS CERTIFICATE IS ISSUED SUBJECT TO ALL PRIOR EXISTING WATER RIGHTS IN THE SOURCE OF SUPPLY.

** BACKFLOW PREVENTOR:
PURSUANT TO SECTION 85-2-505, MCA, TO PREVENT GROUNDWATER CONTAMINATION, AN OPERATIONAL BACK FLOW PREVENTOR MUST BE INSTALLED AND MAINTAINED BY THE APPROPRIATOR IF A CHEMICAL OR FERTILIZER DISTRIBUTION SYSTEM IS CONNECTED TO THE WELL.

FAILURE TO COMPLY WITH ANY TERMS AND CONDITIONS HEREIN MAY RESULT IN THE LOSS OF THE WATER RIGHT GRANTED BY THIS CERTIFICATE.

** TRANSFER OF OWNERSHIP:
UPON A CHANGE IN OWNERSHIP OF ALL OR ANY PORTION OF THIS CERTIFICATE, THE PARTIES TO THE TRANSFER SHALL FILE WITH THE DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION A WATER RIGHT TRANSFER CERTIFICATE, FORM 608, PURSUANT TO SECTION 85-2-424, MCA.

WITNESS PROGRAM ASSISTANT

DATE: MARCH 28, 1996 WATER RIGHTS BUREAU, WATER RESOURCES DIVISION

FILMED

Form No. 602 R 1-95

NOTICE OF COMPLETION OF GROUNDWATER DEVELOPMENT

For groundwater developments with a maximum use of 35 GPM not to exceed 10 AC-FT per year.

GROUNDWATER IS DEFINED AS ANY WATER BENEATH THE GROUND SURFACE
(Use Form 600, Application for Beneficial Water Use Permit for appropriations in excess of 35 GPM or 10 AC-FT per year.)

IMPORTANT

State law requires this form be filed by the appropriator within 60 days after the water has been put to use. Your priority is determined by the date of filing.

WORK COPY

Complete the notice and attach an aerial photo, survey, or other map showing the location of your development. Submit it with the $25.00 filing fee, payable to DNRC, to the appropriate Water Resources Regional Office. This form will be returned if any of the pertinent information is incomplete or incorrect.

RECEIVED
OCT 1 8 1995
DNRC

FOR DEPARTMENT USE ONLY
Notice No. 96195 Basin 41I
Priority Date 10-18-95
Time 12:30 AM/PM
Rec'd By [illegible]
Fee Rec'd $ ~~0~~ 25.00
Check No.
Transmittal No. NWT
Refund $ ______ Date ______

(Please type or print in ink.)

1. **NAME** Montana Dept of Transportation
   MAILING ADDRESS PO Box 3068
   CITY Butte **STATE** Mt **ZIP** 59702
   HOME PHONE 494-3224 **OTHER PHONE** ______
2. **SOURCE OF GROUNDWATER SUPPLY** [X] Well [ ] Developed Spring (Excavation performed at spring location) [ ] Pit
3. **ACTUAL PUMPING RATE** 35 GPM Pump: HP Rating 2 hp Installation Depth 245 Ft.
4. **DATE WATER PUT TO BENEFICIAL USE** (Water must be used prior to this filing) 9 30 95 Month / Day / Year
5. **DOES THIS WELL REPLACE AN EXISTING WELL ?** Yes [X] No [ ]
   Old Well Depth 66 Ft. Old Well GPM 30 Date Old Well Drilled or Dug 1971 Month / Day / Year
6. **WILL THIS DEVELOPMENT** be manifold with another well or spring ? Yes [ ] No [X] different aquifer 2/2/96 pn
   If yes, list the water right numbers and explain how they are used. the existing well was abandoned
   Corp
7. **POINT OF DIVERSION** Describe the location to the nearest 10 acres (i.e.: to the 1/4 1/4 1/4). Legal land descriptions may be obtained from your county records.
   NE 1/4 ~~[illegible]~~ 1/4 NE 1/4 Section 29 Twp 8 N/S Rge 4 E/W County Jefferson
   Lot ______ Block ______ Tract No. ______ Subdivision Name So Jefferson City Restarea I-15
   Government Lot X
8. **PURPOSE AND PLACE OF USE**
   Purpose of Use Public Water Supply If same as Point of Diversion, Check [ ]
   NE 1/4 NE 1/4 ____ 1/4 Section 29 Twp 8N N/S Rge 4 E/W County Jefferson
   Lot ______ Block ______ Tract No. ______ Subdivision Name ______
   Government Lot X

   Purpose of Use ______ If same as Point of Diversion, Check [ ]
   ____ 1/4 ____ 1/4 ____ 1/4 Section ____ Twp ____ N/S Rge ____ E/W County ______
   Lot ______ Block ______ Tract No. ______ Subdivision Name ______
   Government Lot ______

MONTANA DEPARTMENT OF NATURAL RESOURCES &CONSERVATION
1520 EAST SIXTH AVENUE P.O. BOX 202301 HELENA, MONTANA 59620 - 2301 444-6610

DNRC
FILMED

9. PURPOSE AND PERIOD OF USE

DOMESTIC	Number of Households Currently Using Water From This Development ______ Year-round Use? Yes ☐ No ☒ If no, From ______ (Month / Day) to ______ (Month / Day), Inclusive of Each Year. *If lawn and / or garden exceeds 1/4 acre, list total size below*
LAWN AND/ OR GARDEN	Total Size of Lawn and / or Garden 2 Acres (Acres) (Length x Width ÷ 43560 = Acres) Period of Use: From 05/1 (Month / Day) to 10/15 (Month / Day), Inclusive of Each Year.
STOCK	Number and Type ______ Year-round Use? Yes ☐ No ☐ If no, From ______ (Month / Day) to ______ (Month / Day), Inclusive of Each Year.
IRRIGATION (Other Than Lawn And Garden)	Shelterbelt or Type of Crop ~~lawn~~ Total Acres Irrigated ______ Period of Use: From ~~05/1~~ (Month / Day) to ~~10/15~~ (Month / Day), Inclusive of Each Year.
OTHER	Describe the Purpose of Use Public water supply for Rest Area Amount of Water Used 1000 gallons Gallons Per Day Year-round Use? Yes ☐ No ☒ If no, From 05/1 (Month / Day) to 10/15 (Month / Day), Inclusive of Each Year.

Acc 4C 2/27/96 .52 AF

10. REMARKS (Use this space for additional information.)

______

______

11. AFFIDAVIT OF OWNERSHIP OR WRITTEN CONSENT

I certify the statements appearing here are to the best of my knowledge true and correct. I also certify I have possessory interest in the property where the water is to be put to beneficial use and exclusive property rights in the groundwater development or the written consent of the person with those rights.

Appropriator's Signature X Kevin L. Brewer Date: 10/16/95

______ Date: ______

Subscribed and sworn before me this 16th day of October, 1995

Notary's Signature John M Giles

Notary for the State of Montana

Residing at Butte Montana

My commission expires March 2 1998

WORK COPY

SEAL HERE

WATER RESOURCES REGIONAL OFFICES

Billings
1537 Avenue D, Suite 121
Billings, MT 59102
Phone: 657-2105
Fax: 245-2094
Serving: Big Horn, Carbon, Carter, Custer, Fallon, Powder River, Prairie, Rosebud, Stillwater, Sweetgrass, Treasure, and Yellowstone Counties

Bozeman
601 Nickles Suite 2
Bozeman, MT 59715
Phone: 586-3136 or 586-3137
Serving: Gallatin, Madison, and Park Counties

Glasgow
839 First Avenue South
P.O. Box 1269
Glasgow, MT 59230
Phone: 228-2561
Fax: 228-8706
Serving: Daniels, Dawson, Garfield, McCone, Phillips, Richland, Roosevelt, Sheridan, Valley and, Wibaux Counties

Havre
1708 West Second Street
P.O. Box 1828
Havre, MT 59501
Phone: 265-5516 or 265-2225
Fax: 265-2225
Serving: Blaine, Chouteau, Glacier, Hill, Liberty, Pondera, Teton, and Toole Counties

Helena
1520 East Sixth Avenue
P.O. Box 202301
Helena, MT. 59620-2301
Phone: 444-6695
Fax: 444-0533
Serving: Beaverhead, Broadwater, Deer Lodge, Jefferson, Lewis and Clark, Powell, and Silver Bow Counties

Kalispell
3220 Highway 93 South
P.O. Box 860
Kalispell, MT 59903-0860
Phone: 752-2288
Serving: Flathead, Lake, Lincoln, and Sanders Counties

Lewistown
311 West Janeaux
P.O. Box 438
Lewistown, MT 59457
Phone: 538-7459 or 538-7012
Serving: Cascade, Fergus, Golden Valley, Judith Basin, Meagher, Musselshell, Petroleum, and Wheatland Counties

Missoula
Town & Country Shopping Center
1610 South 3rd Street West, Suite 103
P.O. Box 5004
Missoula, MT 59806
Phone: 721-4284
Serving: Granite, Mineral, Missoula, and Ravalli Counties

For Mailing, Use Post Office Box Number

Form No. 602 R 1-95

NOTICE OF COMPLETION OF GROUNDWATER DEVELOPMENT

For groundwater developments with a maximum use of 35 GPM not to exceed 10 AC-FT per year.

GROUNDWATER IS DEFINED AS ANY WATER BENEATH THE GROUND SURFACE
(Use Form 600, Application for Beneficial Water Use Permit for appropriations in excess of 35 GPM or 10 AC-FT per year.)

IMPORTANT

State law requires this form be filed by the appropriator within 60 days after the water has been put to use. Your priority is determined by the date of filing.

Complete the notice and attach an aerial photo, survey, or other map showing the location of your development. Submit it with the $25.00 filing fee, payable to DNRC, to the appropriate Water Resources Regional Office. This form will be returned if any of the pertinent information is incomplete or incorrect.

RECEIVED
OCT 1 8 1995
DNRC

FOR DEPARTMENT USE ONLY
Notice No. 96195 Basin 41I
Priority Date 10-18-95
Time 12:30 AM / PM
Rec'd By dw
Fee Rec'd $ ~~0~~ 25.00
Check No.
Transmittal No. NWT
Refund $ Date

(Please type or print in ink.)

1. NAME Montana Dept of Transportation
   MAILING ADDRESS PO Box 3068
   CITY Butte STATE Mt ZIP 59702
   HOME PHONE 494-3224 OTHER PHONE
2. SOURCE OF GROUNDWATER SUPPLY ☒ Well ☐ Developed Spring (Excavation performed at spring location) ☐ Pit
3. ACTUAL PUMPING RATE 35 GPM Pump: HP Rating 2 hp Installation Depth 245 Ft.
4. DATE WATER PUT TO BENEFICIAL USE (Water must be used prior to this filing) 9 30 95 (Month / Day / Year)
5. DOES THIS WELL REPLACE AN EXISTING WELL ? Yes ☒ No ☐
   Old Well Depth 66 Ft. Old Well GPM 30 Date Old Well Drilled or Dug 1971 (Month / Day / Year)
6. WILL THIS DEVELOPMENT be manifold with another well or spring ? Yes ☐ No ☒
   If yes, list the water right numbers and explain how they are used. the existing well was abandoned & cap
7. POINT OF DIVERSION Describe the location to the nearest 10 acres (i.e.: to the 1/4 1/4 1/4). Legal land descriptions may be obtained from your county records.
   NE 1/4 NE 1/4 NE 1/4 Section 29 Twp 8 N/S Rge 4 E/W County Jefferson
   Lot Block Tract No. Subdivision Name So Jefferson Cnty Rest area I-15
   Government Lot X
8. PURPOSE AND PLACE OF USE
   Purpose of Use Public Water supply If same as Point of Diversion, Check ☐
   NE 1/4 1/4 1/4 Section 29 Twp 8N N/S Rge 4 E/W County Jefferson
   Lot Block Tract No. Subdivision Name
   Government Lot X
   Purpose of Use If same as Point of Diversion, Check ☐
   1/4 1/4 1/4 Section Twp N/S Rge E/W County
   Lot Block Tract No. Subdivision Name
   Government Lot

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION **DNRC**

1520 EAST SIXTH AVENUE P.O. BOX 202301 HELENA, MONTANA 59620-2301 444-6610

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9. PURPOSE AND PERIOD OF USE

DOMESTIC	Number of Households Currently Using Water From This Development ______ Year-round Use? Yes ☐ No ☒ If no, From ______ (Month / Day) to ______ (Month / Day), Inclusive of Each Year. *If lawn and / or garden exceeds 1/4 acre, list total size below*
LAWN AND/ OR GARDEN	Total Size of Lawn and / or Garden 2 Acres (Acres) (Length x Width ÷ 43560 = Acres) Period of Use: From 05/1 (Month / Day) to 10/15 (Month / Day), Inclusive of Each Year.
STOCK	Number and Type ______ Year-round Use? Yes ☐ No ☐ If no, From ______ (Month / Day) to ______ (Month / Day), Inclusive of Each Year.
IRRIGATION (Other Than Lawn And Garden)	Shelterbelt or Type of Crop lawn Total Acres Irrigated ______ Period of Use: From 05/1 (Month / Day) to 10/15 (Month / Day), Inclusive of Each Year.
OTHER	Describe the Purpose of Use Public water supply for Rest Area Amount of Water Used 1000 gallons Gallons Per Day Year-round Use? Yes ☐ No ☒ If no, From 05/1 (Month / Day) to 10/15 (Month / Day), Inclusive of Each Year.

10. REMARKS (Use this space for additional information.)

11. AFFIDAVIT OF OWNERSHIP OR WRITTEN CONSENT

I certify the statements appearing here are to the best of my knowledge true and correct. I also certify I have possessory interest in the property where the water is to be put to beneficial use and exclusive property rights in the groundwater development or the written consent of the person with those rights.

Appropriator's Signature X Kevin T. Brewer Date: 10/16/95

______ Date: ______

Subscribed and sworn before me this 16th day of October, 1995

PLACE SEAL HERE

Notary's Signature John M Giles

Notary for the State of Montana

Residing at Butte Montana

My commission expires March 2 1998

WATER RESOURCES REGIONAL OFFICES

Billings
1537 Avenue D, Suite 121
Billings, MT 59102
Phone: 657-2105
Fax: 245-2094
Serving: Big Horn, Carbon, Carter, Custer, Fallon, Powder River, Prairie, Rosebud, Stillwater, Sweetgrass, Treasure, and Yellowstone Counties

Bozeman
601 Nickles Suite 2
Bozeman, MT 59715
Phone: 586-3136 or 586-3137
Serving: Gallatin, Madison, and Park Counties

Glasgow
839 First Avenue South
P.O. Box 1269
Glasgow, MT 59230
Phone: 228-2561
Fax: 228-8706
Serving: Daniels, Dawson, Garfield, McCone, Phillips, Richland, Roosevelt, Sheridan, Valley and, Wibaux Counties

Havre
1708 West Second Street
P.O. Box 1828
Havre, MT 59501
Phone: 265-5516 or 265-2225
Fax: 265-2225
Serving: Blaine, Chouteau, Glacier, Hill, Liberty, Pondera, Teton, and Toole Counties

Helena
1520 East Sixth Avenue
P.O. Box 202301
Helena, MT. 59620-2301
Phone: 444-6695
Fax: 444-0533
Serving: Beaverhead, Broadwater, Deer Lodge, Jefferson, Lewis and Clark, Powell, and Silver Bow Counties

Kalispell
3220 Highway 93 South
P.O. Box 860
Kalispell, MT 59903-0860
Phone: 752-2288
Serving: Flathead, Lake, Lincoln, and Sanders Counties

Lewistown
311 West Janeaux
P.O. Box 438
Lewistown, MT 59457
Phone: 538-7459 or 538-7012
Serving: Cascade, Fergus, Golden Valley, Judith Basin, Meagher, Musselshell, Petroleum, and Wheatland Counties

Missoula
Town & Country Shopping Center
1610 South 3rd Street West, Suite 103
P.O. Box 5004
Missoula, MT 59806
Phone: 721-4284
Serving: Granite, Mineral, Missoula, and Ravalli Counties

For Mailing, Use Post Office Box Number

41I-C096195-00

DNRC

WELL LOG REPORT

Domestic Water Wells
Large Irrigation Wells
Pumps - Sales & Service
Monitor Holes
Mineral Exploration

LINDSAY & SON DRILLING

(406) 933-5511
Box 67
Clancy, Montana 59634

1. WELL OWNER:
   Department of Transportation
2. CURRENT MAILING ADDRESS:
   Leon Elbert
   Drawer 9
   Boulder, Mt. 59632

3. WELL LOCATION:
NE 1/4 NE 1/4 SECTION 29
TOWNSHIP: 8N RANGE: 4W

COUNTY: Jefferson

4. PROPOSED USE: Domestic

5. DRILLING METHOD: Air Rotary

6. WELL LOG CONSTRUCTION:
PERFORATIONS: 120 - 245
SCREEN: none
GROUT: Bentonite
GROUT DEPTH: 20 ft.

7. WELL TEST DATA:
   A) TESTING MEANS: Air
   B) STATIC LEVEL: 40
   C) DEPTH OF TEST: 242
   D) GPM: 35
   E) MAXIMUM DRAWDOWN: 238
   F) PUMPING TIME: 2 hours
   G) RECOVERY WATER LEVEL: 40
   H) RECOVERY TIME: 2 hours

8. WELL LOG FORMATION:
   0 - 4 Topsoil
   4 - 30 Boulders and Gravel
   30 - 40 Decomposed Granite
   40 - 45 Broken Granite
   45 - 245 Granite Bedrock

HOLE SIZE	CASING SIZE	FRM-TO
6	6	+2 - 50
6	4 5/8	25 - 245

9. WAS WELL ABANDONED? No

10. DATE COMPLETED: 95/09/01

DRILLER/CONTRACTOR CERTIFICATION:
THIS WELL WAS DRILLED UNDER MY JURISDICTION.
THIS REPORT IS TRUE TO THE BEST OF MY KNOWLEDGE.

Terry Lindsay
Signed License # 253
LINDSAY DRILLING INC.

Lindsay Drilling—
Celebrating 46 years in business!!

DATE: 95/09/01

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION (DNRC)
1520 E. sixth ave. Helena, Mt. 59620-2301 444-6610

FILMED

RECEIVED

OCT 18 1995

DNRC

Payable To: Mt Dept of Natural Resources + Conservation
P.O. Box 202301
1520 E Sixth Ave
Helena, MT 59620-2301

Description: Filing Fee to DNRC Notice of Completion of Groundwater Development

Invoice Number: Well location NE 1/4 NE 1/4 Section 29 Township: 8N Range: 4W Jefferson County

Document No.

Prepared by E. Trudeau Date 10/16/95 Approved by Pat Kenney Date 10/16/95

Cr*		Amount	Rspn. Ctr.	Exp/Rev.	Acct.	Cl.	Project	Agr.	Un.	Wk.	Quantity	Unit	Parcel	SDL	
	1	25.00	032120	2804	4030	–	--	–	–	–	1.00	22			A
	2														B
	3														C
	4														D
	5														E
	6														F
	7														G
	8														H
	9														I
	10														J
	11													RECEIVED	K
	12														L
	13													OCT 18 1995	M
	14													DNRC	N
	15														O

FILMED

I certify that the items listed on this claim have been received.

By ______________________

Date ____________ Title ____________

5/91-JH
Store No.: 3255-0100

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (5/21/2009 3:36:12 PM)

Site Name: JEFFERSON CITY SOUTH REST STOP
GWIC Id: 153901
DNRC Water Right: C096195-00

Section 1: Well Owner(s)

1) MT DEPT OF TRANSPORTATION (MAIL)
PO BOX 3068
BUTTE MT 59701 [06/25/1999]
2) ELBERT, LEON (MAIL)
DRAWER 9
BOULDER MT 59632 [09/01/1995]

Section 2: Location

Township	Range	Section	Quarter Sections
08N	03W	29	SW¼ SW¼ SW¼ NE¼

County	Geocode
JEFFERSON	

Latitude	Longitude	Geomethod	Datum
46.4151	-112.0065	MAP	NAD27

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method: AIR ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Friday, September 01, 1995

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	245	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	50	6				
25	245	4				

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
120	245	4			

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	

Section 7: Well Test Data

Total Depth: 245
Static Water Level: 40
Water Temperature:

Air Test *

35 gpm with drill stem set at _ feet for 2 hours.
Time of recovery 2 hours.
Recovery water level 40 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	4	TOPSOIL
4	30	BOULDERS AND GRAVEL
30	40	DECOMPOSED GRANITE
40	45	BROKEN GRANITE
45	245	GRANTE BEDROCK

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: TERRY LINDSAY
Company: LINDSAY DRILLING CO INC
License No: WWC-253
Date Completed: 9/1/1995

Final Jefferson City Northbound Rest Area
Source Water Delineation and Assessment Report
(PWSID # MT0001952)

June, 2010

Prepared for:

Montana Department of Transportation
Hazardous Waste Section, Environmental Services
2701 Prospect Avenue
Helena, MT 59620-1001

Prepared by:

Camp Dresser & McKee Inc.
50 W 14th Street, Suite 200
Helena, Montana 59601

Contents

Section 1
Introduction and Purpose

This source water delineation and assessment report (SWDAR) for a transient public water supply is intended to meet the technical requirements of the Montana Source Water Protection Program (DEQ, 1999) and the Federal Safe Drinking Water Act (EPA, 1996). CDM prepared this report under contract with the Montana Department of Transportation (MDT).

Public Water Supply:	Jefferson City Rest Area Northbound (PWSID #MT0001952)
Location:	2 miles north of Jefferson City, Montana Interstate 15 Milepost 178 Township 8 North, Range 3 West, Section 32
Report Date:	June, 2010
Contact:	MDT Butte Division P.O. Box 3068 Butte, Montana 59702 406-444-6399

The purpose of this SWDAR is to assess possible threats to the public water supply at the MDT Jefferson City Northbound Rest Area located two miles north of Jefferson City, Montana. Information was obtained from published reports, personnel managing the site, the most recent sanitary survey, and the Montana State Library's Natural Resource Information System (NRIS) website, http://nris.mt.gov/gis. The delineation process identifies source water protection regions on a map that contribute to the drinking water for a specific location by evaluating geologic, hydrogeologic and hydrologic conditions. After identifying the source water protection area, it is assessed to locate and identify areas where contaminants may be generated, stored, or transported and the potential for contamination of drinking water by these sources. According to the instructions for completing a transient public water supply report, microbiological contaminants and nitrate are the only regulated contaminants that are required to be identified (DEQ, 2007).

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Section 2
Public Water Supply Information

The existing water system at this rest area is classified as a transient, non-community public water supply (PWS) because it serves 25 or more persons per day, but the same persons are not regularly served for at least six months a year. MDT collected information for the number of people that use the rest area facilities. Preliminary data showed that approximately 150 transient persons use the rest area per day during operational months from April 15 through November 15. According to SWDAR instructions, the estimated water demand is calculated by assuming 10 gallons of water used per patron per day. This equals an estimated water demand of 1,500 gallons per day (SWDAR, 2007). The estimated volume per day is conservative based on volumes per patron; however this PWS is also used for lawn irrigation. Therefore, based on an estimated flow rate of 20 gpm running for 2 hours per day, the estimated water demand is approximately 3,900 gallons per day.

2.1 Facility Description

The Jefferson City Northbound Rest Area is located in Jefferson County on the east side of Interstate 15 at milepost 178, as shown in Figure 1, within T8N, R3W, Section 32. This seasonal rest area operates from April 15 through November 15. It is shut down in the winter to prevent pipes from freezing and breaking. As shown in Figure 1, the public water supply well is located approximately 20 feet southeast of the bathroom facilities. The onsite septic treatment system is located approximately 300 feet down-gradient of the public water supply well (see Figure 1).

2.2 Public Water Supply System

The rest area water supply well is located approximately 20 feet southeast of the actual rest area station. According to the previous SWDAR, the six inch well was installed in 1971 and cased to 50 feet below ground surface (bgs) with a total depth of approximately 65 feet bgs. Well log and static water level information cannot be found within the Groundwater Information Center (GWIC) database.

Well logs of two nearby wells are included as Attachment A. These well logs include the Jefferson City Southbound Rest Area PWS and a nearby domestic well (see Figure 2). The soils in the Jefferson City Southbound Rest Area well were boulders and gravel at the down to about 30 feet below ground surface (bgs) and then decomposed granite to granite bedrock at 45 feet bgs and the static water level was at 40 feet bgs. The nearby domestic well is located just south of the northbound rest area. This well log indicates that 0-20 feet bgs is mostly gravel and 20-100 feet bgs is granite. The static water level in this well was at 40 feet bgs.

2.3 Public Water Supply Quality

Sample results for the rest area well are included as Attachment B. All nitrate results were below the State maximum contaminant level (MCL) of 10 ppm. This indicates that nitrate is not currently a concern for this well. The data does show that there was a violation in 2000 for total coliforms, but all subsequent samples since 2000 have shown an absence of total coliform.

2.4 Source Water Hydrogeology

The rest area is located in the Prickly Pear Creek drainage (see Figure 2). Spring Creek and Beavertown Creek drainages enter the Prickly Pear Creek drainage approximately 1.4 and 1.8 miles upstream of the rest area, respectively. Although the well log is not available for this rest area, two nearby wells with available lithology information show that the aquifer is unconfined with a static water level at approximately 40 feet below ground surface. According to the wells logs, it appears the aquifer is found in fractured bedrock located below a heavily dredged section of the Prickly Pear Creek drainage. It is assumed that the aquifer is in unconsolidated alluvium or fractured shallow bedrock. Shallow unconfined alluvial aquifers and shallow fractured or carbonate bedrock aquifers are considered to have a high sensitivity to potential contaminant sources located within the inventory region (described in Section 4.2)

Section 3
Delineation

Table 1 from the SWDAR instructions for a transient public water supply (not included herein) was used to determine the water protection regions required for this water supply. Two source water protection regions (control and inventory) are delineated for the Jefferson City Northbound Rest Area. A buffer zone is also delineated for the Jefferson City Northbound Rest Area because this aquifer is unconfined. However, a hydraulic connection with Prickly Pear Creek unlikely exists according to sampling results from October of 2009 and reported in a letter to MDT on November 16, 2009 (Attachment C). The control region is a 100-foot radius around the well and is the most critical area where the introduction of contaminants can occur (see Figure 1). The septic system for this rest area is outside of the control region. However, it is located within the inventory region, which is identified as the area within a 1 mile radius of the PWS (see Figure 2). The buffer zone starts ½ mile downstream from the well along Prickly Pear Creek and extends to the top of the drainage for Prickly Pear Creek, Beavertown Creek, and Spring Creek (see Figure 3).

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Section 4
Inventory

Montana Department of Environmental Quality (DEQ) requires that land uses and all potential sources of nitrates and microbial contaminants be identified within the control region and the inventory region for transient public water supplies (DEQ, 1999).

4.1 Control Region

Figure 1 identifies the 100 foot control region. Potential sources of groundwater contamination within the control region could be from animal (pet) waste near the well head, waste dumping or spills in the parking area, or vandalism.

4.2 Inventory Region

Septic system density is low throughout the majority of the inventory region, although a section of moderate density runs along Interstate 15 through the region (Figure 2). Potential sources of nitrates or microbial contaminants include the onsite septic system at the rest area and discharges from nearby domestic septic systems along the Interstate corridor. The Interstate corridor, frontage road and rest area are other potential sources of contaminates due to spills. Using the Montana Bureau of Mines and Geology (MBMG) dataset from within NRIS, there are two abandoned/inactive mines within the inventory region (see Figure 2 for abandoned mine locations). The dataset provides no further information pertaining to the status of the mines or any risks or hazards they may pose. The NRIS database did not list any; underground storage tanks (UST), leaky underground storage tanks (LUST), landfills, Comprehensive Environmental Cleanup Responsibility (CECRA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA), sites within the inventory region. No animal feeding operations are located within the inventory region.

4.3 Buffer Zone

A buffer zone is required when groundwater is under the direct influence of surface water. The most recent microscopic particulate analyses (MPA) analysis (Attachment C) reports that no primary particulates were found in this well indicating there is a disconnect between surface water and groundwater. However, more MPA and hydraulic analysis is likely needed and therefore a buffer zone is delineated for this well. The buffer zone extends up the three creek drainages; Prickly Pear Creek, Beavertown Creek, and Spring Creek. A buffer of ½ mile was established on either side of the creek. This buffer extends to the top of the drainages starting from the rest area. Figure 3 shows the land use within the buffer zone of the Jefferson City Northbound Rest Area as obtained from the NRIS website. Overall, land use for the buffer region consists of evergreen forest, grassland, and shrubland. A transportation corridor exists along Interstate 15.

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Section 5
Susceptibility

Susceptibility to a specific potential contaminant source is determined through a two step process:

1) Assignment of a hazard rating is based on the contaminant source's size and proximity to the well, potential for a spill or release to occur, and potential for wells within the inventory region to act as conduits for contaminants to enter the aquifer; and

2) Identification of barriers that could slow or prevent released contaminants from reaching the public water supply.

According to NRIS, the inventory region is located primarily in a low septic density area. There is a section of moderate septic density (50 to 300 septic systems per square mile) that runs along the Interstate through the inventory region. NRIS also shows two abandoned/inactive mines in the regions. According to Table 6b of the SWDAR instructions (not included herein), moderate density off-site septic systems are assigned a moderate hazard rating. The on-site septic system is a large capacity system within the inventory region and is considered a high hazard.

Septic systems, both onsite and offsite, are the primary source of possible nitrate and bacterial contamination to the Jefferson City Northbound Rest Area public water supply well. The onsite septic system is located approximately 300 feet down-gradient of the public water supply well. The up-gradient location of the PWS, the distance between the PWS and the onsite system, and the fact that the system is routinely maintained, are all considered barriers against potential contamination. Barriers for offsite septic systems include the distance from the PWS to the nearest up-gradient system (>500 feet), and the lot sizes of nearby subdivisions which range from 10 to 20 acres providing adequate onsite treatment for each individual septic system. There are no other known potential sources of pathogens or nitrates such as sewer mains, animal feeding operations, wastewater treatment plants, or waste disposal sites. According to Table 7 of the SWDAR instructions, (not included herein) the susceptibility of contamination for both the onsite and offsite septic system sources is considered to be moderate based on the multiple barriers identified.

Routine compliance monitoring indicates that there is not a source of nitrates that is contaminating this PWS well. There was a violation in 2000 for total coliforms, but sample results since 2000 have been non-detect for total coliform. These results are included in Attachment B.

Other potential sources of contaminats to this PWS well exist from vandalism, pet waste, illegal dumping, and accidental spills. Vandalism is considered to be a deliberate attempt to introduce contaminants directly into this well. Contamination through vandalism results in a high hazard rating since any potential contamination could easily make direct contact with groundwater via the well. However, a covered and locked well head is the barrier to protect against this type of event. Pet waste, mostly from dogs, results in contamination around the wellhead from defecation. Given the infrequency of this event and the depth to groundwater, this source is assigned a moderate susceptibility. Illegal dumping and accidental spills present another potential source of contaminants. The location of the well with respect to the parking area and the depth to groundwater serve as barriers. Routine inspections of this rest area will help to identify potential problems.

According to information found through NRIS, two abandoned mines are found within the inventory region. Heavy metal contamination from acid rock drainage would be a potential low hazard. Given the distance from the mines, this hazard is also considered to be a low susceptibility.

Table 1 on the following page summarizes the hazard ratings and susceptibility for each potential contaminant source.

Table 1. Potential Contaminant Sources for PWSID #MT0001952

Source	Description	Contaminant	Hazard Rating	Barriers	Susceptibility	Management Options
Onsite Septic System	Large capacity septic system located approximately 300 feet northeast of the PWS	Pathogens and Nitrates	High	• Distance from Well • Down-gradient location • Routinely maintained	Moderate	• Continue inspection and maintenance efforts • Properly site replacement areas for septic tank and drainfield • Monitor routine sample results for increasing trends in nitrate/pathogens
Offsite Septic Systems	Systems associated with private lots within subdivisions	Pathogens and Nitrates	Moderate	• Closest up-gradient system >500 feet • Subdivision lot sizes 10 and 20 acres	Moderate	• Be vigilant for any landuse changes • Monitor routine sample results for increasing trends in nitrate/pathogens
Vandalism	Vandalism directed at well to introduce contaminants directly into PWS	Petroleum, solvents, chemicals, etc.	High	• Locked and covered Well	Moderate	• Inspect daily
Pet Waste	Pet defecation at or near wellhead and within control zone	Pathogens and Nitrates	High	• Depth to groundwater	Moderate	• Inspect bi-weekly • Increase signage and warnings
Illegal dumping and accidental spills	Dumping and spills within parking lot	Petroleum, solvents, chemicals, etc	High	• Location of Well with respect to parking area • Depth to groundwater	Moderate	• Inspect daily • Increase signage and warnings
Abandoned or inactive mines	Metals leaching to groundwater from abandoned mine	Heavy metals	Low	• Distance from Well • Size of inactive or abandoned mine	Low	• Keep aware of regional mine cleanups and spills or releases from abandoned mines • Periodic sample for total metals

Section 6
Limitations

Identification of potential contaminant sources is limited to those regulated for this class of PWS and is generally based on readily available information and reports. Unregulated activities or unreported contaminant releases are not being considered in this report. The delineation method utilizes simplifying assumptions that may not fully represent complex groundwater flow systems but is intended to be conservative and protective of public health.

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Section 7
References

Montana Bureau of Mines and Geology (MBMG), GWIC. http://mbmggwic.mtech.edu. September. 2009.

Montana Department of Environmental Quality (DEQ). Source Water Protection Program Guideline Document. Source Water Protection Program. 1999.

Montana Department of Environmental Quality (DEQ). *Instructions for Completing a Source Water Delineation and Assessment Report (SWDAR) and PWS-6 Report for Transient Public Water Supplies*. Source Water Protection. Revised 2007.

Montana Department of Environmental Quality (DEQ). *How to Perform a Nondegradation Analysis for Subsurface Wastewater Treatment Systems (SWTS) Under the Subdivision Review Process.* Public Water and Subdivisions Bureau http://www.deq.mt.gov/wqinfo/Sub/NonDeg%202009/Appendix%20K.jpg. Revised 2009.

Montana Department of Environmental Quality (DEQ). Sanitary Survey of the Jefferson City Rest Stop. 2009.

Montana Natural Resource Information System (NRIS), http://nris.mt.gov/gis. September, 2009.

Tetra Tech. *Jefferson City Northbound Rest Area PWSID#MT0001952 Public Water Supply – Microscopic Particulate Analysis October. November.* 2009.

Tetra Tech EM Inc. *Jefferson City Rest Stop Northbound Source Water Delineation and Assessment Report. July.* 2001.

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Figures

Figure 1. Control Region
Jefferson City Northbound Rest Area

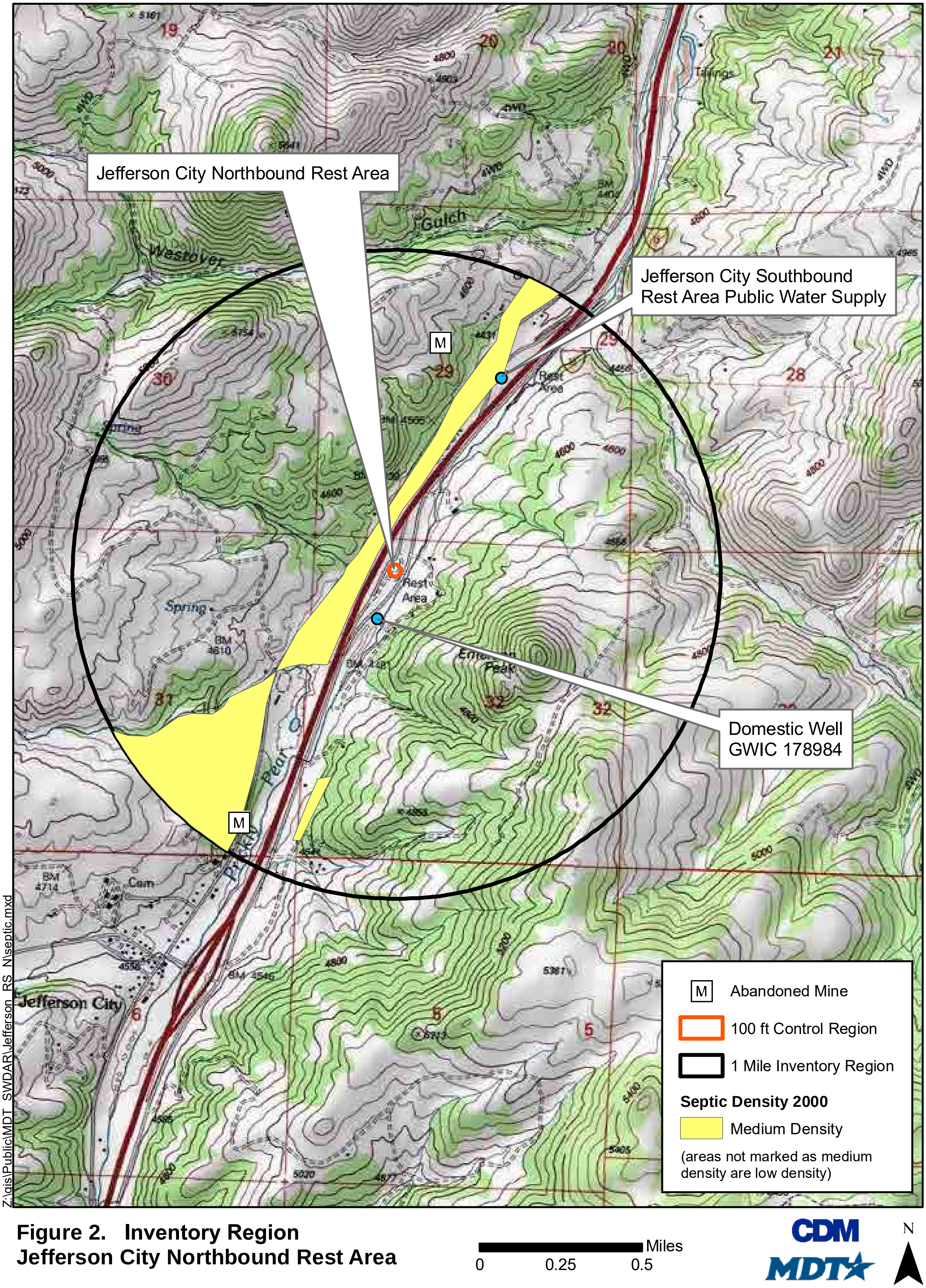
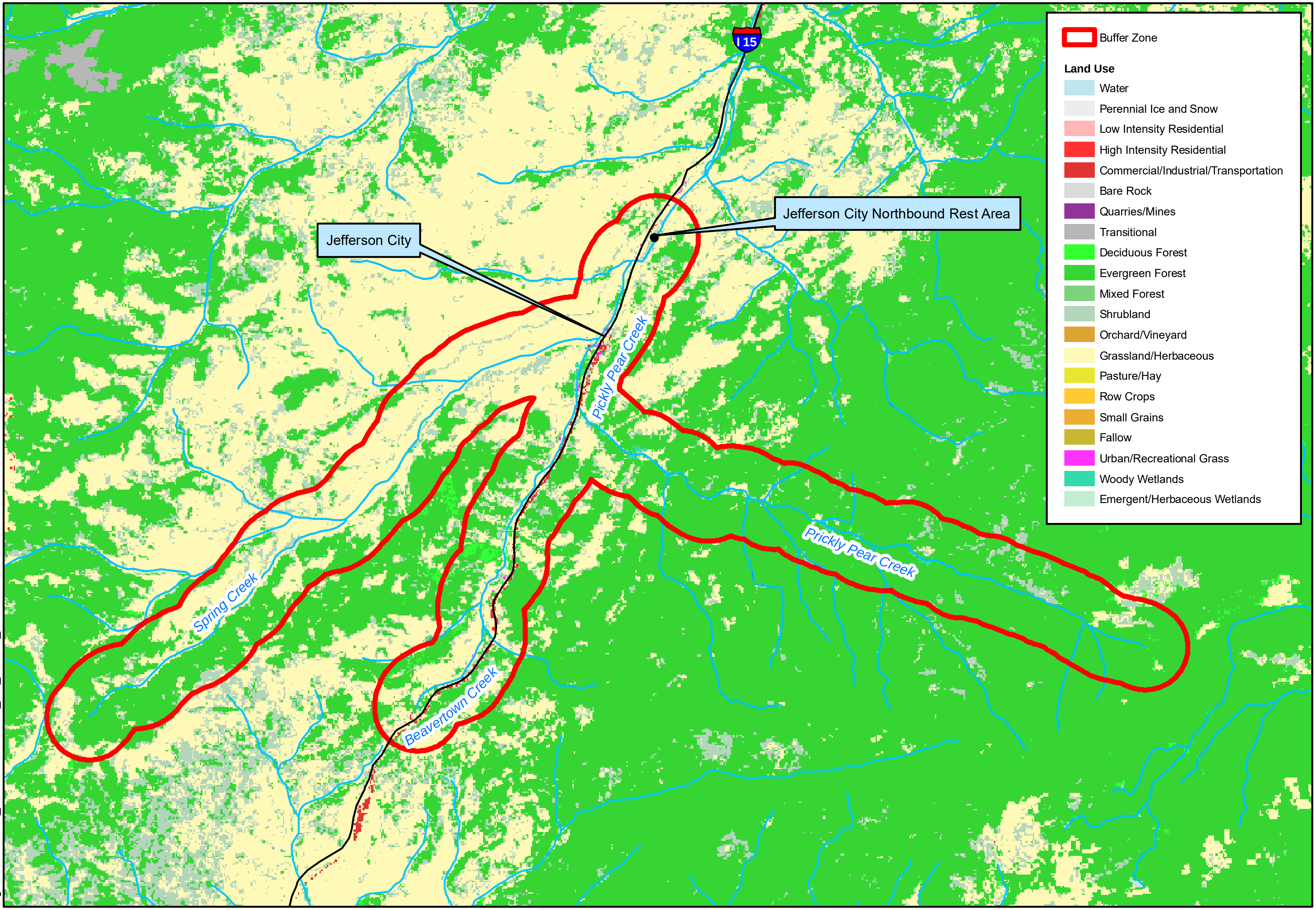


Figure 2. Inventory Region
Jefferson City Northbound Rest Area



Z:\gis\Public\MDT_SWDAR\Jefferson_RS_N\Land_Use.mxd

Figure 3. Land Use
Jefferson City Northbound Rest Area

Miles
0 0.5 1 2 3
N

Attachment A
Jefferson City Northbound Rest Area SWDAR
Nearby Well Logs

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is complied electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View scanned well log (5/21/2009 3:36:12 PM)

Site Name: JEFFERSON CITY SOUTH REST STOP
GWIC Id: 153901
DNRC Water Right: C096195-00

Section 1: Well Owner

Owner Name
MT DEPT OF TRANSPORTATION
Mailing Address
PO BOX 3068

City	State	Zip Code
BUTTE	MT	59701

Section 2: Location

Township	Range	Section	Quarter Sections
08N	03W	29	SW¼ SW¼ SW¼ NE¼

County	Geocode
JEFFERSON	

Latitude	Longitude	Geomethod	Datum
46.4151	112.0065	MAP	NAD27

Altitude	Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: AIR ROTARY

Section 5: Well Completion Date
Date well completed: Friday, September 01, 1995

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	245	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	50	6				
25	245	4				

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
120	245	4			

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	

Section 7: Well Test Data

Total Depth: 245
Static Water Level: 40
Water Temperature:

Air Test *

35 gpm with drill stem set at _ feet for 2 hours.
Time of recovery 2 hours.
Recovery water level 40 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	4	TOPSOIL
4	30	BOULDERS AND GRAVEL
30	40	DECOMPOSED GRANITE
40	45	BROKEN GRANITE
45	245	GRANTE BEDROCK

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	TERRY LINDSAY
Company:	LINDSAY DRILLING CO INC
License No:	WWC-253
Date Completed:	9/1/1995

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is complied electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View scanned well log (5/22/2009 7:51:37 AM)

Site Name: GARY TRAVIS B
GWIC Id: 178984

Section 1: Well Owner

Owner Name
GARY TRAVIS B
Mailing Address
BOX 297

City	State	Zip Code
JEFFERSON CITY	MT	59638

Section 2: Location

Township	Range	Section	Quarter Sections
08N	03W	32	NW¼

County	Geocode
JEFFERSON	

Latitude	Longitude	Geomethod	Datum
46.404172	112.014045	TRS-SEC	NAD83

Altitude	Method	Datum	Date

Addition	Block	Lot
		7

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY

Section 5: Well Completion Date
Date well completed: Tuesday, September 21, 1999

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	20	8
20	100	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	20	6				STEEL
10	100	4				PLASTIC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
60	100	4			SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	

Section 7: Well Test Data

Total Depth: 100
Static Water Level: 40
Water Temperature:

Air Test *

20 gpm with drill stem set at 80 feet for 1.5 hours.
Time of recovery 1 hours.
Recovery water level 40 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	20	TOPSOIL & DECOMPOSED GRAVEL
20	100	GRAY GRANITE

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	RICK L. MURRAY
Company:	MURRAYS WELL SERVICE
License No:	WWC-351
Date Completed:	9/21/1999

Attachment B
Jefferson City Northbound Rest Area SWDAR
Sampling Results

Montana Department of
ENVIRONMENTAL QUALITY
Data Source: Public Water Supply Section

Public Water Supply System

Return to PWS Query

Return to PWS Reports

PWSID: MT0001952 Name: JEFFERSON CITY NORTH REST STOP

City: JEFFERSON CITY **County:** JEFFERSON **Tot Pop:** 100

Pri Src: GW **Class:** NC **Last Snty Srv Dt:** 04/22/2009 **Activity Status:** A

Type	Conn's	In Srvc Dts	Eff Begin Dt	Avg Daily Cnt	Type
CM	1	6/1-11/30	04/22/2009	100	T

Bacti Results

FROM 01/01/2000 TO 09/28/2009

Collection D	Lab Numbe	Type	Orig Lab	Code		TCR Presenc		Fec/EC Result
07/14/2009	W0907-2785	RT		3014	COLIFORM, E. COLI	A		-
07/14/2009	W0907-2785	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/13/2009	W0904-1349	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/13/2009	W0904-1349	RT		3014	COLIFORM, E. COLI	A		-
10/07/2008	W0810-4092	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/15/2008	W0807-2722	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/14/2008	W0804-1384	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/11/2007	W0710-4302	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/16/2007	W0707-2840	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/17/2007	W0704-1480	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/12/2006	W0610-4286	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/13/2006	W0607-2847	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/14/2006	W0604-1454	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/07/2005	W0510-4264	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/11/2005	W0507-2686	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/12/2005	W0504-1391	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/06/2004	W0410-4575	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/01/2004	W0407-2889	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/08/2004	W0404-1482	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/01/2003	W0310-5292	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/01/2003	W0307-3252	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/10/2003	W0304-1789	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/04/2002	W0210-5710	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/01/2002	W0207-3353	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/12/2002	W0204-1876	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/02/2001	W0110-05600	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/12/2001	W0107-03815	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/06/2001	W0104-01768	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/06/2000	W0010-06790	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/03/2000	W0007-04248	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/06/2000	W0004-02146	RT		3100	COLIFORM, TOTAL (TCR)	A	-	

PWSID: MT0001952 Name: JEFFERSON CITY NORTH REST STOP

City: JEFFERSON CITY **County:** JEFFERSON **Tot Pop:** 100

Pri Src: GW **Class:** NC **Last Snty Srv Dt:** 04/22/2009 **Activity Status:** A

Type	Conn's	In Srvc Dts	Eff Begin Dt	Avg Daily Cnt	Type
CM	1	6/1-11/30	04/22/2009	100	T

Nitrate Results

FROM 01/01/2000 TO 09/28/2009

Fac ID: WL002 **Fac Name:** WELL 1 **Avl:** S **Status:** A **Src:** GW

Smp Pt ID: EP502 **Status:** A **Description:** EP FOR WELL 1 **Src Typ** RW

Analyte/CAS No	Code	Analyte Name	Type	Collection D	Lab	Sample Numbe	Result	
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/13/2009	01	C0904-0797	0.37	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/14/2008	01	C0804-0937	0.29	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/17/2007	01	C0704-1168	0.33	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/14/2006	01	C0604-1030	0.46	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/12/2005	01	C0504-0989	0.39	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/08/2004	01	C0404-0869	0.36	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/11/2003	01	C0304-1082	0.39	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	02/12/2002	01	C0204-1230-N502	0.456	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/06/2001	MIG	C0104-0977-I502	0.387	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/06/2000	MIG	C0004-0863-I502	0.24	MG/L

Montana Department of
ENVIRONMENTAL QUALITY
Data Source: Public Water Supply Section

Public Water Supply System

Return to PWS Query

Return to PWS Reports

PWSID: **MT0001952 Name: JEFFERSON CITY NORTH REST STOP**

City: JEFFERSON CITY **County:** JEFFERSON **Tot Pop:**100

Pri Src: GW **Class:** NC **Last Snty Srv Dt:** 04/22/2009 **Activity Status:** A

Type	Conn's	In Srvc Dts	Eff Begin Dt	Avg Daily Cnt	Type
CM	1	6/1-11/30	04/22/2009	100	T

Administrative Contact
MT DEPT OF TRANSPORTATION 59702

Financial Contact
MT DEPT OF TRANSPORTATION 59632

Owner
MT DEPT OF TRANSPORTATION 59632

Facilities and Entry Points

Status: A 10/05/2000 **Fac ID** DS001 DISTRIBUTION SYSTEM **Src:** GW
Lat/Long Dec: **DMS:**

Smp Pt ID	Status	Description
SP001	A 10/05/2000	SP FOR DS

Status: A 10/05/2000 **Fac ID** PC001 PRESSURE CONTROL **Src:** GW
Lat/Long Dec: **DMS:**

Status: A 10/05/2000 **Fac ID** WL002 WELL 1 **Src:** GW
Lat/Long Dec: **DMS:**

Smp Pt ID	Status	Description
EP502	A 10/05/2000	EP FOR WELL 1

Sample Schedules/Monitoring Requirements

Fac ID: DS001 **Fac Name:** DISTRIBUTION SYSTEM **Status:** A **Src:**GW

Smp Pt I	Active	Smp Pt Descriptio
SP001	A	SP FOR DS

Group	Name	Schd Beg Dat	Seas Coll Pe	Requiremen
3100	COLIFORM, TOTAL (TCR)	06/01/2002	6/1-11/30	1 RT QT

Fac ID: WL002 **Fac Name:** WELL 1 **Status:** A **Src:** GW

Smp Pt I	Active	Smp Pt Descriptio
EP502	A	EP FOR WELL 1

Group	Name	Schd Beg Dat	Init MP Be	Seas Coll Pe	Requiremen
NITR	CDS NITRATE NITRITE	01/01/2000	01/01/2000	1/1-12/31	1 RT YR

PWSID: **MT0001952** **Name: JEFFERSON CITY NORTH REST STOP** **(continued)**

Bacti Results

FROM 01/01/2000 TO 09/28/2009

Collection D	Lab Numbe	Type	Orig Lab	Code		TCR Presenc		Fec/EC Result
07/14/2009	W0907-2785	RT		3014	COLIFORM, E. COLI	A		-
07/14/2009	W0907-2785	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/13/2009	W0904-1349	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/13/2009	W0904-1349	RT		3014	COLIFORM, E. COLI	A		-
10/07/2008	W0810-4092	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/15/2008	W0807-2722	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/14/2008	W0804-1384	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/11/2007	W0710-4302	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/16/2007	W0707-2840	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/17/2007	W0704-1480	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/12/2006	W0610-4286	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/13/2006	W0607-2847	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/14/2006	W0604-1454	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/07/2005	W0510-4264	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/11/2005	W0507-2686	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/12/2005	W0504-1391	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/06/2004	W0410-4575	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/01/2004	W0407-2889	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/08/2004	W0404-1482	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/01/2003	W0310-5292	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/01/2003	W0307-3252	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/10/2003	W0304-1789	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/04/2002	W0210-5710	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/01/2002	W0207-3353	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/12/2002	W0204-1876	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/02/2001	W0110-05600	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/12/2001	W0107-03815	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/06/2001	W0104-01768	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
10/06/2000	W0010-06790	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
07/03/2000	W0007-04248	RT		3100	COLIFORM, TOTAL (TCR)	A	-	
04/06/2000	W0004-02146	RT		3100	COLIFORM, TOTAL (TCR)	A	-	

Chemical Results

FROM 01/01/2000 TO 09/28/2009

Fac ID: WL002 **Fac Name:** WELL 1 **Avl:**S **Status:** A **Src:** GW

Smp Pt ID: EP502 **Status:** A **Description:** EP FOR WELL 1 **Src Typ** RW

Analyte/CAS No	Code	Analyte Name	Type	Collection D	Lab	Sample Numbe	Result	
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/13/2009	01	C0904-0797	0.37	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/14/2008	01	C0804-0937	0.29	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/17/2007	01	C0704-1168	0.33	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/14/2006	01	C0604-1030	0.46	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/12/2005	01	C0504-0989	0.39	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/08/2004	01	C0404-0869	0.36	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/11/2003	01	C0304-1082	0.39	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	02/12/2002	01	C0204-1230-N502	0.456	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/06/2001	MIG	C0104-0977-I502	0.387	MG/L
IOC	1038	NITRATE+NITRITE (AS N)	RT	04/06/2000	MIG	C0004-0863-I502	0.24	MG/L

Montana Department of ENVIRONMENTAL QUALITY
Data Source: Public Water Supply Section

Public Water Supply System

Return to PWS Query

Return to PWS Reports

PWSID: MT0001952 Name: JEFFERSON CITY NORTH REST STOP **(continued)**

Lead & Copper Sample Summaries **FROM 01/01/1992 TO 09/28/2009**

Period Begin	Period End	Collection End	Type	Period Name	Code	Count	Measure	UoM

Violations & Enforcements **FROM 01/01/2009 TO 09/28/2009**

Viol Date	Comp Beg	Comp End	Fed F	Viol No	Type	Sev	Cate	Code	Name
03/06/2001	11/01/2000	11/30/2000	2001	3	23	MJ	MON	3100	COLIFORM, TOTAL (TCR)
2002	54895	06/10/2002	SOX	ST COMPLIANCE ACHIEVED					
2009	55619	01/07/2009	SOX	ST COMPLIANCE ACHIEVED					
2001	2656	03/09/2001	SIE	ST PUBLIC NOTIF REQUESTED					
2001	2655	03/09/2001	SIA	ST VIOLATION/REMINDER NOTICE					
12/18/2000	06/01/2000	06/30/2000	2001	3	23	MJ	MON	3100	COLIFORM, TOTAL (TCR)
2002	55617	06/26/2002	SOX	ST COMPLIANCE ACHIEVED					
2009	55619	01/07/2009	SOX	ST COMPLIANCE ACHIEVED					
2001	1602	12/21/2000	SIE	ST PUBLIC NOTIF REQUESTED					
2001	1601	12/21/2000	SIA	ST VIOLATION/REMINDER NOTICE					
12/18/2000	09/01/2000	09/30/2000	2001	3	23	MJ	MON	3100	COLIFORM, TOTAL (TCR)
2009	55619	01/07/2009	SOX	ST COMPLIANCE ACHIEVED					
2002	55617	06/26/2002	SOX	ST COMPLIANCE ACHIEVED					
2001	2432	12/21/2000	SIE	ST PUBLIC NOTIF REQUESTED					
2001	2431	12/21/2000	SIA	ST VIOLATION/REMINDER NOTICE					

Attachment C
Jefferson City Northbound Rest Area SWDAR
Public Water Supply – Microscopic Particulate Analysis October Results

TETRA TECH

RECEIVED
NOV 1 8 2009
ENVIRONMENTAL

November 16, 2009

Mr. Stan Sternberg
Montana Department of Transportation
2701 Prospect Avenue
P.O. Box 201001
Helena, Montana 59620-1001

RE: Jefferson City Northbound Rest Area PWSID#MT0001952
Public Water Supply – Microscopic Particulate Analysis October Results
Term Assignment No. 711
Tetra Tech Job # 114-560163.100

Dear Mr. Sternberg:

This letter transmits the results of the Microscopic Particulate Analysis (MPA) sampling conducted by Tetra Tech at the above mentioned facility during October 2009. This work was completed in accordance with Tetra Tech's approved work plan dated October 5, 2009.

BACKGROUND

The Public Water Supply Section of the Montana Department of Environmental Quality (DEQ) reviews Public Water Systems for the potential of groundwater sources to be connected to surface water in a way that would allow disease producing surface water organisms to enter the Public Water System. A letter dated September 14, 2009 from Mr. Jake Kandelin (DEQ) to Montana Department of Transportation (MDT) indicates the Jefferson City Northbound Rest Area Public Water Supply (PWSID#MT0001952) failed a preliminary assessment and requires further investigation. DEQ required conducting an MPA to identify if the rest areas water supply contains microscopic organisms that only occur in surface water. For instance, the presence of Giardia lamb cysts in a groundwater supply indicates that at least a portion of the water has originated from a nearby surface water body and may pose a threat to human health. The purpose of this Term Assignment is to conduct and report results of the required sampling.

This letter presents results of the October 2009 sampling activities.

METHODS

On October 20, 2009, Tetra Tech installed a microscopic particulate filter apparatus which consisted of a pressure regulator, backflow prevention, filter housing, 1 micron filter, and flow meter. The apparatus and filter were provided by the DEQ public water supply section. Upon entering the buildings utility room, the water supply passes through a meter device and pressure tank before being routed to points of use. No water filtration or softeners are installed on the system. The MPA apparatus was

Tetra Tech
303 Irene Street, Helena, MT 59601
Tel 406 443 5210 Fax 406 449 3729 www.tetratech.com

connected to an existing hose bib located just immediately after the supply line enters the building.

A search of the Montana Bureau of Mines GWIC database could not generate a well log for this location. Based on conversations with Mr. Tony Strainer (MDT Maintenance Supervisor), little is known about this well however the well is believed to be completed with a total depth between 50 and 60 feet. No depth to water is known. DEQ sampling protocol requires three casing volumes to be purged prior to initiating sampling. In order to satisfy DEQ protocol, Tetra Tech planned to purge approximately 135 gallons (assumes 55 ft total depth and 25 ft depth to water). However, due to a miscommunication with field staff, only two casing volumes (80 gallons) were purged prior to attaching the MPA sampling apparatus.

Upon completion of flushing, field water quality parameters (turbidity, pH, specific conductivity (SC) and temperature) were measured. Field personnel then installed the filter cartridge and totalizer. The equipment was adjusted to run at 10 psi and 1 gallon per minute (gpm) with the discharge routed to a floor drain with in the utility room. The apparatus remained in place for 24.25 hours with an average flow rate of 0.89 gpm resulting in a total of 1,300 gallons of water filtered. The filter was shipped unpreserved, on ice, and under chain of custody to Energy Laboratories in Casper, Wyoming for MPA.

RESULTS

During the October 2009 sampling event, the USGS stream gauging station (#06061500) located on the Clark Fork River approximately one mile upstream of the Site experienced flows between 49 and 51 cubic feet per second (cfs) indicating the sample was collected during fall low flow conditions. Mr. Tony Strainer (MDT Maintenance Supervisor) indicated the irrigation system has been turned off for the season at the time sampling was completed.

Field water quality parameter measurements for October 20, 2009 were as follows:

	Turbidity (NTU)	pH	SC (µS/cm)	Temp (°C)
Post casing purge	1.0 NTU	7.26	453	13.8
Post sample collection	1.0 NTU	7.17	426	12.7

The laboratory report for the MPA is included as Attachment A. In summary, no primary particulates were identified resulting in a zero total risk factor. Secondary particulates included large amorph debris (too numerous to count), fine amorph debris (too numerous to count), crystal minerals (too numerous to count), 34 nematodes (5.23 per 100 gallons), 3 amoeba (0.46 per 100 gallons), 41 ciliates-flagellates (6.31 per 100 gallons), and suspended minerals. These secondary particulates are likely what contributed to the observed turbidity readings and slight discoloration of the water.

Tetra Tech anticipates completing a second MPA sampling event during the last week in May or first two weeks in June 2010 when groundwater elevations are near their maximum for the year. A final brief letter report summarizing the results of 2010 and 2009 samples will be prepared following receipt of final analytic results.

TETRA TECH

Tetra Tech appreciates the continued opportunity to provide our services to the MDT. Should you have any questions, need further clarification, or would like to discuss information presented here, please feel free to call me in our Helena office at 406.443.5210.

Respectfully submitted,

Tetra Tech

Jim Maus
Project Coordinator

Attachment A: Laboratory Report October 2009

Jefferson City Southbound Rest Area Source Water Delineation and Assessment Report (PWSID # MT0002591)

May 2012

Prepared for:

MONTANA MDT DEPARTMENT OF TRANSPORTATION
Environmental Services
2701 Prospect Avenue
Helena, MT 59620-1001

Prepared by:

TERRITORIAL LANDWORKS, INC.

620 W. Addison St.
Missoula, MT 59801

Contents

Section 1
Introduction and Purpose

This source water delineation and assessment report (SWDAR) for a transient public water supply is intended to meet the technical requirements of the Montana Source Water Protection Program (DEQ, 1999) and the Federal Safe Drinking Water Act (EPA, 1996). Territorial-Landworks, Inc (TLI) prepared this report under contract with the Montana Department of Transportation (MDT).

Public Water Supply:	Jefferson City Southbound Rest Area (PWSID # MT0002591)
Location:	Jefferson County I-15, Mile Post 178 Section 29, Township 8N, Range 3W
Report Date:	May 2012
System Owner Contact:	Butte Maintenance Area 3751 Wynne PO Box 3068 Butte, MT 59702 406-4943-9600
Report Author:	Kolten Knatterud, EI Territorial-Landworks, Inc. 620 W. Addison St. Missoula, MT 59801 (406) 721-0142

The purpose of this SWDAR is to assess possible threats to the public water supply at the MDT Jefferson City Southbound Rest Area located at mile post 178 of I-15. Information was obtained from published reports, personnel managing the site, the most recent sanitary survey, and the Montana State Library's Natural Resource Information System (NRIS) website, http://nris.mt.gov/gis. The delineation process identifies source water protection regions on a map that contribute to the drinking water for a specific location by evaluating geologic, hydrogeologic and hydrologic conditions. After identifying the source water protection area, it is assessed to locate and identify areas where contaminants may be generated, stored, or transported and the potential for contamination of drinking water by these sources. According to the instructions for completing a transient public water supply report, microbiological contaminants and nitrate are the only regulated contaminants that are required to be identified (DEQ, 2007).

Section 2
Public Water Supply Information

The existing Public Water Supply (PWS) at the Jefferson City Southbound Rest Area is classified as a transient, non-community water supply because it supplies at least 25 people per day for six months a year but does not regularly serve the same population. It is estimated that approximately 700 people visit this rest area each day during the summer with Friday through Sunday being the most popular days. When the rest area is open, data is continuously recorded with a door counter and is observed during each maintenance visit. The water supply also has a flow meter that is read and recorded daily. The flow meter however does not record the water used to irrigate the 1 acre site as that water is plumbed off prior to the flow meter. During the site visit, the average water use for early November was observed to be 370 gallons per day. The door counter readings were not recorded for early November.

2.1 Facility Description

The Jefferson City Southbound Rest Area is located at mile post 178 of I-15 on the southbound interstate. The rest area is open seasonally, April 15th through November 15th, and is served by on-site water well and sewer systems.

The well is near I-15, Prickly Pear Creek, and a small pond on the rest area property which seasonally contains water. The well head is approximately 100 feet from I-15, 325 feet from the creek, approximately 16 feet above the creek surface, and 270 feet from the seasonal pond. The rest area parking lot is also located approximately 95 feet to the west of the well head. See Figure 1.

The on-site wastewater system is assumed to consist of a septic tank and a drainfield. However, during the site visit the septic tank could not be found and the drainfield had a discrepancy in location. The previous SWDAR stated that the drainfield was located in an area approximately 150 feet south of the well. Michael Kroll of MDT who attended the site visit said the drainfield is located 250 feet to the north. For this report, both locations have been shown and the actual location should be verified. South of the rest area, approximately a half mile, is the Jefferson City Northbound Rest Area which is also served by its own individual on-site water well and sewer systems.

2.2 Public Water Supply System

The Jefferson City Southbound Rest Area water supply is served by a well located approximately 40 feet south of the rest area. The well is identified by the Montana Ground Water Information Center (GWIC) with ID number 153901. The well log indicates that the well was drilled in 1995 to a depth of 245 feet and has a diameter of 6 inches for the first 50 feet and 4 inches for the remaining depth.

The well log shows a static water level of 40 feet below the ground surface. Because the water level is not shallower than 25 feet, the system is not required to be equipped with full time disinfection. The well log for this rest area is included as Attachment A.

2.3 Public Water Supply Quality

The classification of this water supply as a transient non-community water supply requires regular monitoring for quality. This water supply is monitored for total coliform monthly and nitrate annually. Currently, two samples for total coliform are taken each month. There has been one positive total coliform sample in the last five years. This occurred on 9/8/09. The cause of this positive bacteria sample is unknown. Nitrate levels for the system over the past five years have all been below 0.05 mg/L. Sample results for the rest area well are included as Attachment B.

This water supply is currently filtered through a 5-micron sediment filter. The system is also equipped with two pressure tanks and a hot water heater.

2.4 Source Water Hydrogeology

The rest area is located near the Prickly Pear drainage, see Figure 2. Lithologic information from the well log indicates that the well is completed in granite bedrock at an interval depth of 120 to 245 feet below ground surface. The aquifer is likely confined or semi-confined. The well log indicates that the borehole was drilled through boulders and gravel from 4 to 30 feet bgs. Ten feet of decomposed granite is present from 30 to 40 feet bgs. Fractured granite is present from 40 to 245 bgs.

The Jefferson City Southbound Rest Area is located in a heavily dredged section of the Prickly Pear drainage that has been placer mined. Boulders and gravel logged to 30 feet bgs are likely placer spoils from the dredging operations (Tetra Tech, 2001).

Section 3
Delineation

Table 1 from the SWDAR instructions for a transient public water supply included below was used to determine the water protection regions required for this water supply. Two source water protection regions (control and inventory) are delineated for the Jefferson City Southbound Rest Area. The control region is a 100-foot radius around the well and is the most critical area where the introduction of contaminants can occur (see Figure 1). The septic system for this rest area is outside of the control region. However, it is located within the inventory region, which is identified as the area within a 1 mile radius of the PWS (see Figure 2).

If Your Source of Water Is:	Delineate These Water Protection Regions	Method For Each Region:	Minimum Distance Values & Type of Inventory Required: LU – Land Uses; P&N – Pathogens and Nitrate sources
1. Ground Water that is: • Unconfined/Semi-confined*,	Control Inventory	Fixed radius Fixed radius	Distance - 100 feet Distance - 1 mile
• Confined	Control Inventory	Fixed radius Fixed radius	Distance - 100 feet Distance - 1000 feet
*Ground Water that is hydraulically Connected to Surface Water	Buffer Zone	Fixed Distance	One-half mile buffer extending upstream a distance corresponding to a 4-hour TOT but not to exceed ten miles or the nearest intake. Buffer will not exceed the extent of the watershed.
Surface water	Spill Response	Fixed Distance	One-half mile buffer extending upstream a distance corresponding to a 4-hour TOT but not to exceed ten miles or the nearest intake. Buffer will not exceed the extent of the watershed.

Table 1: Methods and Criteria for Delineating Source Water Protection Regions for PWSs (DEQ, 2007)

Section 4
Inventory

Montana Department of Environmental Quality (DEQ) requires that land uses and all potential sources of nitrates and microbial contaminants be identified within the control region and the inventory region for transient non-community public water supplies (DEQ,1999).

4.1 Control Region

The Control Region for this non-community public water supply is the area within 100 feet of the wellhead as identified in Figure 1. Potential sources of contamination identified within this region include: spills from the rest area parking lot, spills from the I-15 right-of-way, pet waste, vandalism, illegal dumping, and infiltration of surface water around the wellhead. The on-site wastewater septic tank also could not be located but was not observed to be located within 100 feet of the well during the site visit.

4.2 Inventory region

The inventory region for this well head is the area within 1 mile of the wellhead (Figure 2). The inventory process identifies potential sources of pollution that may contaminate the PWS. Within one mile of this well head, potential sources of contamination were identified to be: on-site wastewater disposal systems including the system for the Jefferson City Southbound Rest Area, off-site wastewater disposal systems including those of the Jefferson City Northbound Rest Area and surrounding residences (SR); I-15 right-of-way (HRW); and Agricultural dryland pasture (ADP). The septic system density in the inventory region is almost all identified as "low density" with small areas of "medium density" and "high density" (NRIS).

The well head is located approximately 325 feet away and above the river surface from Prickly Pear Creek. A preliminary assessment was completed for the well which determined the well is not under the direct influence of surface water. See Attachment C. Land uses within the Inventory Region are Grassland, Shrubland, and Evergreen Forest. No remediation response sites or mine sites or underground storage tanks were identified within the inventory region. No animal feeding operation sites, wastewater treatment facilities, sludge handling sites, land application sites, landfills, sewer mains or other significant potential sources of microbiological and nitrate contamination were identified within the inventory region. The only apparent significant potential contaminant sources for the Jefferson City Southbound Rest Area are septic systems.

4.3 Buffer Zone and Land Use

A Ground Water Under the Direct Influence of Surface Water (GWUDISW) analysis shows that this water system is not under the direct influence of surface water and therefore does not require a buffer zone.

In addition to the inventory region assessment of one mile around the well head, MDT has requested the land uses be identified within five miles of the water source well. Land uses within this five mile region include Evergreen Forest; I-15 Right-of-Way (HRW); Grassland; and Shrubland.

Section 5
Susceptibility

Susceptibility to a specific potential contaminant source is determined through a two step process:

1) Assignment of a hazard rating is based on the contaminant source's size and proximity to the well, potential for a spill or release to occur, and potential for wells within the inventory region to act as conduits for contaminants to enter the aquifer; and

2) Identification of barriers that could slow or prevent released contaminants from reaching the public water supply.

According to NRIS, the inventory region is located primarily in a low septic density area. However, the area immediately adjacent to the rest area has regions of medium to high septic density. According to Table 6b of the SWDAR instructions (not included herein), high density off-site septic systems are assigned a high hazard rating. The on-site septic system is a large capacity system within the inventory region and is considered a high hazard.

Septic systems, both onsite and offsite, are the primary source of possible nitrate and bacterial contamination to the Jefferson City Southbound Rest Area public water supply well. The on-site drainfield is likely within 150 feet of the rest area. The properly constructed well and routine maintenance provides barriers against possible contamination. Barriers for offsite septic systems include the distance from the PWS to the nearest up-gradient system, and the lot sizes of nearby subdivisions which range from 10 to 20 acres providing adequate onsite treatment for each individual septic system. There are no other known potential sources of pathogens or nitrates such as sewer mains, animal feeding operations, wastewater treatment plants, or waste disposal sites. According to Table 7 of the SWDAR instructions, (not included herein) the susceptibility of contamination for both the onsite and offsite septic system sources is considered to be moderate based on the multiple barriers identified.

Routine compliance monitoring indicates that there is not a source of nitrates that is contaminating this PWS well. There was a previous violation for total coliform as discussed in Section 2.3, but sample results have relatively been non-detect for total coliform. These results are included in Attachment B.

Other potential sources of contaminants to this PWS well exist from vandalism, pet waste, illegal dumping, and accidental spills. Vandalism is considered to be a deliberate attempt to introduce contaminants directly into this well. Contamination through vandalism results in a high hazard rating since any potential contamination could easily make direct contact with groundwater via the well.

However, a covered well head is a barrier to protect against this type of event. At the time of inspection, the well head was not locked so it is recommended that be done to provide another barrier against contamination. Pet waste, mostly from dogs, results in contamination around the wellhead from defecation. Given the infrequency of this event and the depth to groundwater, this source is assigned a moderate susceptibility. Illegal dumping and accidental spills present another potential source of contaminants. The location of the well with respect to the parking area and the depth to groundwater serve as barriers. Routine inspections of this rest area will help to identify potential problems.

Table 2 on the following page summarizes the hazard ratings and susceptibility for each potential contaminant source.

Source	Description	Contaminants	Hazard Rating	Barriers	Susceptibility	Management Options
On-site Septic Systems	On-site septic systems located at rest area	Pathogens and Nitrates	High	-Properly constructed well head -Routinely maintained	Moderate	-Continue regular maintenance and inspection -Determine exact location of drainfield
Off-site Septic Systems	Surrounding area septics and northbound rest area septic system	Pathogens and Nitrates	Moderate	-Separation -Properly constructed well head -Subdivision lot sizes -Distance to closest up gradient system	Low	-Monitor well samples for increased nitrates
Highway ROW	I-15 ROW adjacent to Rest Area, approximately 100 feet from wellhead	Potential for spill of hazardous materials being transported (i.e. petroleum, chemicals, solvents, etc.)	High	-Separation -Properly constructed well head	Moderate	-Document spills occurring near site -Should a spill occur near site, increase monitoring of water quality
Vandalism	Potential for contamination of aquifer through vandalism	Chemicals, solvents, metals, etc.	High	-Properly constructed well head	Moderate	-Install lock on well cap and keep well locked at all times
Pet Waste	Pet defecation at or near wellhead and within control zone	Pathogens and Nitrates	High	-Depth to groundwater -Properly constructed well head	Moderate	-Inspect bi-weekly -Increase signage and warnings
Illegal dumping and accidental spills	Dumping and spills within parking lot	Petroleum, solvents, chemicals, etc	High	-Location of well to parking lot -Depth to groundwater	Moderate	-Inspect bi-weekly -Increase signage and warnings

Table 2: Potential Contaminant Sources of Jefferson City Southbound Rest Area (PWSID #0002591)

Section 6
Limitations

Identification of potential contaminant sources is limited to those regulated for this class of PWS and is generally based on readily available information and reports. Unregulated activities or unreported contaminant releases may not be considered in this report. The delineation method utilizes simplifying assumptions that may not fully represent complex ground water flow systems but is intended to be conservative and protective of public health. (DEQ, 2007)

Section 7
References

Groundwater Information Center (GWIC), Montana Bureau of Mines and Geology, Montana Tech of The University of Montana, http://mbmggwic.mtech.edu/ January, 2012.

Montana Department of Environmental Quality (DEQ). *Department Circular PWS 6, Source Water Protection Delineation*, 1999 Edition

Montana Department of Environmental Quality (DEQ). *Instructions for Completing a Source Water Delineation and Assessment Report (SWDAR) and PWS-6 Report for Transient Public Water Supplies.* Source Water Protection. Revised 2007.

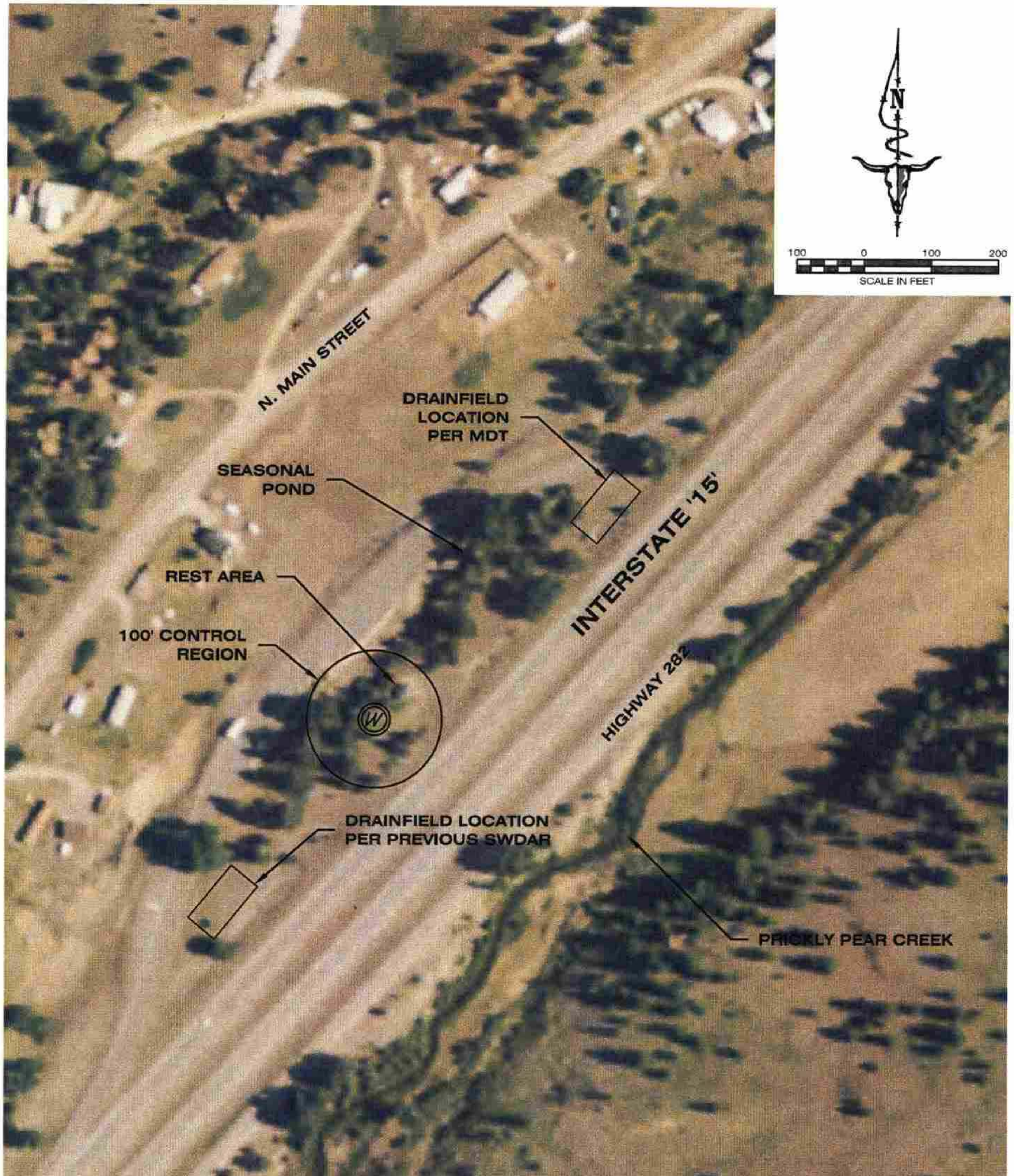
Montana Natural Resource Information System (NRIS), http://maps2.nris.mt.gov/mapper/ . January, 2012.

Montana Department of Environmental Quality (DEQ), Public Water Supply Online Query Reports, http://deq.mt.gov/wqinfo/pws/reports.mcpx . January, 2012.

Tetra Tech EM Inc. *Jefferson City Rest Stop Southbound, Source Water Delineation and Assessment Report, Public Water Supply: PWSID #MT0002591*, July, 2001.

Montana Department of Environmental Quality (DEQ), Sanitary Survey, Denver Fraser, 2003.

Figures



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Missoula, MT 59806

FIGURE 1
CONTROL REGION
JEFFERSON CITY SOUTH
SEC.29, T8N, R3W, P.M.M.
JEFFERSON COUNTY, MONTANA

PROJECT#: 11-28311
TAB: CONTROL
DRAFTER: JVB
DATE: 11/10/11
SHEET 1 OF 1

PLOT DATE: 4/20/2012 9:46 AM

DWG LOCATION: T:\1_ACTIVE FILES\2011 PROJECTS\28311- MDT SWDAR JEFFERSON CITY SOUTH\DWG\EXH-SWDAR.DWG

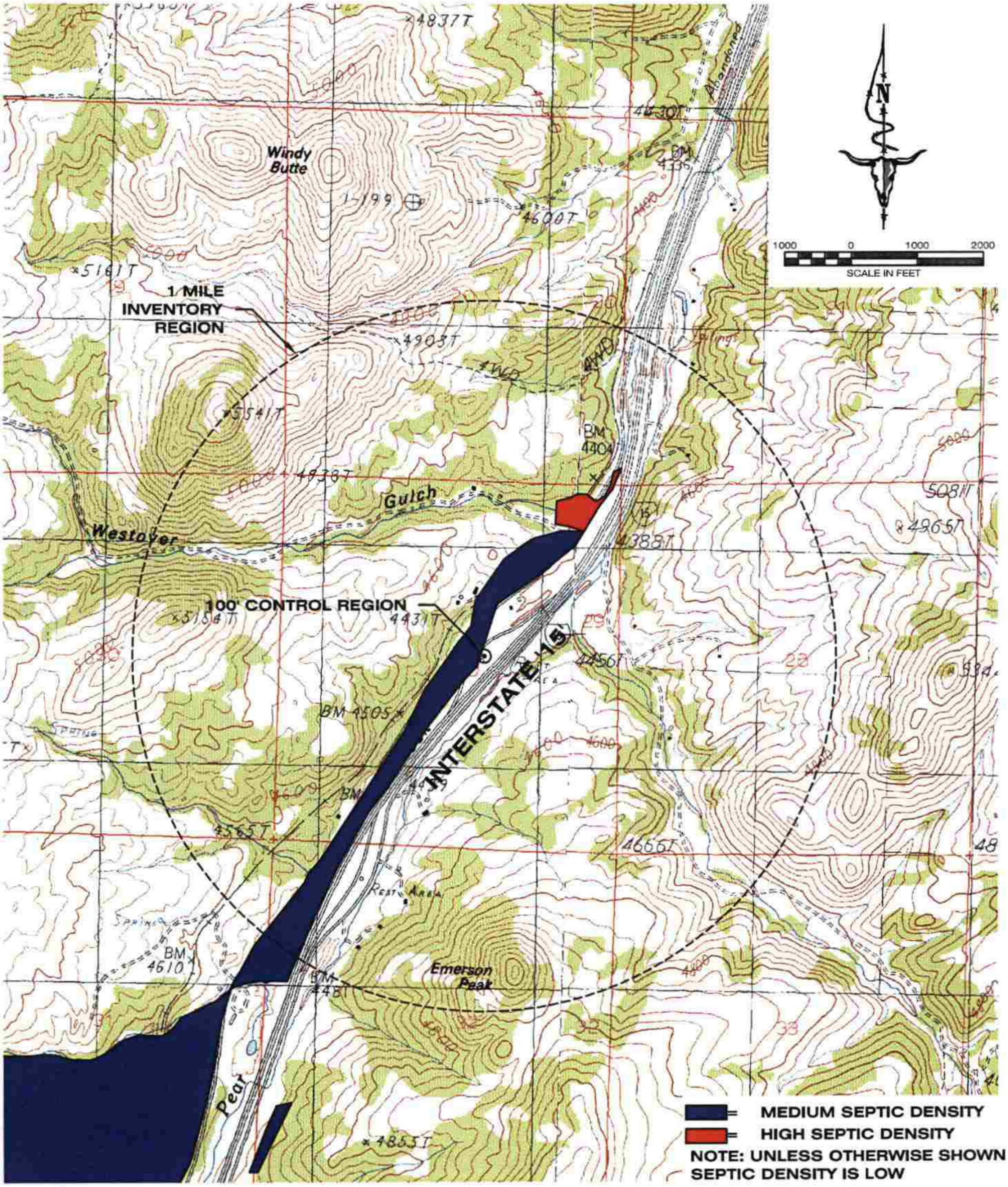

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FIGURE 2
INVENTORY REGION
JEFFERSON CITY SOUTH
SEC.29, T8N, R3W, P.M.M.
JEFFERSON COUNTY, MONTANA

PROJECT#: 11-28311
TAB: INVENTORY
DRAFTER: JVB
DATE: 11/10/11
SHEET 1 OF 1

PLOT DATE: 4/20/2012 9:41 AM

DWG LOCATION: T:\1_ACTIVE FILES\2011 PROJECTS\28311- MDT SWDAR JEFFERSON CITY SOUTH\DWG\EXH-SWDAR.DWG

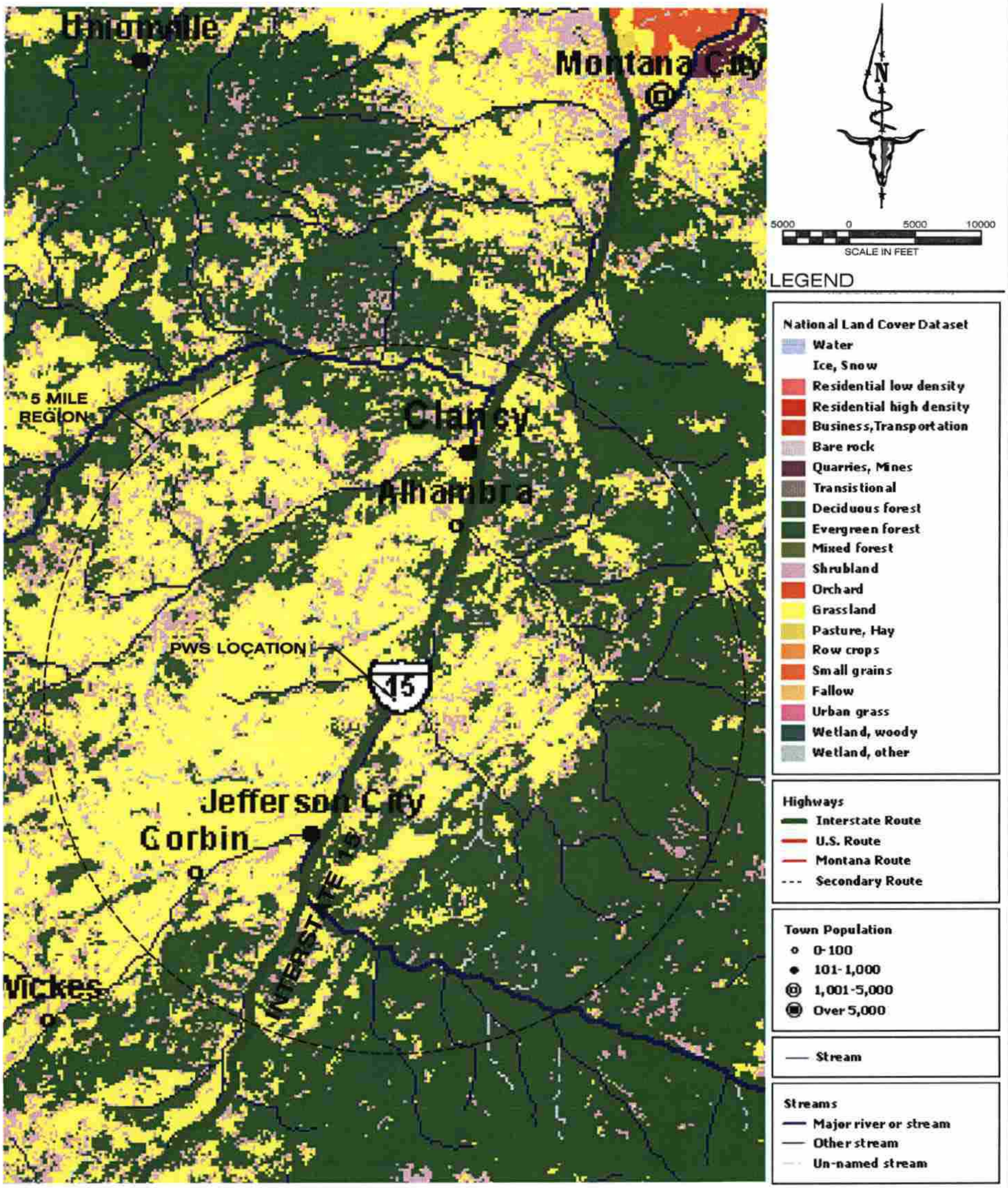

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FIGURE 3
LAND USE
JEFFERSON CITY SOUTH
SEC.29, T8N, R3W, P.M.M.
JEFFERSON COUNTY, MONTANA

PROJECT#: 11-28311
TAB: LAND USE
DRAFTER: JVB
DATE: 11/10/11
SHEET 1 OF 1

PLOT DATE: 4/20/2012 9:45 AM

DWG LOCATION: T:\1_ACTIVE FILES\2011 PROJECTS\28311- MDT SWDAR JEFFERSON CITY SOUTH\DWG\EXH-SWDAR.DWG

Attachment A
Jefferson City Southbound Rest Area
SWDAR Well Log

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View scanned well log (5/21/2009 3:36:12 PM)

Site Name: JEFFERSON CITY SOUTH REST STOP
GWIC Id: 153901
DNRC Water Right: C096195-00

Section 1: Well Owner

Owner Name
MT DEPT OF TRANSPORTATION
Mailing Address
PO BOX 3068

City	State	Zip Code
BUTTE	MT	59701

Section 2: Location

Township	Range	Section	Quarter Sections
08N	03W	29	SW¼ SW¼ SW¼ NE¼

County	Geocode
JEFFERSON	

Latitude	Longitude	Geomethod	Datum
46.4151	112.0065	MAP	NAD27

Ground Surface Altitude	Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method: AIR ROTARY

Section 5: Well Completion Date

Date well completed: Friday, September 01, 1995

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	245	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	50	6				
25	245	4				

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
120	245	4			

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	

Section 7: Well Test Data

Total Depth: 245
Static Water Level: 40
Water Temperature:

Air Test *

35 gpm with drill stem set at _ feet for 2 hours.
Time of recovery 2 hours.
Recovery water level 40 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	4	TOPSOIL
4	30	BOULDERS AND GRAVEL
30	40	DECOMPOSED GRANITE
40	45	BROKEN GRANITE
45	245	GRANTE BEDROCK

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: TERRY LINDSAY
Company: LINDSAY DRILLING CO INC
License No: WWC-253
Date Completed: 9/1/1995

Attachment B
Jefferson City Southbound Rest Area
SWDAR Sampling Results

Montana Department of Environmental Quality
Data Source: Public Water Supply Section

Public Water Supply System

Return to PWS Query

Return to PWS Reports

PWSID: MT0002591 **Name: JEFFERSON CITY SOUTH REST STOP**

City: JEFFERSON CITY **County:** JEFFERSON **Tot Pop:**600

Pri Src: GW **Class:** NC **Last Snty Srv Dt:** 04/22/2009 **Activity Status:** A

Type	Conn's	In Srvc Dts	Eff Begin Dt	Avg Daily Cnt	Type
CM	1	4/15-11/15	04/22/2009	600	T

Administrative Contact	Financial Contact	Owner
GAGE, MIKE	HUOTTE, MIKE	MT DEPT OF TRANSPORTATION 59702

Facilities and Entry Points

Status: A 10/05/2000 **Fac ID** DS001 DISTRIBUTION SYSTEM **Src:** GW
Lat/Long Dec: **DMS:**

Smp Pt ID	Status	Description
SP001	A 10/05/2000	SP FOR DS

Status: A 10/05/2000 **Fac ID** PC001 PRESSURE CONTROL TANKS **Src:** GW
Lat/Long Dec: **DMS:**

Status: A 04/22/2009 **Fac ID** TP001 TREATMENT PROCESS WELL 2 **Src:** GW
Lat/Long Dec: **DMS:**
TP Units: P341

Smp Pt ID	Status	Description
EP503	A 04/22/2009	EP FOR WL 2 TP

Status: I 10/05/2000 **Fac ID** WL002 WELL 1 INACTIVE **Src:** GW
Lat/Long Dec: **DMS:**

Smp Pt ID	Status	Description
EP502	I 10/05/2000	INACT EP FOR WELL 1

Status: A 10/05/2000 **Fac ID** WL003 WELL 2 **Src:** GW
Lat/Long Dec: **DMS:**

Smp Pt ID	Status	Description
RW003	A 09/07/2010	WELL 2

Sample Schedules/Monitoring Requirements

Fac ID: DS001 **Fac Name:** DISTRIBUTION SYSTEM **Status:** A **Src:**GW

Smp Pt I	Active	Smp Pt Descriptio
SP001	A	SP FOR DS

Group	Name	Schd Beg Dat	Seas Coll Pe	Requiremen
3100	COLIFORM (TCR)	11/01/2009	6/1-10/31	1 RT MN

Fac ID: TP001 **Fac Name:** TREATMENT PROCESS WELL 2 **Status:** A **Src** GW

Smp Pt I	Active	Smp Pt Descriptio
EP503	A	EP FOR WL 2 TP

Group	Name	Schd Beg Dat	Init MP Be	Seas Coll Pe	Requiremen
NITR	CDS NITRATE NITRITE	01/01/2000	01/01/2000	1/1-12/31	1 RT YR

PWSID: MT0002591 Name: JEFFERSON CITY SOUTH REST STOP (continued)

Bacti Results

FROM 05/16/2007 TO 05/16/2012

Collection D	Lab Number	Type	Orig Lab #	Code		TCR Presenc		Fec/EC Result
05/09/2012	W1205-1518	RT		3014	E. COLI	A		-
05/09/2012	W1205-1518	RT		3100	COLIFORM (TCR)	A	-	
04/18/2012	W1204-1231	RT		3014	E. COLI	A		-
04/18/2012	W1204-1231	RT		3100	COLIFORM (TCR)	A	-	
11/03/2011	W1111-4471	RT		3014	E. COLI	A		-
11/03/2011	W1111-4471	RT		3100	COLIFORM (TCR)	A	-	
10/06/2011	W1110-4120	RT		3014	E. COLI	A		-
10/06/2011	W1110-4120	RT		3100	COLIFORM (TCR)	A	-	
09/07/2011	W1109-3612	RT		3100	COLIFORM (TCR)	A	-	
09/07/2011	W1109-3612	RT		3014	E. COLI	A		-
08/02/2011	W1108-3147	RT		3100	COLIFORM (TCR)	A	-	
08/02/2011	W1108-3147	RT		3014	E. COLI	A		-
07/06/2011	W1107-2702	RT		3100	COLIFORM (TCR)	A	-	
07/06/2011	W1107-2702	RT		3014	E. COLI	A		-
06/01/2011	W1106-2067	RT		3014	E. COLI	A		-
06/01/2011	W1106-2067	RT		3100	COLIFORM (TCR)	A	-	
05/09/2011	W1105-1717	RT		3100	COLIFORM (TCR)	A	-	
05/09/2011	W1105-1717	RT		3014	E. COLI	A		-
04/15/2011	W1104-1334	RT		3014	E. COLI	A		-
04/15/2011	W1104-1334	RT		3100	COLIFORM (TCR)	A	-	
11/02/2010	W1011-4099	RT		3100	COLIFORM (TCR)	A	-	
11/02/2010	W1011-4099	RT		3014	E. COLI	A		-
10/12/2010	W1010-3776	RT		3100	COLIFORM (TCR)	A	-	
10/12/2010	W1010-3776	RT		3014	E. COLI	A		-
09/07/2010	W1009-3241	RT		3014	E. COLI	A		-
09/07/2010	W1009-3241	RT		3100	COLIFORM (TCR)	A	-	
08/04/2010	W1008-2874	RT		3014	E. COLI	A		-
08/04/2010	W1008-2874	RT		3100	COLIFORM (TCR)	A	-	
07/09/2010	W1007-2457	RT		3014	E. COLI	A		-
07/09/2010	W1007-2457	RT		3100	COLIFORM (TCR)	A	-	
06/03/2010	W1006-1973	RT		3014	E. COLI	A		-
06/03/2010	W1006-1973	RT		3100	COLIFORM (TCR)	A	-	
05/14/2010	W1005-1731	RT		3014	E. COLI	A		-
05/14/2010	W1005-1731	RT		3100	COLIFORM (TCR)	A	-	
04/20/2010	W1004-1381	RT		3014	E. COLI	A		-
04/20/2010	W1004-1381	RT		3100	COLIFORM (TCR)	A	-	
11/09/2009	W0911-4658	RT		3014	E. COLI	A		-
11/09/2009	W0911-4658	RT		3100	COLIFORM (TCR)	A	-	
10/06/2009	W0910-4060	RT		3100	COLIFORM (TCR)	A	-	
10/06/2009	W0910-4060	RT		3014	E. COLI	A		-
10/06/2009	W0910-4061	RT		3100	COLIFORM (TCR)	A	-	
10/06/2009	W0910-4061	RT		3014	E. COLI	A		-
10/06/2009	W0910-4062	RT		3014	E. COLI	A		-

PWSID: MT0002591 Name: JEFFERSON CITY SOUTH REST STOP **(continued)**

Collection D	Lab Number	Type	Orig Lab #	Code		TCR Presenc		Fec/EC Result
10/06/2009	W0910-4062	RT		3100	COLIFORM (TCR)	A	-	
10/06/2009	W0910-4063	RT		3100	COLIFORM (TCR)	A	-	
10/06/2009	W0910-4063	RT		3014	E. COLI	A		-
10/06/2009	W0910-4064	RT		3014	E. COLI	A		-
10/06/2009	W0910-4064	RT		3100	COLIFORM (TCR)	A	-	
09/14/2009	W0909-3734	RP	W0909-36	3014	E. COLI	A		-
09/14/2009	W0909-3734	RP	W0909-36	3100	COLIFORM (TCR)	A	-	
09/14/2009	W0909-3735	RP	W0909-36	3014	E. COLI	A		-
09/14/2009	W0909-3735	RP	W0909-36	3100	COLIFORM (TCR)	A	-	
09/14/2009	W0909-3736	RP	W0909-36	3100	COLIFORM (TCR)	A	-	
09/14/2009	W0909-3736	RP	W0909-36	3014	E. COLI	A		-
09/14/2009	W0909-3737	RP	W0909-36	3100	COLIFORM (TCR)	A	-	
09/14/2009	W0909-3737	RP	W0909-36	3014	E. COLI	A		-
09/08/2009	W0909-3644	RT		3014	E. COLI	A		-
09/08/2009	W0909-3644	RT		3100	COLIFORM (TCR)	P	+	
08/06/2009	W0908-3167	RT		3014	E. COLI	A		-
08/06/2009	W0908-3167	RT		3100	COLIFORM (TCR)	A	-	
07/14/2009	W0907-2786	RT		3014	E. COLI	A		-
07/14/2009	W0907-2786	RT		3100	COLIFORM (TCR)	A	-	
06/04/2009	W0906-2225	RT		3100	COLIFORM (TCR)	A	-	
06/04/2009	W0906-2225	RT		3014	E. COLI	A		-
05/06/2009	W0905-1741	RT		3100	COLIFORM (TCR)	A	-	
05/06/2009	W0905-1741	RT		3014	E. COLI	A		-
04/13/2009	W0904-1348	RT		3100	COLIFORM (TCR)	A	-	
04/13/2009	W0904-1348	RT		3014	E. COLI	A		-
11/06/2008	W0811-4608	RT		3100	COLIFORM (TCR)	A	-	
10/07/2008	W0810-4091	RT		3100	COLIFORM (TCR)	A	-	
09/08/2008	W0809-3619	RT		3100	COLIFORM (TCR)	A	-	
08/07/2008	W0808-3178	RT		3100	COLIFORM (TCR)	A	-	
07/15/2008	W0807-2721	RT		3100	COLIFORM (TCR)	A	-	
06/12/2008	W0806-2229	RT		3100	COLIFORM (TCR)	A	-	
05/06/2008	W0805-1642	RT		3100	COLIFORM (TCR)	A	-	
04/14/2008	W0804-1383	RT		3100	COLIFORM (TCR)	A	-	
11/05/2007	W0711-4617	RT		3100	COLIFORM (TCR)	A	-	
10/11/2007	W0710-4304	RT		3100	COLIFORM (TCR)	A	-	
09/07/2007	W0709-3716	RT		3100	COLIFORM (TCR)	A	-	
08/07/2007	W0708-3236	RT		3100	COLIFORM (TCR)	A	-	
07/16/2007	W0707-2841	RT		3100	COLIFORM (TCR)	A	-	
06/08/2007	W0706-2281	RT		3100	COLIFORM (TCR)	A	-	
05/17/2007	W0705-1943	RT		3100	COLIFORM (TCR)	A	-	

Chemical Results

FROM 05/16/2007 TO 05/16/2012

Fac ID: TP001 **Fac Name:** TREATMENT PROCESS WELL 2 **Avl:**S **Status:** A **Src:** GW

Public Water Supply System

Return to PWS Query
Return to PWS Reports

PWSID: **MT0002591 Name: JEFFERSON CITY SOUTH REST STOP** **(continued)**

Fac ID: TP001 **Fac Name:** TREATMENT PROCESS WELL 2 **Avl:**S **Status:** A **Src:**
Smp Pt ID: EP503 **Status:** A **Description:** EP FOR WL 2 TP **Src Typ** FN

Analyte/CAS No	Code	Analyte Name	Type	Collection D	Lab	Sample Numbe	Result
IOC	1038	NITRATE-NITRITE	RT	04/18/2012	01	C1204-0569	< MRL .005 MG/L
IOC	1038	NITRATE-NITRITE	RT	04/15/2011	01	C1104-0520	< MRL .005 MG/L
IOC	1038	NITRATE-NITRITE	RT	04/20/2010	01	C1004-0614	< MRL .01 MG/L
IOC	1038	NITRATE-NITRITE	RT	04/13/2009	01	C0904-0796	0.01 MG/L
IOC	1038	NITRATE-NITRITE	RT	04/14/2008	01	C0804-0936	< MRL .01 MG/L

Lead & Copper Sample Summaries FROM 01/01/1992 TO 05/16/2012

Period Begin	Period End	Collection End	Type	Period Name	Code	Count	Measure	UoM

Violations & Enforcements FROM 05/16/2007 TO 05/16/2012

Viol Date	Comp Beg	Comp End	Fed F	Type	Sev	Cate	Code	Name
09/18/2007	08/01/2007	08/31/2007	2007	23	MJ	MON	3100	COLIFORM (TCR)

2009	5563709	12/04/2008	SOX	ST COMPLIANCE ACHIEVED
2007	5563607	10/29/2007	SOX	ST COMPLIANCE ACHIEVED
2007	5563507	09/18/2007	SIE	ST PUBLIC NOTIF REQUESTED
2007	5563407	09/18/2007	SIA	ST VIOLATION/REMINDER NOTICE

Attachment C
Jefferson City Southbound Rest Area
Preliminary Assessment Report

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Metcalf Building 1520 East Sixth Avenue P.O. Box 200901 Helena, MT 59620-0901

PRELIMINARY ASSESSMENT WORKSHEET

Preliminary Assessment of Ground Water Sources that may be Under the Direct Influence of Surface Water

PWS System and Source Facility Information					
PWS Name:	JEFFERSON CITY SOUTHBOUND REST AREA			**PWS ID#:** (MT000nnnn)	MT0002591
Type (C, NTNC, NC): NC	**County:** JEFFERSON			**Population Served:**	700
Source Facility Name:		**SDWIS Facility ID:** (WL00n,SP00n,IG00n)		**Date:** (m/d/yy)	5/16/12

COMPUTE PA SCORE Mark (X) ONE option that applies and enter option index pts at right					Points
A. TYPE OF STRUCTURE					
Spring (40) ___	Horizontal Well (40) ___	Well (0) **X**			**0**
B. HISTORICAL PATHOGENIC ORGANISM CONTAMINATION: History or suspected outbreak of Giardia, or other pathogenic organisms associated with surface water, with current system configuration.					
Yes (40) ___	No (0) **X**				**0**
C. HISTORICAL MICROBIOLOGICAL CONTAMINATION:					
I) Record of **acute** (boil order or fecal positive sample) MCL violations of the Total Coliform Rule during the last 3 years. **Number of violations:**					
None (0) **X**	One (5) ___	Two (10) ___	Three (15) ___		**0**
II) Record of **non-acute** (two coliform positive samples in one month) MCL violations of the Total Coliform Rule during the last 3 years. **Number of violations:**					
None or One (0) **X**	Two (5) ___	Three (10) ___	Turbidity Complaints (DEQ verified) (5) ___		**0**
D. HYDROLOGICAL FEATURES: Horizontal distance between surface water & source.					
> 250 ft (0) **X**	175 - 250 ft (10) ___	100 - 174 ft (20) ___	< 100 ft (40) ___		**0**
E. WELL SEAL: Poorly constructed well (uncased, or annular space not sealed to depth of at least 18 feet below land surface), or casing construction is unknown.					
Yes (15) ___	No (0) **X**				**0**
F. WELL INTAKE CONSTRUCTION: In wells tapping unconfined or semi-confined aquifers, the depth below land surface to top of perforated interval or screen is:					
>100 ft (0) **X**	50-100 ft (5) ___	25-49 ft (10) ___	0-24 ft (15) ___	Unkn (15) ___	**0**
G. STATIC WATER LEVEL: In wells tapping unconfined or semi-confined aquifers, the depth to static water level below land surface is:					
>100 ft (0) ___	50-100 ft (5) ___	25-49 ft (10) **X**	0-24 ft (15) ___	Unkn (15) ___	**10**
H. WELL CAP CONSTRUCTION: Poor sanitary seal, or seal without acceptable material.					
Yes (15) ___	No (0) **X**				**0**
TOTAL PA SCORE (Right click in cell to right and select Update Field.)					**10**

PRELIMINARY ASSESSMENT WORKSHEET (continued)

I. PRELIMINARY ASSESSMENT DETERMINATION	Mark (X) ONE
1. PASS: Source is not under the direct influence of surface water.	X
2. FAIL: Well must undergo further GWUDISW analysis.	___
3. FAIL: Spring, must undergo further GWUDISW analysis.	___
4. FAIL: Well or horizontal well less than 100 feet from surface water, **must undergo further GWUDISW analysis.**	___
5. FAIL: Well **will** PASS if well construction deficiencies (section E or F) are repaired.	___
6. FAIL: Well **may** PASS if well construction details (section E, F, or G) become available.	___

ANALYST INFORMATION AND COMMENTS
NAME: KOLTEN KNATTERUD, EI
AFFILIATION: Territorial-Landworks, Inc
COMMENTS
The source appears to pass and not under direct influence of surface water. At this time, there are no further comments.

Electronic Entry Instructions: Open the WORD document template (DOT) as a WORD document (DOC) with an appropriate name and location. The document is protected from all edits other than form entry. Enter the requested information in the form fields and tab forward between fields. All character entries will be converted to upper case. In the Compute PA Score table for questions A through H, mark with an X the one option which applies to each, then enter the score corresponding to that option in the field to the right under the Points column. When scores A-H have been entered right click on the Total PA Score field and select Update Field. The total score will be computed. Select the PA Determination option by marking with an X. Fill out the Analyst Information and Comments table. Save the document with your entries.

Appendix D: Preliminary Wastewater System Sizing

Jefferson City
Safety Rest Area Study

Jefferson City Rest Areas
Preliminary Wastewater System Sizing

The following is a preliminary evaluation of the estimated rest area design flow and sizing of a new wastewater treatment system for the Jefferson City rest area facilities.

Daily Design Flow

The following existing estimated rest area usage is based on limited door count data provided by MDT. The door count data represents the summer average rest area usage. To estimate the peak seasonal average usage for preliminary sizing of the wastewater system, a peaking factor, average day to peak, of 2.5 was used

Table 1 – Estimated Jefferson City Rest Area Usage – Existing (2018)

Facility	Door Counts		Peaking Factor	Estimated Peak Usage	Estimated Peak Daily Wastewater Flow (2018)[1]
	Summer Average Door Count (Count)	Summer Average Daily People (PPD)		(PDP)	(gpd)
Northbound Rest Area	231	116	2.50	289	434
Southbound Rest Area	206	103	2.50	257	386

1- The estimated peak daily wastewater flow is based on an average water usage per restroom user is 1.5 gallons/user and a peaking factor of 2.5 to represent the peak seasonal rest area usage. For facility design, historical door counts data should be utilized to determine the existing and projected peak seasonal flow rates.

The preliminary projected rest area usage utilizes the above estimated average people per day to estimate an average daily user count based on a 1.0% growth rate. Additionally, the estimated water usage per restroom user is increase from 1.5 gal/user to 2.5 gal/user to more accurately reflect the water usage at new/reconstructed rest area facilities.

Table 2 – Estimated Jefferson City Rest Area Usage – Projected (2040)

Facility	2040 Projected Rest Area Usage		
	Average Daily People[1] (PDP)	Projected Water Usage per Restroom User[2] (gal./user)	Projected Peak Daily Wastewater Flow[3] (PDP)
Northbound Rest Area	367	2.50	2,295
Southbound Rest Area	326	2.50	2,040

1- A 1.0% annual growth rate was applied to the 2016 estimated average daily people count to project the rest area wastewater usage at a 20-year life cycle.

2- The estimated water usage per restroom user is 2.5 gal/user at improved and newly constructed rest area facilities.

3- The projected peak daily wastewater flow is based on a peaking factor of 2.5 to represent the peak seasonal rest area usage. For facility design, actual door counts shall be utilized to determine the existing and projected peak seasonal flow rates.

Existing Wastewater System Estimated Capacity

There are no records of the existing wastewater treatment system on file with Jefferson County Health Department, therefore, the estimated existing wastewater system sizing is based on the drainfield lateral shown on the rest area's record drawings and an estimated application rate based on the heavily dredged soil present on-site. The record drawings show identical sized wastewater treatment at both the NB and SB facilities, 5 laterals at 100 ft long.

5 laterals at 100 ft = 500 lf of laterals
Assume 3.0 ft wide trench; 3.0 ft x 500 ft = 1,500 ft^2 drainfield trench
Assume application rate of 0.8 gpd/ft^2; 0.8 gpd/ft^2 x 1,500 ft^2 = **1,200 gpd (each site)**

Based on the calculated 2018 average daily rest area usage, see Table 1 above, the existing wastewater treatment system is operating within its estimated design hydraulic capacity. Prior to any future system improvements or evaluations, the calculated rest area usage shall be verified with the historical system door counts, traffic counts, or measured/recorded water usage meters.

Northbound & Southbound Onsite Drainfield Sizing

The following calculations show the preliminary drainfield sizing for both a conventional septic system with a gravel-less drainfield absorption system and an advanced level II waste water treatment system. Both the NB and SB rest areas are assumed to have similar soil conditions and 2040 system design flow.

Conventional Gravity System with Gravel-less Absorption System

Drainfield systems with gravel-less “infiltrators” are allowed a 25% reduction in the required drainfield size.

Projected Estimated 2040 Design Flow = 2,300 gpd
Estimated Site Application Rate = 0.80 gpd/ft^2
2,300 gpd / 0.80 gpd/ft^2 = 2,875 ft^2
2,875 ft^2 x 0.75 (gravel-less reduction factor) = **2,156 ft^2 Required Drainfield Size**

Lateral Requirements
Assume 100-foot long laterals, with 36” wide “infiltrator” gravel-less drainfield septic chambers, and “standard depth trench” at 7.0 feet on center (minimum).

2,156 ft^2 / 3.0 ft wide trench = 719 lineal feet of laterals
719 lf / 100-foot long laterals = ~7 laterals

6 lateral (7 laterals -1 lateral for end lateral) x 7-foot on center = 42 ft in width

Total Drainfield Area = 100 ft x 42 ft

100% Replacement Area
The replacement area shall be sized without any reduction factor. Assume 100-foot long laterals, with 36” wide “infiltrator” gravel-less drainfield septic chambers, and “standard depth trench” at 7.0 feet on center (minimum).

2,875 ft^2 /3.0 ft wide trench = 958 lineal feet of laterals
958 lf / 100-foot long laterals =~10 laterals
9 laterals (10 laterals -1 lateral for end lateral) x 7-foot on center = 63 ft in width

Total Replacement Drainfield Area = 100 ft x 63 ft

Advanced Level II Wastewater Treatment System

Due to the level of treatment, a 50% reduction factor can be applied to the overall system drainfield.

Projected Estimated 2040 Design Flow = 2,300 gpd
Estimated Site Application Rate = 0.80 gpd/ft^2
2,300 gpd / 0.80 gpd/ft^2 = 2,875 ft^2
2,875 ft^2 x 0.50 (Level II reduction factor) = **1,438 ft^2 Required Drainfield Size**

Lateral Requirements
Assume 100-foot long laterals, with 36" wide "infiltrator" gravel-less drainfield septic chambers, and "standard depth trench" at 7.0 feet on center (minimum).

1,438 ft^2 / 3.0' = 480 lineal feet of laterals
480 lf / 100-foot long laterals = ~5 laterals

4 lateral (5 laterals -1 lateral for end lateral) x 7-foot on center = 28 ft in width

Total Drainfield Area = 100 ft x 28 ft

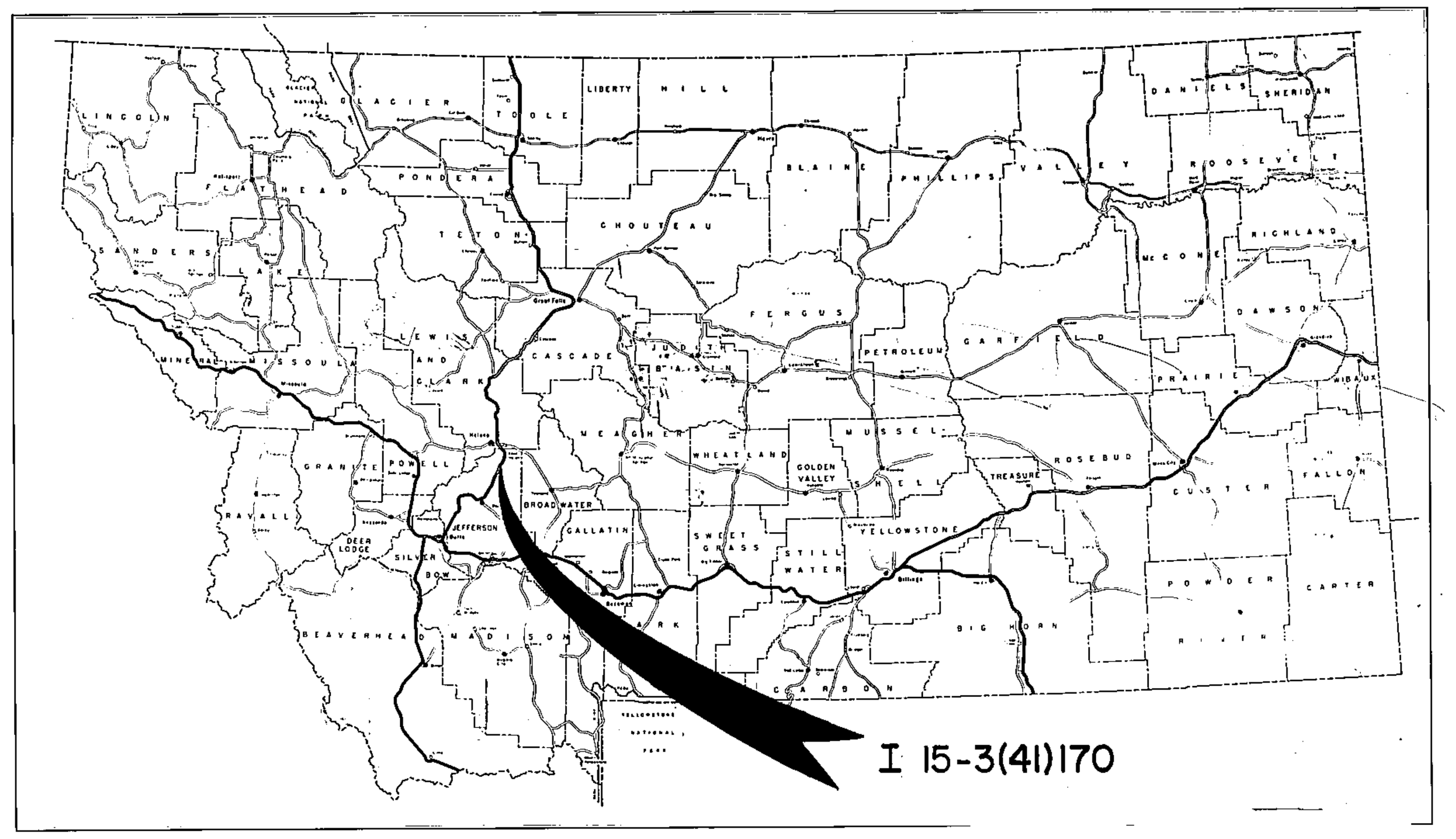
100% Replacement Area
The replacement area shall be sized without any reduction factor. See calculations above.

Total Replacement Drainfield Area = 100 ft x 63 ft

Non-Degradation Analysis
Due to the close proximity to surface water, potential for seasonal high groundwater, subsurface soil conditions, and high nitrate concentrations in the wastewater stream, the nitrate sensitivity, phosphorous breakthrough, and surface water non-degradation analysis may be difficult to meet the required standard. Additional, analysis of the hydraulic conductivity, groundwater gradient, seasonal high groundwater, and facility design flows are necessary to further evaluate the facilities for non-degradation.

Appendix E: Record Drawings

Jefferson City
Safety Rest Area Study



MONTANA DEPARTMENT OF HIGHWAYS

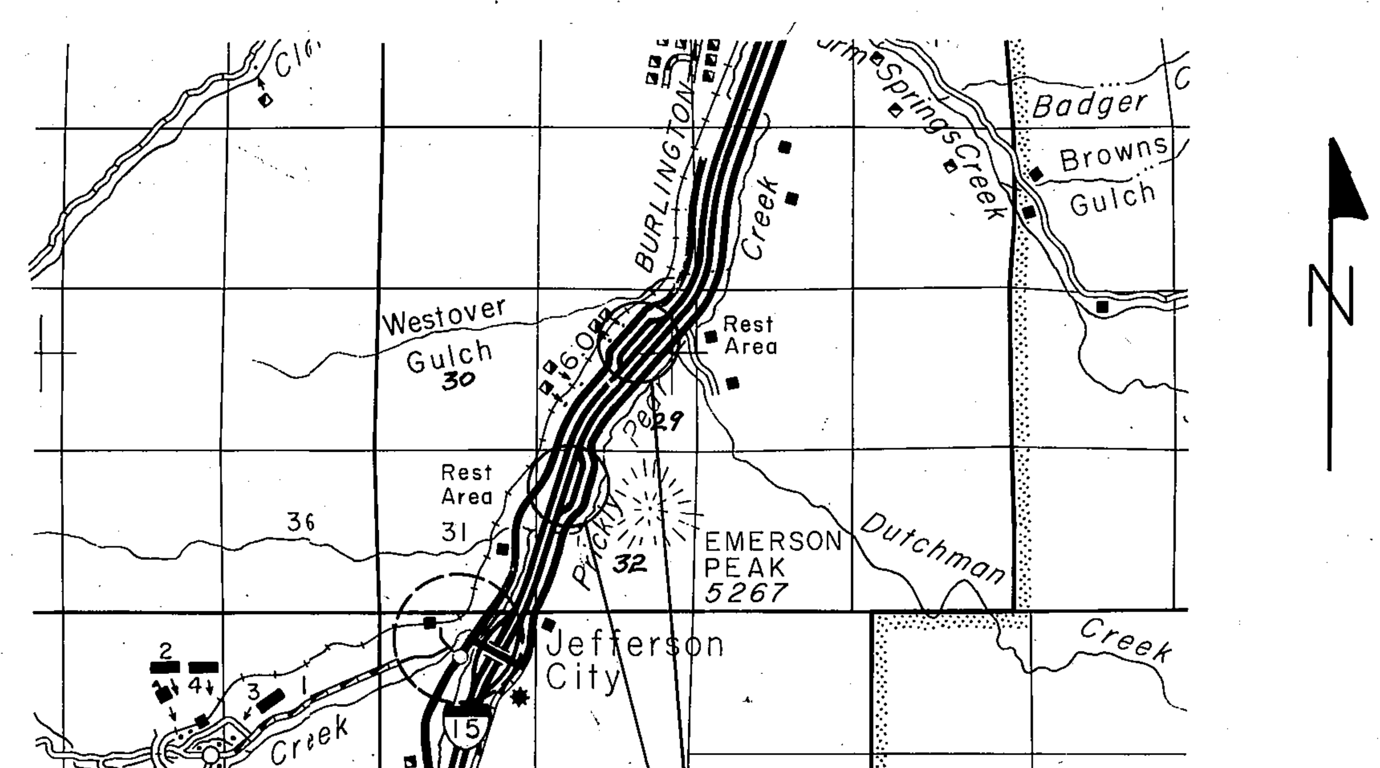
FEDERAL AID PROJECT NO I 15-3(41)170
JEFFERSON CITY REST AREAS
JEFFERSON COUNTY

DESIGN DATA	
A.D.T. 1976	= 1856
A.D.T. 1991	= 2550
D.H.V.	= 371
D	= .6
T	= 9%
V	= 70 MPH

LETTING DATE — JAN. 16, 1981
COMPLETED AUG. 14, 1981

LENGTH **MILES**

SCALES
HORIZONTAL: 1 Inch= Feet
VERTICAL: 1 Inch= Feet
CROSS SECTIONS--HOR. & VERT.: 1 Inch= Feet
REDUCED PRINTS APPROX. 1/2 ORIGINAL SCALE



REST AREA HANDICAPPED RENOVATION
THIS PROJECT

RELATED PROJECTS
NONE

ASSOCIATED PROJECT AGREEMENT NUMBERS	
R W & I.C.	
P. E.	I15-3(41)170

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS

APPROVED:
_______________ 19 ____

RONALD P RICHARDS
DIRECTOR OF HIGHWAYS
BY_______________
ADMINISTRATOR
ENGINEERING DIVISION

MONTANA
JACK R. BECKERT
205 ES
REGISTERED
PROFESSIONAL ENGINEER & LAND SURVEYOR

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ENGINEER DATE

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	I 15-3(41) 170	2 of 8

CONST.
SUMMARY

REST AREA HANDICAPPED RENOVATION ITEMS

ITEM:		UNIT:	QUANTITY:	REMARKS:
PLUMBING:				
drinking fountain	1.0 L. SUM $9,000.00	each	2	see plans and special provisions
urinal		each	2	
water closet		each	6	
lavatory		each	4	
misc piping		lin ft	req	
REST ROOM HARDWARE:				
grab rail	1.0 L. SUM $5,500.00	set	4	mount grab rails on right and left inside handicapped toilet stall, see plans and special provisions
mirror		each	4	see plans and special provisions
toilet paper holder		each	12	" "
hand dryer		each	4	with 2-20 amp breaker and #12 wire required for hook-up
door pulls		each	4	
toilet partitions		each	6	
urinal screen		each	2	
SIGNS:				
building signs	1.0 L SUM $700.00	each	12	see plans and special provisions
parking signs		each	2	" " " " "
advanced signs		each	2	" " " " "
ELECTRICAL:	1.0 L. SUM $5,200.00	each		
CONCRETE:				
concrete fill, comfort stations	1.0 L.S. $750.00	sq yds	10.5	gravel cushion w.w.f. dividers, forms, ramps curb cuts absorbed in unit bid price check plans and special provisions carefully.
DEMOLITION:				
comfort station interior	1.0 L SUM $1,400.00	each	2	see plans and special provisions
existing walks		sq yds	N/A	" " " " "
trailer dump facilities		each	2	" " " " "
PAINTING:				
comfort station interior	1.0 L.S. $3,000.00	sq ft	1600	see plans and special provisions
rest room entry door and jamb		each	4	includes international symbol on door, see plans and special provisions.
MISCELLANEOUS:				
display case	1.0 L SUM $500.00	each	one	

WORK BY AGREEMENT ~ C.O. #1

ALTERATIONS OF SERVICE ENTRANCE ~ 1.0 L SUM - $1,341.46

ADMINISTRATIVE ALLOWANCE ~ 1.0 L SUM - $109.37

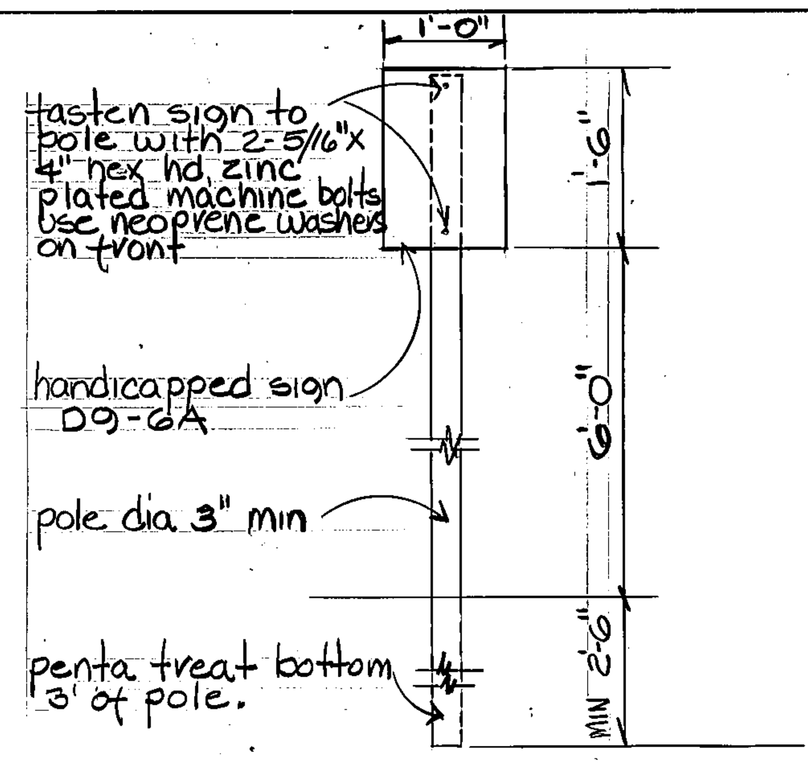
DESIGNED		
DRAWN		
CHECKED		
REVISED		
REVISED		
REVISED		

K+E

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MONT.	I-15-3(41)170	3	8

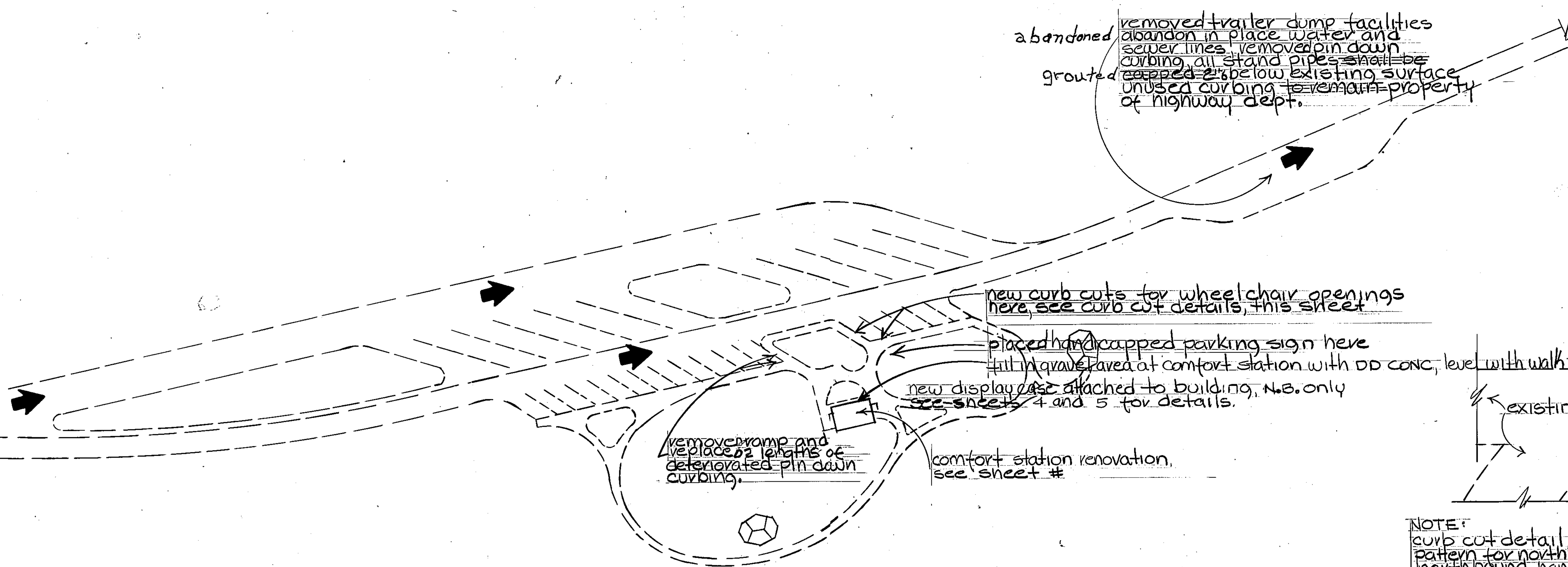
LAYOUT PLAN - SOUTHBOUND REST AREA

SCALE: 1" = 50'



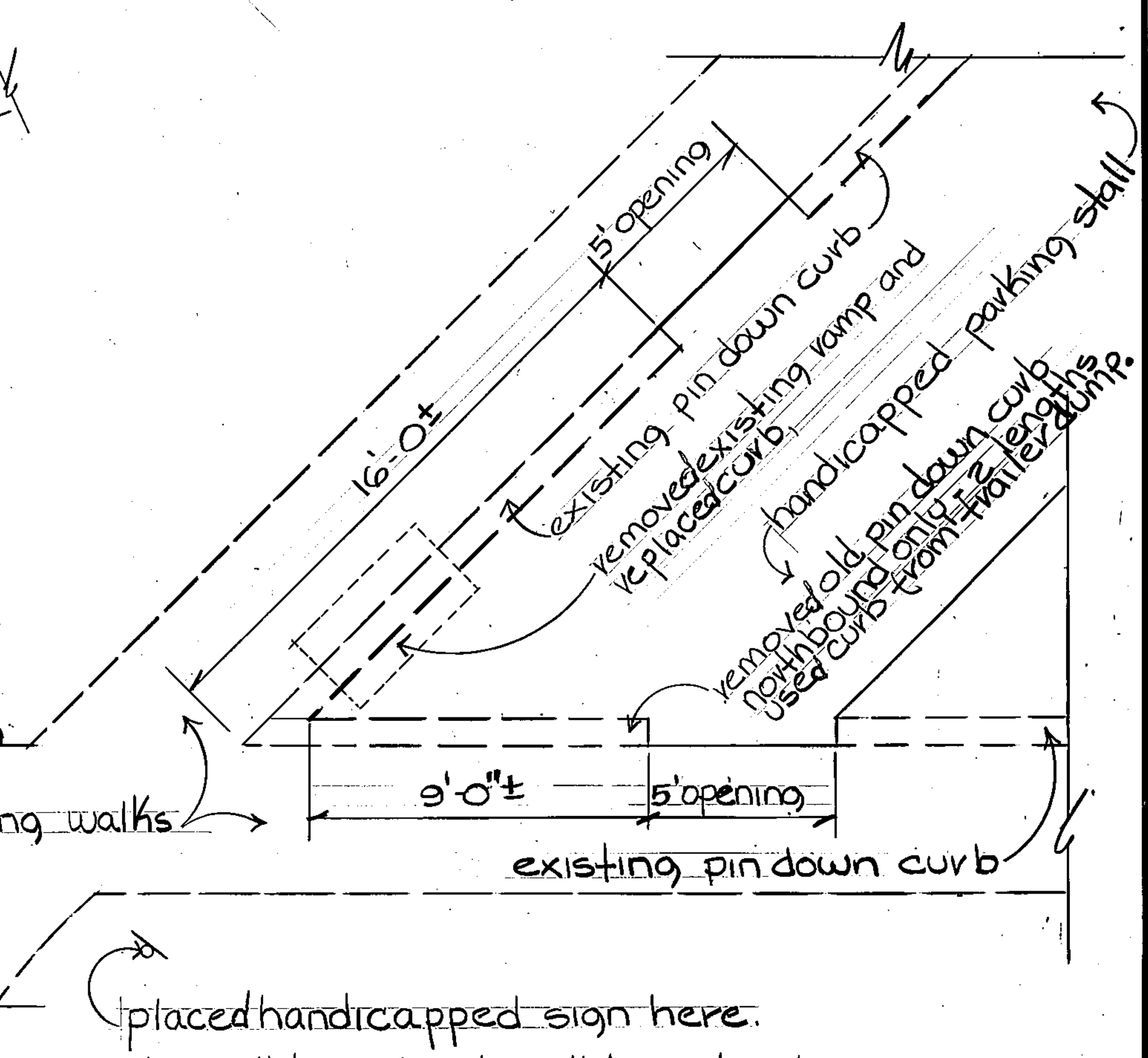
HANDICAPPED SIGN

SCALE: 3/4" = 1'-0"



LAYOUT PLAN - NORTHBOUND REST AREA

SCALE: 1" = 50'

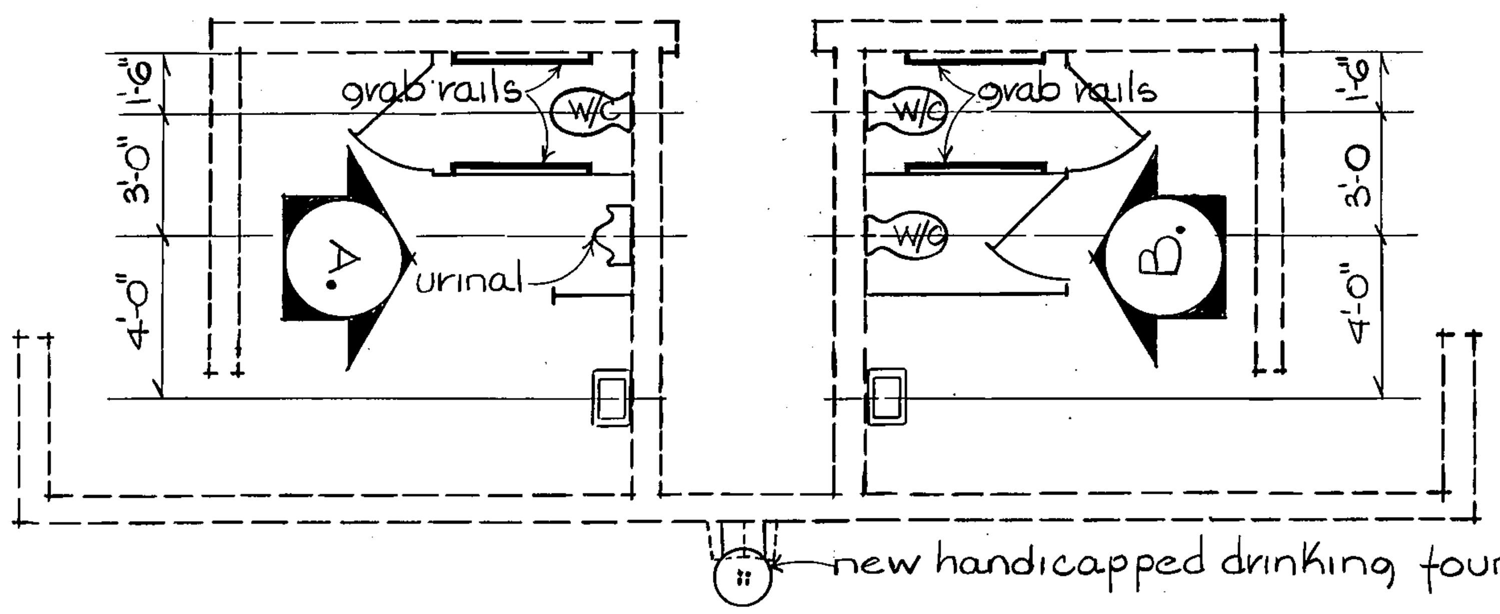


NOTE:
curb cut detail for both northbound and southbound rest area, reverse pattern for northbound rest area, exist ramp removal not needed for northbound handicapped parking.

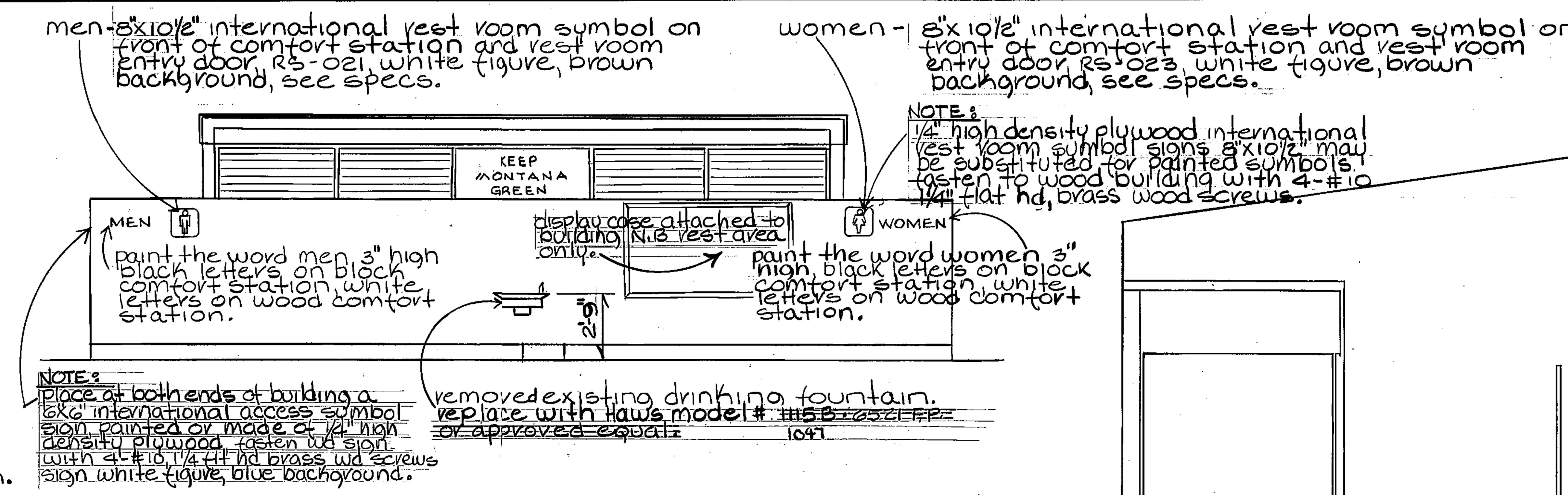
PLAN VIEW - CURB CUT DETAIL

SCALE: 1/4" = 1'-0"

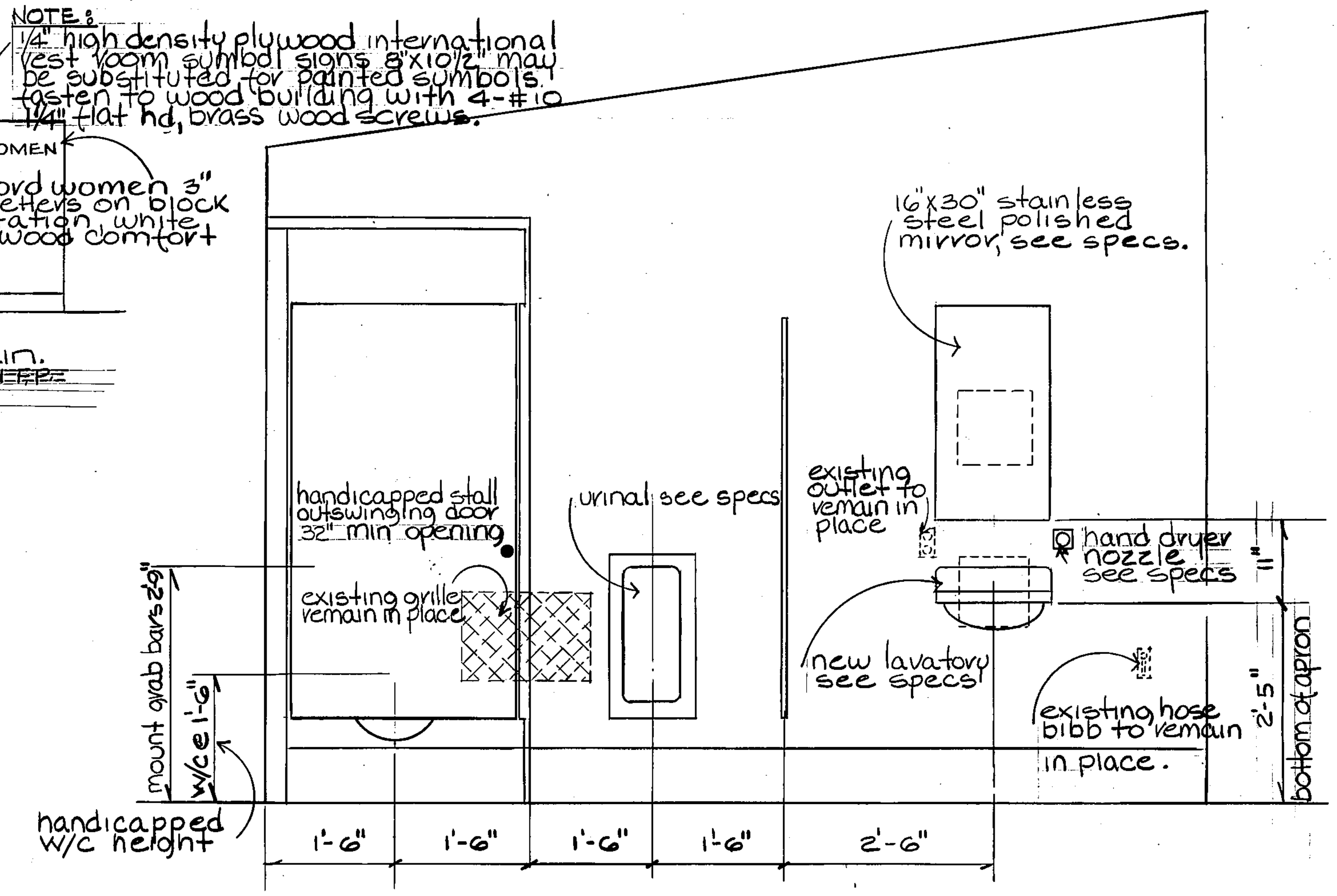
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MONT.	I 15-3(41)170	4	8



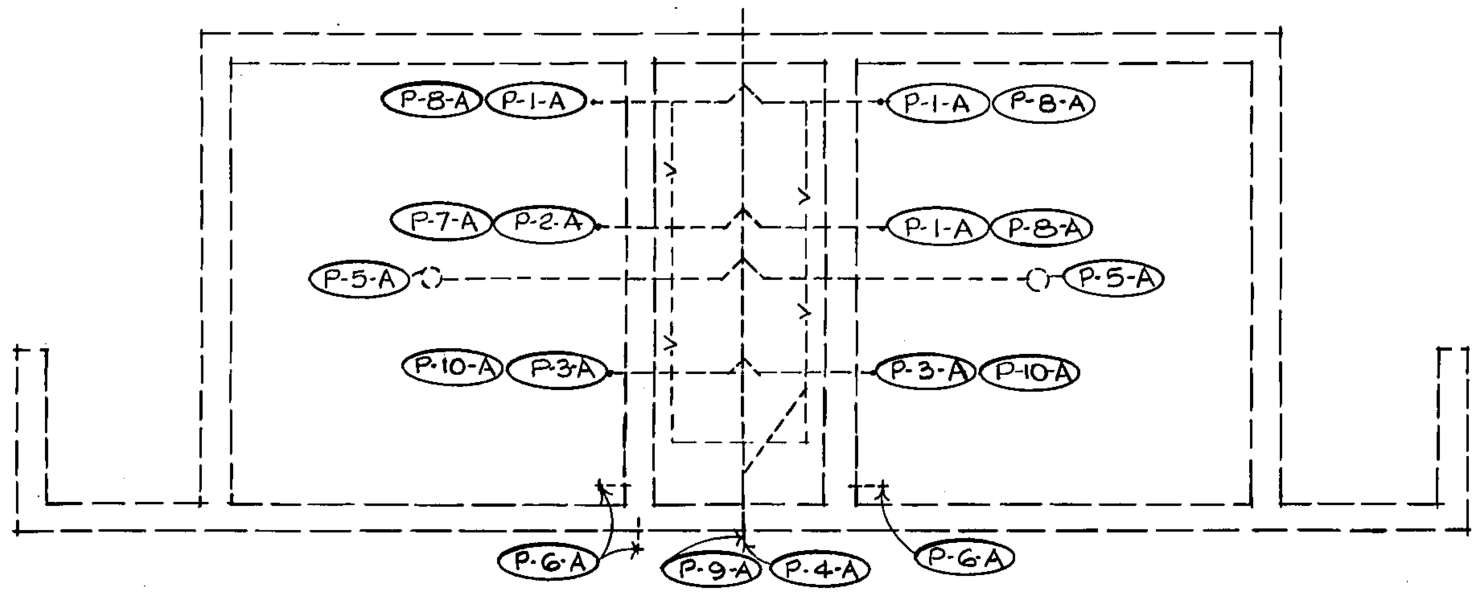
FIXTURES PLAN
SCALE: 1/4"=1'-0"



FRONT ELEVATION
SCALE: 1/4"=1'-0"



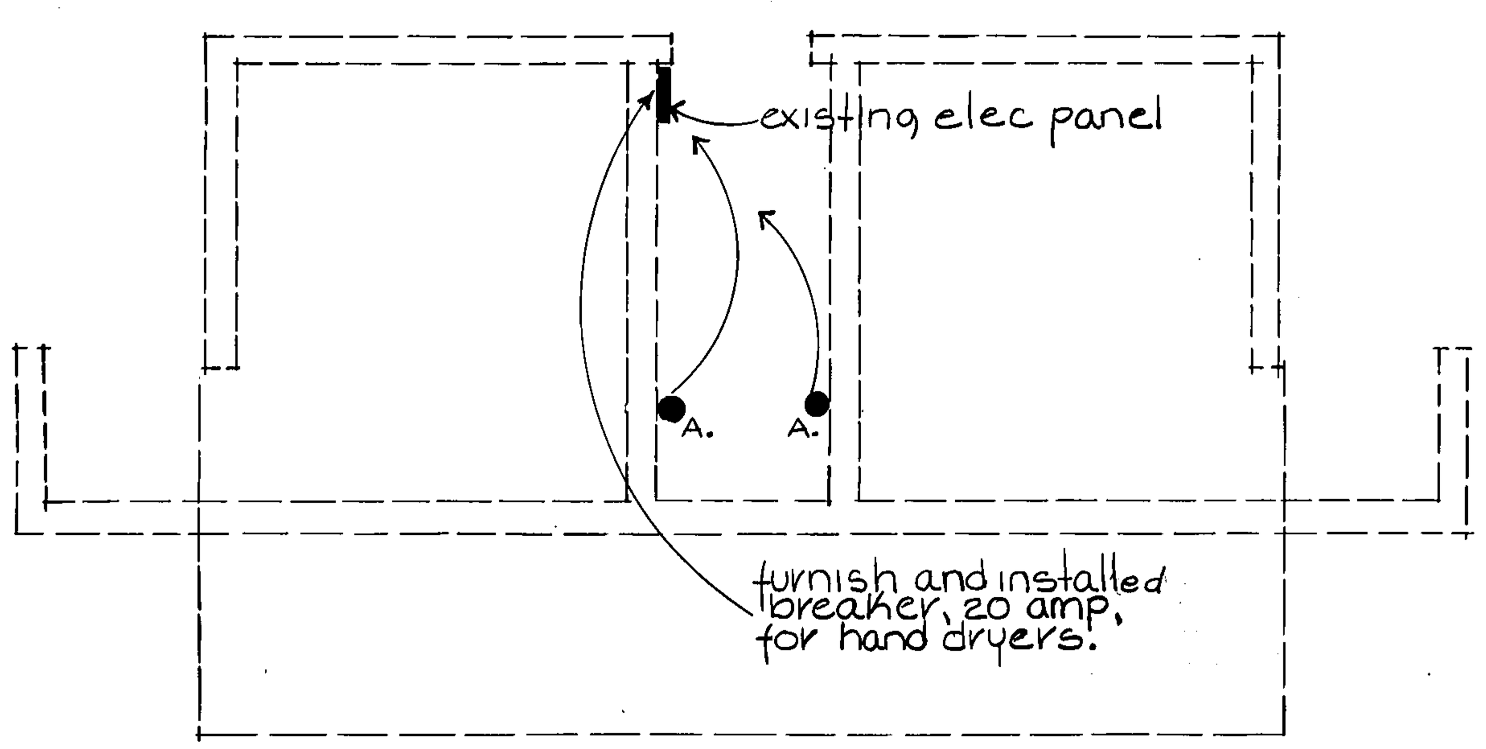
DETAILED ELEVATION - A
MEN'S REST ROOM
SCALE 3/4"=1'-0"



PLUMBING SCHEMATIC
SCALE: 1/4"=1'-0"

PLUMBING SCHEDULE

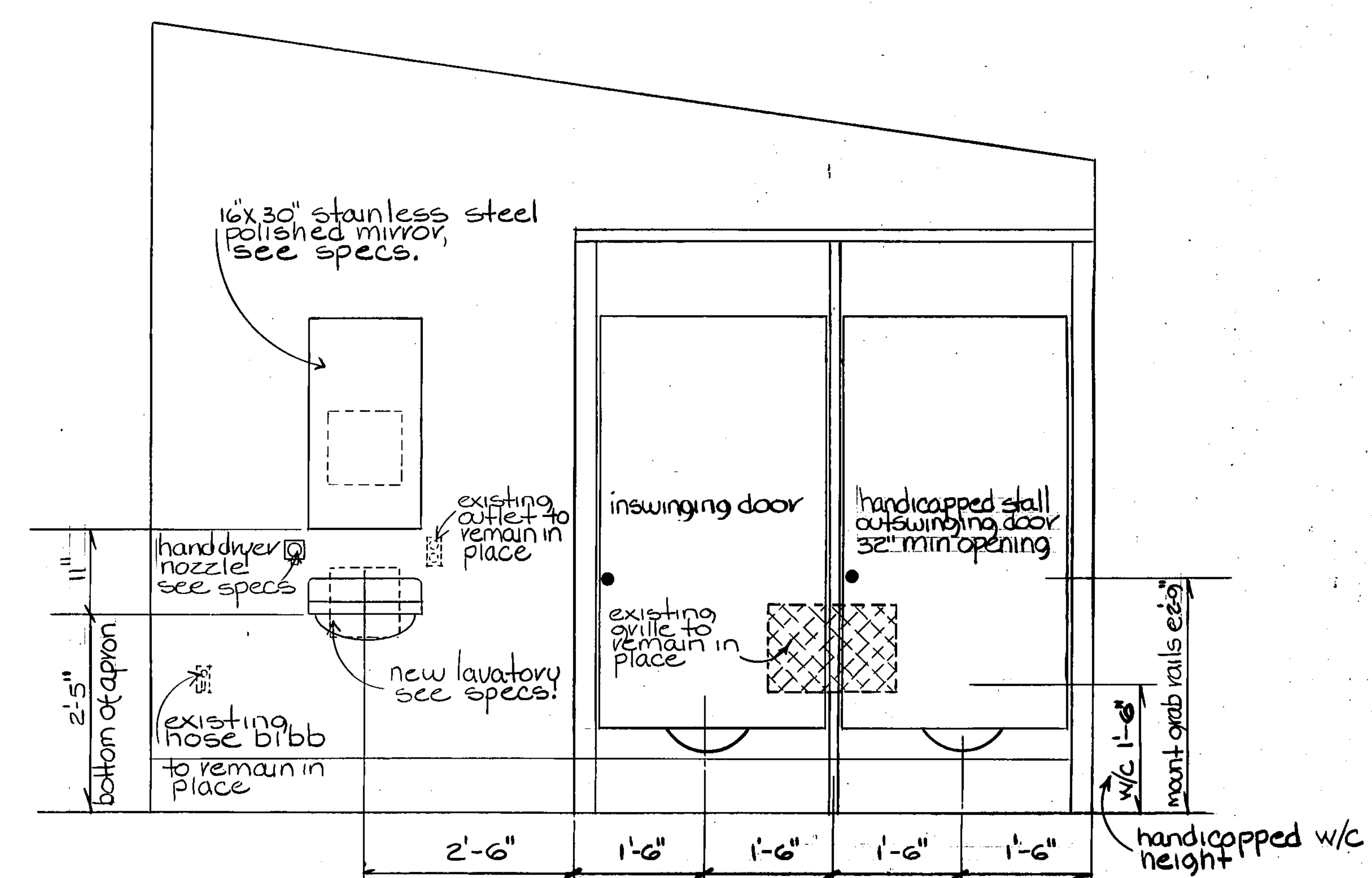
MARK	FIXTURE	C.W.	WASTE	VENT	REMARKS:
P-1-A	WATER CLOSET	1/2"	4"	2"	REMOVED FIXTURE
P-2-A	URINAL	1/2"	4"	2"	REMOVED FIXTURE
P-3-A	LAVATORY	1/2"	3"	2"	REMOVED FIXTURE
P-4-A	DRINKING FOUNTAIN	1/2"	2"		REMOVED FIXTURE
P-5-A	FLOOR DRAIN				SAVED
P-6-A	HOSE BIBB				SAVED
P-7-A	URINAL	1/2"	4"	EXT	NEW FIXTURE
P-8-A	WATER CLOSET				NEW FIXTURE
P-9-A	DRINKING FOUNTAIN	1/2"	2"		NEW FIXTURE
P-10-A	LAVATORY	1/2"	3"	2"	NEW FIXTURE



ELECTRICAL PLAN
SCALE: 1/4"=1'-0"

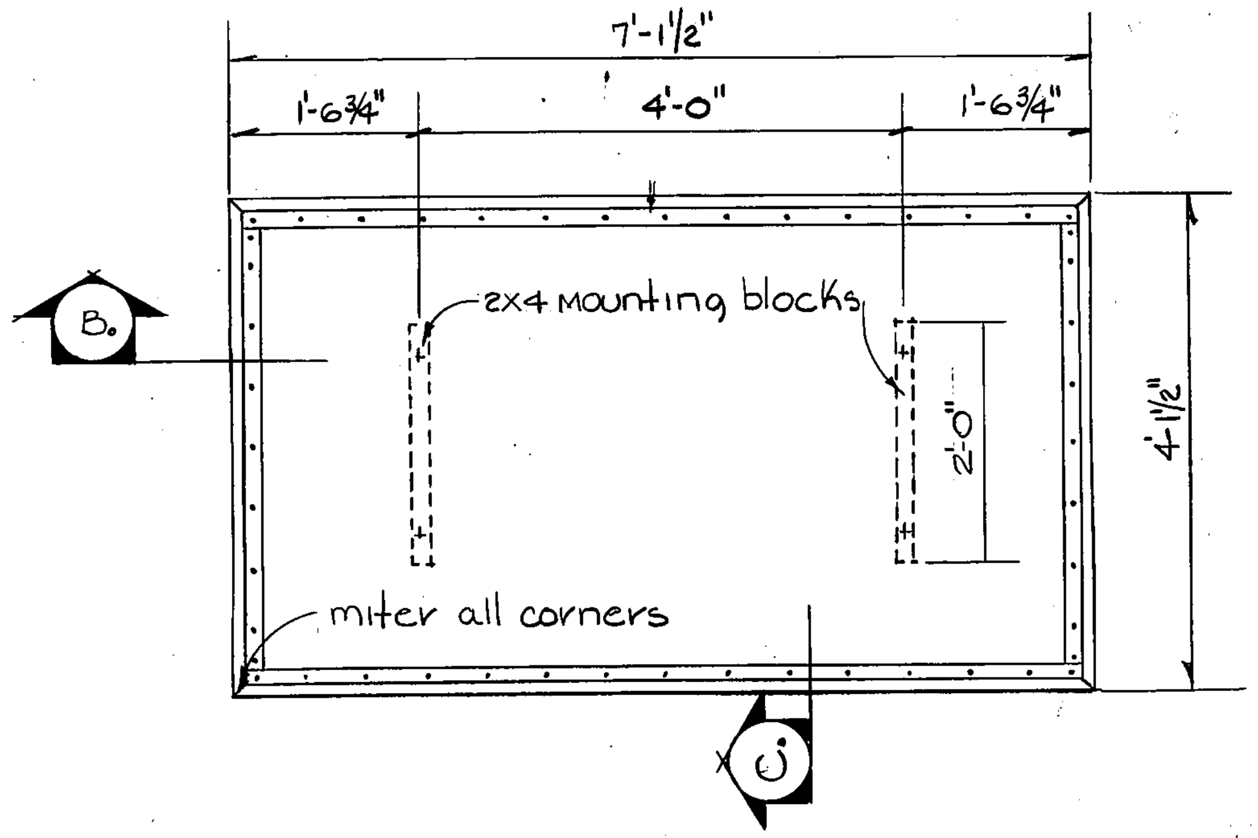
ELECTRIC FIXTURE SCHEDULE

MARK	FIXTURE	REMARKS
A.	HUMPHERY INC, FASTAIRE PRODUCTS	MODEL HD03

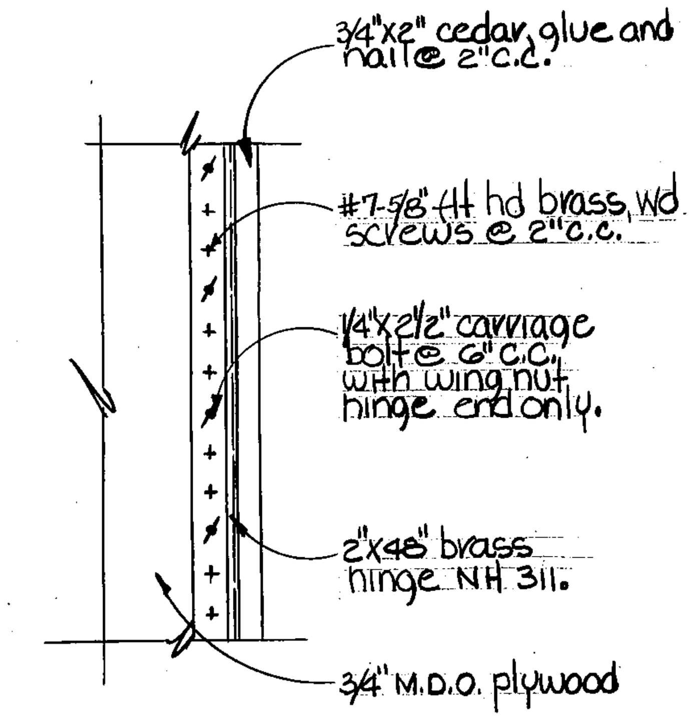


DETAILED ELEVATION-B
WOMEN'S REST ROOM
SCALE 3/4"=1'-0"

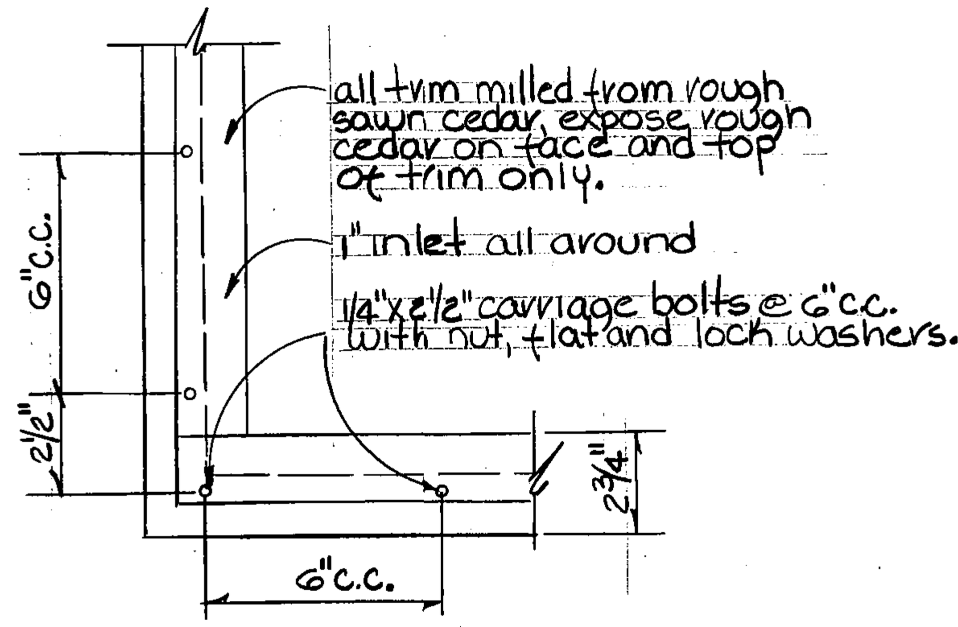
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MONT.	I-15-3(41)170	5	8



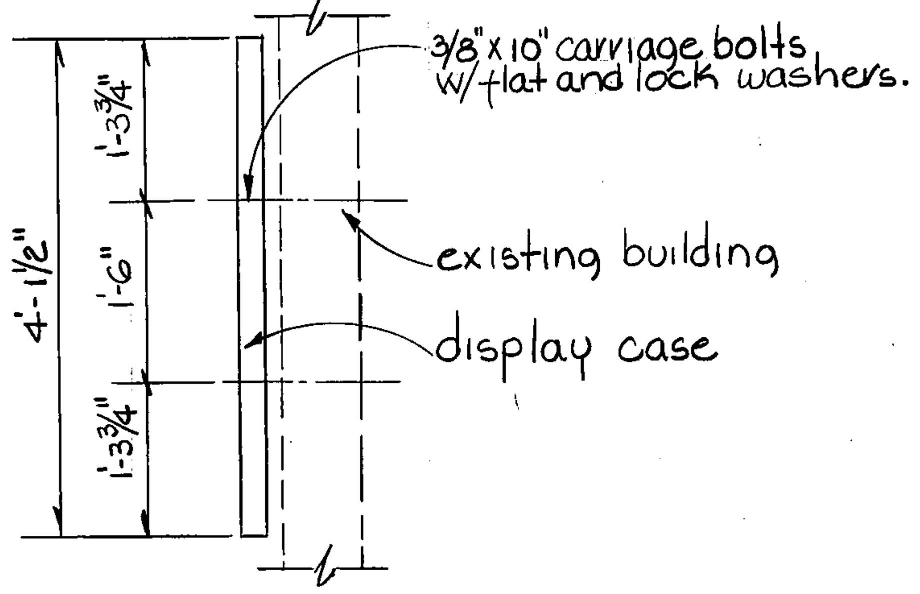
FRONT ELEVATION - DISPLAY CASE
SCALE: ¾" = 1'-0"



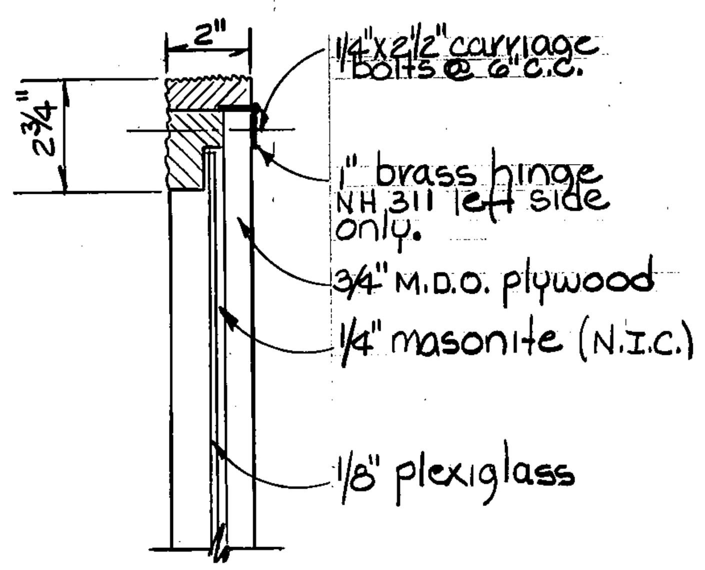
REAR VIEW - HINGE
SCALE: ¾" = 1'-0"



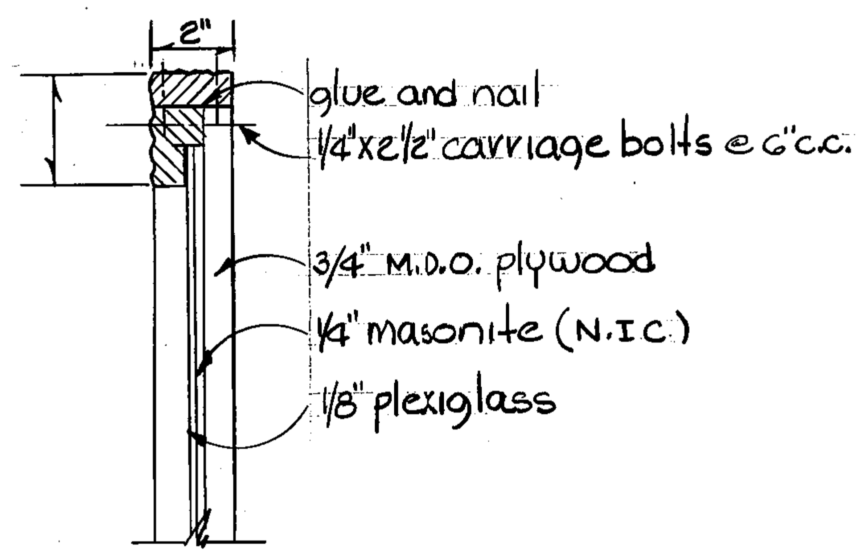
TYPICAL TRIM DETAIL
SCALE: ¾" = 1'-0"



SIDE VIEW - DISPLAY CASE
SCALE: ¾" = 1'-0"



SECTION B.
SCALE: ¾" = 1'-0"



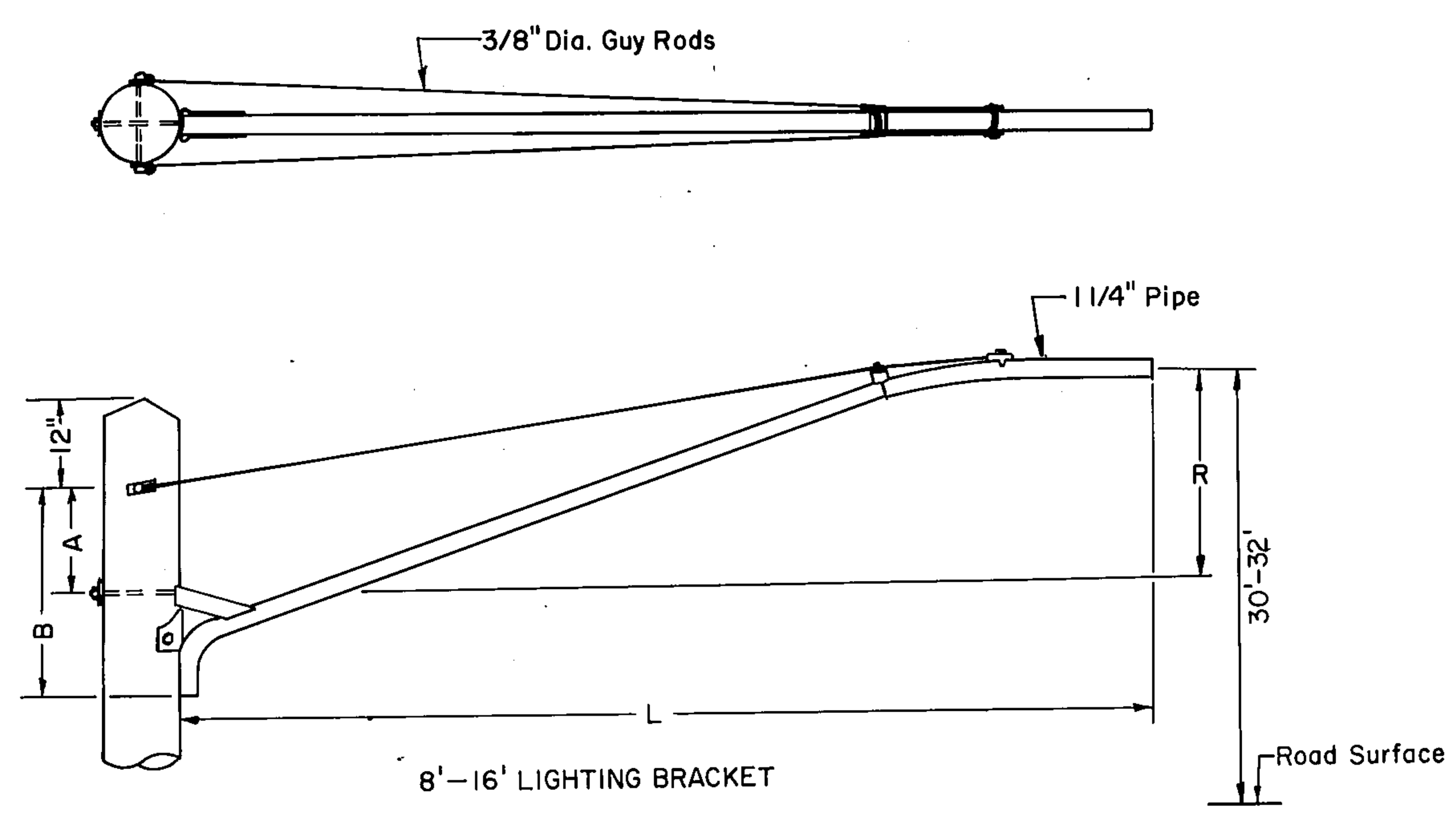
SECTION C.
SCALE: ¾" = 1'-0"

DESIGNED		
DRAWN		
CHECKED		
REVISED		
REVISED		
REVISED		

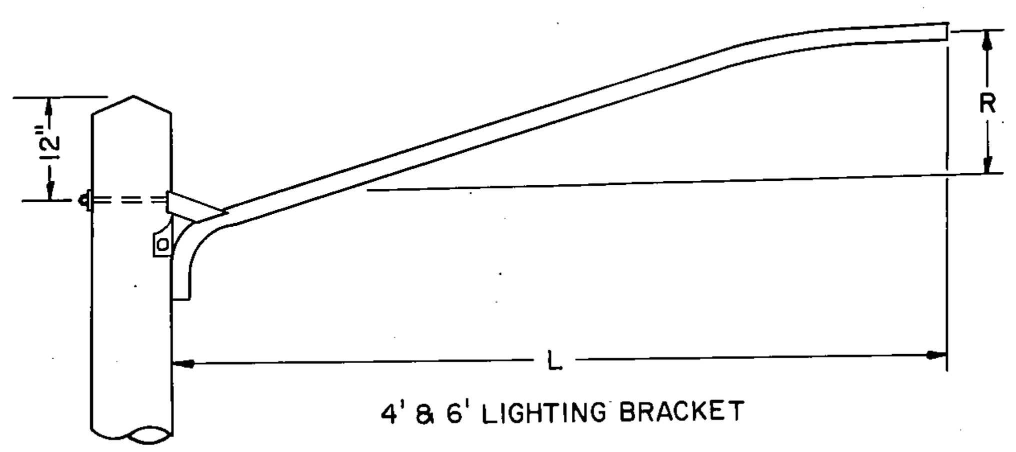
DRAWING NO.

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	I 15-3 (41) 170	6 OF 8

TYPE 1 LIGHTING BRACKET



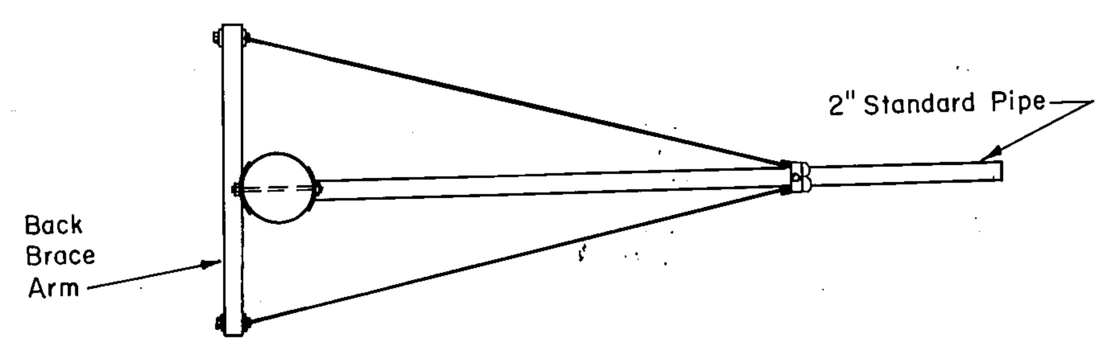
8'–16' LIGHTING BRACKET

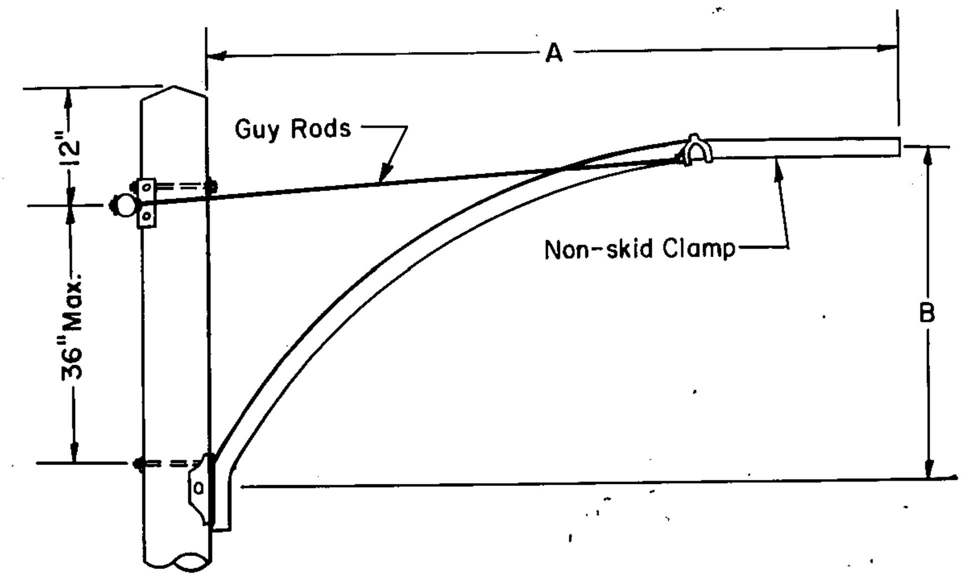


4' & 6' LIGHTING BRACKET

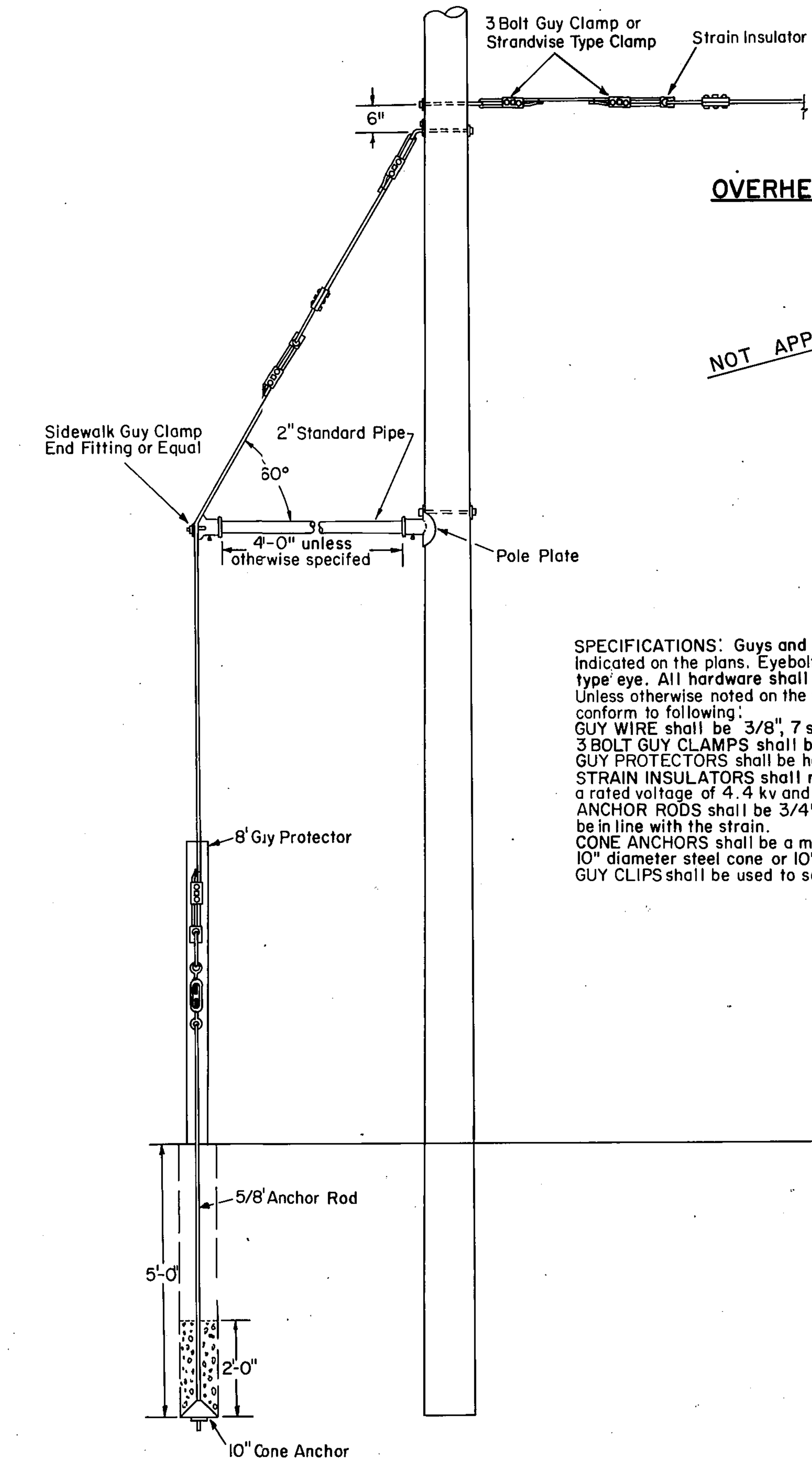
LENGTH L	RISE R	A	B
4'	14"	—	—
6'	22"	—	—
8'	35"	8"	15"
10'	35"	8"	15"
12'	42"	8"	15"
14'	47"	10"	17"
16'	52"	12"	19"

TYPE 2 LIGHTING BRACKET





BRACKET SPREAD A	RISE OF ARM B
6'	24"
8'	27"
10'	52"
12'	54"
14'	58"
16'	58"
18'	62"
20'	62"

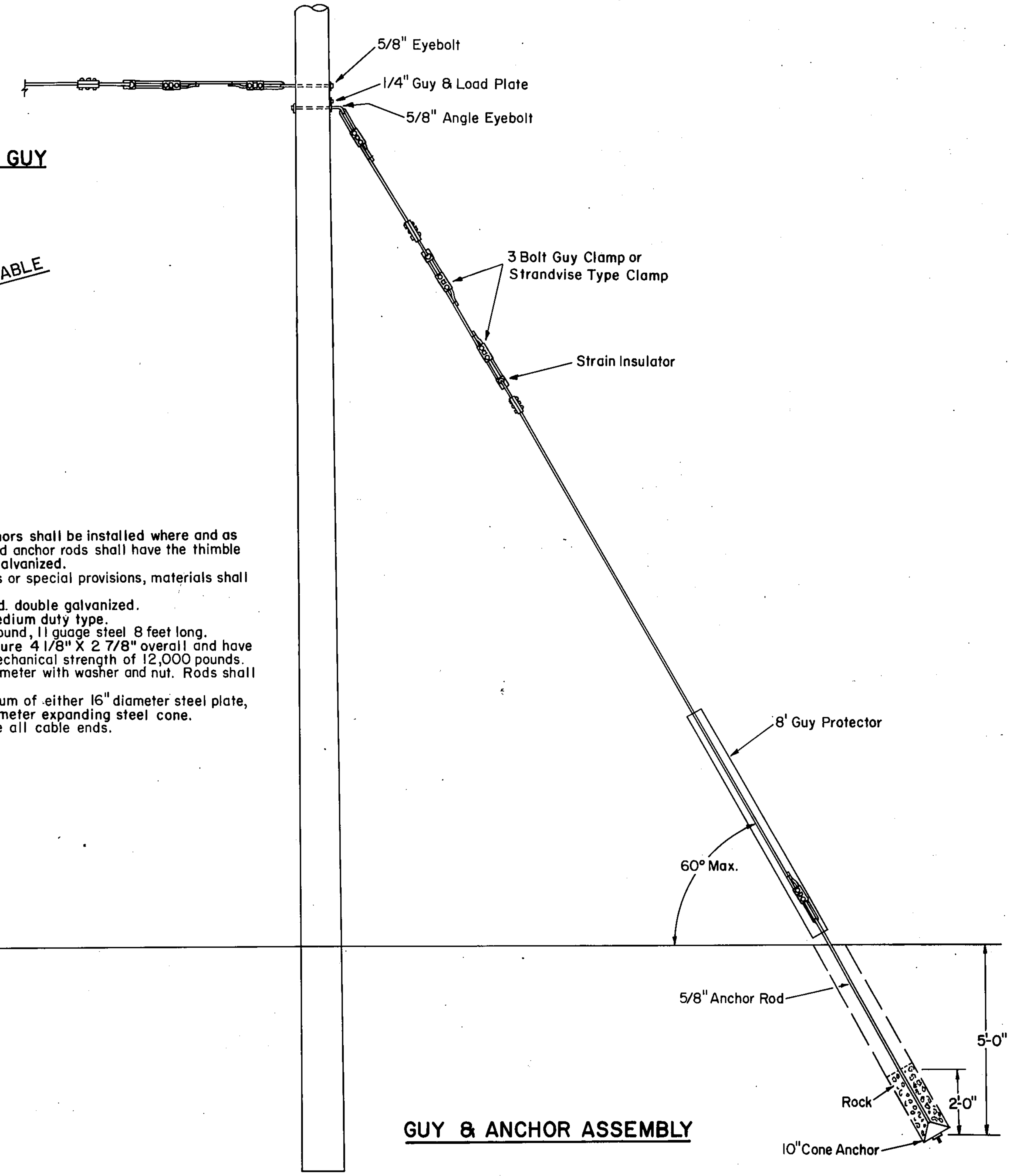


SIDEWALK GUY & ANCHOR ASSEMBLY

OVERHEAD GUY

NOT APPLICABLE

SPECIFICATIONS: Guys and anchors shall be installed where and as indicated on the plans. Eyebolts and anchor rods shall have the thimble type eye. All hardware shall be galvanized.
Unless otherwise noted on the plans or special provisions, materials shall conform to following:
GUY WIRE shall be 3/8", 7 strand. double galvanized.
3 BOLT GUY CLAMPS shall be medium duty type.
GUY PROTECTORS shall be half round, 11 guage steel 8 feet long.
STRAIN INSULATORS shall measure 4 1/8" X 2 7/8" overall and have a rated voltage of 4.4 kv and a mechanical strength of 12,000 pounds.
ANCHOR RODS shall be 3/4" diameter with washer and nut. Rods shall be in line with the strain.
CONE ANCHORS shall be a minimum of either 16" diameter steel plate, 10" diameter steel cone or 10" diameter expanding steel cone.
GUY CLIPS shall be used to secure all cable ends.



GUY & ANCHOR ASSEMBLY

ELECTRICAL
DETAIL DRAWING NO. 111

TYPE 1 AND TYPE 2 LIGHTING BRACKETS

GUY AND ANCHOR ASSEMBLIES

APPROVED: RONALD P. RICHARDS, - DIRECTOR OF HIGHWAYS
BY: Jack R. Baker
ADMINISTRATOR - ENGINEERING DIVISION

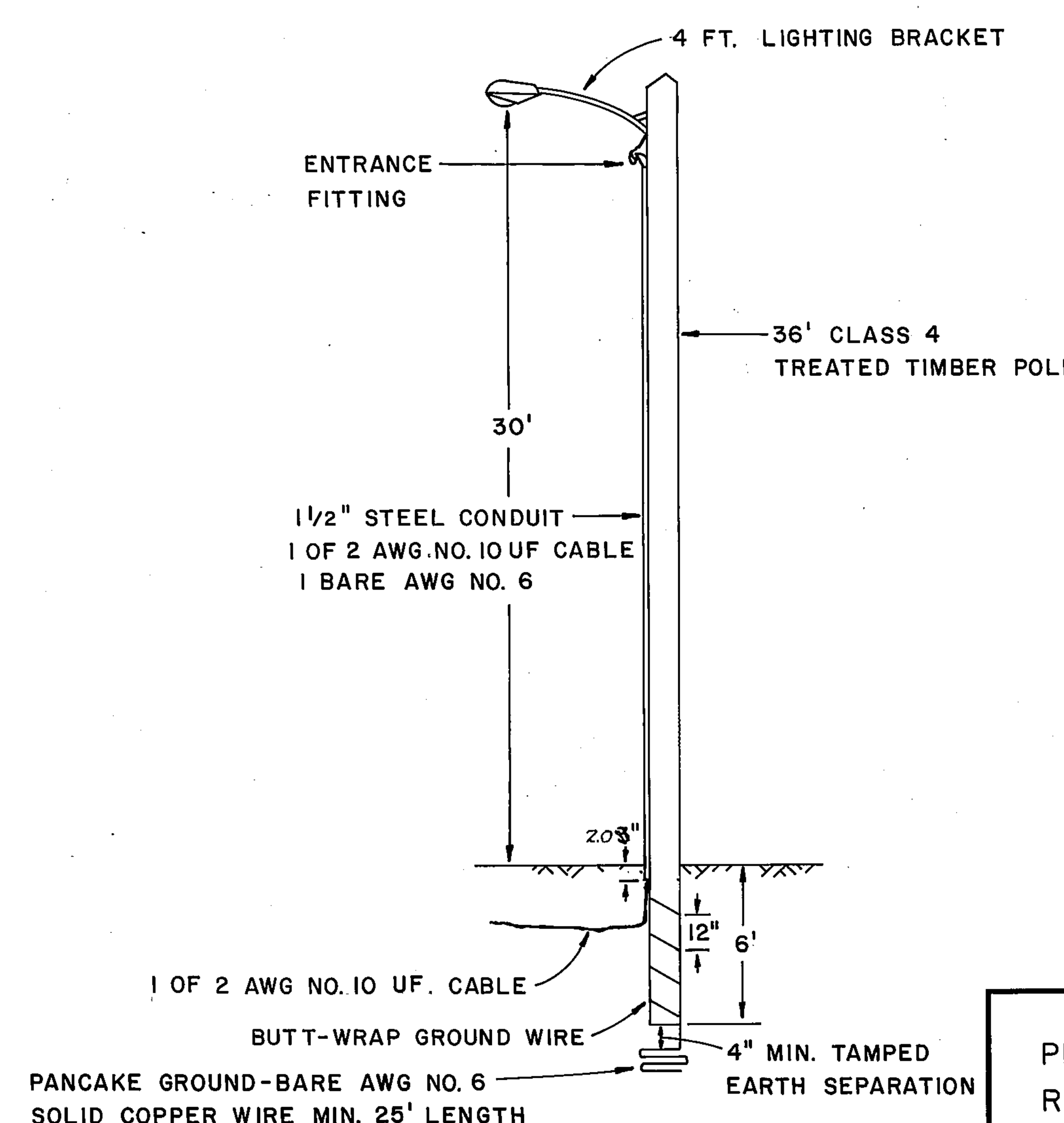
NO SCALE

DRAWN BY:	J. E. M.	7/10/73
CHECKED BY:	LLC	8-28-73

~~ESTIMATED~~ BILL OF MATERIAL			
ITEM	DESCRIPTION	QUANTITY	UNIT
1	CLASS 4, TREATED TIMBER POLE, 36 FT.	144	LIN. FT.
2	CONDUIT, RIGID STEEL, 1 1/2"	120 ~~108~~	LIN. FT.
3	CABLE, DIRECT BURIAL, 2 AWG NO. 10 UF	754 ~~590~~	LIN. FT.
4	CONDUCTOR, BARE AWG NO. 6	360	LIN. FT.
5	LUMINAIRE ASSY., H.P.S.V. 250 WATT	7	EACH
6	LIGHTING BRACKET, 4 FT.	4	EACH
7	REMOVE AND SALVAGE 250 WATT LUMINAIRE AND POLE	1	EACH
8	REMOVE AND SALVAGE 100 WATT LUMINAIRES AND POLES	11	EACH
9	REMOVE AND SALVAGE 250 WATT LUMINAIRES	3	EACH

BID QUANTITY SUMMARY			
ITEM NO.	DESCRIPTION	QTY	UNIT
871000090	REST AREA LIGHTING	1	LUMP SUM

NOTE: SERVICE TO THE NEW LUMINAIRES ~~WILL BE~~ TAKEN FROM THE EXISTING SERVICE AND CONTROL ASSEMBLY THAT SERVES THE EXISTING LUMINAIRES.



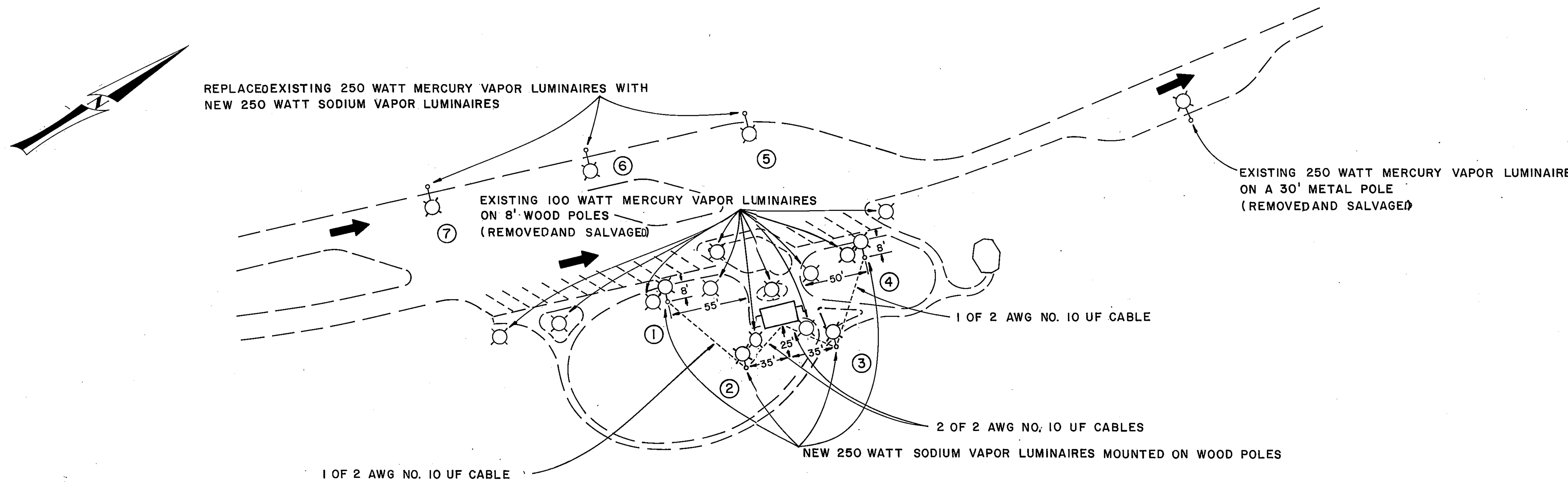
LIGHT POLE INSTALLATION DETAIL

PROJECT NO. I 15-3(41)170
REST AREA RENOVATION
JEFFERSON CITY REST AREA
JEFFERSON COUNTY

DESIGNED		
DRAWN	AWL	7/10/80
CHECKED		
REVISED		
REVISED		
REVISED		

DRAWING NO. TE-E-1519

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	I 15-3(41) 170	8 OF 8



REFERENCE ONLY: SEE PROJECT NO. I 15-3(22)168 UNIT 3 FOR THE ORIGINAL REST AREA PLANS

NORTHBOUND REST AREA

POLE SCHEDULE			
POLE NO.	H.P. SODIUM VAPOR LUMINAIRES	MOUNTING HEIGHT	MAST ARM LENGTH
1	250 WATT TYPE III	30'	4'
2	250 WATT TYPE V	30'	4'
3	250 WATT TYPE V	30'	4'
4	250 WATT TYPE III	30'	4'
5	250 WATT TYPE III	———	———
6	250 WATT TYPE III	———	———
7	250 WATT TYPE III	———	———

PROJECT NO. I 15-3(41) 170
REST AREA RENOVATION
JEFFERSON CITY REST AREA
JEFFERSON COUNTY

SCALE: 1" = 50'   DRAWING NO. TE-E-1513

DESIGNED		
DRAWN	AWL	6/3/80
CHECKED		
REVISED		
REVISED		
REVISED		

F.A.P.
I 15-3( )168

JEFFERSON CITY NORTH & SOUTH
SOUTH BOUND REST AREA

SCALE 1" = 100' OR AS NOTED
CONTOUR INTERVAL = 2 FT.
CONTOUR BEFORE GRADING
CONTOUR AFTER GRADING

NOTE:
EXISTING VEGETATION WITHIN REST AREA LIMITS IS TO BE PRESERVED AS MUCH AS POSSIBLE. CONTOUR GRADING AS SHOWN DEPICTS IN GENERAL THE DESIRED GRADING. TO PRESERVE EXISTING VEGETATION THE ACTUAL GRADING, LOCATION OF WALKS AND OTHER FACILITIES SHALL BE AS DIRECTED BY THE ENGINEER.

1	2	3	4	5
Δ = 16°18' LT.	Δ = 7°18'	Δ = 24° 45'	Δ = 25° 54'	Δ = 21° 23' 47"
D = 6°00	D = 4°00'	D = 12° 00'	D = 12° 00'	D = 4° 00'
T = 136.8	T = 91.4	T = 104.8'	T = 109.8'	T = 270.6'
L = 271.7	L = 182.5'	L = 206.3'	L = 215.8	L = 534.9'
R = 955.0	R = 1432.5	R = 458.4'	R = 458.4'	R = 1432.5'
P.C. = 155+00.0	P.C. = 157+80.3	P.C. = 161+16.0	P.C. = 166+27.7	P.C. = 168+76.9
P.I. = 156+36.8	P.I. = 158+71.7	P.I. = 162+20.8	P.I. = 167+37.5	P.I. = 171+47.5
P.T. = 157+71.7	P.T. = 159+62.8	P.T. = 163+22.3	P.T. = 168+43.5	P.T. = 174+11.8
SUPER = 0.07'/1.0'	SUPER = 0.06'/1.0'	SUPER = 0.04'/1.0'	SUPER = 0.04'/1.0'	SUPER = 0.06'/1.0'

JEFFERSON CITY NORTH & SOUTH
SOUTH BOUND REST AREA
SCALE 1" = 100' OR AS NOTED

I-15-3(3)168

Rest Area

- COMFORT STATION
- PICNIC SHELTER
- EXHIBIT CASE STD. DWG. NO. 100-10
- BENCH STD. DWG. NO. 100-05
- TABLE & SLAB TABLES FURNISHED BY STATE FORCES
- GARBAGE CAN RACK
- -W- WATER LINE
- -S- DRAIN TILE
- ..... STEEL EDGING
- -P- POWER LINE

LIGHTING LEGEND

- 100W MERCURY VAPOR - 8 FOOT
- 250W MERCURY VAPOR - 30 FOOT

LIGHTING SPECIFICATIONS

FIXTURE - 15" DIA. SEAMLESS WHITE BUTYRATE PLASTIC GLOBE WITH 100 WATT ASA # H38-4JA/DX/E MERCURY LAMP. FIXTURE TO BE STERNER # GSC15-100M-BLACK-120 VOLT, LESS POLE. MOUNT ON RYTHER-PURDY TYPE W TAPERED WOOD POLE NO W-7-4-8-3-3-C-R N-P3 COMPLETE WITH PLINTHS AS REQUIRED TO HOUSE BALLAST AT BASE OF POLE.

FIXTURE - 24" DIA. SEAMLESS WHITE BUTYRATE PLASTIC GLOBE WITH 250 WATT ASA # H37 5KC/DX/E MERCURY LAMP. FIXTURE TO STERNER # GDC24-250M-BLACK-120 VOLT, LESS POLE. MOUNT ON RYTHER-PURDY TYPE M-10-30-9-S-N3-P3 COMPLETE WITH PLINTHS AS REQUIRED TO HOUSE BALLAST AT BASE OF POLE.

Please call J.R.B.

JEFFERSON CITY NORTH & SOUTH
NORTH BOUND REST AREA
SCALE 1" = 100' OR AS NOTED

1	2	3	4	5	6	7	8
Δ = 2°54' RT.	Δ = 11°33'13"	Δ = 13°14'13"	Δ = 10°17'26"	Δ = 12°55'26"	Δ = 25°13'30" RT.	Δ = 35°00' LT.	Δ = 25°22'30" RT.
D = 0°45'	D = 3°00	D = 6° 00'	D = 6°00'	D = 4°30'	D = 3°30'	D = 3°00	D = 6°00
T = 193.4'	T = 193.2'	T = 110.8'	T = 86.0'	T = 144.2'	T = 366.3'	T = 602.2'	T = 215.0'
L = 386.7	L = 385.3	L = 220.6'	L = 171.5'	L = 287.2'	L = 720.7'	L = 1166.7'	L = 422.8'
R = 7640.0	R = 1910.0'	R = 955.0'	R = 955.0'	R = 1273.3'	R = 1637.1'	R = 1910.0'	R = 955.0'
P.C. 109 + 64.6	P.C. 115 + 39.8	P.C. 121 + 20.1'	P.C. 127 + 03.9	P.C. 132 + 64.3	P.C. 109 + 47.5	P.C. 120 + 43.5	P.C. 136 + 42.6
P.I. 111 + 58.0	P.I. 117 + 33.0	P.I. 122 + 30.9	P.I. 127 + 89.9	P.I. 134 + 08.5	P.I. 113 + 13.8	P.I. 126 + 45.7	P.I. 138 + 57.6
P.T. 113 + 51.3	P.T. 119 + 25.1	P.T. 123 + 40.7	P.T. 128 + 75.4	P.T. 135 + 51.5	P.T. 116 + 68.2	P.T. 132 + 09.8	P.T. 140 + 65.5 BK.
SUPER 0.02/1.0'	SUPER 0.04/1.0'	SUPER 0.04/1.0'	SUPER 0.04/1.0'	SUPER 0.06'/1.0'	SUPER 0.05/1.0'	SUPER 0.05/1.0'	SUPER 0.07/1.0'

PROFILE REST AREA
NORTH BOUND
(GRADING QUAN. INCL. IN MAINLINE)

PROFILE REST AREA
SOUTH BOUND *(GRADING QUAN. INCL. IN MAINLINE)*
I 15-3(22)168
JEFFERSON CITY-N & S

PROFILE
FRONTAGE ROAD

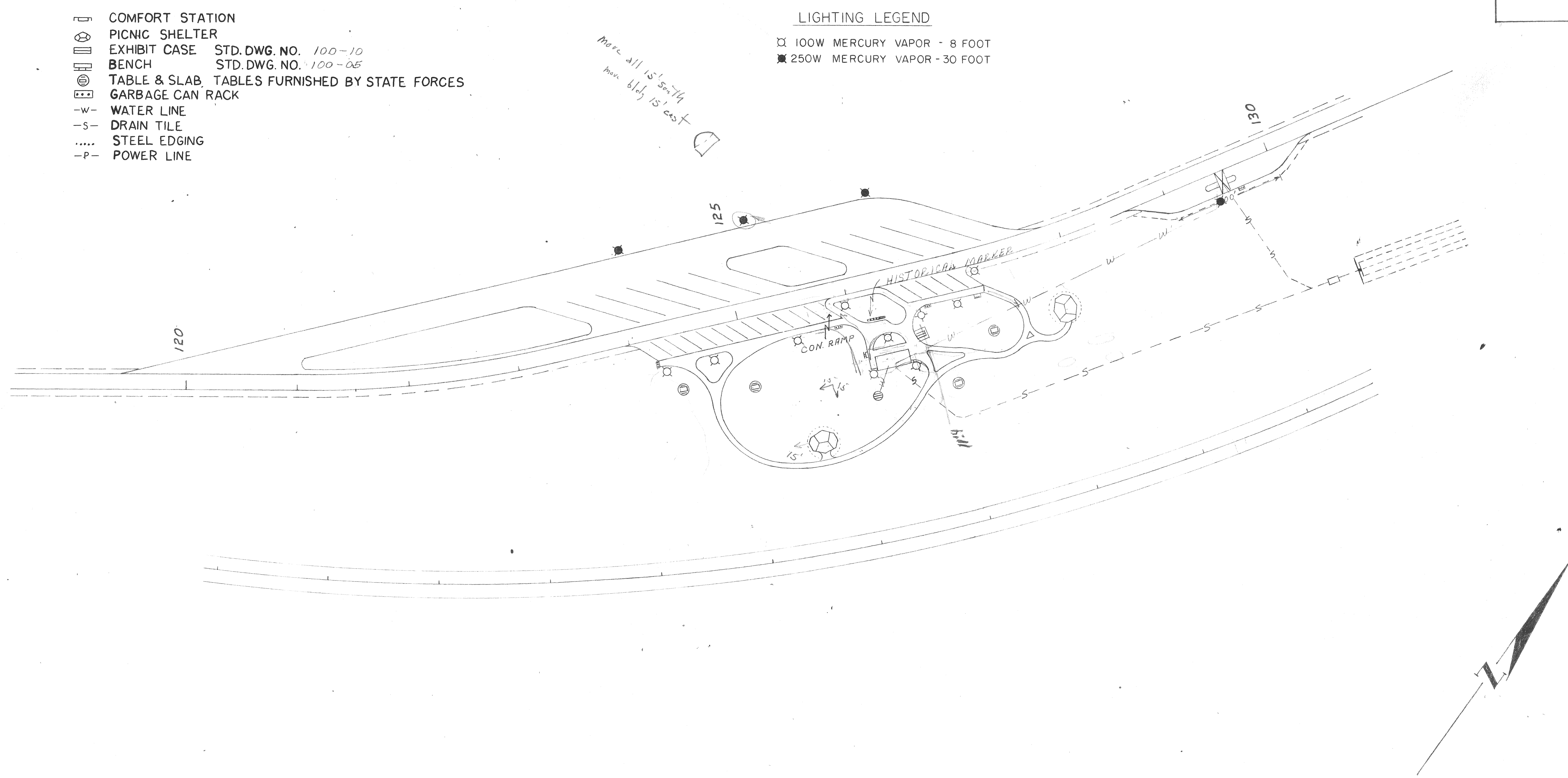
T. 8 N.
R. 3 W.
SEC. 31
STK. RAMP
RANDOM
S RIPRAP
STKD. ¢ PROJ. N. 7°57'30" E.
TYP. SEC. NO. 2
TRANS.
TYP. SEC. NO. 1
HAUL 51746'
102+00
750 C.Y. ADD. EXC.
STK. RAMP 5 LT. & RT.
H.W. 4493.7
Q.50 = 700 C.F.S.


PLAN
PROFILE
T.8 N.
R.3 W.
TO BUTTE
TO HELENA
STKD. N. 17°57'30" E.
PROJ. N. 17°57'30" E.
STKD. N. 27°06'30" E.
PROJ. N. 40°37'30" E.
FOR DETAIL OF REST AREA
SEE SHEET NO.
STRB.
END N.B. RAMP
PT. 135+51.5 BK.
POC. 135+50.0 AH.
BEG. TAPER
PROJ.
Δ: 22°40' RT.
D: 0°30'
T: 2296.8'
L: 4533.3'
R: 11460.0'
SEC. 29
SEC. 32
112+00
NEW 24"X152' MED. DR.
2 T-SEC - 2' RISER
2 MED. INLET COVER
STD. DWG. 77-03
F.E.T.S. RT.
80 C.Y. CULV. EXC.
132+70 REST AREA
NEW 24"X68' PIPE DR.
2 F.E.T.S.
20 C.Y. CULV. EXC.
TYP. SEC. NO. 2
121+00± TO 128+50±
REST AREA SITE PREP.
4200 C.Y. ADD. EXC.
HAUL 6487
800' V.C.
80
70
60
4450
40
30
110
5
120
5
130
5
140

150
160
STKD. N.27°06'30"E.
STKD.℄ PROJ. N.40°37'30"E.
FOR DETAIL OF REST AREA
SEE SHEET NO.
143+20
NEW 24"X150' MED.DR.
2 T-SEC.-2 MED.INLET COVER
STD.DWG.77-03
60 C.Y. CULV. EXC.
158+50
NEW 24"X 150' MED.DR.
2 T-SEC. - 2 MED.INLET COVER
STD. DWG. 77-03
20 C.Y. CULV. EXC.
168+50
NEW 24"X 210' PIPE DR.
STD. DWG. 77-03
TYP. SEC. NO. 2
TYP. SEC. NO. 1
160+50 TO 168+50
REST AREA SITE PREP
2000 C.Y. RDD. EXC.
-1.125%
50
40
30
20
10

173+57 (STK'D)
PWR. LINE X-ING ℄
3 PWR. & 2 TEL. LINES
173+96 (STK'D)
PWR. LINE X-ING. ℄
3 PWR. & 4 TEL. LINES
184+04 (STK'D)
PWR. LINE X-ING. ℄
189+30±
TIMBER BR. IN PL. RT.
TO BE REMOVED & RESET
170
180
190
200
STK'D ℄ PROJ. N. 40°37'30" E.
FRTG. RD. PROJ. NO. RT. ℄ PARALLEL TO THE MED. ℄
PROJ. N. 5°47'30" E.
R/W
HAUL 68,655 M. YDS.
183+53
INLET & OUTLET DTS.
355 C.Y. ADD. EXC.
183+70
DT. BLKS. ℄ MED. & DT. RT.
15 C.Y. ADD. EXC.
188+00 TO 196+50
CREEK CH. CH. RT.
INCL. IN ROADWAY CUT
FRTG. RD. RT.
189+00
FARM RD. APP. RT.
675 C.Y. ADD. EXC.
TYP. SEC. NO. 3

I-15-3(3)168



JEFFERSON CITY
NORTH BOUND REST AREA
SCALE 1" = 50'

I-15-3(3)168

▭ COMFORT STATION
⌀ PICNIC SHELTER
▭ EXHIBIT CASE STD. DWG. NO. 100-10
▭ BENCH STD. DWG. NO. 100-05
◎ TABLE & SLAB TABLES FURNISHED BY STATE FORCES
▭ GARBAGE CAN RACK
-W- WATER LINE
-S- DRAIN TILE
..... STEEL EDGING
-P- POWER LINE

LIGHTING LEGEND

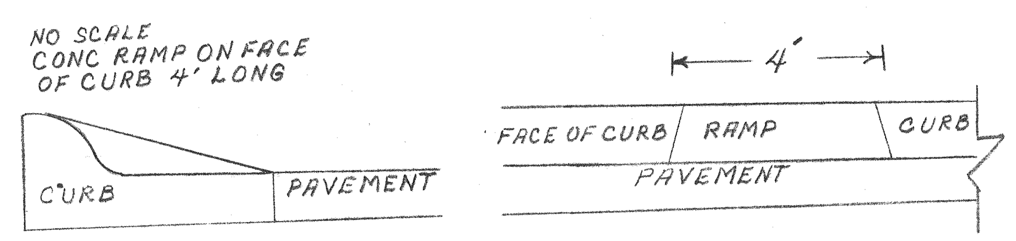
¤ 100W MERCURY VAPOR - 8 FOOT
✱ 250W MERCURY VAPOR - 30 FOOT

LIGHTING SPECIFICATIONS

FIXTURE ¤ - 15" DIA. SEAMLESS WHITE BUTYRATE PLASTIC GLOBE WITH 100 WATT ASA #H38-4JA/DX/E MERCURY LAMP. FIXTURE TO BE STERNER #GSC15-100M-BLACK-120 VOLT, LESS POLE. MOUNT ON RYTHER-PURDY TYPE W TAPERED WOOD POLE NO W-7-4-8-3-3-C-R N-P3 COMPLETE WITH PLINTHS AS REQUIRED TO HOUSE BALLAST AT BASE OF POLE.

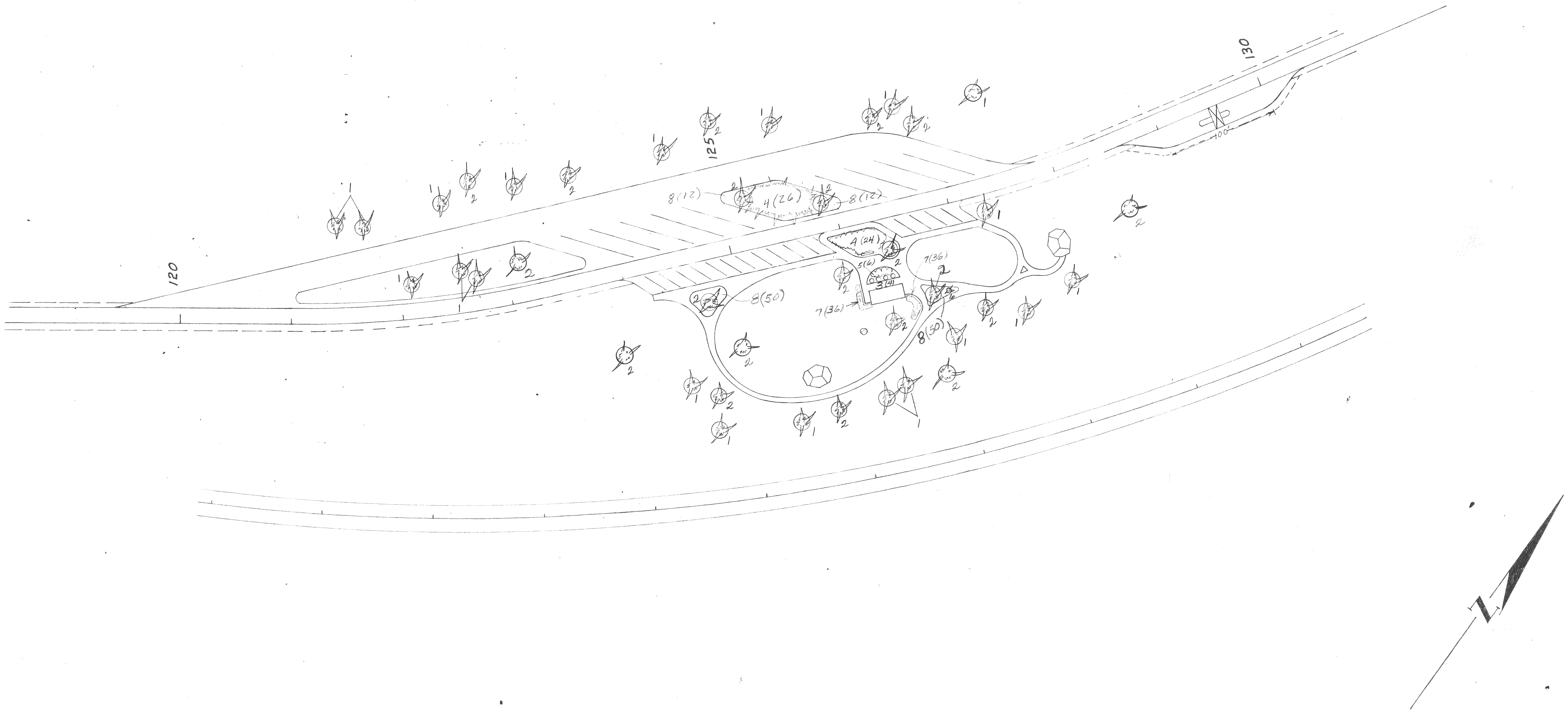
FIXTURE ✱ - 24" DIA. SEAMLESS WHITE BUTYRATE PLASTIC GLOBE WITH 250 WATT ASA #H37 5KC/DX/E MERCURY LAMP. FIXTURE TO STERNER #GDC24-250M-BLACK-120 VOLT, LESS POLE. MOUNT ON RYTHER-PURDY TYPE M-10-30-8-S-N3-P3 COMPLETE WITH PLINTHS AS REQUIRED TO HOUSE BALLAST AT BASE OF POLE.

CONC RAMP DETAIL
FOR BOTH NORTH AND SOUTH
BOUND REST AREAS.



SCALE 1"=50'

I-15-3(3)168



PLANT LIST

KEY	COMMON NAME	BOTANICAL NAME	QUAN.
1.	DOUGLAS FIR	Pseudotsuga menziesii	20
2	PONDEROSA PINE	Pinus ponderosa	20
3	DWARF MUGO PINE	Pinus mugho var. mughus	4
4	COMMON MOUNTAIN JUNIPER	Juniperus communis	50
5	CREEPING JUNIPER	Juniperus horizontalis	6
6	PFITZER JUNIPER	Juniperus chinensis var. pfitzeriana	0
7	SHRUBBY CINQUEFOIL	Potentilla fruticosa	72
8	KINNIKINNICK	Arctostaphylos uva-ursi	124

JEFFERSON CITY
NORTH BOUND REST AREA

SCALE 1" = 50'

—NOTE—

ALL SIDE WALKS, BUILDINGS, ARBORS AND OTHER FACILITIES SHALL BE ADJUSTED AND LOCATED BY THE ENGINEER SO AS NOT TO DESTROY ANY EXISTING TREES AND SHRUBS

ONLY THOSE TREES AND SHRUBS LOCATED WITHIN THE CONSTRUCTION LIMITS OF THE REST AREA RAMP AND PARKING AREA MAY BE REMOVED OR DESTROYED. ALL TREES AND SHRUBS OUTSIDE THE CONSTRUCTION LIMITS SHALL BE TAGGED AND PRESERVED.

~NOTE~

FIRST FIGURE DESIGNATES TYPE OF SHRUB FROM KEY. SECOND FIGURE DESIGNATES QUANTITY OF PLANTS

PLANT LIST

KEY	COMMON NAME	BOTANICAL NAME	QUAN.
1.	DOUGLAS FIR	Pseudotsuga menziesii	6
2.	PONDEROSA PINE	Pinus ponderosa	6
3.	DWARF MUGO PINE	Pinus mugho var. mughus	0
4.	COMMON MOUNTAIN JUNIPER	Juniperus communis	2
5.	CREEPING JUNIPER	Juniperus horizontalis	6
6.	PFITZER JUNIPER	Juniperus chinensis var. pfitzeriana	3
7.	SHRUBBY CINQUEFOIL	Potentilla fruticosa	8
8.	KINNIKINNICK	Arctostaphylos uva-ursi	126

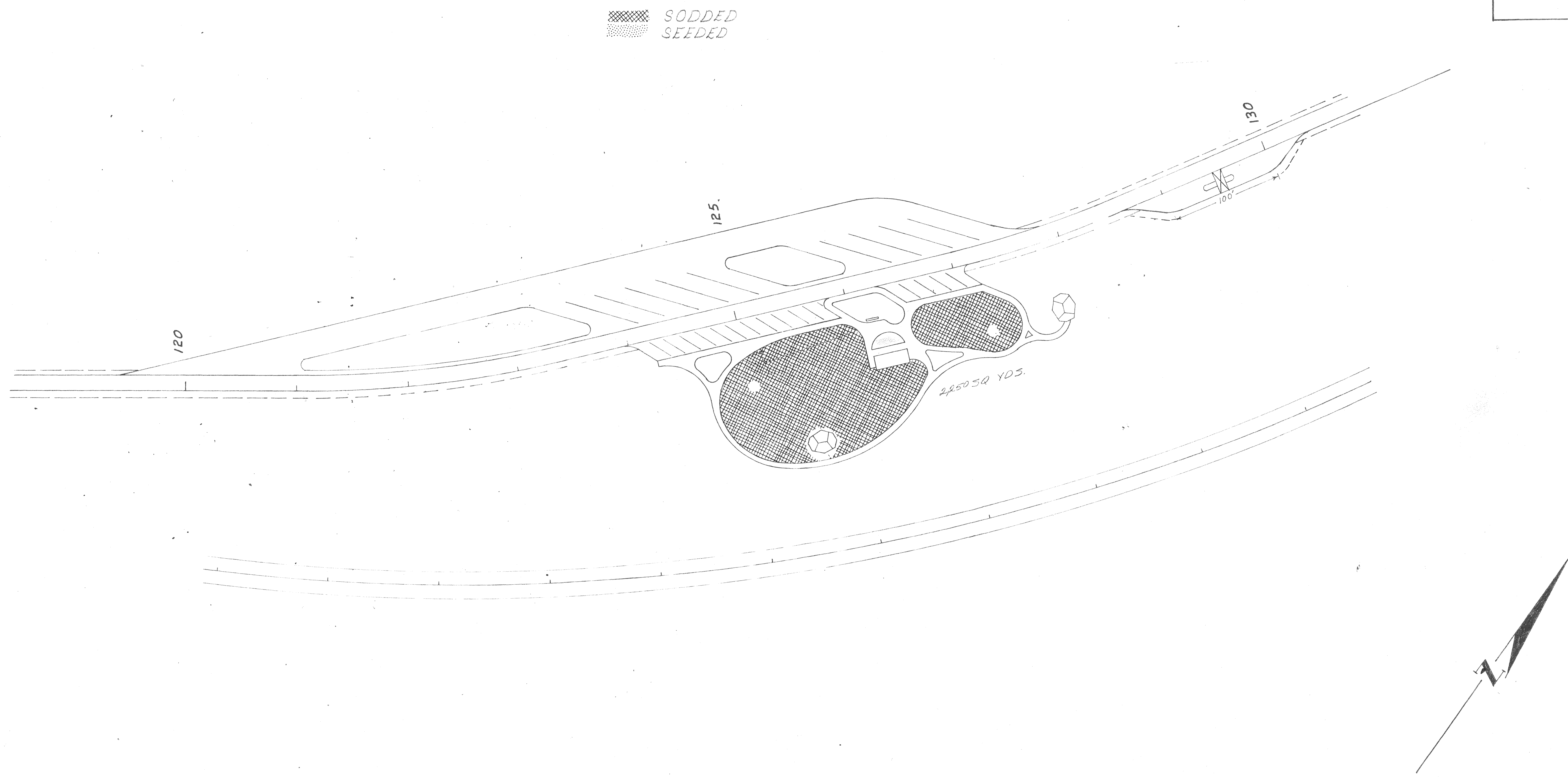
SCALE 1" = 50'

EXISTING CONIFERS

EXISTING DICIDUOUS TREE OR SHRUB

NEW CONIFER TO BE PLANTED ~ THIS CONTRACT

I-15-3(3)168

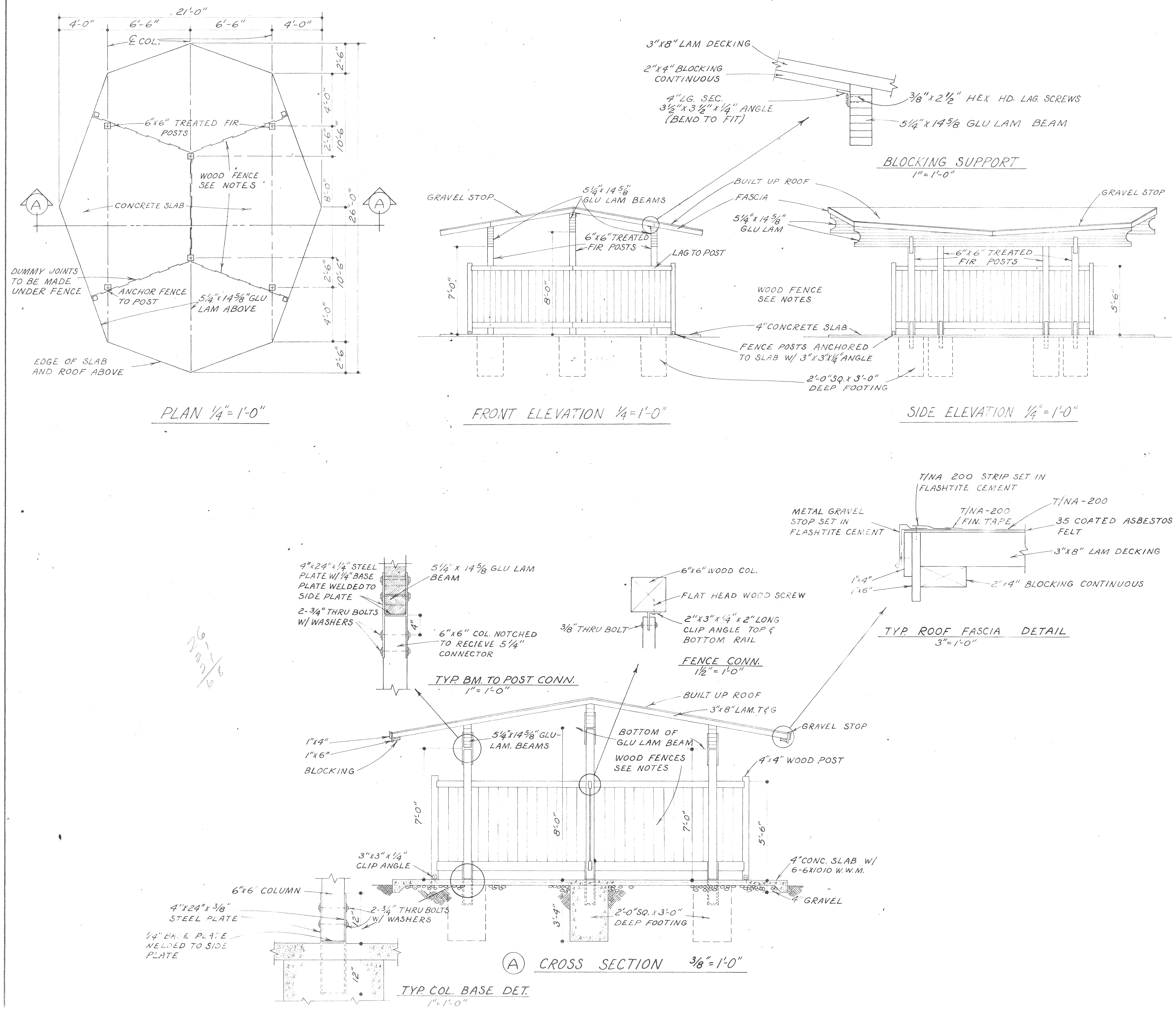


JEFFERSON CITY
NORTH BOUND REST AREA

SCALE 1" = 50'

I-15-3(3)168

SCALE 1" = 50'



GENERAL NOTES & SPECIFICATIONS

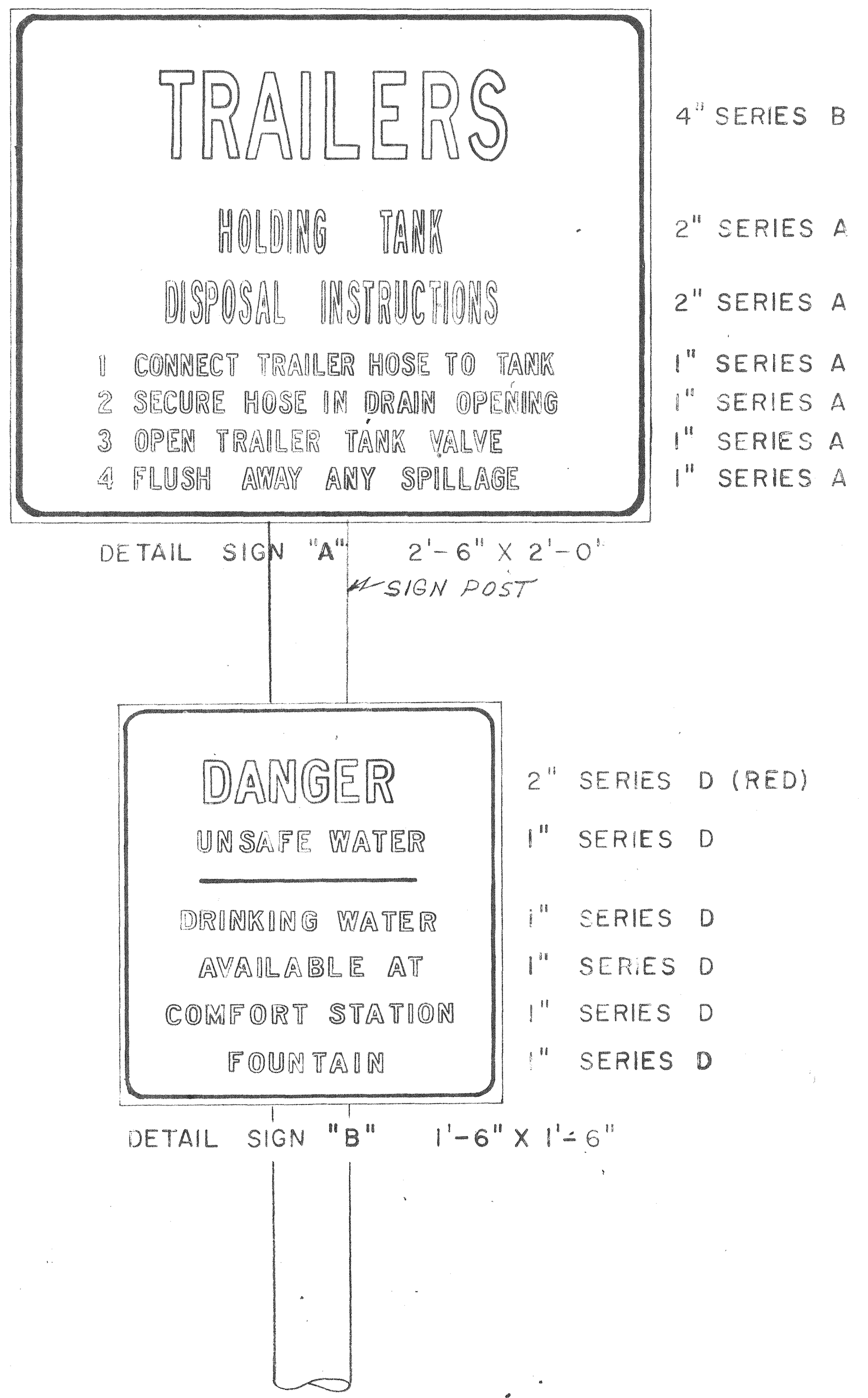
1. SITE WORK - DO NO MORE STRIPPING, CLEARING AND GRUBBING NOR EXCAVATION THAN IS NECCESSARY TO COMPLETE THE WORK OUTLINED IN THESE SPECIFICATIONS. GET ENGINEER'S APPROVAL. REMOVE FROM THE SITE AND DISPOSE OF ALL EXCESS STRIPPED OR EXCAVATED MATERIAL NOT REUSED IN NEW CONSTRUCTION AS DIRECTED BY THE ENGINEER
2. CONCRETE - ALL SHALL BE CLASS "DD". WIRE MESH 6x6 #10 GAUGE. CURING COMPOUND; ALL EXPOSED CONCRETE, TYPE AS APPROVED BY THE ENGINEER. BROOM FINISH FOR ALL SLABS.
3. CARPENTRY - SEE DETAILS AND NOTES ON THIS SHEET FOR MATERIALS IN GENERAL. LAMINATED CONSTRUCTION - BEAMS; 2400 F WEST COAST DOUGLAS FIR - LOCK DECK; IDAHO WHITE PINE, FIR OR LARCH. CUT BEAMS TO SHAPE AND LENGTH. FURNISH ALL WOOD TO WOOD CONNECTORS. BEAMS AND DECK COMPLETELY FACTORY PRE-FINISHED. PHENOLIC WATERPROOF ADHESIVE FOR ALL LAMINATED CONSTRUCTION. FENCE; POSTS, RAILS AND BOARDS ALL RESAWN CEDAR SIMILAR TO "GAP 'N LAP" BY POTLATCH.
4. MOISTURE PROTECTION - 4 MIL POLYETHYLENE UNDER ALL CONCRETE SLABS TAKING CARE NOT TO TEAR OR PIERCE. SHEET METAL; 24 GAUGE GALVANIZED IRON. ROOFING; 1 PLY OF 43 LB. UNIVERSAL BASE SHEET, 1 PLY OF 15 LB. ASPHALT IMPREGNATED NON-PERFORATED ROOFING FELT, 2½ GALS. (25 LBS.) PER SQUARE OF COLD METHOD CEMENT, FINISHING TAPE. FINISHED ROOFING TO HAVE A TOTAL WT. OF 83 LBS. PER SQUARE. ROOFING SHALL BE RUBEROLD T/NA 200 OR APPROVED EQUAL.
5. PAINTING AND STAINING - SUBMIT COMPLETE DESCRIPTIVE LITERATURE AND/OR SAMPLES OF ALL MATERIALS PROPOSED FOR USE. OBTAIN APPROVAL OF ALL MATERIALS BEFORE PROCEEDING WITH WORK. ALL EXPOSED WOOD; 2 COATS SEMI-TRANSPARENT STAIN. GALVANIZED IRON; 1 COAT OF PITTSBURGH IRONHIDE, 2 COATS OF PITTSBURGH SUNPROOF HOUSE PAINT. ALL OTHER METAL; 1 COAT OF PRIMER UNLESS SHOP PRIMED, 2 COATS PITTSBURGH SUNPROOF HOUSE PAINT. OTHER ACCEPTABLE MANUFACTURERS ARE BENJAMIN MOORE, SHERWIN WILLIAMS, GLIDDEN OR APPROVED EQUAL.
6. ALL "H" PLATES, ANGLE IRONS, PLATES AND CONNECTION PLATES SHALL BE OF A SELF WEATHERING STEEL.
7. REFER TO MONTANA HIGHWAY DEPARTMENT SPECIAL PROVISIONS FOR GENERALLY APPLICABLE SPECIFICATIONS.

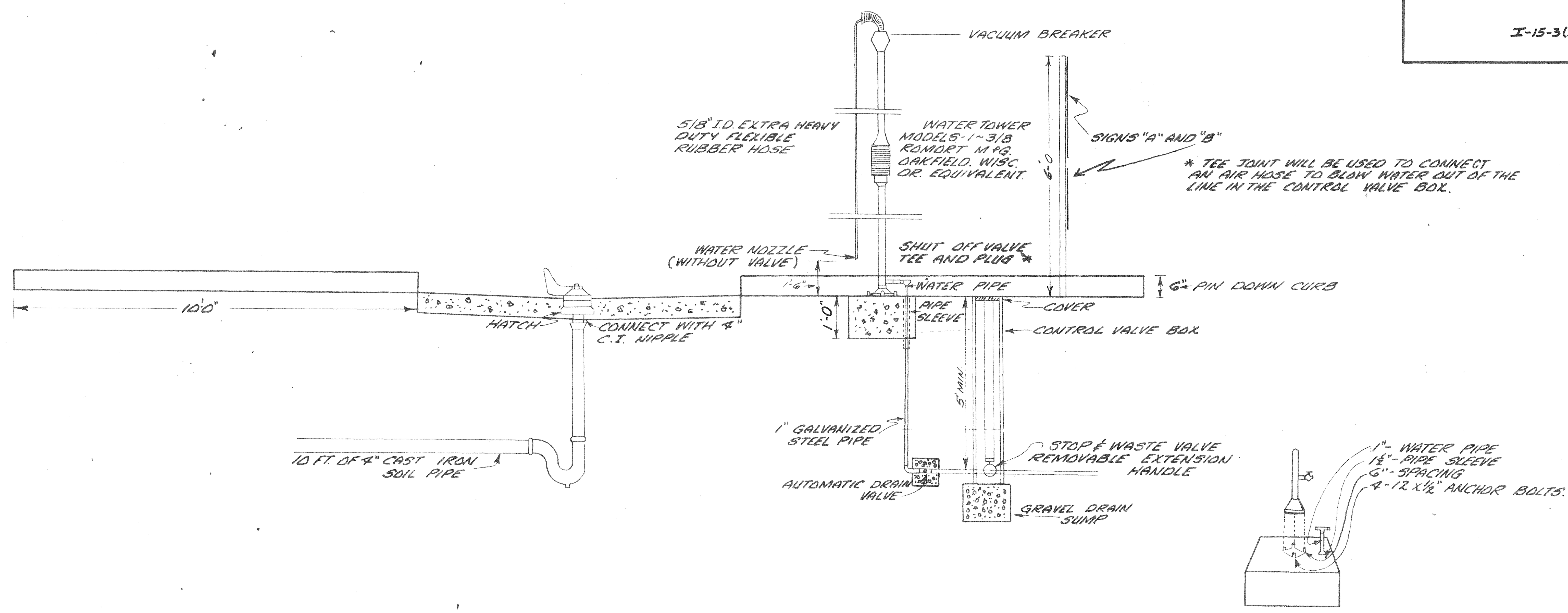
NOTE - COLOR OF PENETRATING SEMI-TRANSPARENT STAIN FOR ALL BEAMS, POSTS AND RAILS SHALL BE OLYMPIC STAIN NO. 711 OR A CORRESPONDING COLOR OF ANOTHER BRAND. THE COLOR OF PENETRATING SEMI-TRANSPARENT STAIN FOR THE SCREEN FENCE PANELS, AND THE DECKING SHALL BE OLYMPIC STRAIN NO. 723, OR A CORRESPONDING COLOR OF ANOTHER BRAND.

FOUR-TABLE PICNIC ARBOR

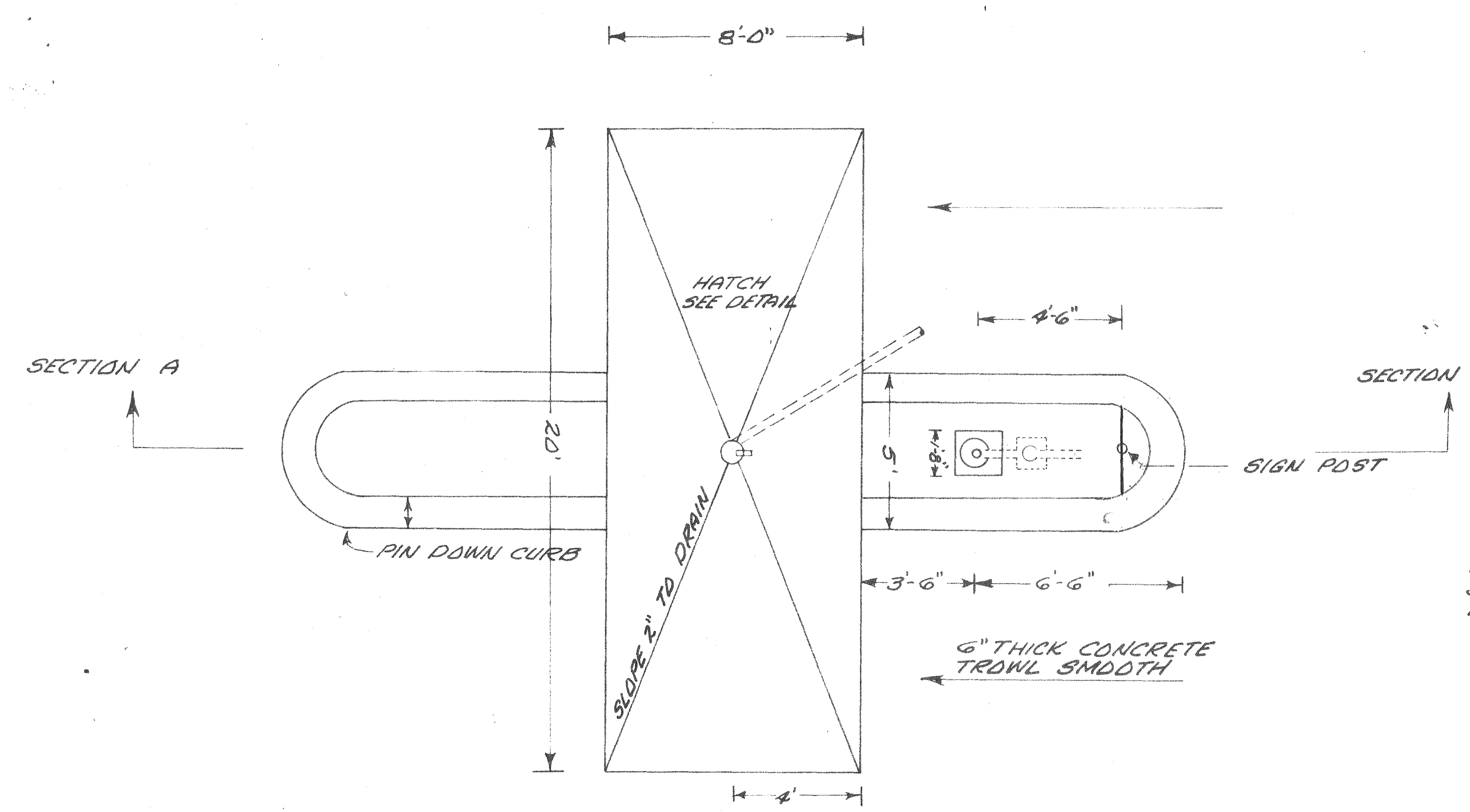
MONTANA HIGHWAY DEPARTMENT

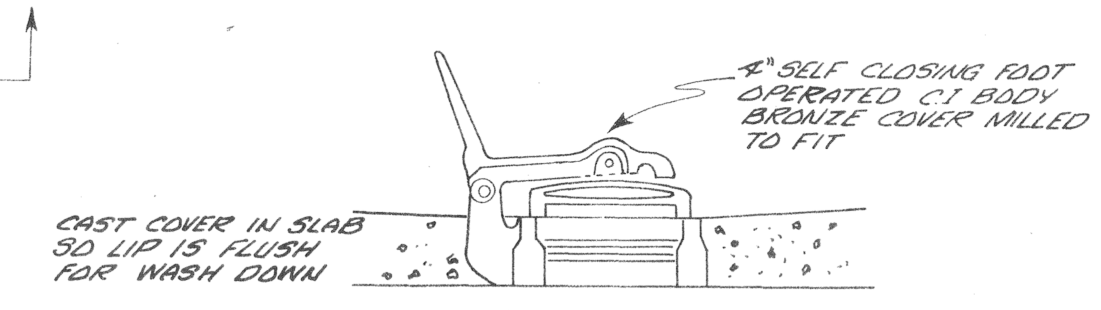
SCALE AS SHOWN





SECTION AA
SCALE ½" = 1'-0"





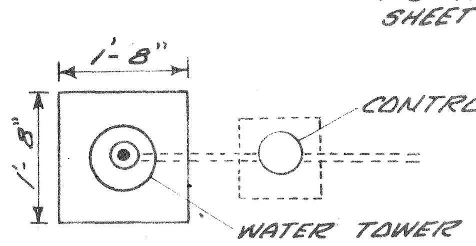
DETAIL 2
NO SCALE

THE UNIT PRICE BID FOR THE SANITARY DISPOSAL STATION SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY TO COMPLETE THE SANITARY DISPOSAL STATION.

WATER SUPPLY LINE AND SEWERLINE SHALL BE SEPARATE BID ITEMS
ALL HARDWARE AND SUPPLIES AS RECOMMENDED BY MOBILE HOMES MANUFACTURES ASSOCIATION PARKS DIVISION.

NOTE:
THE WATER SUPPLY PIPE SHALL BE LOCATED 7'6" FROM THE DRAIN HATCH SEE PL. ON SHEET FOR TRAILER DUMP & WATER PIPE LOCATION

SCALE ¾" = 1'



SANITARY DISPOSAL STATION FOR TRAVEL TRAILERS

SCALE AS SHOWN

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	I-15-3(3)168		

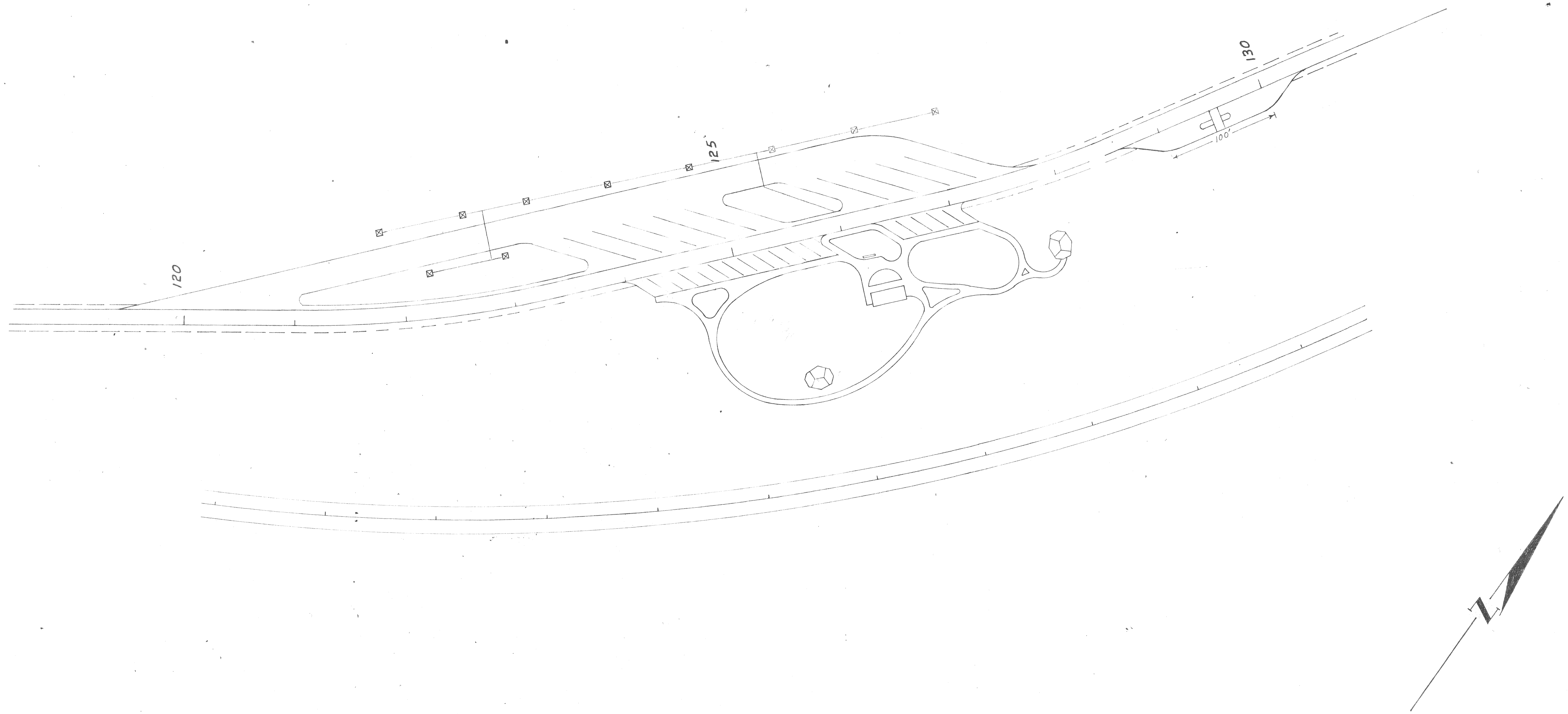
STATE OF MONTANA
STATE HIGHWAY COMMISSION
REST AREA SPRINKLING SYSTEM
I-15-3-(22) 168
JEFFERSON CITY
SCALE AS NOTED

SHEET NO. 1

DESIGNED		
DRAWN	4/22/71	RRH
TRACED		
CHECKED		
REVISED		
REVISED		

DRAWING NO.

I-15-3(3)168

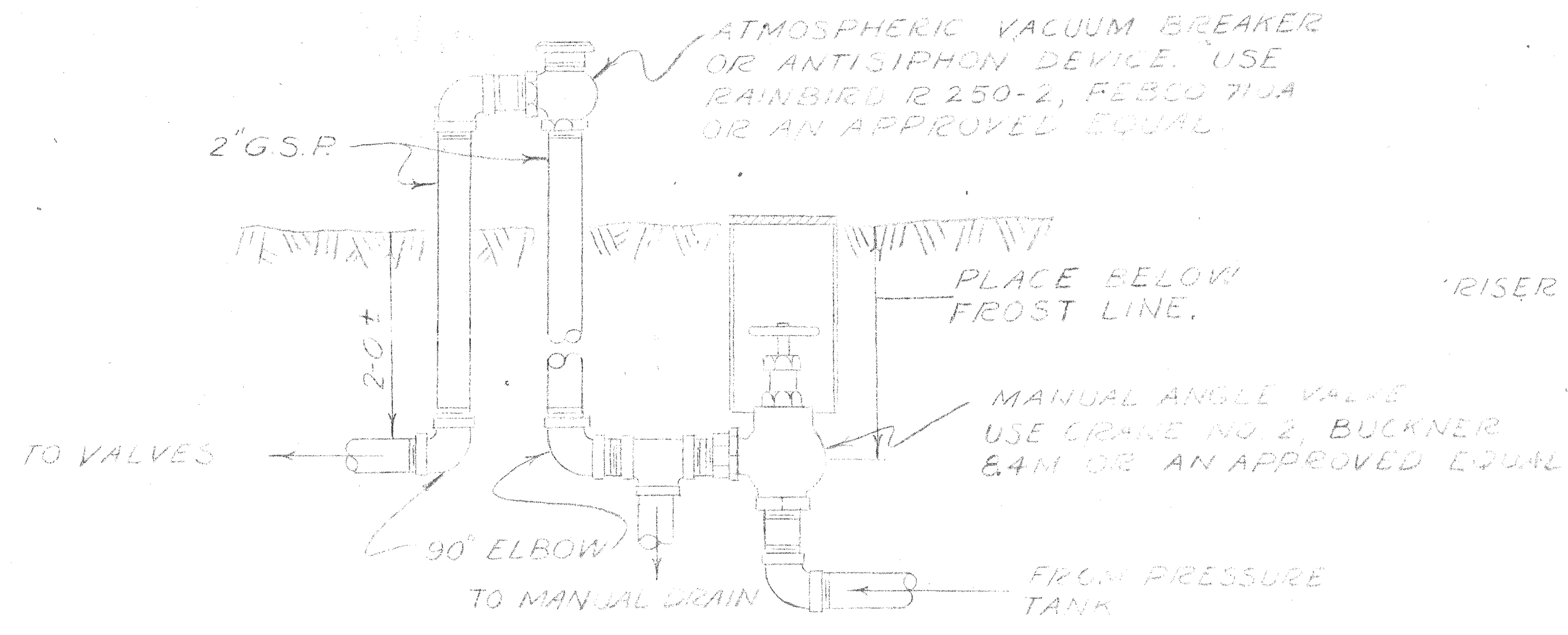


JEFFERSON CITY
NORTH BOUND REST AREA
SCALE 1" = 50'

REST AREA SPRINKLING SYSTEM
I-15-3-(22) 168
JEFFERSON CITY
SCALE AS NOTED

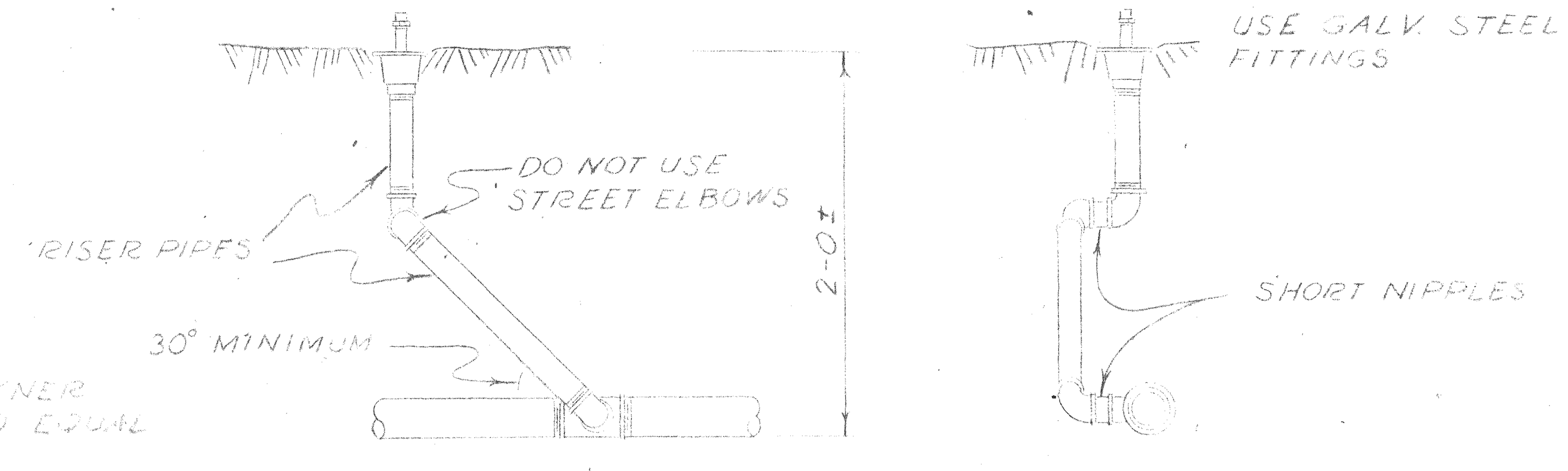
SHEET NO. 2

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	I-15-3(22)168		

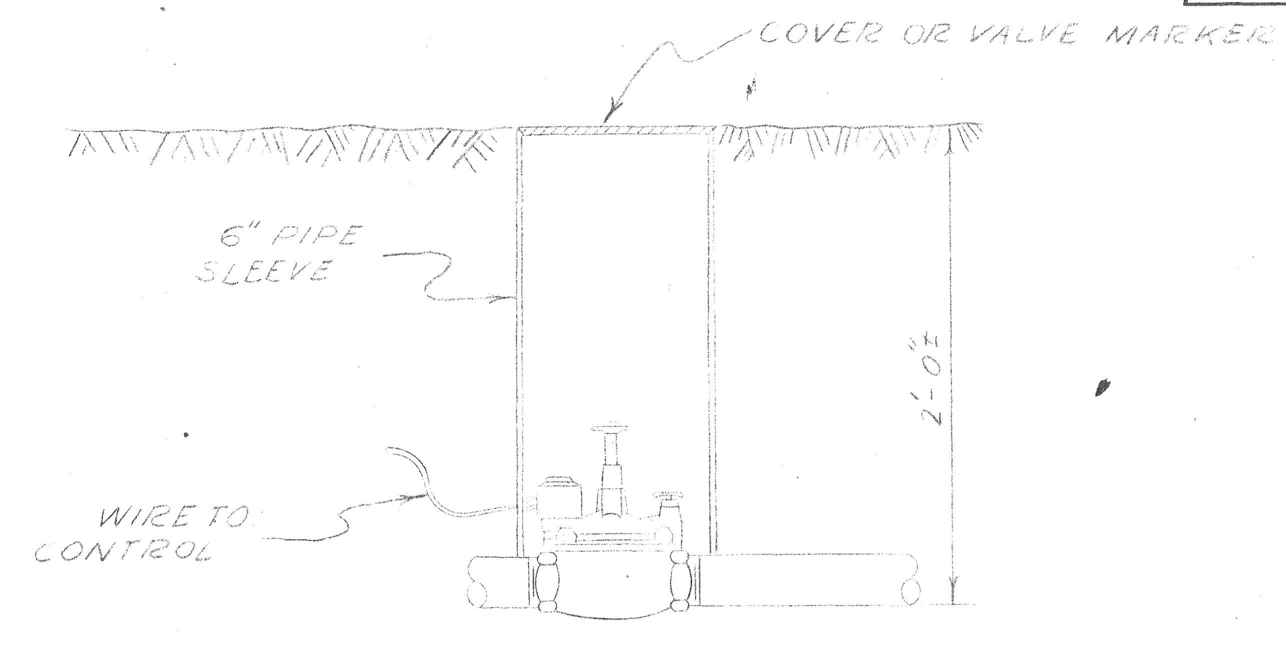


VACUUM BREAKER DETAIL
NO SCALE

ALL SPRINKLER HEADS ARE TO BE POP-UP SPRINKLER HEADS.
SHRUBBERY HEAD RISER PIPES ARE TO EXTEND APPROX. 1'-0" ABOVE GROUND LINE.



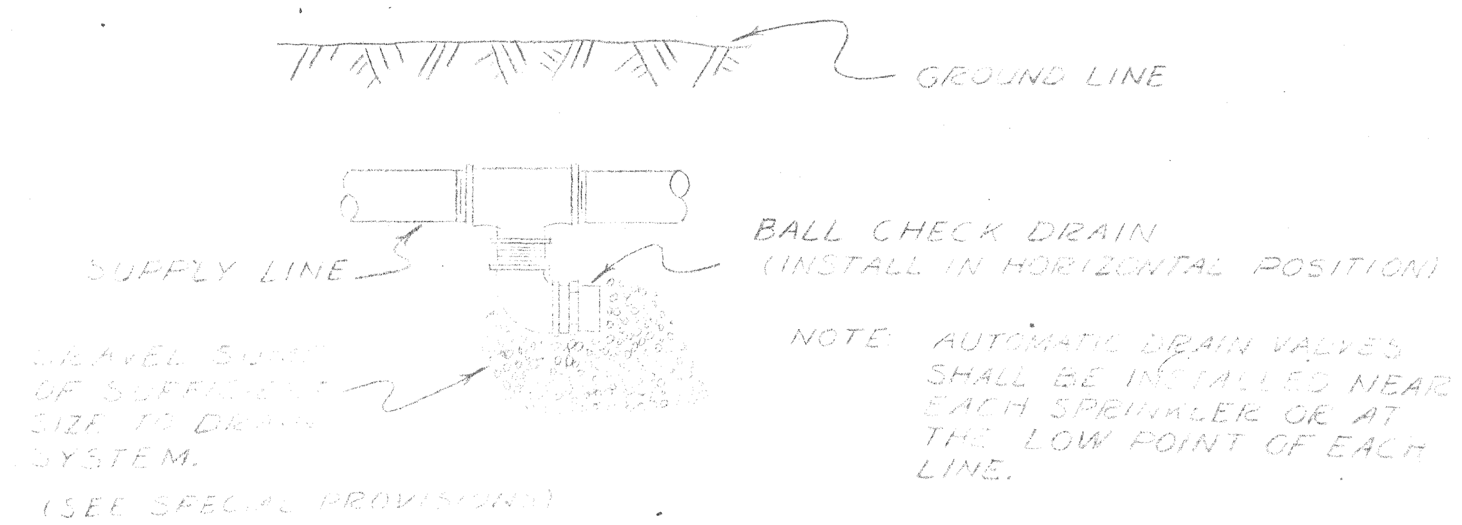
SWING JOINT DETAILS
NO SCALE



ELECTRIC CONTROL VALVE
NO SCALE

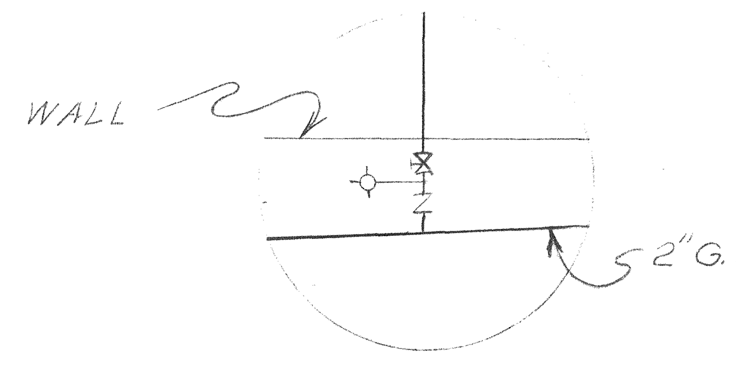
SPRINKLER SYSTEM LAYOUT

- ✧ MANUAL DRAIN VALVE (SEE DETAIL)
- ⧖ ELECTRIC CONTROL VALVE (SEE DETAIL)
- ⩫ VACUUM BREAKER (SEE DETAIL)
- ⊖ AUTOMATIC DRAIN VALVE (SEE DETAIL)
- ⊗ VARIABLE ROTOR POP-UP SPRINKLER - RAINBIRD 27, BUCKNER 8278H OR APPROVED EQUAL.
- ● FULL CIRCLE POP-UP SPRINKLER - BUCKNER 404F, RAINBIRD 181F OR APPROVED EQUAL.
- ○ FULL CIRCLE POP-UP SPRINKLER - RAINBIRD 21, BUCKNER 8278 OR APPROVED EQUAL.
- ◗ HALF CIRCLE POP-UP SPRINKLER - BUCKNER 404DH, RAINBIRD 181H OR APPROVED EQUAL.
- ⧖ MANUAL ANGLE VALVE - (SEE DETAIL)
- △ SURFACE HEAD BUBBLER - RAINBIRD 2600B, BUCKNER 403 OR APPROVED EQUAL.

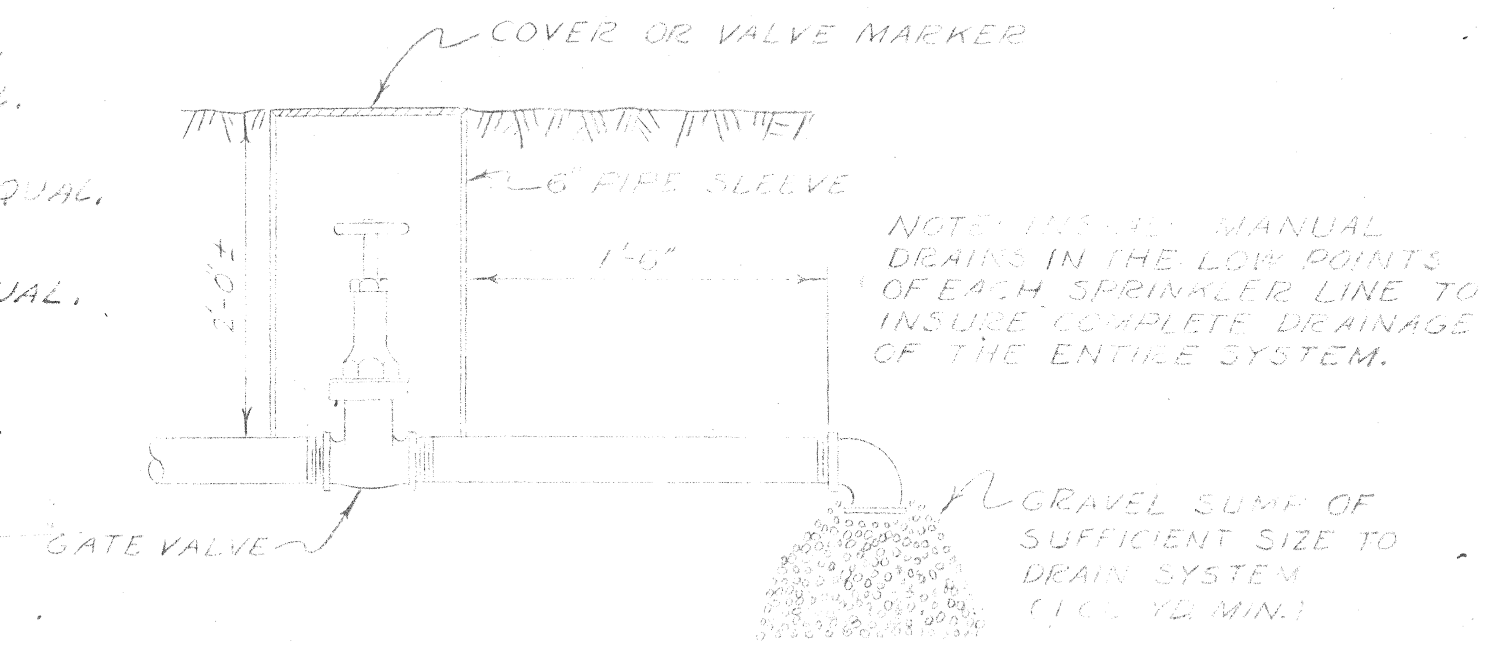


AUTOMATIC DRAIN VALVE
NO SCALE

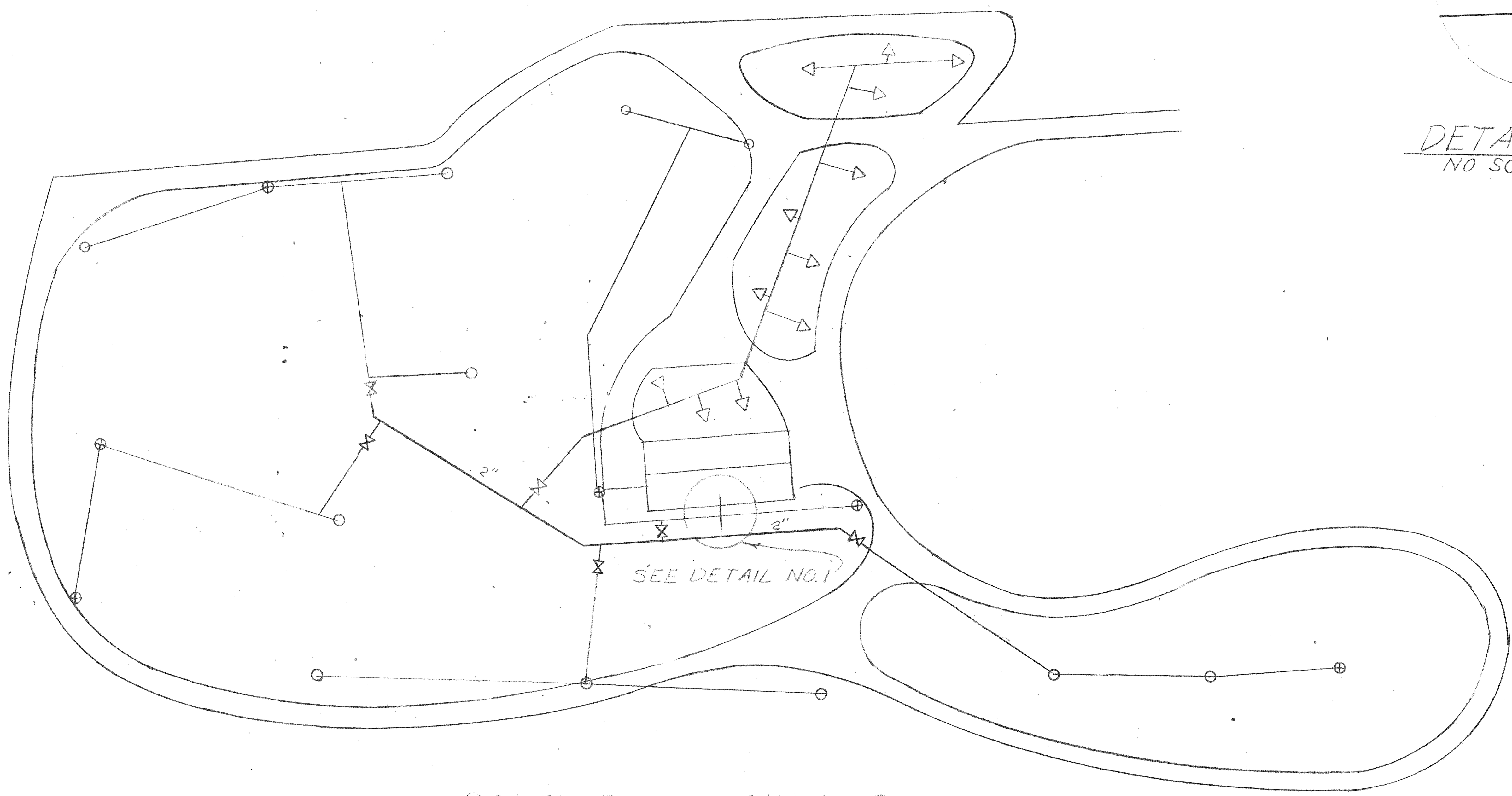
NOTE: ALL PIPE SHALL BE GALVANIZED STEEL. PIPES DELIVERING WATER TO ONE SPRINKLER HEAD ARE $\frac{3}{4}$" G.S.P. LATERAL PIPES DELIVERING TO MORE THAN ONE SPRINKLER HEAD ARE $1\frac{1}{4}$" G.S.P. UNLESS AUTHORIZED BY THE ENGINEER.



DETAIL NO. 1
NO SCALE



MANUAL DRAIN VALVE
NO SCALE



SOUTH BOUND REST AREA
SCALE: 1" = 20'

STATE OF MONTANA
STATE HIGHWAY COMMISSION

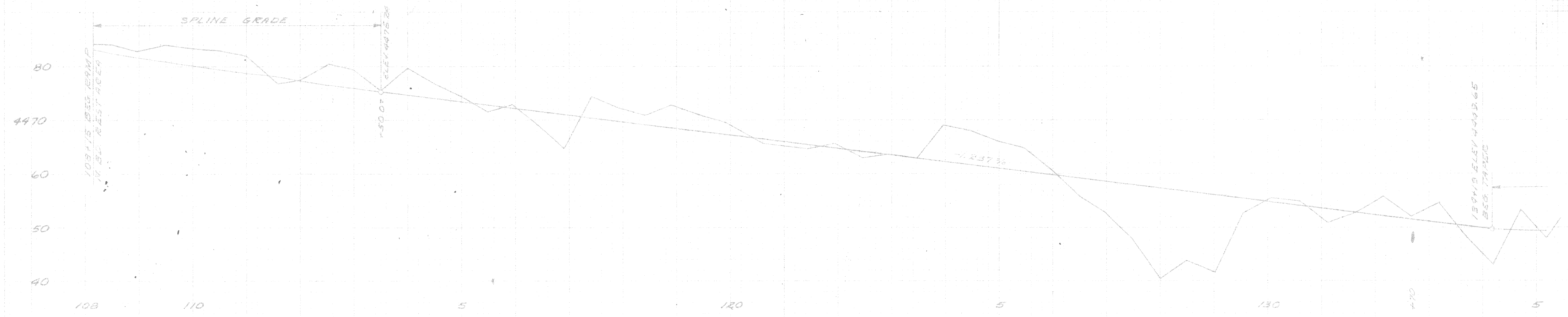
REST AREA SPRINKLING SYSTEM
I-15-3-(22) 168
JEFFERSON CITY NORTH
SCALE AS NOTED

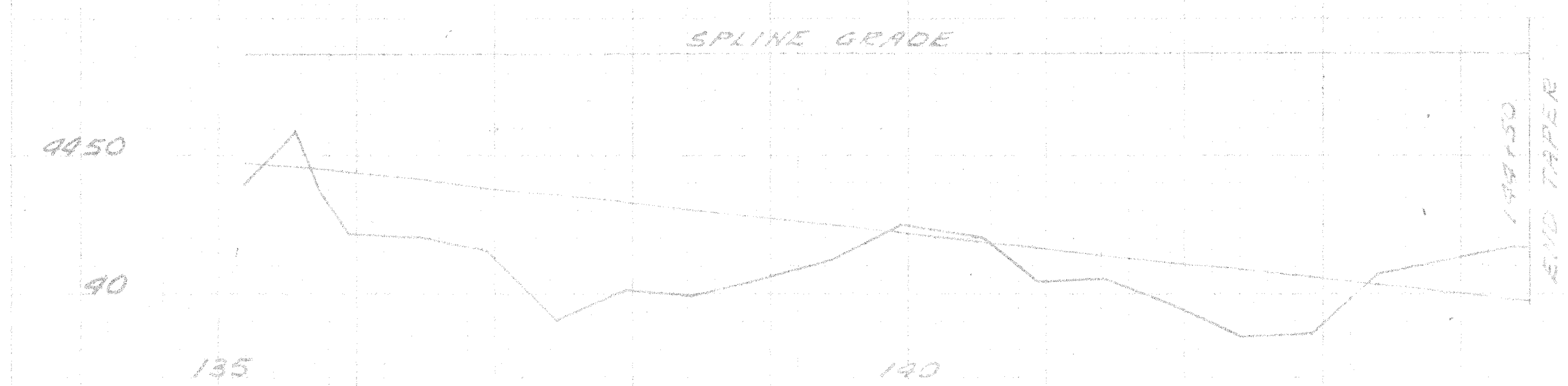
DESIGNED		
DRAWN	5/1/70	TJR
TRACED		
CHECKED		
REVISED		
REVISED		

DRAWING NO.

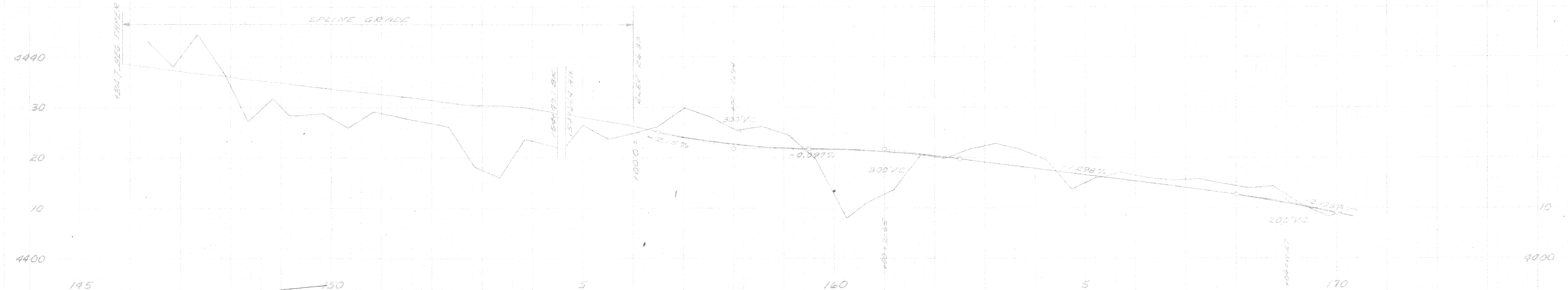
JEFFERSON CITY NORTH & SOUTH
NORTH BOUND REST AREA
SCALE 1" = 100' OR AS NOTED

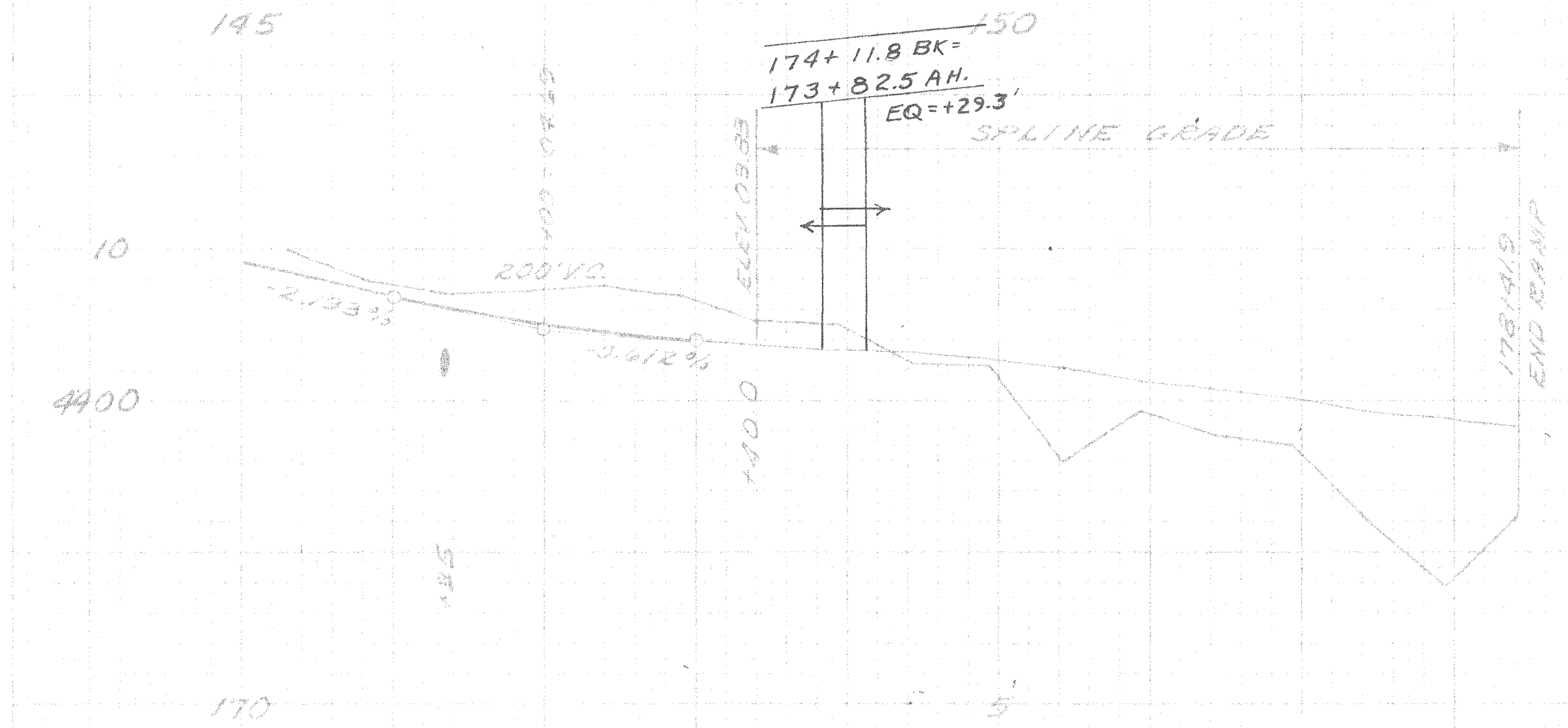
MONTANA HIGHWAY COMMISSION
RECEIVED
MAY 21 1970
BUTTE, MONTANA





PROFILE REST AREA
NORTH BOUND
(GRADING QUAN. INCL. IN MAINLINE)



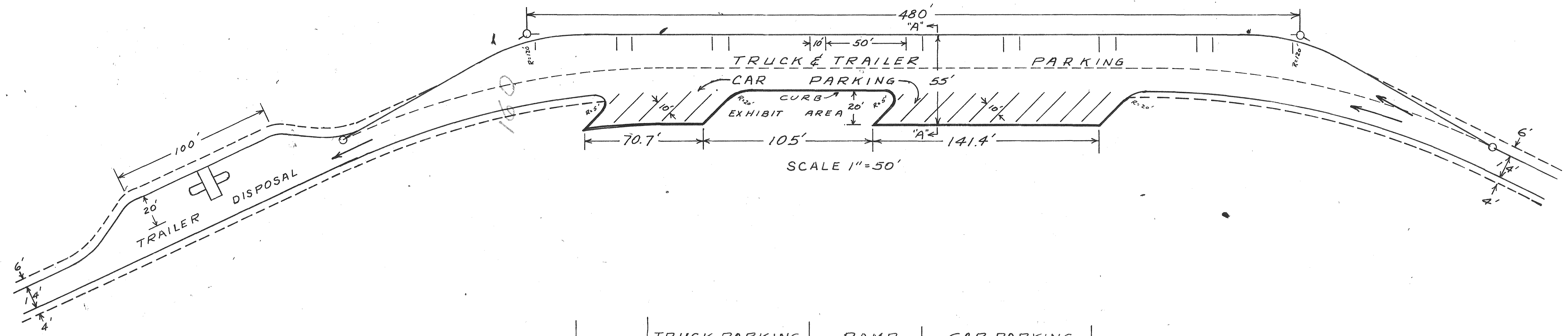


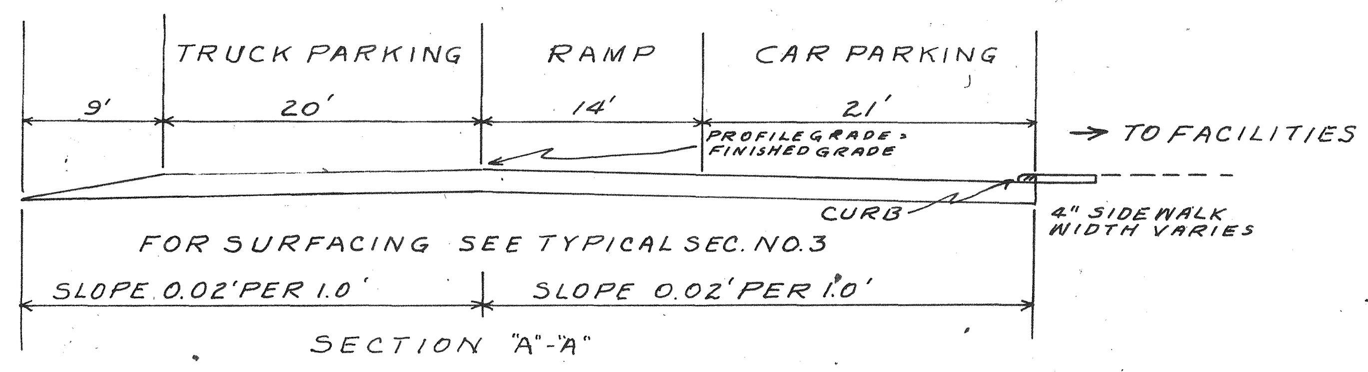
PROFILE REST AREA
SOUTH BOUND (GRADING QUAN. INCL. IN MAINLINE)
I 15-3(22)168
JEFFERSON CITY-N & S

PROFILE
FRONTAGE ROAD

102+00
750 CY ADD EXC
STK RAMP 5 CY RT
H.W. 4493.7


PLAN
PROFILE
PROJ. N 17°57'30" E.
STRD. N 27°26'30" E.
PROJ. N 40°37'30" E.
FOR DETAIL OF REST AREA
SEE SHEET NO.
END N.B. RAMP
PT 135+51.5 BK.
BEG. TAPER
PROJ.
Δ = 22°40' RT.
D = 0°30'
T = 2296.8'
L = 4533.3'
R = 11460.0'
HAUL 6937





MONTANA HIGHWAY COMMISSION
RECEIVED
MAY 21 1970
BUTTE, MONTANA

①	②	③	④	⑤
Δ = 16° 18' LT.	Δ = 7° 18'	Δ = 24° 45'	Δ = 25° 54'	Δ = 21° 23' 47"
D = 6° 00	D = 4° 00'	D = 12° 00'	D = 12° 00'	D = 4° 00'
T = 136.8	T = 91.4	T = 104.8'	T = 109.8'	T = 270.6'
L = 271.7	L = 182.5'	L = 206.3'	L = 215.8	L = 534.9'
R = 955.0	R = 1432.5	R = 458.4'	R = 458.4'	R = 1432.5'
P.C. = 155+00.0	P.C. = 157+80.3	P.C. = 161+16.0	P.C. = 166+27.7	P.C. = 168+76.9
P.I. = 156+36.8	P.I. = 158+71.7	P.I. = 162+20.8	P.I. = 167+37.5	P.I. = 171+47.5
P.T. = 157+71.7	P.T. = 159+62.8	P.T. = 163+22.3	P.T. = 168+43.5	P.T. = 174+11.8
SUPER = 0.07'/1.0'	SUPER = 0.06'/1.0'	SUPER = 0.04'/1.0'	SUPER = 0.04'/1.0'	SUPER = 0.06'/1.0'

JEFFERSON CITY NORTH & SOUTH
SOUTH BOUND REST AREA
SCALE 1" = 100' OR AS NOTED

JEFFERSON CITY NORTH & SOUTH
SOUTH BOUND REST AREA

SCALE 1"=100' OR AS NOTED
CONTOUR INTERVAL = 2 FT.
CONTOUR BEFORE GRADING
CONTOUR AFTER GRADING

F.A.P.
I 15-3(22)168

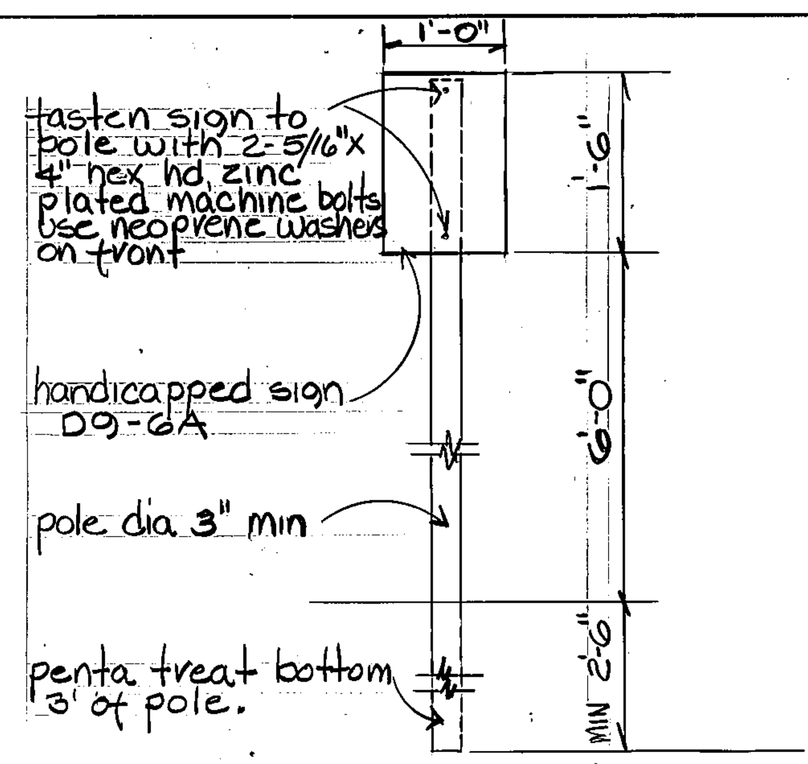
PROFILE REST AREA
NORTH BOUND
(GRADING QUAN. INCL. IN MAINLINE)

PROFILE REST AREA
SOUTH BOUND (GRADING QUAN. INCL. IN MAINLINE)
I 15-3(22)168
JEFFERSON CITY-N & S

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MONT.	I-15-3(41)170	3	8

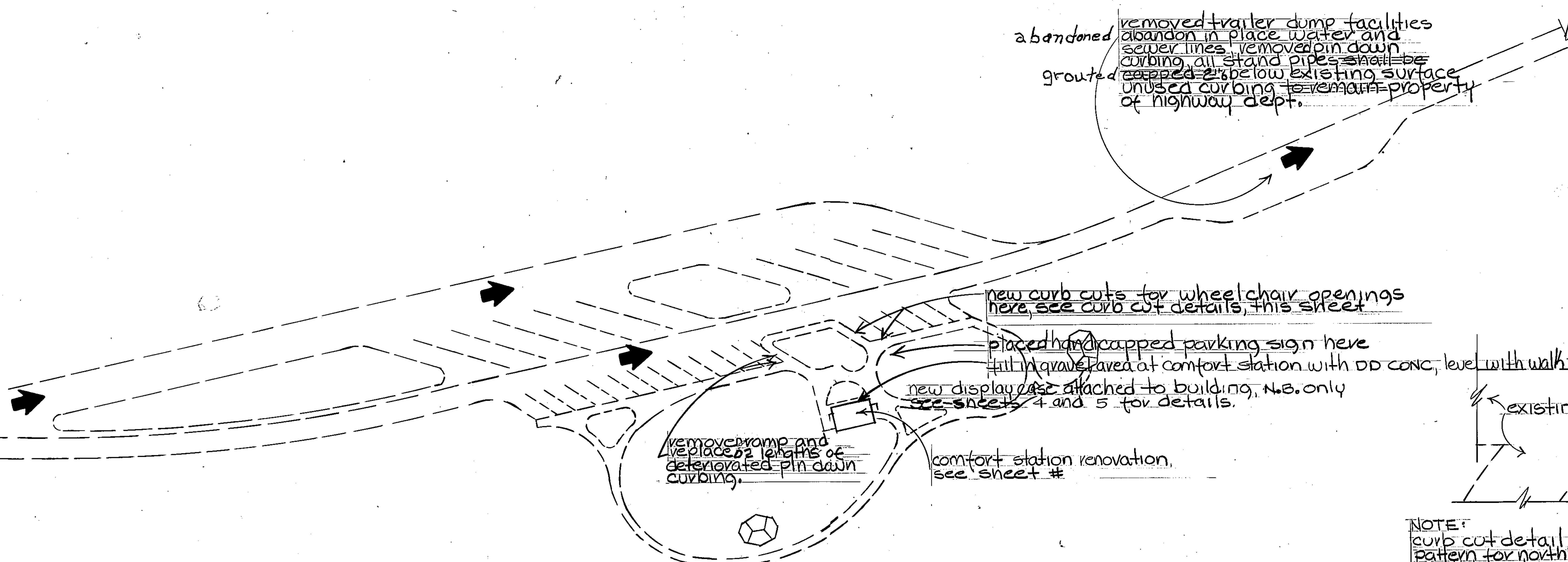
LAYOUT PLAN - SOUTHBOUND REST AREA

SCALE: 1" = 50'



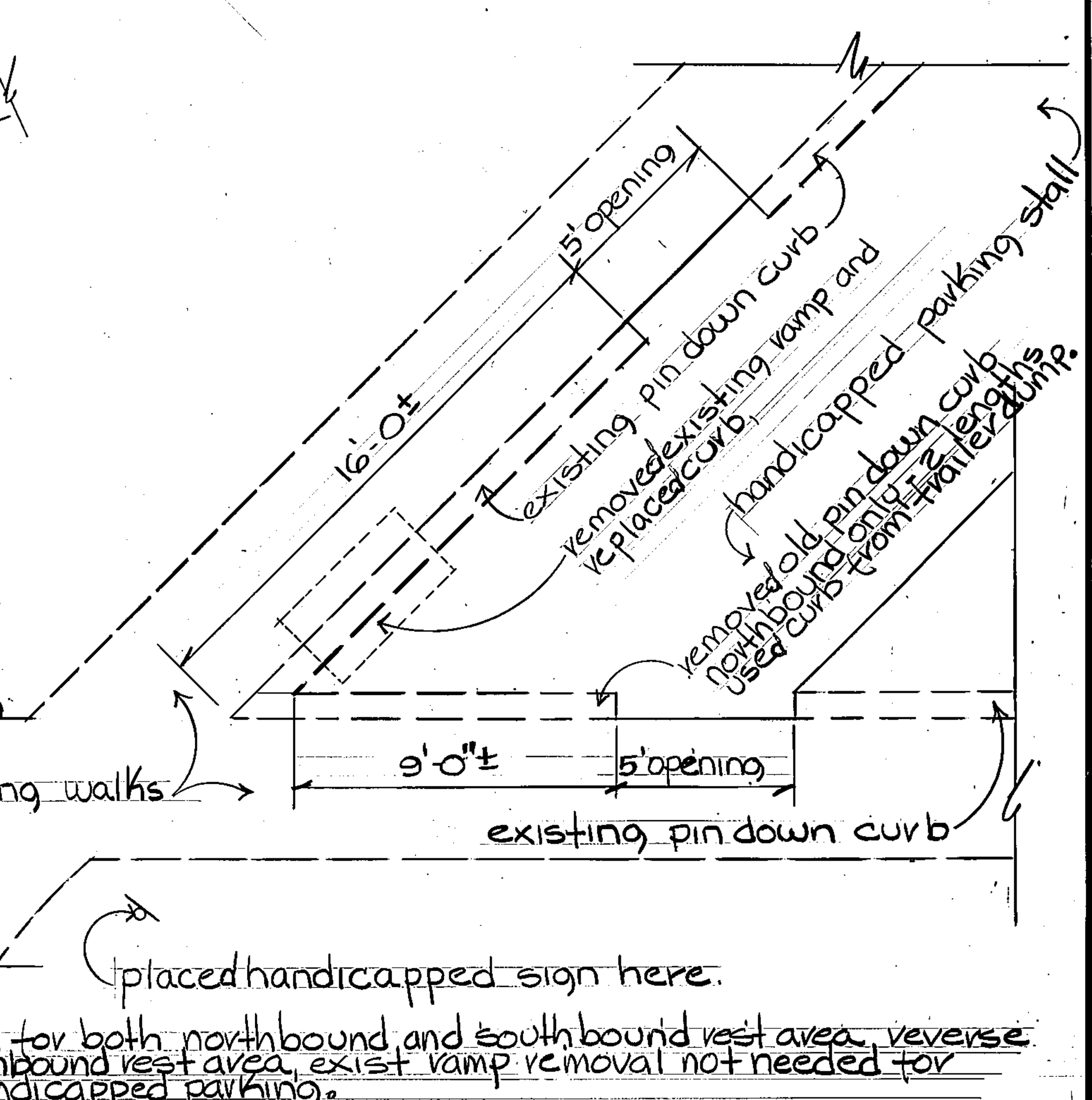
HANDICAPPED SIGN

SCALE: 3/4" = 1'-0"



LAYOUT PLAN - NORTHBOUND REST AREA

SCALE: 1" = 50'

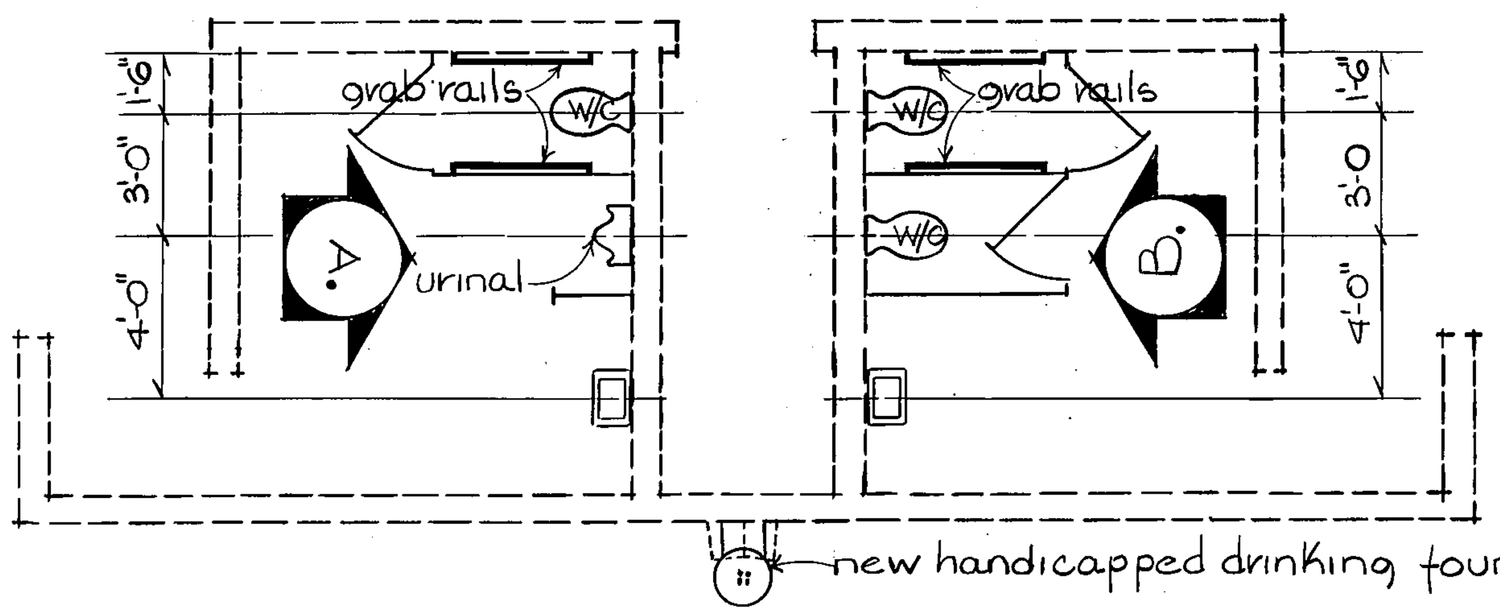


NOTE:
curb cut detail for both northbound and southbound rest area, reverse pattern for northbound rest area, exist ramp removal not needed for northbound handicapped parking.

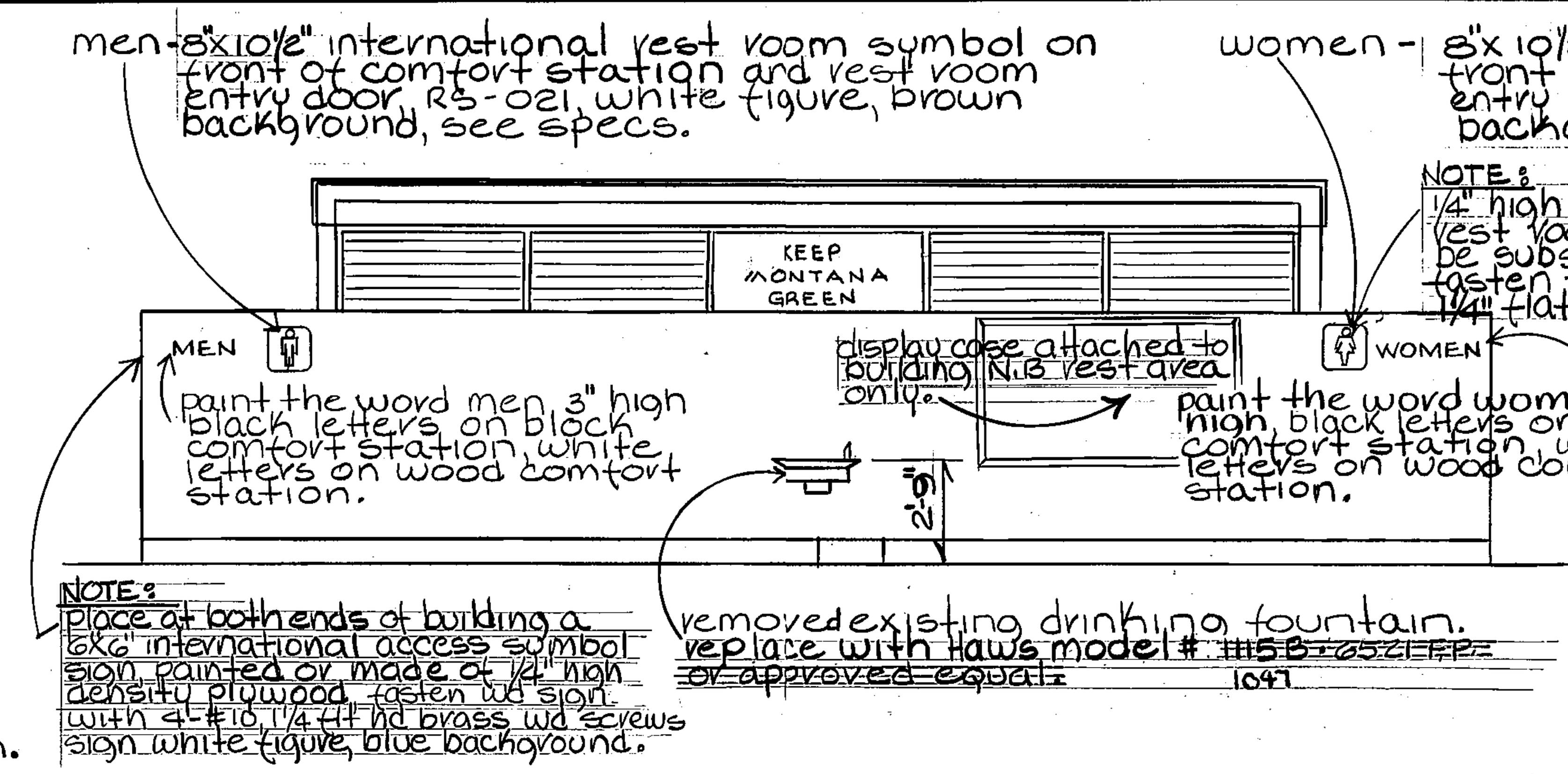
PLAN VIEW-CURB CUT DETAIL

SCALE: 1/4" = 1'-0"

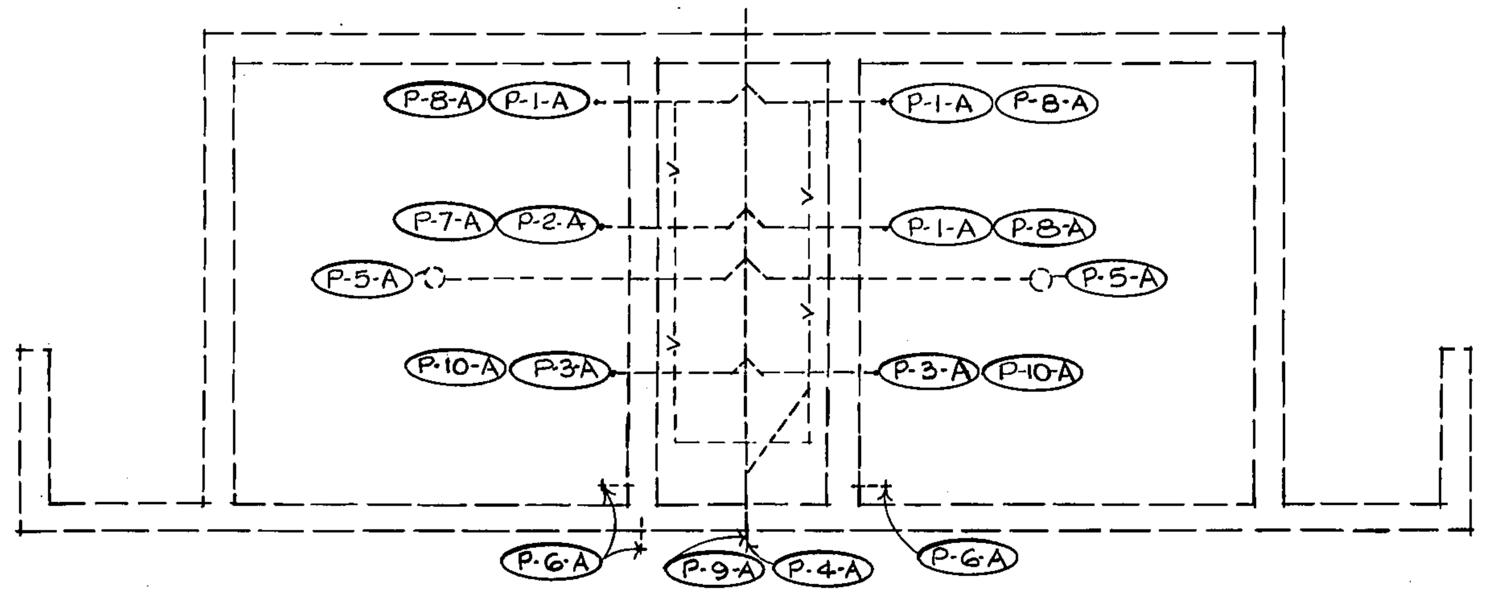
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MONT.	I 15-3(41)170	4	8



FIXTURES PLAN
SCALE: 1/4"=1'-0"



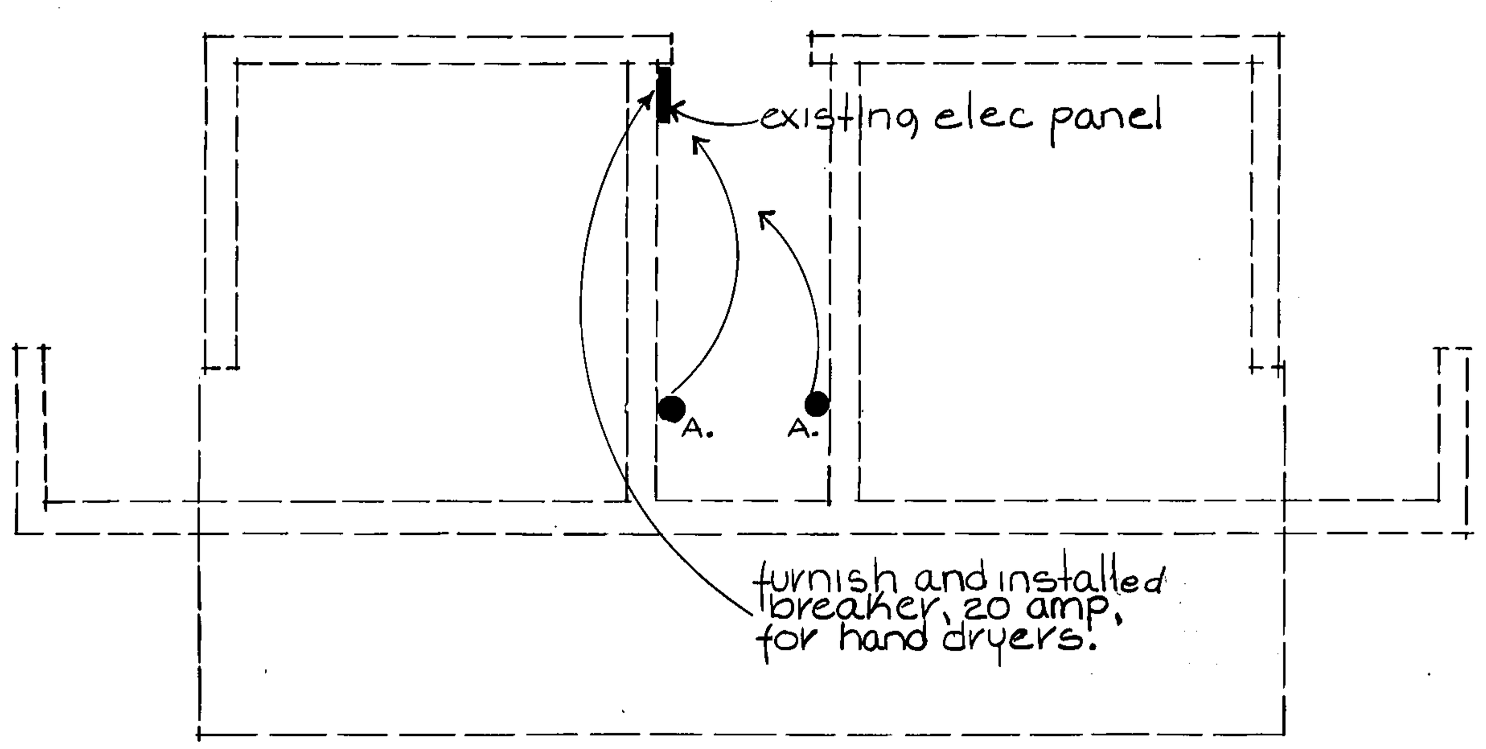
FRONT ELEVATION
SCALE: 1/4"=1'-0"



PLUMBING SCHEMATIC
SCALE: 1/4"=1'-0"

PLUMBING SCHEDULE

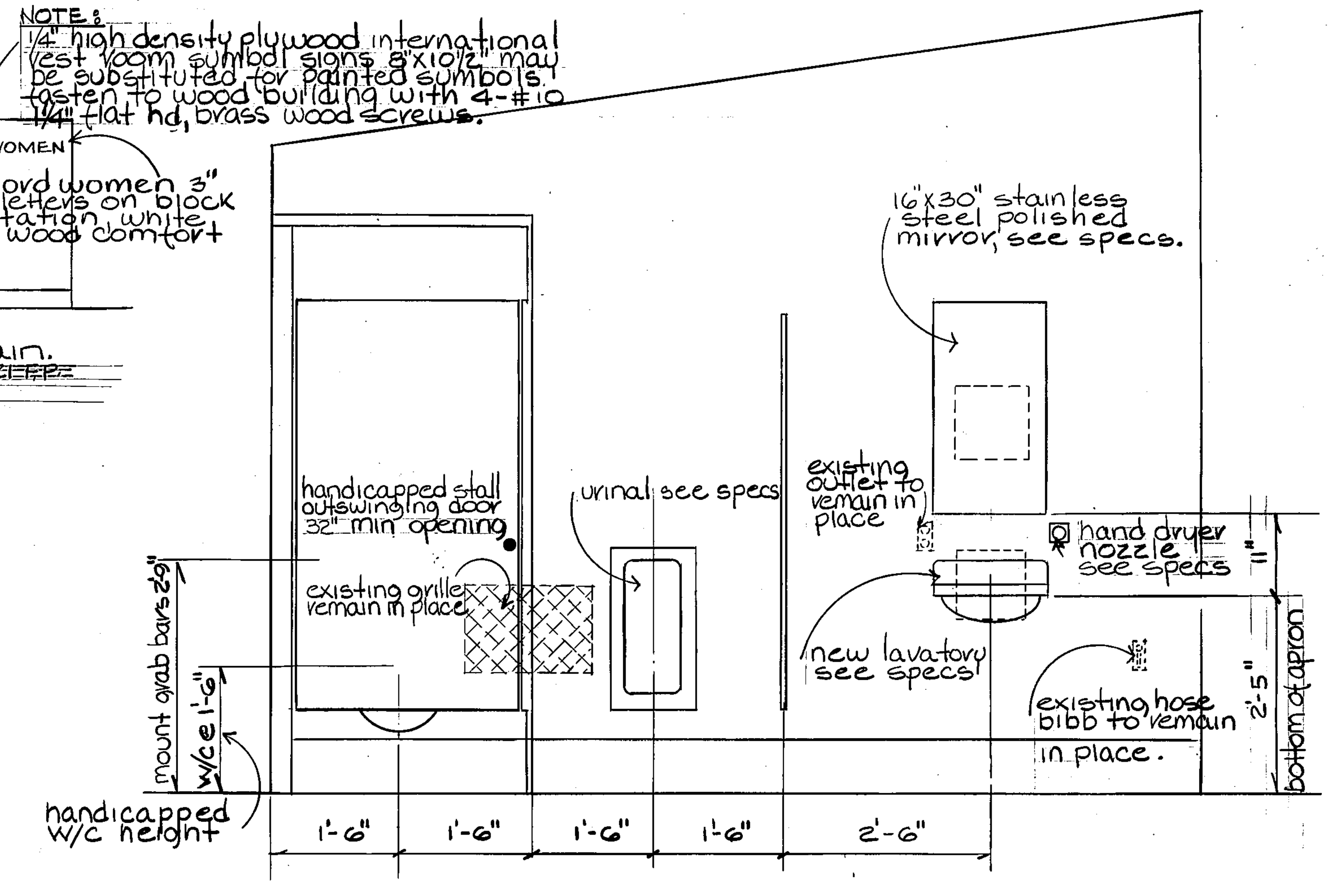
MARK	FIXTURE	C.W.	WASTE	VENT	REMARKS:
P-1-A	WATER CLOSET	1/2"	4"	2"	REMOVED FIXTURE
P-2-A	URINAL	1/2"	4"	2"	REMOVED FIXTURE
P-3-A	LAVATORY	1/2"	3"	2"	REMOVED FIXTURE
P-4-A	DRINKING FOUNTAIN	1/2"	2"		REMOVED FIXTURE
P-5-A	FLOOR DRAIN				SAVED
P-6-A	HOSE BIBB				SAVED
P-7-A	URINAL	1/2"	4"	EXT	NEW FIXTURE
P-8-A	WATER CLOSET				NEW FIXTURE
P-9-A	DRINKING FOUNTAIN	1/2"	2"		NEW FIXTURE
P-10-A	LAVATORY	1/2"	3"	2"	NEW FIXTURE



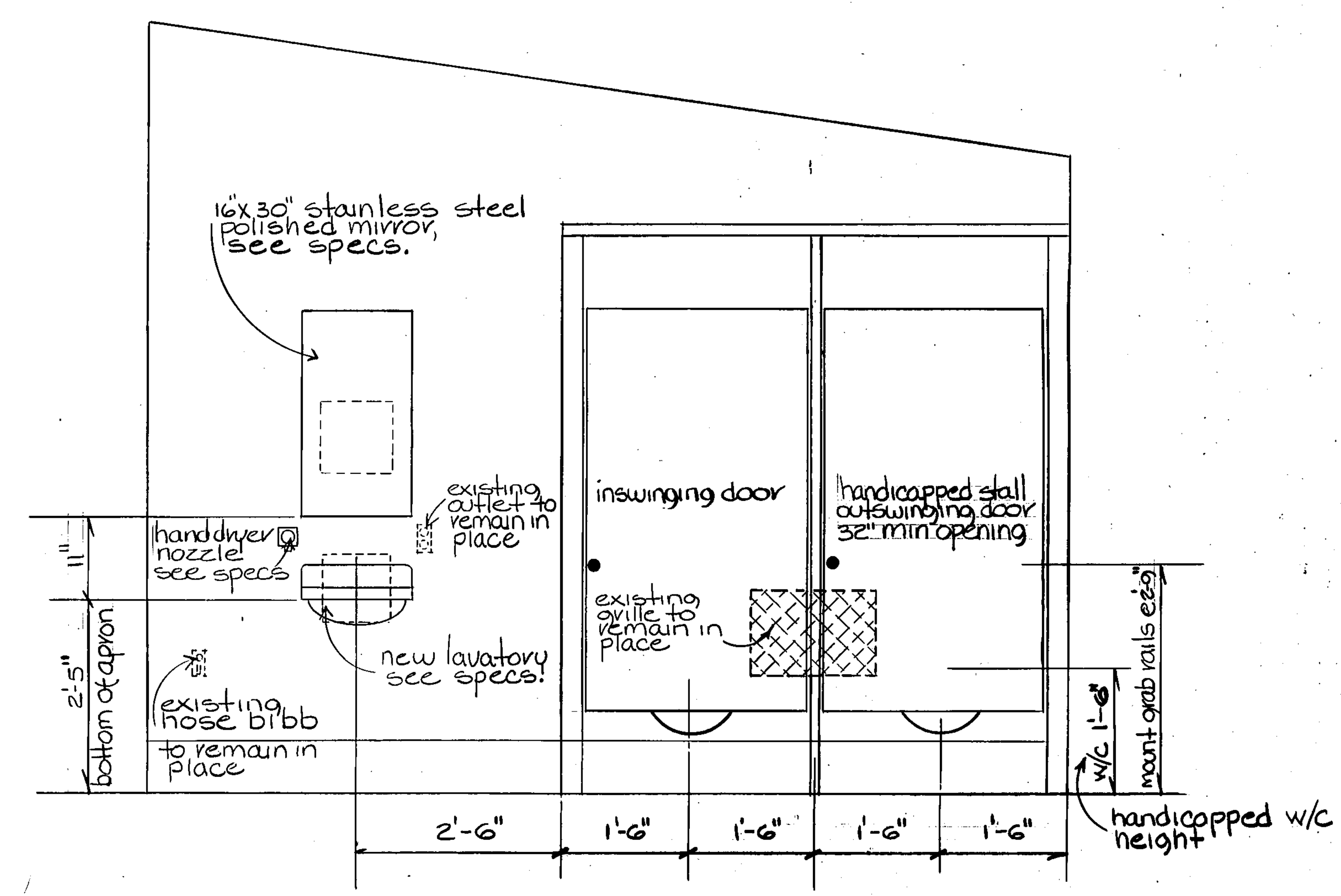
ELECTRICAL PLAN
SCALE: 1/4"=1'-0"

ELECTRIC FIXTURE SCHEDULE

MARK	FIXTURE	REMARKS
A.	HUMPHERY INC, FASTAIRE PRODUCTS	MODEL HD03

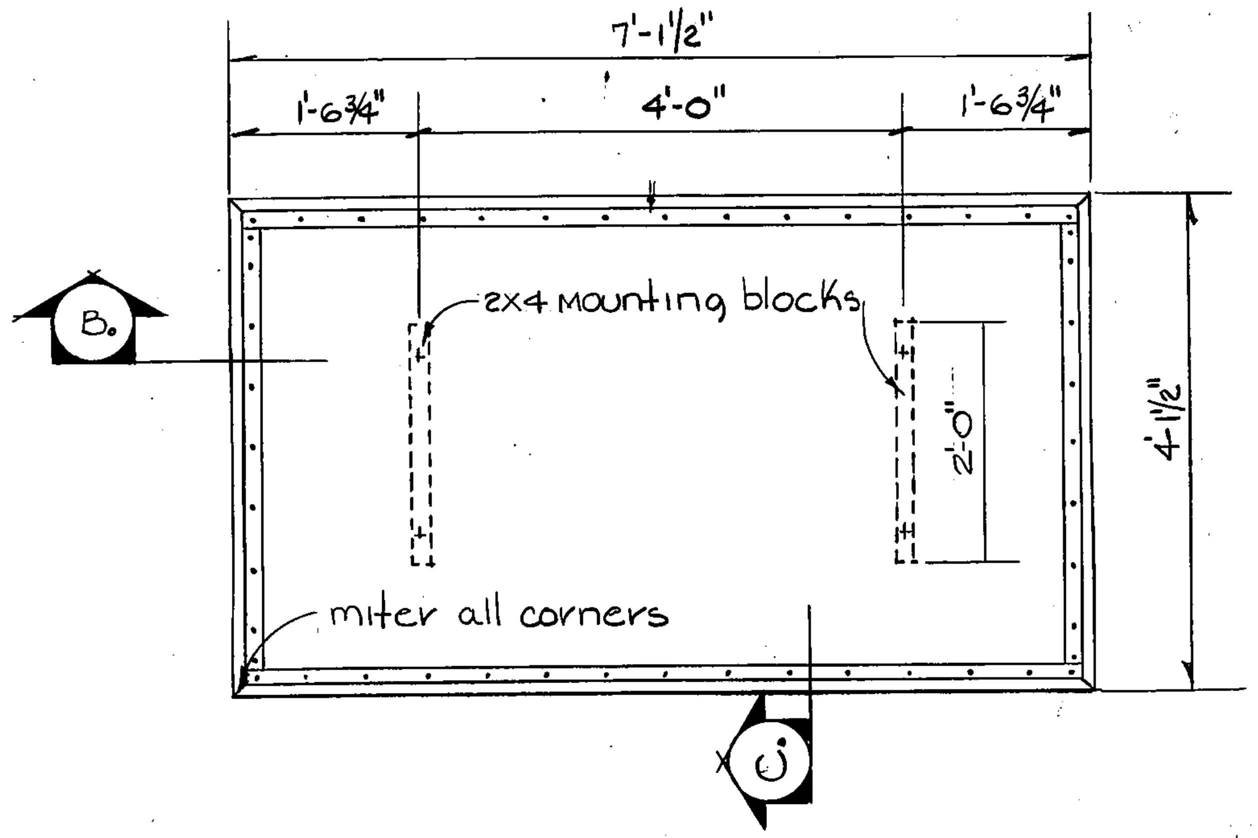


DETAILED ELEVATION - A
MEN'S REST ROOM
SCALE 3/4"=1'-0"

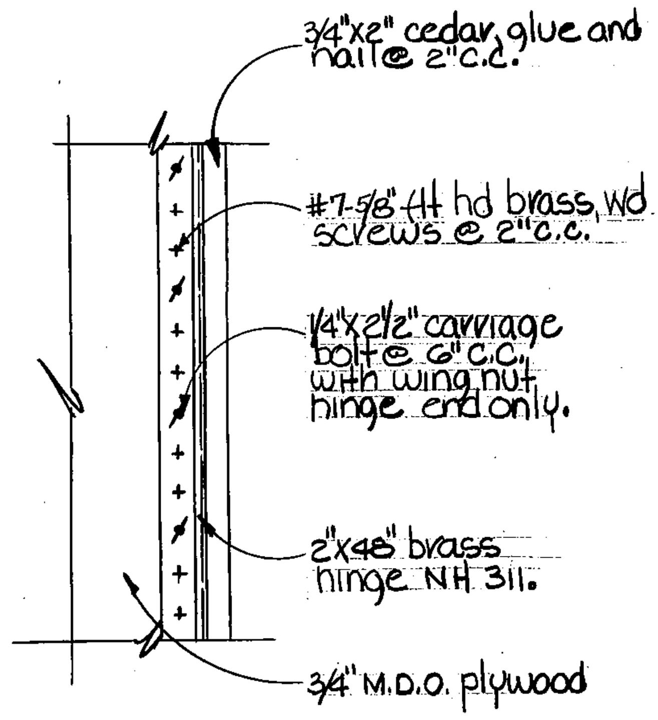


DETAILED ELEVATION - B
WOMEN'S REST ROOM
SCALE 3/4"=1'-0"

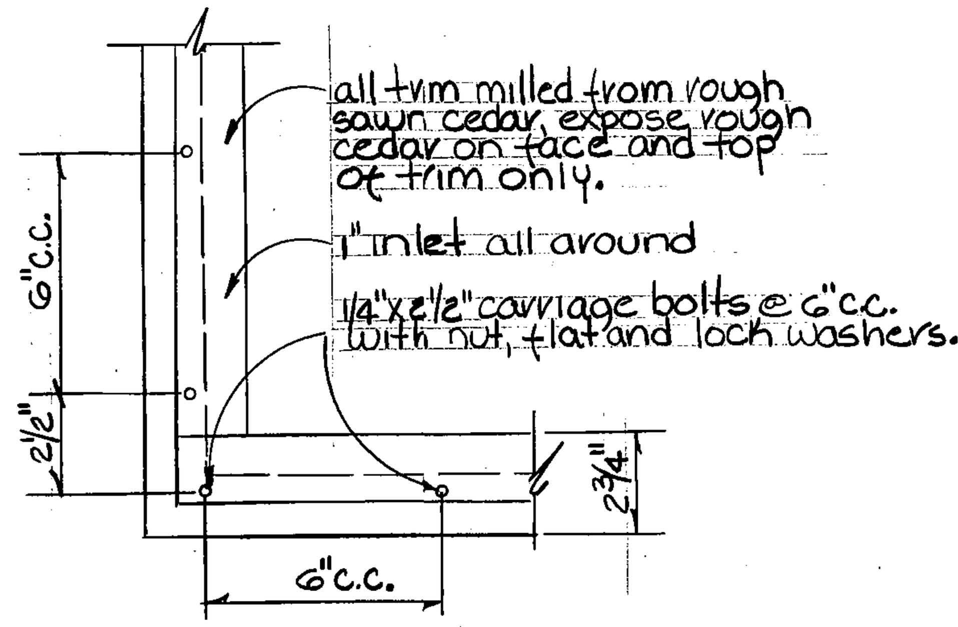
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MONT.	I 15-3(41)170	5	8



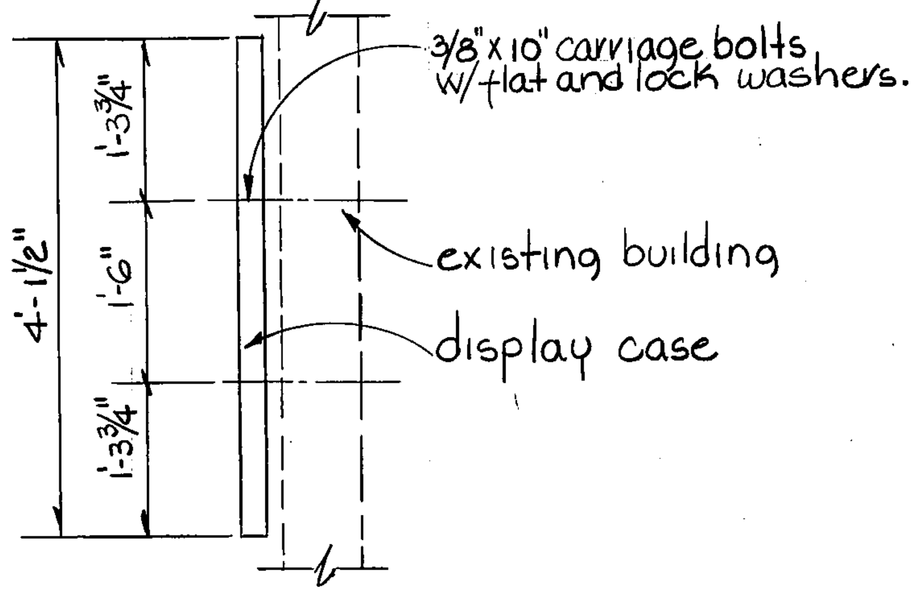
FRONT ELEVATION - DISPLAY CASE
SCALE: ¾" = 1'-0"



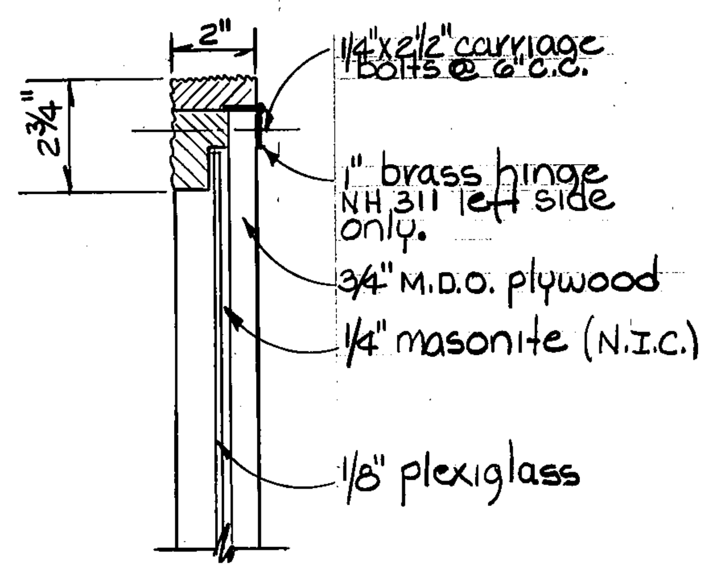
REAR VIEW - HINGE
SCALE: ¾" = 1'-0"



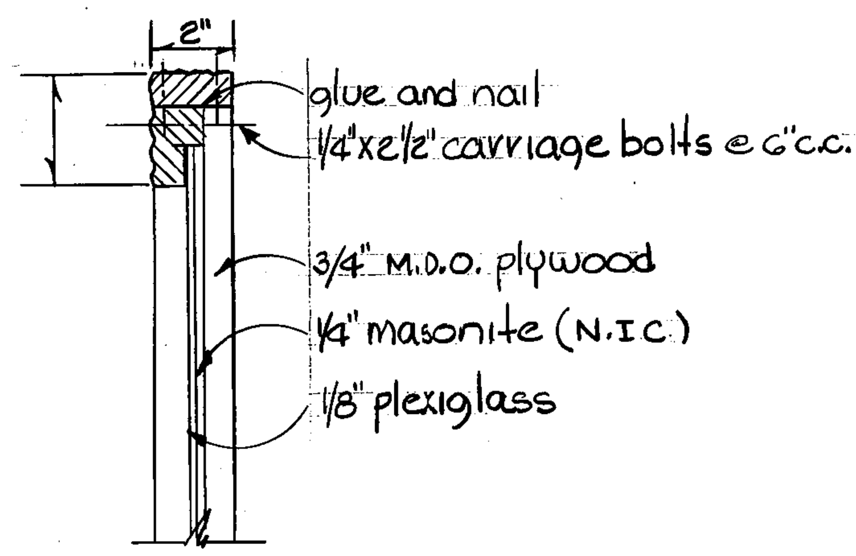
TYPICAL TRIM DETAIL
SCALE: ¾" = 1'-0"



SIDE VIEW - DISPLAY CASE
SCALE: ¾" = 1'-0"



SECTION B.
SCALE: ¾" = 1'-0"



SECTION C.
SCALE: ¾" = 1'-0"

DESIGNED		
DRAWN		
CHECKED		
REVISED		
REVISED		
REVISED		

DRAWING NO.

Appendix F: Accessibility Data

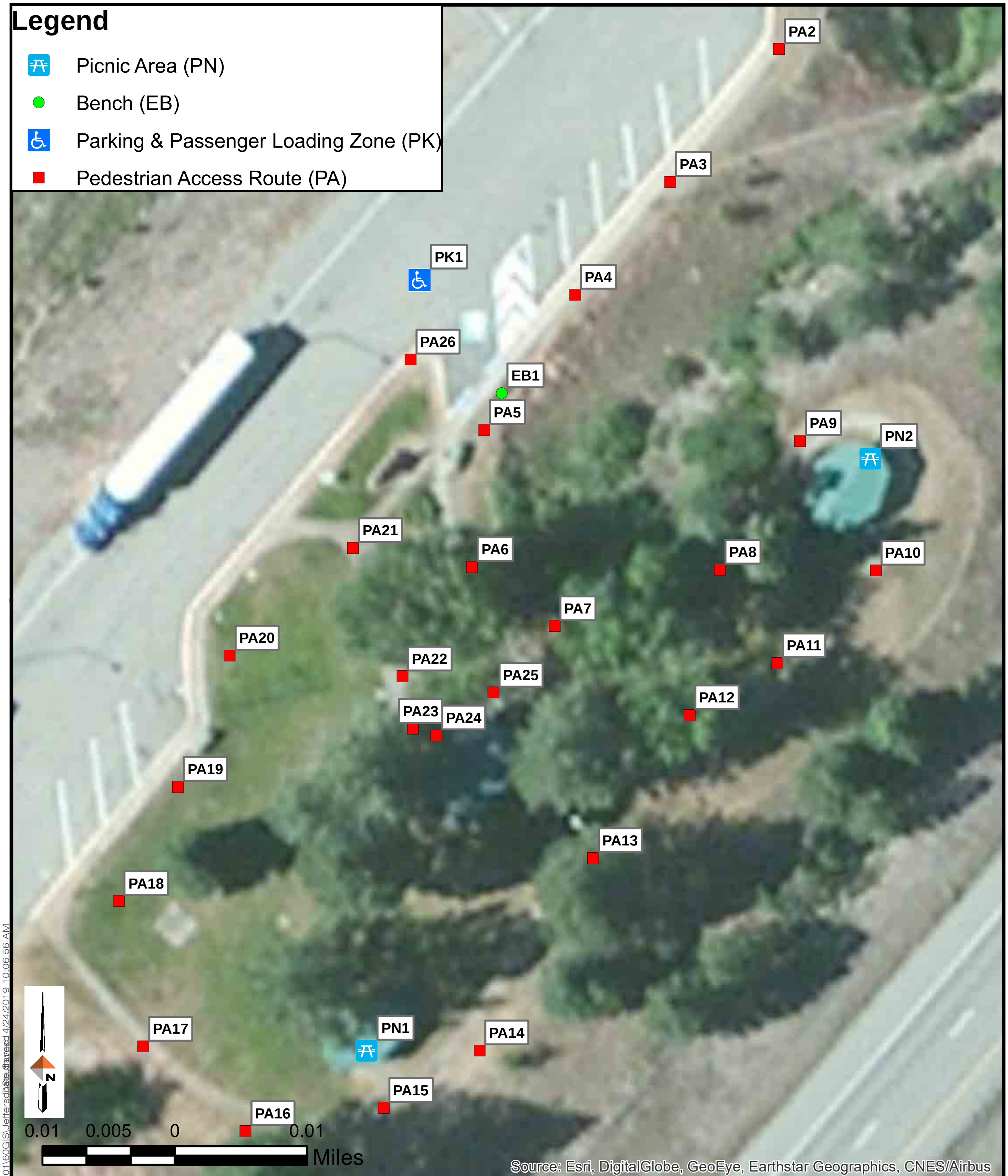
Jefferson City
Safety Rest Area Study

DOWL

Notes:
1. Date of inventory: April 24th, 2018
2. Pedestrian Access Routes (PA) were measured along the most direct path to accessible facilities at approximately 20-foot intervals.

JEFFERSON CITY NORTHBOUND REST AREA

EXISTING EXTERIOR ADA FEATURES



Notes:
1. Date of inventory: May 29th, 2018
2. Pedestrian Access Routes (PA) were measured along the most direct path to accessible facilities at approximately 20-foot intervals.

JEFFERSON CITY SOUTHBOUND REST AREA

EXISTING EXTERIOR ADA FEATURES

Jefferson City Safety Rest Area - Northbound
ADA Inventory

Feature Type	Feature Element	Compliance Requirements	None
Pedestrian Ramp	Ramp Layout	Perpendicular, Parallel, Blended	N/A
	Flush With Surface	Yes	N/A
	Ramp Slope	8.3% Maximum	N/A
	Ramp Cross Slope	2% Maximum	N/A
	Ramp Width	48" Minimum	N/A
	Landing Length	48" Minimum	N/A
	Landing Width	48" Minimum	N/A
	Landing Slope	2% Maximum	N/A
	Landing Cross Slope	2% Maximum	N/A
	Gutter Slope	5% Maximum	N/A
	Detectable Warning Device	Yes	N/A
	DWD Condition	Good	N/A
	DWD Color Contrast	Yes	N/A
	Vertical Surface Discontinuities (Trip Hazards)	½" Maximum	N/A

Feature Type	Feature Element	Compliance Requirements		PK1	PK2
Accessible Parking Spaces	Minimum Number per Parking Facility	Total Number of Parking Spaces Provided in Parking Facility	Minimum Number of Required Accessible Parking Spaces	2 accessible, 13 total	
		1 to 25	1		
		26 to 50	2		
		For every six or fraction of six parking spaces, at least one shall be a van parking space.		YES	NO
	Parking Sign with International Symbol of Accessibility	Yes except where four or fewer parking spaces, including accessible parking spaces, are provided.		YES	YES
		Signs identifying van parking spaces shall contain the designation "van accessible".		YES	
	Sign Mounting Height	60" Minimum above the finish floor or ground surface measured to the bottom of the sign.		YES	YES
	Vehicle Space Width	96" Minimum for a Car Parking Space 132" Minimum for a Van Parking Space 96" Minimum for a Van Parking Space w/ an Access Aisle >= 96"			
	Adjacent Access Aisle	Yes except for parallel on-street parking spaces where the adjacent sidewalk or available right-of-way is less than or equal to 14 feet (168") wide.		YES	
	Access Aisle Width	60" Minimum		123	123
	Access Aisle Length	Shall extend the full length of the parking spaces they serve.		YES	YES
	Access Aisle Markings	Yes		YES	YES
	Access Aisle Location	Either side of the parking space except for angled van spaces which shall have access aisles on the passenger side of the parking space		YES	YES
	Parking Space and Access Aisle Slopes and Cross Slopes	2% Maximum		>2%	NO

Feature Type	Feature Element	Compliance Requirements		PN1	PN2
Picnic Areas	Minimum Number per Site	Total Number of Picnic Areas Provided at Site	Minimum Number of Required Accessible Picnic Areas	2 picnic areas, 2 accessible tables	
		2 or Fewer	All		
		More than 2	20 percent; not less than 2		
	Picnic Table Clear Space	36" on all usable sides of the tables measured from the back edge of the benches		NO	NO
		Slope not steeper than 1:48 (2%)		YES	YES
	Openings in Clear Ground Space	Not more than 1/2 inch in diameter		YES	YES
	Table Height	28" Minimum; 34" Maximum		29.25	30.25
	Wheelchair Space	At least 1 wheelchair spave for each 24 linear feet of usable table surface perimeter.		YES	YES
		30" by 48 " Minimum		YES	NO
		Positioned for a forward approach to the table; provide knee and toe clerance.		NO	NO

Jefferson City Safety Rest Area - Northbound
ADA Inventory

Feature Type	Feature Element	Compliance Requirements	None
Benches (not at Picnic Areas)	Bench Clear Space	36" by 48" Minimum; Must adjoin accessible route.	N/A
	Bench Seat Size	42" long Minimum	N/A
		20" deep Minimum; 24 " deep Maximum	N/A
	Bench Seat Height	17" Minimum; 19" Maximum	N/A
	Bench Back Support	42" long Minimum	N/A
		Extend from a point 2" Maximum above seat surface.	N/A
		Extend to point 18" Minimum above seat surface.	N/A
		2.5" Maximum from rear edge of seat measured horizontally.	N/A

Feature Type	Feature Element	Compliance Requirements	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	PA11	PA12	PA13
Pedestrian Access Routes	Continuous Clear Width	48" Minimum	48	45	48	48	44	42	42	47	48	51	44.5	48	47
		Where the clear width is less than 60", passing spaces (60" x 60" minimum) shall be provided at intervals of 200 feet maximum.	NO	NO	NO	NO	NO	NO	NO	OK	OK	OK	OK	OK	OK
	Slope if not contained within a street right-of-way	5% Maximum	3.2	2.5	0.2	2.1	0.4	1.2	1.6	1.1	1.7	0.4	1	0.2	2.7
	Cross Slope	2% Maximum	4.5	0.7	0.3	1.2	1.3	0.8	0.4	0.7	1.9	2.5	0.3	2.6	1.9
	Vertical Surface Discontinuities (Trip Hazards)	½" Maximum	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES	NO	YES	NO

Feature Type	Feature Element	Compliance Requirements	PA14	PA15	PA16	PA17	PA18	PA19	PA20	PA21	PA22	PA23	PA24	PA25	
Pedestrian Access Routes	Continuous Clear Width	48" Minimum	47	48	47.5	74	109	44	46	44	46	53	127	106	
		Where the clear width is less than 60", passing spaces (60" x 60" minimum) shall be provided at intervals of 200 feet maximum.	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	
	Slope if not contained within a street right-of-way	5% Maximum	3.5	4.8	1.7	2.5	10.2	6.2	0.6	15.7	7.8	3.4	0.9	5.1	
	Cross Slope	2% Maximum	0.3	0.5	0.5	2.4	1.9	0.4	2.6	0.8	4	2.8	3.9	2.6	
	Vertical Surface Discontinuities (Trip Hazards)	½" Maximum	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	YES	

Source of Compliance Requirements:
- 2010 ADA Standards for Accessible Design
- 2011 Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way
- 2013 Architectural Barriers Act Accessibility Guidelines Outdoor Developed Areas Final Rule

Red highlighted cells indicate non-compliant elements.

Jefferson City Safety Rest Area - Southbound
ADA Inventory

Feature Type	Feature Element	Compliance Requirements	None
Pedestrian Ramp	Ramp Layout	Perpendicular, Parallel, Blended	N/A
	Flush With Surface	Yes	N/A
	Ramp Slope	8.3% Maximum	N/A
	Ramp Cross Slope	2% Maximum	N/A
	Ramp Width	48" Minimum	N/A
	Landing Length	48" Minimum	N/A
	Landing Width	48" Minimum	N/A
	Landing Slope	2% Maximum	N/A
	Landing Cross Slope	2% Maximum	N/A
	Gutter Slope	5% Maximum	N/A
	Detectable Warning Device	Yes	N/A
	DWD Condition	Good	N/A
	DWD Color Contrast	Yes	N/A
	Vertical Surface Discontinuities (Trip Hazards)	½" Maximum	N/A

Feature Type	Feature Element	Compliance Requirements		1
Accessible Parking Spaces	Minimum Number per Parking Facility	Total Number of Parking Spaces Provided in Parking Facility	Minimum Number of Required Accessible Parking Spaces	1 accessible, 10 total
		1 to 25	1	
		26 to 50	2	
		For every six or fraction of six parking spaces, at least one shall be a van parking space.		Yes
	Parking Sign with International Symbol of Accessibility	Yes except where four or fewer parking spaces, including accessible parking spaces, are provided.		Yes
		Signs identifying van parking spaces shall contain the designation "van accessible".		Yes
	Sign Mounting Height	60" Minimum above the finish floor or ground surface measured to the bottom of the sign.		Yes
	Vehicle Space Width	96" Minimum for a Car Parking Space 132" Minimum for a Van Parking Space 96" Minimum for a Van Parking Space w/ an Access Aisle >= 96"		
	Adjacent Access Aisle	Yes except for parallel on-street parking spaces where the adjacent sidewalk or available right-of-way is less than or equal to 14 feet (168") wide.		Yes
	Access Aisle Width	60" Minimum		118
	Access Aisle Length	Shall extend the full length of the parking spaces they serve.		Yes
	Access Aisle Markings	Yes		Yes
	Access Aisle Location	Either side of the parking space except for angled van spaces which shall have access aisles on the passenger side of the parking space		Yes
	Parking Space and Access Aisle Slopes and Cross Slopes	2% Maximum		>2%

Feature Type	Feature Element	Compliance Requirements		1	2
Picnic Areas	Minimum Number per Site	Total Number of Picnic Areas Provided at Site	Minimum Number of Required Accessible Picnic Areas	2 picnic areas, 2 accessible tables	
		2 or Fewer	All		
		More than 2	20 percent; not less than 2		
	Picnic Table Clear Space	36" on all usable sides of the tables measured from the back edge of the benches		NO	NO
		Slope not steeper than 1:48 (2%)		YES	YES
	Openings in Clear Ground Space	Not more than 1/2 inch in diameter		YES	YES
	Table Height	28" Minimum; 34" Maximum		30.25	30
	Wheelchair Space	At least 1 wheelchair spave for each 24 linear feet of usable table surface perimeter.		YES	YES
		30" by 48 " Minimum		YES	YES
		Positioned for a forward approach to the table; provide knee and toe clerance.		NO	NO

Feature Type	Feature Element	Compliance Requirements	1
Benches (not at Picnic Areas)	Bench Clear Space	36" by 48" Minimum; Must adjoin accessible route.	YES
	Bench Seat Size	42" long Minimum	72.25
		20" deep Minimum; 24 " deep Maximum	11
	Bench Seat Height	17" Minimum; 19" Maximum	16.5
	Bench Back Support	42" long Minimum	72.25
		Extend from a point 2" Maximum above seat surface.	10
		Extend to point 18" Minimum above seat surface.	18.5
		2.5" Maximum from rear edge of seat measured horizontally.	2

Jefferson City Safety Rest Area - Southbound
ADA Inventory

Feature Type	Feature Element	Compliance Requirements	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	PA11	PA12	PA13	PA14	PA15
Pedestrian Access Routes	Continuous Clear Width	48" Minimum	47	81	47	48	48	48	47.5	71.5	46	48.5	47	48	46	46	45.5
		Where the clear width is less than 60", passing spaces (60" x 60" minimum) shall be provided at intervals of 200 feet maximum.	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Slope if not contained within a street right-of-way	5% Maximum	11.2	2.6	2.6	6.5	0.0	4.8	5.8	2.4	5.1	0.3	1.5	11.2	2.6	1.5	2.6
	Cross Slope	2% Maximum	0.9	1.3	0.3	2.5	4.0	4.0	2.4	4.3	0.4	2.4	0.6	4.8	0.9	0.2	3.6
	Vertical Surface Discontinuities (Trip Hazards)	½" Maximum	NO	YES	NO	YES	NO	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO
		Comments															

Feature Type	Feature Element	Compliance Requirements	PA16	PA17	PA18	PA19	PA20	PA21	PA22
Pedestrian Access Routes	Continuous Clear Width	48" Minimum	43	57.5	67	48	45	48	47
		Where the clear width is less than 60", passing spaces (60" x 60" minimum) shall be provided at intervals of 200 feet maximum.	OK	OK	OK	OK	OK	OK	OK
	Slope if not contained within a street right-of-way	5% Maximum	0.5	6.9	11.7	2.9	1.2	4.2	3.0
	Cross Slope	2% Maximum	3.3	2.3	1.4	3.0	0.3	1.7	2.6
	Vertical Surface Discontinuities (Trip Hazards)	½" Maximum	NO	YES	NO	YES	NO	NO	YES
		Comments							

Source of Compliance Requirements:

2010 ADA Standards for Accessible Design

2011 Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

2013 Architectural Barriers Act Accessibility Guidelines Outdoor Developed Areas Final Rule

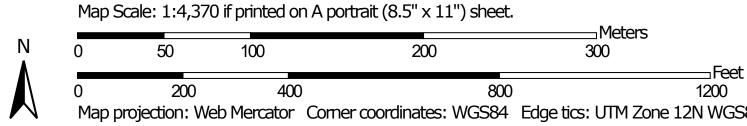
Red highlighted cells indicate non-compliant elements.

Appendix G: Soils Data

Jefferson City
Safety Rest Area Study

Soil Map—Jefferson County Area and Part of Silver Bow County, Montana

Map Scale: 1:4,370 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jefferson County Area and Part of Silver Bow County, Montana
Survey Area Data: Version 19, Sep 5, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 4, 2013—Nov 12, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1803C	Breeton-Cometcrik complex, 2 to 8 percent slopes	14.7	100.0%
Totals for Area of Interest		**14.7**	**100.0%**

Soil Map—Jefferson County Area and Part of Silver Bow County, Montana

Map Scale: 1:3,880 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

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Survey Area Data: Version 19, Sep 5, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

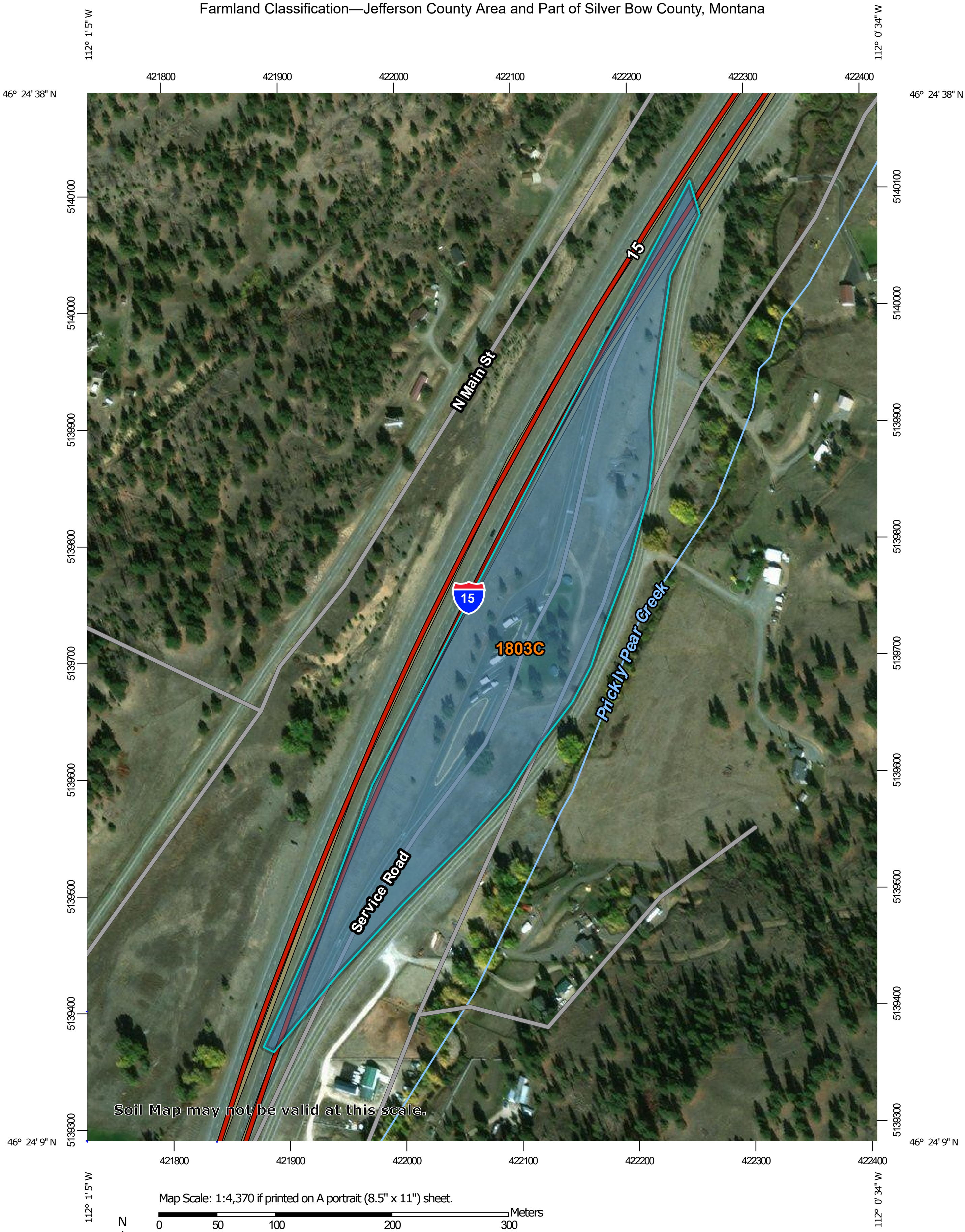
Date(s) aerial images were photographed: May 4, 2013—Nov 12, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

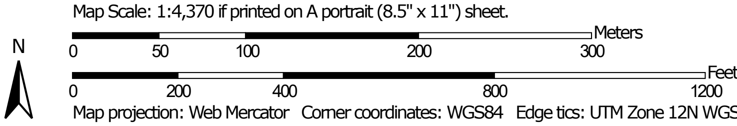
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1800D	Breeton coarse sandy loam, 4 to 15 percent slopes	2.8	36.3%
1803C	Breeton-Cometcrik complex, 2 to 8 percent slopes	5.0	63.7%
Totals for Area of Interest		**7.8**	**100.0%**

Farmland Classification—Jefferson County Area and Part of Silver Bow County, Montana



Map Scale: 1:4,370 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jefferson County Area and Part of Silver Bow County, Montana
Survey Area Data: Version 19, Sep 5, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 4, 2013—Nov 12, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1803C	Breeton-Cometcrik complex, 2 to 8 percent slopes	Farmland of local importance	14.7	100.0%
Totals for Area of Interest			**14.7**	**100.0%**

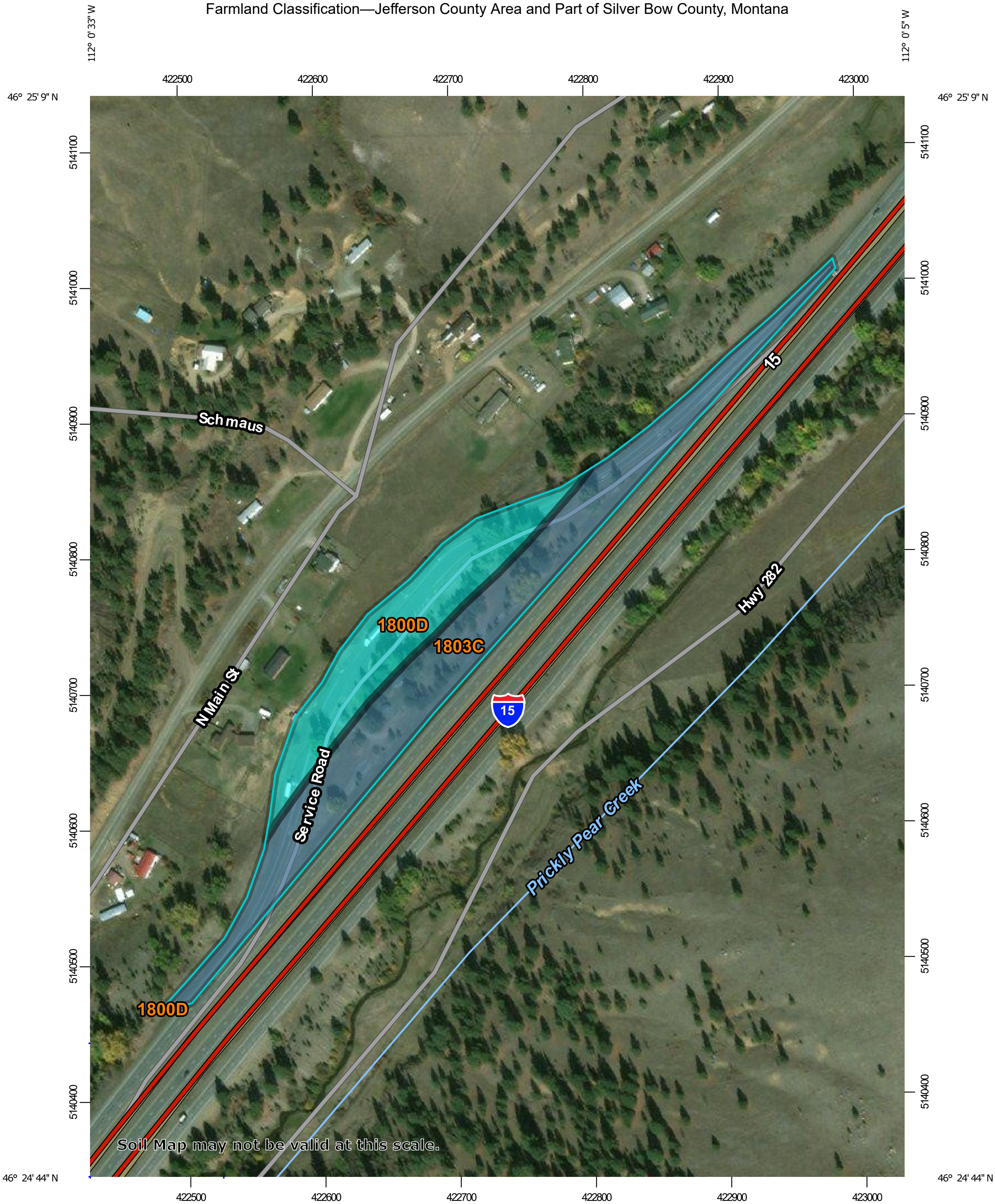
Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower



Map Scale: 1:3,880 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jefferson County Area and Part of Silver Bow County, Montana
Survey Area Data: Version 19, Sep 5, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 4, 2013—Nov 12, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1800D	Breeton coarse sandy loam, 4 to 15 percent slopes	Farmland of statewide importance	2.8	36.3%
1803C	Breeton-Cometcrik complex, 2 to 8 percent slopes	Farmland of local importance	5.0	63.7%
Totals for Area of Interest			**7.8**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Appendix H: Geologic Condition

Jefferson City
Safety Rest Area Study

MBMG
Montana Bureau of Mines and Geology

Montana Bureau of Mines and Geology
Natural Resources Building
1300 West Park Street
Butte, MT 59701

Mapper Main | Proppant | Quakes | Swamp | Wells

▾ Layers

Basemap Layers Basemaps ▾

Current Basemap: Topographic

▾ Legend/Tools

Geology: The geology portrayed in the mapper is the 1:500,000 scale geologic geodatabase maintained by the MBMG. Click here to download a free copy of GM 62D, an information booklet that explains formation names and codes portrayed in the mapper. Note: The geologic map was originally drawn to match different base maps than those currently served on the MBMG mappers. Therefore disagreements between the geologic map and landforms will become apparent at scales larger than 1:500,000.

Geology Transparency

Significant Historic Earthquakes

- 5.3 - 5.9
- 6.0 - 6.9
- 7.3

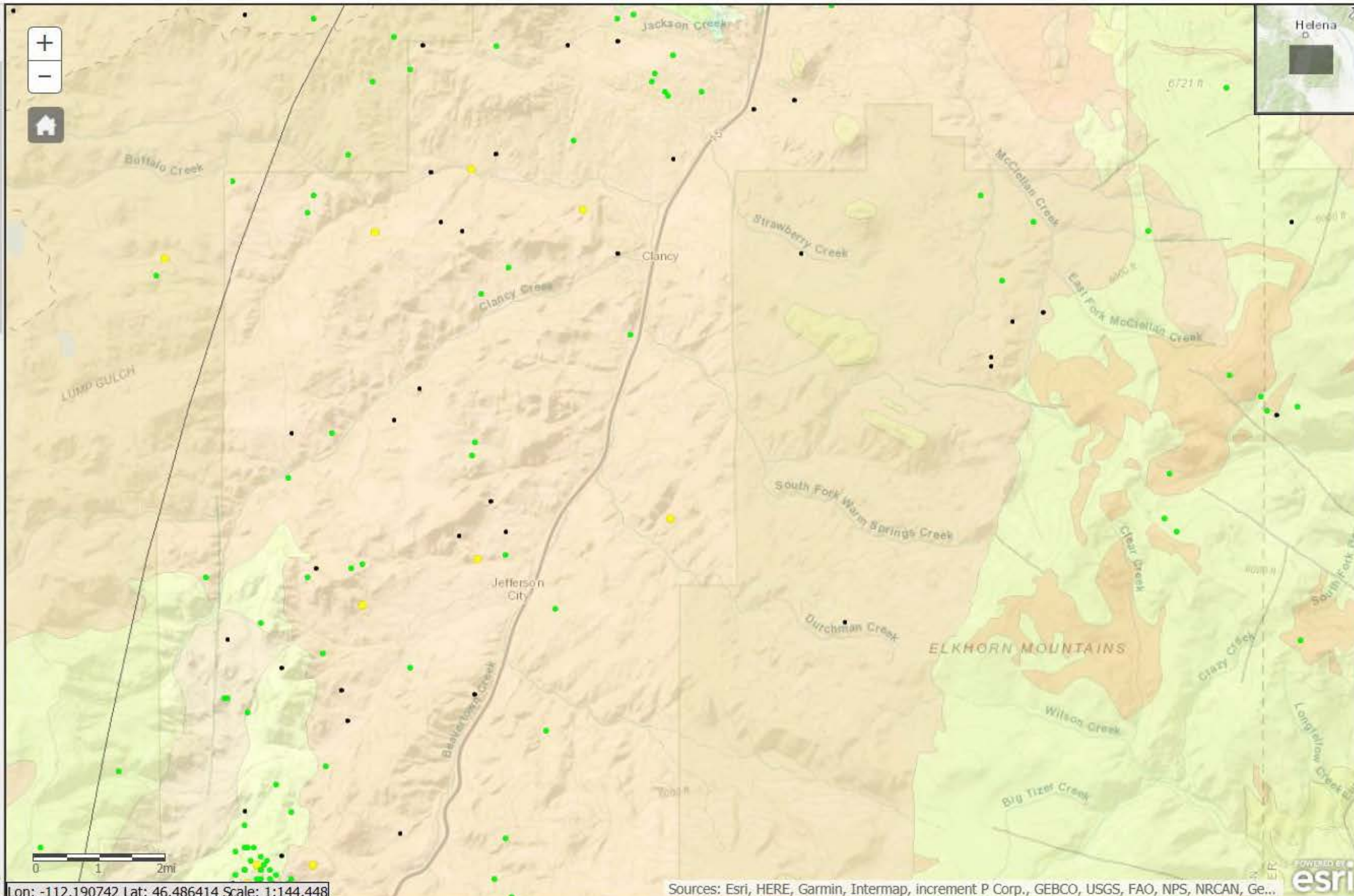
Earthquake Events

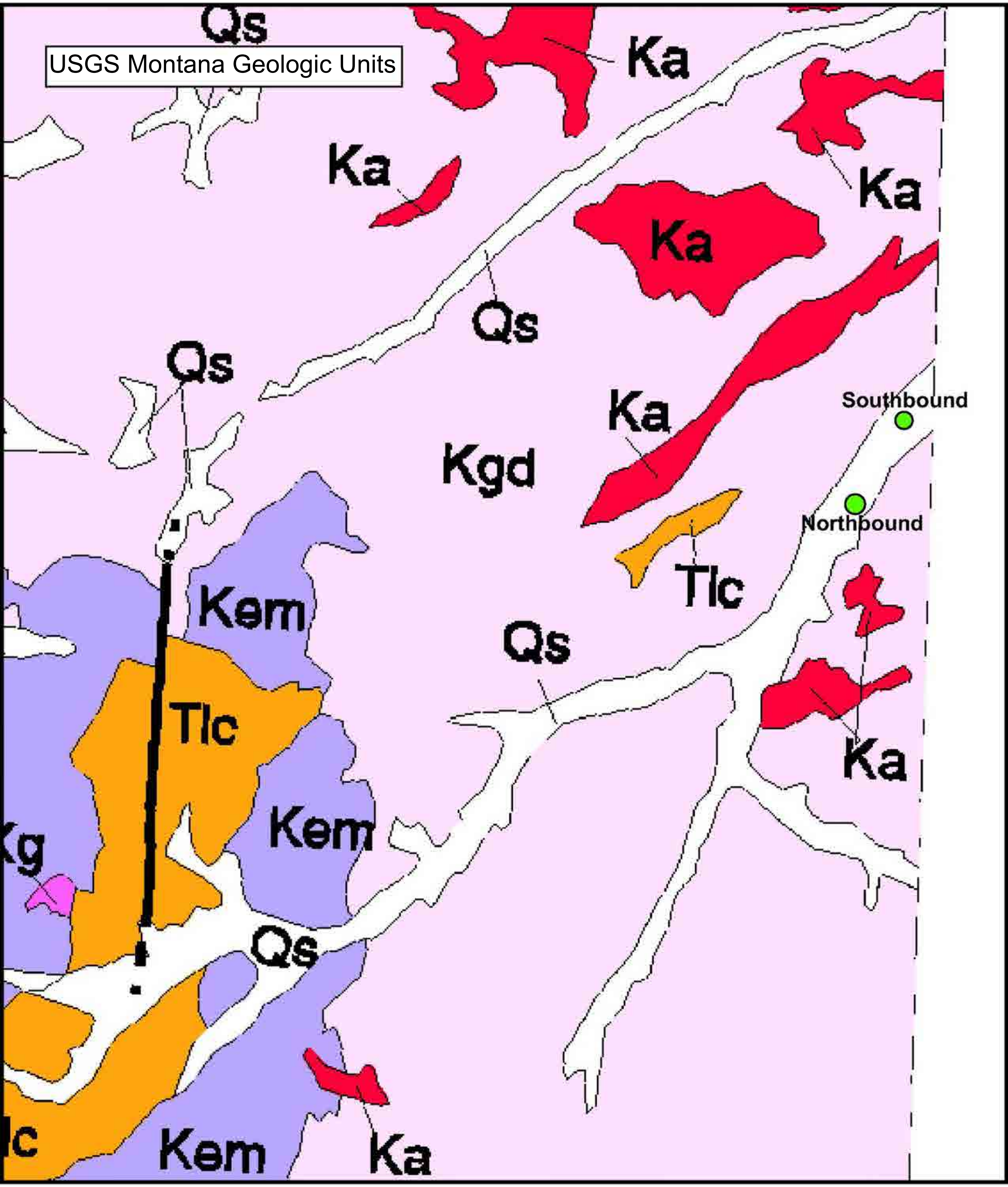
- 0.00 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- 4.01 - 5.60

Earthquake Magnitudes (Popups available at scales of 1:144,448 or greater)

- 0.00 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- 4.01 - 5.60

Seismic Hazard Zones, units are peak horizontal acceleration in percent of the acceleration of gravity





USGS Montana Geologic Units
Qs
Ka
Ka
Ka
Ka
Qs
Qs
Ka
Kgd
Southbound
Northbound
Tlc
Kem
Qs
Tlc
Ka
Kem
Kg
Qs
lc
Kem
Ka

Appendix I:
Water Quality Impairment

Jefferson City
Safety Rest Area Study

Water Quality Restoration Plan and Total Maximum Daily Loads (TMDLs) for the Lake Helena Watershed Planning Area:

Volume I – Watershed Characterization and Water Quality Status Review

December 30, 2004

Prepared for the Montana Department of Environmental Quality

Prepared by the U.S. Environmental Protection Agency, Montana Operations Office
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EXECUTIVE SUMMARY

This document presents the results of the first of several phases of the water quality restoration process for the Lake Helena watershed to establish Total Maximum Daily Loads (TMDLs), or limits, on the pollutants entering the watershed. The report includes (1) a characterization of the Lake Helena watershed, (2) a description of the applicable water quality standards, and (3) an assessment and description of the known pollution problems and their geographical locations based on the currently available data. The report is intended to set the stage for the development of a comprehensive, watershed-wide water quality restoration plan in the coming months.

The Lake Helena Watershed TMDL Planning Area (TPA) drains approximately 620 square miles of west-central Montana. The watershed includes the drainages of Prickly Pear Creek, Tenmile Creek, and Silver Creek, in addition to Lake Helena and the Lake Helena Causeway Arm of Hauser Reservoir. Twenty stream segments and two reservoir segments in the Lake Helena TPA appeared on Montana's 1996 Clean Water Act Section 303(d) List as either impaired or threatened relative to their ability to support the designated water uses defined in Montana's water quality standards. The suspected causes of impairment included flow alteration, habitat alterations, thermal modifications, suspended solids, siltation, turbidity, nutrients, un-ionized ammonia, salinity/total dissolved solids/chlorides, other inorganics, metals, pH, priority organics, and unknown toxicity. Cold-water fish and other aquatic life, drinking water, primary contact recreation (swimming), and agricultural and industrial uses were the beneficial uses listed as impaired or threatened. The Montana Department of Environmental Quality (MDEQ) revised the 303(d) list in 2002 using a new procedure, and the status of some beneficial uses and causes of impairment for several segments changed as a result of the revised listing procedure. Three additional stream segments were added to the list after 1996 and a fourth segment was removed from the list in 2004 based on new data.

This project re-evaluated the currently available data on water quality and assessed beneficial water uses in 25 individual segments of the following 18 water bodies in the Lake Helena watershed:

Clancy Creek	Corbin Creek	Golconda Creek
Granite Creek (Austin Creek)	Granite Creek (Sevenmile Creek)	Jackson Creek
Jennie's Fork	Lake Helena	Lump Gulch
Middle Fork Warm Springs Creek	North Fork Warm Springs Creek	Prickly Pear Creek
Sevenmile Creek	Silver Creek	Skelly Gulch
Spring Creek	Tenmile Creek	Warm Springs Creek

The evaluation has tentatively concluded that TMDL water quality restoration plans will be required for 43 individual pollutant and water body combinations in the Lake Helena watershed. These include 20 stream segments totalling 145 stream miles and 1,600 lake acres that are impacted by heavy metals and related problems, 17 segments totalling 121 stream miles with excess quantities of sediment, and 17 segments totalling 41 stream miles and 1,600 lake acres that are impaired as result of nutrients and related pollutants.

The specific pollution problems and affected water bodies that will be addressed by the forthcoming Lake Helena watershed water quality restoration plan and TMDLs are summarized in Table ES-1.

Table ES-1. Water quality status of suspected impaired water bodies and required TMDLs in the Lake Helena watershed.

Water Body Name and Number	Suspected Impairment Causes	Conclusions	Proposed Action
Clancy Creek, MT41I006_120	Sediment	Impaired	A TMDL will be written.
	Nutrients	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Corbin Creek, MT41I006_090	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
	Temperature	Unknown	A TMDL will not be written at this time.
	Salinity/total dissolved solids/chlorides	Impaired for salinity and total dissolved solids. Not impaired for chlorides.	A TMDL will not be written. Impairments will be addressed by the metals TMDL.
Golconda Creek, MT41I006_070	Sediment	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for cadmium and lead.
Granite Creek, MT41I006_179	Habitat alterations	Not impaired	A TMDL will not be written.
Granite Creek, MT41I006_230	Metals	Unknown	A TMDL will not be written at this time.
Jackson Creek, MT41I006_190	Sediment	Not impaired	A TMDL will not be written.
Jennie's Fork, MT41I006_210	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for lead.
Lake Helena, MT41I007_010	Sediment	Unknown	A TMDL will not be written at this time.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic and lead.
	Temperature	Unknown	A TMDL will not be written at this time.

Water Body Name and Number	Suspected Impairment Causes	Conclusions	Proposed Action
Lump Gulch, MT41I006_130	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for cadmium, copper, lead, and zinc.
Middle Fork Warm Springs Creek, MT41I006_100	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, lead, and zinc.
North Fork Warm Springs Creek, MT41I006_180	Sediment	Impaired	A TMDL will be written.
	Low dissolved oxygen, organic enrichment	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, and zinc.
Prickly Pear Creek, MT41I006_060	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for lead.
Prickly Pear Creek, MT41I006_050	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for cadmium, lead, and zinc.
Prickly Pear Creek, MT41I006_040	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
	Temperature[a]	Impaired	A TMDL will be written.
Prickly Pear Creek, MT41I006_030	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic and lead.
	Temperature	Impaired	A TMDL will be written.
Prickly Pear Creek, MT41I006_020	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Total ammonia	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, and lead.
	Temperature	Impaired	A TMDL will be written.

Water Body Name and Number	Suspected Impairment Causes	Conclusions	Proposed Action
Prickly Pear Creek, MT41I006_010	Metals	Not evaluated	TMDL needs will be addressed as part of Hauser Reservoir TMDL.
Sevenmile Creek, MT41I006_160	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for copper and lead.
Silver Creek, MT41I006_150	Metals	Impaired	A TMDL will be written for arsenic and mercury.
	Priority organics	Not impaired	A TMDL will not be written.
Skelly Gulch, MT41I006_220	Sediment	Impaired	A TMDL will be written.
	Metals	Not impaired	A TMDL will not be written.
Spring Creek, MT41I006_080	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Tenmile Creek, MT41I006_141	Sediment	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Tenmile Creek, MT41I006_142	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Tenmile Creek, MT41I006_143	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Warm Springs Creek, MT41I006_110	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, lead, and zinc.

[a] These impairment causes have not been reflected on past 303(d) lists but were identified during this review.

1.0 INTRODUCTION

1.1 Background

The Lake Helena Watershed TMDL planning area (TPA) is located in west-central Montana and encompasses an area of nearly 620 square miles. The watershed is bounded by the Continental Divide to the west and by the Elkhorn Mountains to the southeast (Figure 1-1). In general, streams in the watershed exhibit a dendritic pattern, flowing toward Lake Helena and the Missouri River in the northeastern part of the watershed. The three major drainages of the watershed are Silver, Tenmile, and Prickly Pear Creeks. Major tributaries include Sevenmile Creek in the Tenmile drainage, and Warm Springs Creek, Lump Gulch, Clancy Creek, and McClellan Creek in the Prickly Pear Creek drainage. The mountainous areas of the watershed are part of the Northern Rockies ecoregion while the Helena Valley area surrounding Lake Helena is part of the Montana Valley and Foothill Prairies ecoregion (Omernik, 1987). Approximately 68 percent of the watershed is located within Lewis and Clark County, and the remaining 32 percent lies within Jefferson County. Montana's capital city, Helena, is near the center of the watershed.

A number of stream segments in the Lake Helena watershed, and Lake Helena proper, are designated as "water quality-limited" or "threatened" and have been placed on Montana's list of water bodies in need of restoration, a list prepared in accordance with Section 303(d) of the Clean Water Act and known as the "303(d) list." The following water bodies were listed as impaired on Montana's 1996 303(d) list and are addressed in this document (see Section 3 for more details regarding the 303(d) listing status of these water bodies):

Clancy Creek	Corbin Creek	Golconda Creek
Granite Creek (Austin Creek)	Granite Creek (Sevenmile Creek)	Jackson Creek
Jennie's Fork	Lake Helena	Lump Gulch
Middle Fork Warm Springs Creek	North Fork Warm Springs Creek	Prickly Pear Creek
Sevenmile Creek	Silver Creek	Skelly Gulch
Spring Creek	Tenmile Creek	Warm Springs Creek

The TMDL and water quality restoration planning process in Montana involves several steps. The first step consists of characterizing the environment in which the water bodies exist (this step is referred to as "watershed characterization"). This is followed by developing a thorough understanding of the water quality problem (what pollutant is causing the impairment and how is the impairment manifested in the water body – referred to in this report as "water quality impairment status") and establishing water quality goals ("targets"). Once the water quality problem has been defined, the next step is to identify all significant sources of pollutants ("source assessment"). Then, the maximum load of a pollutant (for example, sediment, nutrients, or metals) that a water body is able to assimilate and still fully support its designated uses is determined (the total maximum daily load or TMDL). Next, the pollutant load is allocated among all sources within the watershed, including natural sources (i.e., "allocation"), and voluntary (for nonpoint sources) and regulatory control (for point sources) measures are identified for attaining the source allocations (i.e., "restoration strategy"). Last, a monitoring plan and associated corrective feedback loop are established to ensure that the control measures are effective at restoring water quality and all designated beneficial water uses.

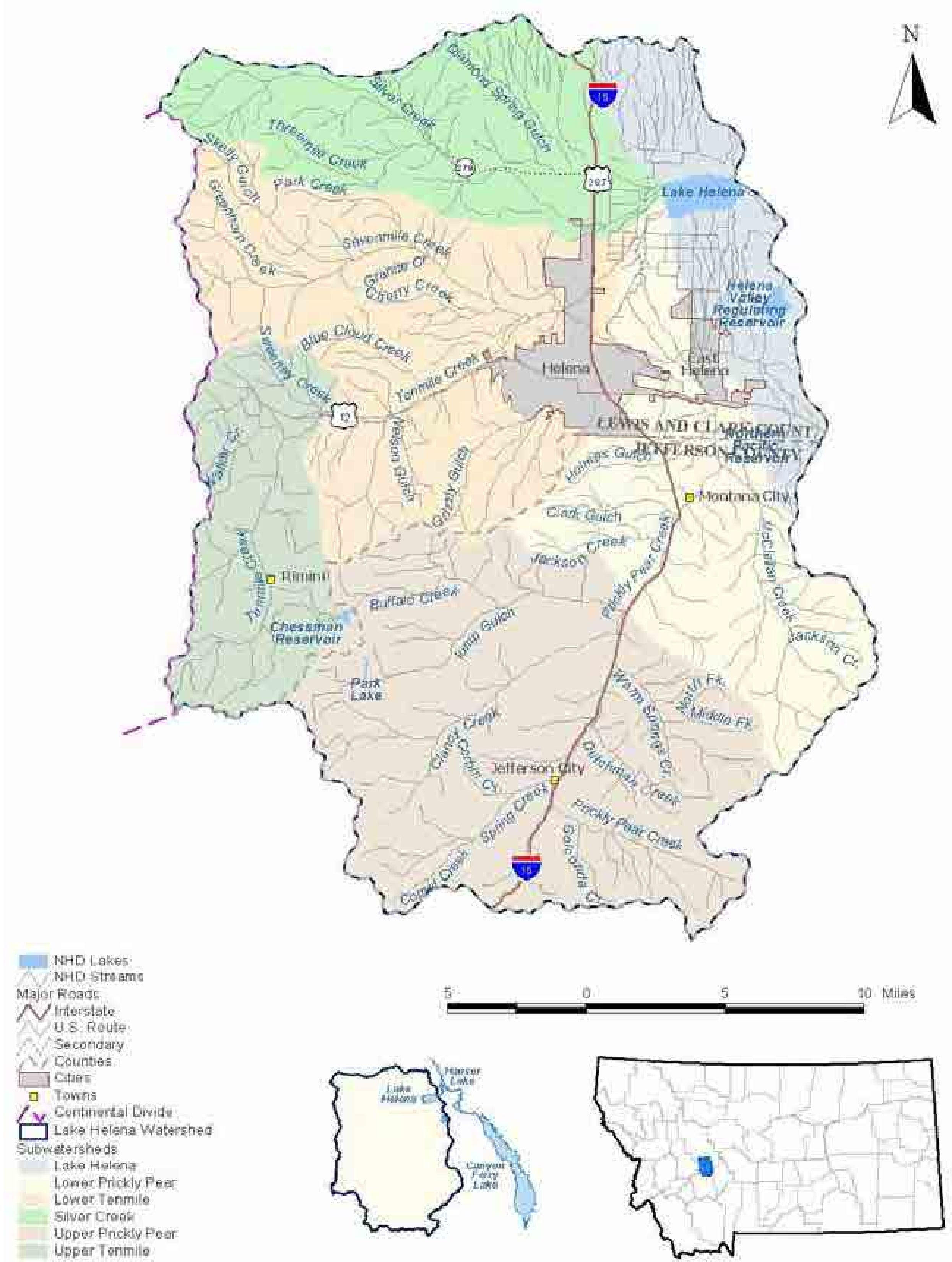

Figure 1-1. General location of the Lake Helena watershed.

1.2 Document Purpose and Content

This report, volume I of the Lake Helena Watershed Water Quality Restoration Plan, is intended to provide a foundation for water quality improvement by confirming and documenting existing water quality impairments, evaluating the causes of impairment, establishing water quality goals, and preliminarily evaluating the potential sources of impairment. The primary function of this report is to clearly describe and characterize the existing conditions of all the water bodies in the TPA that appeared on Montana's 303(d) list and determine their current impairment status. The findings in this report therefore determine whether or not TMDLs should be established for the water bodies studied, although final formal impairment status changes will not be made until MDEQ prepares the 2006 section 303(d) list. Comments from all interested parties are welcomed on this Volume I report. Although EPA and MDEQ will not be preparing a revised version of this report, all data and comments will be considered during the preparation of the draft TMDLs and the 2006 section 303(d) list.

The physical, chemical, and biological characteristics of the watershed are described in Section 2, Watershed Characterization. A summary and evaluation of all available water quality information are presented in Section 3, Water Quality Impairment Status.

1.3 Future Phases

Future phases of the TMDL process that will be presented in the next volume of the Lake Helena Watershed Restoration Plan (expected to be released in 2005) will include a more detailed assessment of the sources of water quality impairment, final water quality goals or targets, TMDLs, load allocations, a restoration strategy, and a monitoring strategy. These subsequent phases will build upon the information presented in this report.

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2.0 WATERSHED CHARACTERIZATION

The purpose of this section is to put Lake Helena and the 303(d)-listed tributaries into context within the environment in which they occur. A general discussion of location, environmental characteristics, and socioeconomic characteristics is included below. A more detailed watershed characterization can be found at the end of this report in Appendix A, Lake Helena Watershed Characterization.

2.1 General Watershed Characteristics

The Lake Helena watershed is in west-central Montana and encompasses an area of nearly 620 square miles (Figure 2-1). There are three major streams in the watershed—Silver, Tenmile, and Prickly Pear Creeks. All three flow into Lake Helena, which is a regulated reservoir formed in the old creek valleys just north of the city of Helena, Montana. Lake Helena eventually flows into Hauser Reservoir on the Missouri River. Other impoundments in the watershed are the Chessman Reservoir, Scott Reservoir, and the Helena Valley Regulating Reservoir, all of which are part of the City of Helena's water supply storage and delivery system.

The Lake Helena watershed is in the semi-arid region of Montana and receives between 12 to 16 inches of precipitation per year. Snow generally averages from 50 to 63 inches per year. Both rain and snow are heavily influenced by the dramatic elevation changes found in the watershed (3,600 to 9,400 feet above sea level). Evergreen forest and grasslands are the dominant land cover types, comprising over 70 percent of the total area. Agricultural lands are concentrated in the valley in the northeastern portion of the watershed where irrigation water is readily available.

Approximately 55,000 people live within the Lake Helena watershed, mostly in the cities of Helena, East Helena, and Montana City. The rate of population growth in the Helena Valley has fluctuated over the years, varying with the economy and other factors. On average, there has been an 18 percent increase in population every decade since 1950. Most of land in the watershed is privately owned, although various tribal, state, and federal agencies hold title to portions of the area. Federal land holdings, represented by agencies such as the U.S. Forest Service and the Bureau of Land Management (BLM), make up approximately 40 percent of the watershed area. The U.S. Forest Service is the largest federal landowner in the watershed, and its lands are the second largest land holdings in the watershed.

Mining has been and continues to be an important industry in the Lake Helena watershed. Heavy metals, limestone, sand, and gravels have all been mined at one time. Mining and mine drainage, particularly from abandoned mines, can have a detrimental effect on water quality and aquatic health. Extensive agricultural development, timber harvesting, road construction, livestock grazing, and wildfires have also altered the natural ecology of the Lake Helena watershed. These changes and their implications for water quality are discussed in more detail in Section 3 of this report.

Figure 2-1. Streams in the Lake Helena watershed.

2.2 Water Body Characteristics

Lake Helena is a shallow water body located northeast of the city of Helena, Montana. Its surface area is approximately 3.2 square miles (2,072 acres). When Hauser Dam was constructed on the Missouri River, the wetlands in the lower reaches of Silver and Prickly Pear Creeks were flooded, creating Lake Helena. In 1945, an earthen causeway and control mechanisms were constructed to separate Hauser Reservoir and Lake Helena, allowing the two to be regulated independently. The major tributaries flowing into Lake Helena are Prickly Pear Creek, Tenmile Creek, Silver Creek and their tributaries.

A network of intermittent and perennial streams and canals drains the Lake Helena watershed. Mountain streams of varying sizes have perennial flow due to snowmelt, precipitation, and discharge from bedrock aquifers, while many of the smaller tributaries in the valley regions of the watershed are intermittent. All canals and ditches are concentrated in agricultural areas surrounding Lake Helena in the Helena Valley. Seasonal dewatering occurs in the lower sections of Silver, Tenmile, and Prickly Pear Creeks as a result of irrigation withdrawals and losses to groundwater. However, seasonal flooding occurs in these same streams as a result of spring runoff and unpredictable winter thaws (Wetlands Community Partnership, 2001). During drought years, many of the streams in the watershed run dry.

2.3 Stream Flow

Stream flow varies from site to site and from season to season in the Helena Valley as a result of complex patterns of precipitation and runoff, groundwater and surface water interactions, and water diversions and storage. Flow increases in streams are attributed to tributary inflows or groundwater discharge, and flow depletions occur as a result of irrigation diversions and seepage to groundwater (USGS, 2001). A series of tile drains was installed throughout much of the Helena Valley during the late 1950s. The drainage system has lowered the elevation of the shallow aquifer, drained numerous acres of historical wetlands, caused the loss of natural infiltration and groundwater recharge areas, and reduced surface flows in lower Tenmile, Prickly Pear, and possibly Silver Creeks. The tile drains discharge directly into Lake Helena as a series of open drains.

Ten U.S. Geological Survey (USGS) flow gages with recent flow data were analyzed to obtain a general understanding of flow patterns from the tributary headwaters to Lake Helena (Table 2-1). Flow patterns at most of the stations show peaks in late April and again in early June due to snowmelt runoff and precipitation. In general, flows in Lake Helena watershed streams are low and fairly constant from September through March. The highest flows can be expected during the months of April and June, and these are typically one to two orders magnitude greater than the base flow levels.

Table 2-1. Selected USGS stream gages in the Lake Helena watershed.

		Drainage Area			
Station ID	**Gage Name**	**Acres**	**Square Miles**	**Start Date**	**End Date**
06061900	McClellan Creek near East Helena	21,248	33	Sep 1988	Sep 1990
06061500	Prickly Pear Creek near Clancy	122,880	192	Jul 1908	Sep 2001
06058900	Prickly Pear Creek below Anderson Gulch near Jefferson City	8,960	14	Oct 1988	Sep 1990
06064150	Tenmile Creek above Prickly Pear Creek near Helena	120,320	188	May 1997	Sep 1998
06064100	Tenmile Creek at Green Meadow Drive at Helena	103,040	161	May 1997	Sep 1998
06063000	Tenmile Creek near Helena	61,760	97	Aug 1908	Sep 1998
06062990	Tenmile Creek at State Nursery Bridge near Helena	N/A	N/A	Mar 1990	Aug 1992
06062750	Tenmile Creek at Tenmile Water Treatment Plant near Rimini	32,704	51	May 1997	Sep 2001
06062500	Tenmile Creek near Rimini	19,776	31	Oct 1914	Sep 2001
06063600	Sevenmile Creek below Granite Creek near Helena	N/A	N/A	Mar 1990	Sep 1991

2.4 Water Use

Irrigation in the Helena Valley began in the 1880s. Water from Prickly Pear, Tenmile, and Silver Creeks was diverted for irrigation purposes as land claims were granted. The construction of the present irrigation system began in 1957 and was completed in 1959. By 1950, more than 8,000 acres of formerly productive land in the low-lying areas of the Helena Valley became saturated because of seepage from irrigation canals and infiltration from flood-irrigated fields. The Bureau of Reclamation installed several irrigation drains beginning in 1958, in part to drain previously saturated land but also to accommodate the additional irrigation water imported from the Missouri River. Portions of some canals in the valley are lined with polyvinyl chloride (PVC), compacted earth, asphalt, or concrete (Kendy et al., 1998).

The Helena Valley Irrigation District receives about 81,300 acre-feet of water diverted from the Missouri River annually. The water is diverted from Canyon Ferry Dam about 15 miles east of Helena. Turbine-driven pumps below the dam (the Helena Valley Pumping Plant) lift water to the Helena Valley Canal Tunnel and feeder canal. The feeder canal flows 8.3 miles across the Spokane Bench to the Helena Valley Regulating Reservoir, which has a volume of 5,900 acre-feet. The reservoir discharges water into the valley section of the Helena Valley Canal, which nearly encircles the Helena Valley alluvial plain and distributes water into the central part of the Helena Valley through an extensive network of lateral canals (Figure 2-2). The length of the Helena Valley Canal is 31.7 miles, 10.2 miles of which are lined and 21.5 miles are unlined. Of the 64.4 miles of lateral canals, 51.9 are lined and 12.5 are unlined. A 56.6-mile drainage system consisting of 26.6 miles of open drains and 29.9 miles of pipe drains prevents irrigated land from becoming saturated (Kendy et al., 1998).

Irrigation practices in the Lake Helena watershed help to sustain crops through the arid summer growing season. The Helena Valley Irrigation District manages irrigation in the Helena Valley totaling 15,608 acres, 12,500 acres of which are flood-irrigated. The district is proposing to increase the total irrigated acreage by 2,600 acres (Foster, 2004; USBR, 2004a).

Figure 2-2. Map of irrigation canals and drains in the Helena Valley Irrigation District.

3.0 WATER QUALITY IMPAIRMENT STATUS

This section of the document first describes the water quality status of stream and lake segments in the Lake Helena watershed, as presented in past and current versions of the Montana 303(d) list. This is followed by a summary of the applicable water quality standards and a translation of those standards into proposed water quality goals and indicators. The remainder of this section is devoted to a review of the available chemical, physical, and biological water quality data for each listed water body, including new information that may not have been considered during the preparation of past 303(d) lists. A weight-of-evidence approach is used to draw conclusions about the present status of each water body relative to TMDL development needs.

3.1 Montana 303(d) List Status

A summary of the 303(d) list status and history of listings is provided in Table 3-1. Figure 3-1 shows the locations of suspected impaired and threatened segments in the Lake Helena watershed, as identified in the 1996–2004 303(d) lists. As mentioned in Section 1.1, all necessary TMDLs must be completed for all pollutant and water body combinations appearing on Montana’s 1996 303(d) list. The 1996 303(d) list reported that Corbin, Clancy, Golconda, Granite, Prickly Pear, Sevenmile, Silver, Spring, Tenmile, Warm Springs, and Middle Fork Warm Springs Creeks, and Jennie’s Fork, Lump Gulch, Skelly Gulch, and Lake Helena were impaired (MDEQ, 1996). Listed causes of impairment for these water bodies included habitat alterations, flow alteration, thermal modifications, siltation, suspended solids, turbidity, nutrients, un-ionized ammonia, salinity/total dissolved solids/chlorides, metals, other inorganics (sulfate), pH, priority organics, and unknown toxicity (see Table 3-2). The most common impaired beneficial uses in the Lake Helena watershed were cold-water fisheries and aquatic life.

The U.S. Environmental Protection Agency (EPA) has made a determination that some categories of water quality impairment are best resolved through measures other than TMDLs. The following impairments have all been placed in a general category of “pollution” for which TMDLs are not required: habitat alterations, fish habitat degradation, channel incisement, bank erosion, riparian degradation, stream dewatering, and flow alterations. On the other hand, TMDLs are required to address impairments caused by discrete “pollutants,” such as heavy metals, nutrients, and sediment (Dodson, 2001). The Lake Helena water quality restoration plan focuses on this latter category, but it attempts to understand the relationships between general pollution problems (such as bank erosion) and those caused by specific pollutants (such as sediment). Although no TMDLs will be established to specifically address the “pollution” problems described above, the problems will be addressed as sources of impairment within the context of TMDLs developed for the related “pollutants” of concern.

It should also be noted here that the project team has determined that any and all water quality impairments in the Lake Helena Causeway Arm of Hauser Reservoir (Prickly Pear Creek segment MT41I006_010) will be addressed as part of a future water quality restoration plan for Hauser Reservoir rather than as a component of the Lake Helena plan. This is appropriate because the Causeway Arm is a major part of Hauser Reservoir. The water quality problems in the Causeway Arm cannot be resolved separately from those in Hauser Reservoir and the entire upper Missouri River system.

Table 3-1. Impaired streams on the Montana 303(d) list within the Lake Helena watershed and associated impaired beneficial uses.

Water Body and Stream Description	Water Body Number	Use Class	Year	Aquatic Life	Fisheries – Cold-water	Drinking Water	Swimmable (Recreation)	Agriculture	Industry
Clancy Creek, from the headwaters to the mouth (Prickly Pear Creek)	MT41I006_120	B-1	1996	P	P	P	P		
			2000	N	N	N	X	F	F
			2002	N	N	N	F	F	F
			2004	N	N	N	F	F	F
Corbin Creek, from the headwaters to the mouth (Spring Creek)	MT41I006_090	B-1	1996	N	N	N	N	N	
			2000	N	N	N	N	P	P
			2002	N	N	N	N	P	P
			2004	N	N	N	N	P	P
Golconda Creek, from the headwaters to the mouth (Prickly Pear Creek) T7N R3W	MT41I006_070	B-1	1996	N	N	N	N		
			2000	N	N	N	X	F	F
			2002	N	N	N	X	F	F
			2004	N	N	N	X	F	F
Granite Creek, from the headwaters to the mouth (Austin Creek – Greenhorn Creek – Sevenmile Creek)	MT41I006_179	B-1	1996		T				
			2004	F	F	F	F	F	F
Granite Creek, from the headwaters to the mouth (Sevenmile Creek)	MT41I006_230	B-1	2002	X	X	N	X	X	X
			2004	X	X	N	X	X	X
Jackson Creek, from the headwaters to the mouth (McClellan Creek – Prickly Pear Creek)	MT41I006_190	B-1	1998	P	P				
			2000	X	X	X	X	X	X
			2002	X	X	F	F	F	F
			2004	X	X	F	F	X	X
Jennie's Fork, from the headwaters to the mouth (Silver Creek – Missouri River)	MT41I006_210	B-1	1996	N	N	N	N		
			2000	X	X	X	X	X	X
			2002	X	X	F	F	F	F
			2004	X	X	X	X	X	X
Lake Helena	MT41I007_010	B-1	1996	P	P		P		
			2000	X	X	N	X	F	F
			2002	X	X	N	X	F	F
			2004	X	X	N	X	F	F
Lump Gulch, from the headwaters to the mouth (Prickly Pear Creek)	MT41I006_130	B-1	1996	P	P	P			
			2000	N	N	N	X	F	F
			2002	N	N	N	X	F	F
			2004	N	N	N	X	F	F

Water Body and Stream Description	Water Body Number	Use Class	Year	Aquatic Life	Fisheries – Cold-water	Drinking Water	Swimmable (Recreation)	Agriculture	Industry
Middle Fork Warm Springs Creek, from the headwaters to the mouth (Warm Springs Creek – Prickly Pear Creek)	MT41I006_100	B-1	1996	P	P				
			2000	N	N	N	X	X	X
			2002	N	N	N	F	F	F
			2004	N	N	N	F	F	F
North Fork Warm Springs Creek, from the headwaters to the mouth (Warm Springs Creek – Prickly Pear Creek)	MT41I006_180	B-1	1998	P	P				
			2000	X	X	F	X	X	X
			2002	F	P	N	F	F	F
			2004	F	P	F	F	F	X
Prickly Pear Creek, from the headwaters to Spring Creek	MT41I006_060	B-1	1996		T				
			2000	N	F	N	F	P	F
			2002	N	P	N	F	P	F
			2004	N	P	N	F	P	F
Prickly Pear Creek, from Spring Creek to Lump Gulch	MT41I006_050	B-1	1996	N	N	P	N	N	
			2000	N	N	N	F	P	F
			2002	N	N	N	F	P	F
			2004	N	N	N	F	P	F
Prickly Pear Creek, from Lump Gulch to Montana Highway 433 crossing	MT41I006_040	B-1	1996	P	P			P	
			2000	N	N	N	F	P	F
			2002	N	N	N	F	P	F
			2004	N	N	N	F	P	F
Prickly Pear Creek, from Highway 433 Crossing to the Helena wastewater treatment plant discharge ditch	MT41I006_030	I	1996	N	N	N	N	N	
			2000	N	N	N	P	P	P
			2002	N	N	N	P	P	P
			2004	N	N	N	P	P	P
Prickly Pear Creek, from the Helena wastewater treatment plant discharge ditch to Lake Helena	MT41I006_020	I	1996	N	N	N	N	N	
			2000	N	N	N	X	F	P
			2002	N	N	N	P	F	P
			2004	N	N	N	P	F	P
Prickly Pear Creek, from Lake Helena to Hauser Lake	MT41I006_010	B-1	1996	P	P		P		
			2000	X	X	N	X	X	X
			2002	X	X	N	X	X	X
			2004	X	X	N	X	X	X
Sevenmile Creek, from the headwaters to the mouth (Tenmile Creek)	MT41I006_160	B-1	1996		T				
			2000	X	X	X	F	X	X
			2002	P	P	F	F	F	F
			2004	P	P	F	F	F	F

Water Body and Stream Description	Water Body Number	Use Class	Year	Aquatic Life	Fisheries – Cold-water	Drinking Water	Swimmable (Recreation)	Agriculture	Industry
Silver Creek, from the headwaters to the mouth (Lake Helena)	MT41I006_150	B-1	1996	N	N	P	N		
			2000	N	N	N	P	F	P
			2002	N	N	N	P	F	P
			2004	N	N	N	P	F	P
Skelly Gulch, tributary of Greenhorn Creek – Sevenmile Creek	MT41I006_220	B-1	1996	P	P				
			2000	X	X	X	X	X	X
			2002	P	P	F	F	F	F
			2004	P	P	F	F	F	F
Spring Creek, from Corbin Creek to the mouth (Prickly Pear Creek)	MT41I006_080	B-1	1996	N	N	N	N	N	
			2000	N	N	N	P	N	P
			2002	N	N	N	P	N	P
			2004	N	N	N	P	N	P
Tenmile Creek, from the headwaters to the Helena public water supply intake above Rimini	MT41I006_141	A-1	1996	P	P	P	P		
			2000	N	N	N	F	F	F
			2002	P	P	N	F	F	F
			2004	P	P	N	F	F	F
Tenmile Creek, from the Helena public water supply intake above Rimini to the Helena water treatment plant	MT41I006_142	B-1	1996	P	P	P	P		
			2000	N	N	N	N	N	N
			2002	N	N	N	N	N	N
			2004	N	N	N	N	N	N
Tenmile Creek, from the Helena water treatment plant to the mouth (Prickly Pear Creek)	MT41I006_143	B-1	1996	P	P	P	P		
			2000	N	N	N	P	F	F
			2002	P	P	N	P	F	F
			2004	P	P	N	P	F	F
Warm Springs Creek, from the Middle Fork to the mouth (Prickly Pear Creek)	MT41I006_110	B-1	1996	P	P				
			2000	X	X	N	X	X	X
			2002	P	P	N	F	F	F
			2004	P	P	N	F	F	F

F = Full Support; **P** = Partial Support; **N** = Not Supported; **T** = Threatened; **X** = Not Assessed (Insufficient Credible Data).

Table 3-2. Probable causes of water quality impairment in the Lake Helena watershed identified in 1996–2004 Montana 303(d) lists.

Water body	1996 Causes	2000 Causes	2002 Causes	2004 Causes
Clancy Creek	Metals Nutrients Habitat alterations Siltation Suspended solids	Metals (Did not meet SCD for Primary Contact Recreation)	*Arsenic* *Channel incisement* *Lead* *Mercury* *Metals* *Other habitat alterations* *Siltation*	*Arsenic* *Channel incisement* *Lead* *Mercury* *Metals* *Other habitat alterations* *Siltation*
Corbin Creek	Metals Other inorganics Salinity/TDS/ chlorides Suspended solids pH	Metals Suspended solids pH Thermal modifications Habitat alterations	*Metals* *Other habitat alterations* *pH* *Suspended solids* *Thermal modifications*	*Metals* *Other habitat alterations* *pH* *Suspended solids* *Thermal modifications*
Golconda Creek	Metals Suspended solids Turbidity Unknown toxicity	Metals	*Metals*	*Metals*
Granite Creek	Habitat alterations	Arsenic Cadmium	*Arsenic* *Cadmium* *Metals*	*Arsenic* *Cadmium* *Metals*
Jackson Creek	**1998 Listing:** Siltation	*(Did not meet SCD)*	*(Did not meet SCD for Aquatic Life, Cold-water Fishery)*	*(Did not meet SCD for Aquatic Life, Cold-water Fishery)*
Jennie's Fork	Metals Siltation	*(Did not meet SCD)*	*(Did not meet SCD for Aquatic Life, Cold-water Fishery)*	*(Did not meet SCD for Aquatic Life, Cold-water Fishery)*
Lake Helena	Metals Nutrients Suspended solids Thermal modifications	Lead Arsenic	*Arsenic* *Lead* *Metals*	*Arsenic* *Lead* *Metals*
Lump Gulch	Metals Suspended solids	Cadmium Mercury Copper Lead Zinc	*Cadmium* *Copper* *Lead* *Mercury* *Metals* *Zinc*	*Cadmium* *Copper* *Lead* *Mercury* *Metals* *Zinc*
Middle Fork Warm Springs Creek	Metals Habitat alterations Siltation	Arsenic Mercury Copper Zinc	*Arsenic* *Copper* *Mercury* *Metals* *Other habitat*	*Arsenic* *Copper* *Mercury* *Metals* *Other habitat*

Water body	1996 Causes	2000 Causes	2002 Causes	2004 Causes
			alterations *Siltation* *Zinc*	*alterations* *Siltation* *Zinc*
North Fork Warm Springs Creek	**1998 Listing:** Siltation	*(Did not meet SCD)*	*Arsenic* *Bank erosion* *Fish habitat degradation* *Metals* *Organic enrichment/Low dissolved oxygen* *Other habitat alterations* *Siltation*	*Arsenic* *Bank erosion* *Fish habitat degradation* *Metals* *Organic enrichment/Low dissolved oxygen* *Other habitat alterations* *Siltation*
Prickly Pear Creek MT41I006_060	Metals Suspended solids	Metals Fish habitat degradation Habitat alterations	*Fish habitat degradation* *Metals* *Other habitat alterations*	*Fish habitat degradation* *Metals* *Other habitat alterations*
Prickly Pear Creek MT41I006_050	Siltation Suspended solids	Metals Fish habitat degradation Bank erosion Habitat alterations Siltation	*Bank erosion* *Fish habitat degradation* *Metals* *Other habitat alterations* *Siltation*	*Bank erosion* *Fish habitat degradation* *Metals* *Other habitat alterations* *Siltation*
Prickly Pear Creek MT41I006_040	Flow alteration Metals Habitat alterations	Metals Siltation Fish habitat degradation Habitat alterations	*Fish habitat degradation* *Metals* *Other habitat alterations* *Siltation*	*Fish habitat degradation* *Metals* *Other habitat alterations* *Siltation*
Prickly Pear Creek MT41I006_030	Flow alteration Metals Habitat alterations Siltation Suspended solids	Metals Dewatering Siltation Fish habitat degradation Riparian degradation Nutrients Thermal modifications	*Dewatering* *Fish habitat degradation* *Flow alteration* *Metals* *Nutrients* *Other habitat alterations* *Riparian degradation* *Siltation* *Thermal modifications*	*Dewatering* *Fish habitat degradation* *Flow alteration* *Metals* *Nutrients* *Other habitat alterations* *Riparian degradation* *Siltation* *Thermal modifications*

Water body	1996 Causes	2000 Causes	2002 Causes	2004 Causes
Prickly Pear Creek MT41I006_020	Flow alteration Metals Nutrients Habitat alterations Siltation Suspended solids Un-ionized ammonia	Metals Un-ionized ammonia Nutrients Thermal modifications Siltation Dewatering Fish habitat degradation Bank erosion	*Bank erosion* *Dewatering* *Fish habitat degradation* *Flow alteration* *Metals* *Nutrients* *Other habitat alterations* *Siltation* *Thermal modifications* *Un-ionized ammonia*	*Bank erosion* *Dewatering* *Fish habitat degradation* *Flow alteration* *Metals* *Nutrients* *Other habitat alterations* *Siltation* *Thermal modifications* *Un-ionized ammonia*
Prickly Pear Creek MT41I006_010	Nutrients Suspended solids Thermal modifications	Arsenic	*Arsenic* *Metals*	*Arsenic* *Metals*
Sevenmile Creek	Habitat alterations Siltation	*(Did not meet SCD)*	*Flow alteration* *Metals* *Nutrients* *Other habitat alterations* *Riparian degradation* *Siltation*	*Flow alteration* *Metals* *Nutrients* *Other habitat alterations* *Riparian degradation* *Siltation*
Silver Creek	Flow alteration Metals Habitat alterations Priority organics	Metals Habitat alterations Flow alteration Priority organics	*Flow alteration* *Metals* *Other habitat alterations* *Priority organics*	*Flow alteration* *Metals* *Other habitat alterations* *Priority organics*
Skelly Gulch	Siltation	*(Did not meet SCD)*	*Metals* *Siltation*	*Metals* *Siltation*
Spring Creek	Metals Nutrients Habitat alterations Suspended solids pH	Metals Dewatering Fish habitat degradation Habitat alterations Riparian Degradation	*Dewatering* *Fish habitat degradation* *Flow alteration* *Metals* *Other habitat alterations* *Riparian degradation*	*Dewatering* *Fish habitat degradation* *Flow alteration* *Metals* *Other habitat alterations* *Riparian degradation*

Water body	1996 Causes	2000 Causes	2002 Causes	2004 Causes
Tenmile Creek MT41I006_141	Flow alteration Metals Habitat alterations Siltation pH	Mercury Lead Arsenic Copper Cadmium Zinc Metals Turbidity Habitat alterations	*Arsenic* *Cadmium* *Copper* *Lead* *Mercury* *Metals* *Other habitat alterations* *Siltation* *Zinc*	*Arsenic* *Cadmium* *Copper* *Lead* *Mercury* *Metals* *Other habitat alterations* *Siltation* *Zinc*
Tenmile Creek MT41I006_142	Flow alteration Metals Habitat alterations Siltation pH	Arsenic Cadmium Lead Zinc Copper Flow alteration Metals	*Arsenic* *Cadmium* *Copper* *Flow alteration* *Lead* *Metals* *Siltation* *Zinc*	*Arsenic* *Cadmium* *Copper* *Flow alteration* *Lead* *Metals* *Siltation* *Zinc*
Tenmile Creek MT41I006_143	Flow alteration Metals Habitat alterations Siltation pH	Arsenic Lead Cadmium Copper Mercury Zinc Flow alteration Siltation Habitat alterations	*Arsenic* *Cadmium* *Copper* *Flow alteration* *Lead* *Mercury* *Metals* *Nutrients* *Other habitat alterations* *Siltation* *Zinc*	*Arsenic* *Cadmium* *Copper* *Flow alteration* *Lead* *Mercury* *Metals* *Nutrients* *Other habitat alterations* *Siltation* *Zinc*
Warm Springs Creek	Metals Suspended Solids	Arsenic Lead	*Arsenic* *Cadmium* *Lead* Metals Siltation	*Arsenic* *Cadmium* *Lead* Metals Siltation

Source: MDEQ, 2003, 2004.
SCD = Sufficient Credible Data

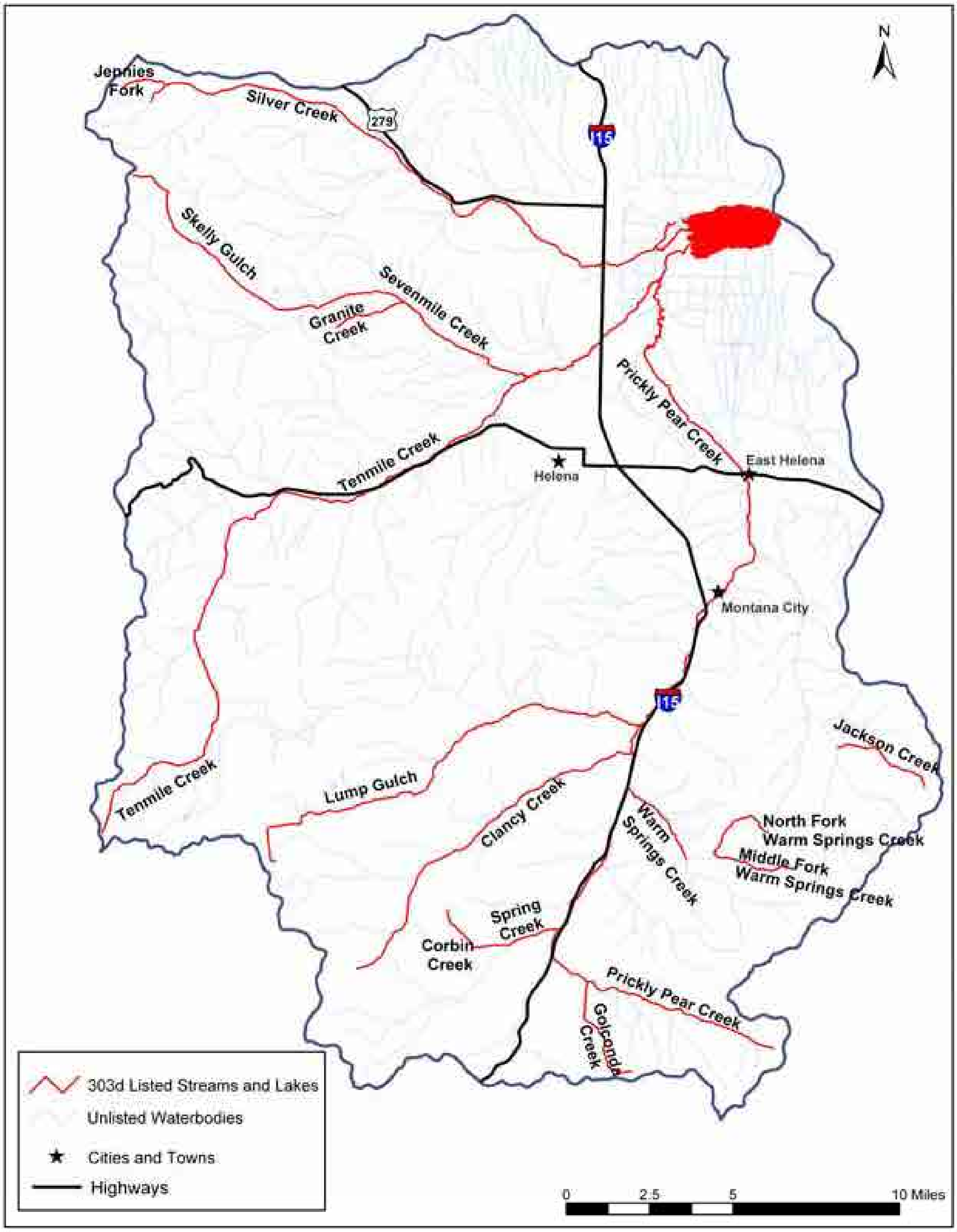

Figure 3-1. Locations of 1996–2004 303(d)-listed stream segments in the Lake Helena watershed.

3.2 Applicable Water Quality Standards

Water quality standards include the uses designated for a water body, the legally enforceable standards that ensure that the uses are supported, and a non-degradation policy that protects the existing high quality of a water body. The ultimate goal of the Lake Helena watershed water quality restoration plan is to ensure that all designated beneficial uses of the water bodies in the watershed are fully supported and all standards are met.

The pollutants addressed in the Lake Helena water quality restoration plan are nutrients, dissolved oxygen, ammonia, sedimentation/siltation, metals, pH, and thermal modifications/water temperature. For many of these pollutants (metals, ammonia, dissolved oxygen), Montana has numeric standards which specify an average or maximum value that must not be exceeded. In other cases (sedimentation/siltation, nutrients), Montana has narrative standards which indicate that water quality goals should strive toward a reference condition that reflects the water body's greatest potential. Thermal modifications and pH are addressed through a combination of numeric and narrative standards. Both have numeric guidelines that specify a range of allowable changes over "naturally occurring" levels. However, naturally occurring levels in the streams are interpreted using the narrative standards found in the general water quality provisions.

A complete summary of the applicable water quality standards is attached as Appendix B of this report. These standards form the basis for the water goals and indicators, and are described in further detail in Section 3.3.

3.3 Water Quality Goals and Indicators

To develop a TMDL, it is necessary to establish quantitative water quality goals, referred to in this document as targets. TMDL targets must represent the applicable numeric or narrative water quality standards and full support of all associated beneficial uses. For many pollutants with established numeric water quality standards, the water quality standard is used directly as the TMDL target. For pollutants with only narrative standards, the selected target must be a water body-specific, measurable interpretation of the narrative standard. The pollutants of concern in the Lake Helena watershed with established numeric water quality standards that can be directly applied as TMDL targets are metals (arsenic, cadmium, copper, lead, and zinc), ammonia, and dissolved oxygen. Other pollutants in the Lake Helena watershed, including nutrients/organic enrichment and sedimentation/siltation, have only narrative standards, and targets must be identified that are water body-specific, measurable interpretations of the narrative standard.

Because there is no single direct measure of beneficial use impairment associated with nutrients, sediment, or temperature, a suite of water quality targets and supplemental indicators has been selected for use in combination with one another. In light of the available data, the targets are considered to be the most reliable and robust measures of nutrient and sediment impairment and beneficial use support. The proposed supplemental indicators are not sufficiently reliable to be used alone as a measure of nutrient impairment. These are used as supplemental information, in combination with the targets, to better define potential nutrient and sediment impairments. When combined, the targets and supplemental indicators address the physical, biological, and chemical characteristics of the waters, as well as the presence or absence of potential human sources that may be contributing to impairments.

Targets

As described in the discussions of individual targets presented in the following paragraphs, there is a documented relationship between the selected target values and beneficial use support, or sufficient reference data are available to establish a threshold value representing “natural” conditions. In addition to having a documented relationship with the suspected impaired beneficial use, the targets have direct relevance to the pollutants of concern. The targets, therefore, are relied upon as threshold values that, if exceeded (as determined by sufficient data), indicate water quality impairment. The targets will also be applied as water quality goals by which the ultimate success of implementation of this plan will be measured in the future.

Supplemental Indicators

The supplemental indicators provide supporting or collaborative information or both when used in combination with the targets. In addition, some of the supplemental indicators are necessary to determine whether exceedances of targets are a result of natural versus anthropogenic (human-caused) causes. However, the proposed supplemental indicators are not sufficiently reliable to be used alone as a measure of impairment because (1) the cause-effect relationship between the supplemental indicators and beneficial use impairments is weak or uncertain or both; (2) the supplemental indicators cannot be used to isolate an impairment associated with individual pollutants (for example, to differentiate between an impairment caused by excessive levels of sediment versus high concentrations of metals); <u>or</u> (3) there is too much uncertainty associated with the supplemental indicators to have a high level of confidence in the result.

Water Quality Targets and Supplemental Indicators Applied to Beneficial Use Impairment Determinations

The beneficial use impairment determinations presented in Section 3.4 are based on a weight-of-evidence approach in combination with the application of best professional judgment. The weight-of-evidence approach is outlined in Figure 3-2 and is applied as follows. If none of the target values are exceeded, the water is considered to be fully supporting its uses and no TMDL is necessary. This is true even if one or more of the supplemental indicator values are exceeded. On the other hand, if one or more of the target values are exceeded, the circumstances around the exceedance are investigated and the supplemental indicators are used to provide additional information to support a determination of impairment/non-impairment. The circumstances around the exceedance of a target value are investigated before it is automatically assumed that the exceedance represents human-caused impairment (for example: Are the data reliable and representative of the entire reach? Might the exceedance be a result of natural causes such as floods, drought, fire, or the physical character of the watershed?). In addition, the supplemental indicators assist by providing collaborative and supplemental information, and the weight of evidence of the complete suite of targets and supplemental indicators is used to make the impairment determination.

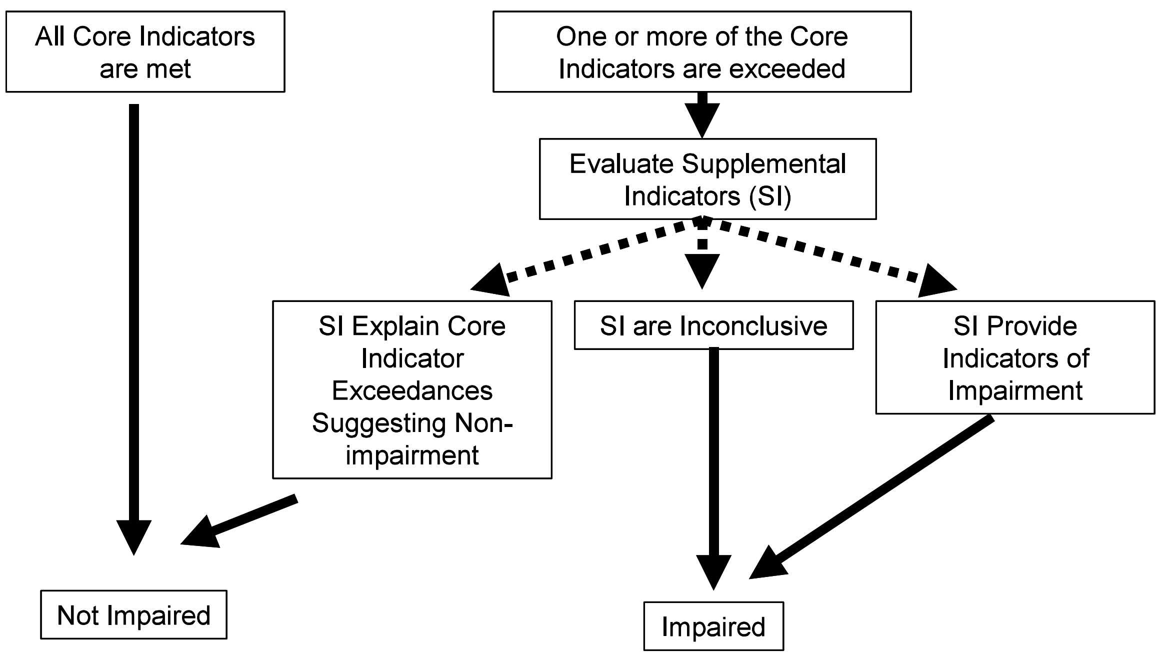

Figure 3-2. Weight-of-evidence approach for determining beneficial use impairments.

3.3.1 Proposed Nutrient Targets and Supplemental Indicators for Streams in the Lake Helena TPA

Because of the interrelated nature of nutrient, organic enrichment/low dissolved oxygen, and total ammonia impairments, water quality targets for them are discussed together in this section under the general heading of nutrients. The proposed targets and supplemental indicators for nutrient and nutrient-related impairments in the streams of the Lake Helena watershed are summarized in Table 3-3 below and are discussed in more detail in the paragraphs that follow. Nutrient targets for Lake Helena itself are discussed in Section 3.3.2.

Table 3-3. Proposed nutrient targets and supplemental indicators for streams in the Lake Helena TPA.

Water Quality Targets	Threshold Values
Total Nitrogen	< 0.34 mg/L[a]
Total Kjeldahl Nitrogen	< 0.30 mg/L[a]
Total Phosphorus	< 0.027 mg/L[a]
Total Ammonia-Nitrogen[b]	Less than the Montana water quality standard as defined in Circular WQB-7 (7)(2002), Appendix B.
Diurnal Variability in Dissolved Oxygen and pH	Low variability in diurnal rates (using hourly readings of dissolved oxygen and pH from a multiple-day data set collected with a data sonde). ▪ dissolved oxygen percent saturation < 115% during afternoon hours ▪ no dissolved oxygen deficit as defined in Circular WQB-7 (15) ▪ pH values not exceeding pH standards defined in Circular WQB-7
Benthic Algae	< 37 mg/m^2
Supplemental Indicators	**Recommended Values**
Soluble Reactive Phosphorus	< 0.011 mg/L
Nitrate plus Nitrite-Nitrogen	< 0.04 mg/L
Dissolved Oxygen[d]	Meeting or exceeding concentrations defined in Circular WQB-7 (15) (2002)
Macroinvertebrate Index of Biotic Integrity (IBI) for Montana Valley and Foothill Prairie (MVFP) streams	> 75
Macroinvertebrate Hilsenhoff Index of Biotic Integrity (HBI)	< 3.5
Periphyton Indices	Best professional judgment - Site-specific determinations based on several community, biological, and pollution indices, and comparison with the least impaired reference conditions in Montana (described in more detail below)
Anthropogenic Nutrient Sources	No significant sources identified based on field surveys

Notes: mg/L = milligrams per liter; mg/m^2 = milligrams per square meter.
[a] Expressed as a 5-year median concentration.
[b] This indicator is applied only to streams listed for Total Ammonia Nitrogen.
[c] The total ammonia standard varies depending on stream temperature and pH.
[d] This indicator is applied to streams listed for nutrients/organic enrichment and low dissolved oxygen.

3.3.1.1 In-stream Nutrient Concentrations

In-stream total nitrogen, total Kjeldahl nitrogen, and total phosphorus are proposed as targets for the nutrient-related impairments in the streams of the Lake Helena watershed. Water quality targets for the streams were calculated on the basis of in-stream concentrations of nitrogen and phosphorus and were derived from reference stream information for the watershed as well as published criteria. Nutrient data from reference streams were collected by MDEQ in 2001 and by Land & Water Consulting in 2003 (Appendix D). All the reference streams are located in EPA's nutrient Ecoregion II, sub-ecoregion 15 (Northern Rockies) or sub-ecoregion 16 (Montana Valley Foothill Prairies) (USEPA, 2000a). Five reference streams were sampled in the watershed in 2001, and seven reference streams were sampled in 2003. The locations of the 2003 reference stream stations are shown in Table 3-4. EPA's recommended limits for nutrient concentrations in rivers and streams in Ecoregion II, sub-ecoregions 15 and 16, were also reviewed during the selection of proposed targets (USEPA, 2000a). The recommendations are for total phosphorus, total nitrogen, and total Kjeldahl nitrogen (TKN), and they are proposed here as 5-year median concentrations. The threshold values are shown in Table 3-3, above.

Table 3-4. Lake Helena TPA reference stream monitoring locations.

Site ID	Site Type	Description
	New	Moose Creek above City Diversion near Rimini, MT
M09MNTRC01	Established	Monitor Creek 3 miles upstream from Rimini, MT
M09MCCLC02	Established	McClellan Creek downstream of confluence of Crystal Creek
M09SKLYG01	Established	Skelly Gulch downstream of private land (Spring Creek Ranch Association)
	New	Minnehaha Creek
M09MFWSC01	Established	Warm Springs Creek, Middle Fork, 500 feet downstream of private land
M09WMSC01	Established	Warm Springs Creek, 1 mile north of Clancy, MT

3.3.1.2 Total Ammonia - Nitrogen

Total ammonia is proposed as a target for the nutrient-related impairments in the streams of the Lake Helena TPA. High concentrations of total ammonia in the water column can be toxic to aquatic life. For streams listed as impaired due to total ammonia nitrogen, Table 3-5 in the Montana Numeric Water Quality Standards (Circular WQB-7 [7] [2002]) will be used to calculate the pH-dependent values of the acute toxicity criterion for total ammonia. Table 3-6 in Circular WQB-7 (7)(2002) will be used to calculate temperature and pH-dependent values of the chronic toxicity criterion for total ammonia in the presence or absence of early life stages of fish (MDEQ, 2002).

3.3.1.3 Diurnal Dissolved Oxygen and pH

Dissolved oxygen and pH are proposed as targets for the nutrient-related impairments in the streams of the Lake Helena TPA. Large diurnal fluctuations in dissolved oxygen or pH can be indicative of nutrient enrichment in streams because algae produce oxygen during the day and consume it at night. High densities of algae can cause supersaturated levels of dissolved oxygen, and high pH during the day.

Dissolved oxygen levels of more than 115 percent saturation have been shown to be harmful to aquatic life (Behar, 1996). Fluctuations in pH and dissolved oxygen were analyzed for several streams in the Lake Helena TPA during 2003 by taking samples during pre-dawn hours (for minimum dissolved oxygen and pH) and afternoon hours (for maximum pH and dissolved oxygen). Significant fluctuations between values for these two time periods were considered to be indicative of excessive algal growths. Using the hourly readings of dissolved oxygen and pH from a multiple-day data set collected with a data sonde, the following thresholds were used as threshold values:

- dissolved oxygen percent saturation not exceeding 115 percent during afternoon hours
- dissolved oxygen concentrations not less than the dissolved oxygen numeric standard defined in Circular WQB-7 (15) (during pre-dawn hours)
- pH values not exceeding pH standards (during afternoon hours) as defined in Circular WQB-7.

3.3.1.4 Periphyton

The amount of benthic algae is proposed as a target for the nutrient-related impairments in streams of the Lake Helena TPA. Benthic algae are found growing on stream bottom substrates, in contrast to free-living algae found in the water column of lakes and large rivers (phytoplankton). Benthic algae data help to provide a better understanding of the cumulative and intermittent impacts that might have occurred over time in a stream, and are useful for determining whether impairments due to nutrients are present. A value of less than 37 milligrams per square meter (mg/m^2) of attached algae is recommended as a threshold indicator value for streams that are not impaired for nutrients based on mean summer benthic algae data (as measured from natural substrates) from the 2001 and 2003 sampling of reference streams in the Lake Helena TPA.

3.3.1.5 Soluble Reactive Phosphorus

Soluble reactive phosphorus is proposed as a supplemental indicator for the nutrient-related impairments in the streams of the Lake Helena TPA. Nutrients released into streams in a dissolved inorganic form can be readily taken up by aquatic plants and can cause nuisance levels of attached algae. A value of more than 0.011 milligrams per liter (mg/L) for dissolved inorganic phosphorus measured as soluble reactive phosphorus is recommended as a supplemental indicator value for the prevention of nuisance algal growths in streams of the Lake Helena watershed. This value was derived from the 2001 and 2003 sampling of reference streams in the Lake Helena watershed.

3.3.1.6 Nitrate+Nitrite - Nitrogen

Nitrate+Nitrite (NO_3+NO_2) is proposed as a supplemental indicator for the nutrient-related impairments in the streams of the Lake Helena TPA. Similar to soluble reactive phosphorus, nitrate and nitrite are soluble forms of nutrients that are readily taken up by algae. A value of more than 0.04 mg/L for nitrate+nitrite was determined to be an appropriate supplemental indicator value based on the 2001 and 2003 sampling of reference streams in the Lake Helena watershed.

3.3.1.7 Dissolved Oxygen

The Montana dissolved oxygen standard is 5.0 mg/L as a 1-day minimum concentration and will be used as a supplemental indicator for nutrient-related aquatic life use impairment in Lake Helena watershed streams.

3.3.1.8 Macroinvertebrate Index of Biological Integrity

Aquatic invertebrates are frequently used as a component of bioassessments because they are important indicators of stream ecosystem health (Bollman, 2003a). Long lives, complex life cycles, and limited mobility mean there is ample time for the benthic invertebrate community to respond to the cumulative effects of environmental perturbations (Bollman, 2003a). The macroinvertebrate Index of Biological Integrity is used as a supplemental indicator for nutrient-related impairments in the Lake Helena TPA.

Benthic macroinvertebrate data for the Lake Helena TPA were compiled from four different reports: Eakin (1998) and Bollman (2000, 2001, 2003a). The three Bollman data sets are from benthic macroinvertebrate sampling and assessments over a three-year period (2000–2003). The Eakin (1998) data set is for lower Tenmile and Sevenmile Creeks. All assessment data were from six sub-watersheds in the Lake Helena watershed: Sevenmile Creek, Tenmile Creek, Clancy Creek, North Fork Warm Springs Creek, Spring Creek, and Prickly Pear Creek (lower segments). Macroinvertebrate data were also collected by MDEQ staff from 1997 to 2001 and by Land & Water Consulting in 2003.

Macroinvertebrate data are typically evaluated using a “multimetric index” developed for Montana water bodies (Bollman, 2001). Biological metrics are designed to test for population sensitivity or response to varying degrees of human-induced impacts. Scores are assigned to the individual metrics and the total score allows comparison between sampling sites, and between reference and test streams. Historically, MDEQ has used three ecoregional indices for assessing aquatic life use attainment: (1) the Mountain IBI, (2) the Foothill Valley and Plains IBI, and (3) the Plains IBI. The original mountain and plains indices were developed using best professional judgment to select metrics viewed as responsive to environmental stressors. All of the Lake Helena streams that have been sampled for macroinvertebrates are located within the Montana Valley and Foothill Prairies (MVFP) ecoregion. Therefore, the MVFP index (Bollman, 2001) is the most appropriate for use in the Lake Helena TPA.

MDEQ’s scoring criteria (Bukantis, 1998) were applied to the MVFP IBI. The maximum possible score is 100 percent. Total scores greater than 75 percent are considered to be within the range of expected natural variability and represent full support of beneficial aquatic life uses. Streams scoring between 25 and 75 are considered as partially supporting their aquatic life uses, and scores lower than 25 percent represent non-support. Thus, the total index score and the percentage of the total index score are included for each site, when available. A score of greater than 75 is recommended as a supplemental indicator of nutrient-related impairments in streams of the Lake Helena watershed.

3.3.1.9 Hilsenhoff Biotic Index

The Hilsenhoff Biotic Index (HBI) is an abundance weighted index developed to assess impacts from organic pollution (Hilsenhoff, 1987). Since the original HBI was developed in Wisconsin, the HBI metric is used to “screen” for possible indications of nutrient impacts. Bahls et al. (1992) determined that the average HBI value for Montana Mountain reference streams was less than four. A conservative value of 3.5 would provide a threshold for comparison and is proposed as a nutrient supplemental indicator.

3.3.1.10 Periphyton Indices

Periphyton are recommended as an additional biological assemblage for evaluating water quality conditions (USEPA, 1997, 2003). Diatoms, in particular, are considered useful water quality indicators because so much is known about the relative pollution tolerance of different taxa and the water quality preferences of common species (Bahls, 2003; Barbour et al., 1999). MDEQ uses several different diatom indices to assess stream condition. Those indicating impairment due to organic loading were used as supplemental indicators for nutrient-related impairments in the Lake Helena TPA.

Periphyton values from the Lake Helena watershed were compared with biocriteria (numeric thresholds) developed for streams in the Rocky Mountain ecoregion of Montana. Best professional judgment was used, and site-specific determinations for the Lake Helena watershed streams were based on several community, biological, and pollution indices. These indices were also compared with reference conditions in Montana. These criteria are based on metric values measured in least-impaired reference streams and metric values measured in streams that are known to be impaired by various sources and causes of pollution (Bahls, 2004). For the Lake Helena watershed, periphyton assessment data were compiled from three different reports: Bahls (1997, 2001, 2004). All assessment data were from five sub-watersheds in the Lake Helena watershed basin: Sevenmile Creek, Tenmile Creek, North Fork Warm Springs Creek, Spring Creek, and Prickly Pear Creek (lower segments). Appropriate indices were used, and they include species richness, pollution index values, pollution tolerant classes, taxonomic composition, algal genera, diatom metrics, biological integrity, and comparison with least-impaired reference conditions for streams in western Montana.

3.3.1.11 Nutrient Source Assessment

A visual, screening-level assessment of sediment, nutrients, and metals sources was conducted in the Lake Helena watershed in summer 2003 as a precursor to a more detailed pollution source evaluation (to be completed during the next phase of the TMDL process). Results from the source assessment were used as an additional supplemental indicator for evaluating nutrient-related impairments. This assessment included photo documentation, global positioning system (GPS) locational indexing, and narrative descriptions of current and potential sources of water quality impairment in all stream segments of the Lake Helena TPA that appeared on the 303(d) list. Each of the 25 individual 303(d) segments were surveyed from available access points and road networks, and relevant features were documented. Obvious water quality impairments associated with the identified sources were noted (for example, turbid water, nuisance algae, dewatered stream channels).

A sediment source assessment was carried out for Helena National Forest streams that appeared on the 303(d) list. Some of these streams were also on Montana's 303(d) list for nutrient or nutrient-related impairments. The source assessment consisted of office and field reconnaissance followed by on-the-ground surveys (Sampling and Analysis Plan, Lake Helena Planning Area Draft Report, July 2003 [Tetra Tech and Land & Water Consulting, 2003]).

The source assessment for the Lake Helena watershed reflected the findings of the 2003 summer field source assessment, field sampling (chemical, physical, and biological), aerial photography inventory (photographs dating mostly from the late 1990s), and the U.S. Forest Service sediment source assessment. The full results of the source assessment are summarized in Appendix C of this report. A proposed threshold for this supplemental indicator is “no significant anthropogenic sources identified” based on standard field survey methods.

3.3.2 Nutrients - Lake Helena

Determining appropriate nutrient targets and supplemental indicators for Lake Helena is a complex undertaking due to the lake’s unique features (e.g., shallow flooded arm of Hauser Reservoir). Because of these features, regional standards developed for other lakes may or may not be appropriate. Therefore, targets and indicators were selected based on a suite of data including both regional targets and the results of a modeling analysis. The selected targets and indicators are shown in Table 3-5 and further discussed in Sections 3.3.2.1 through 3.3.2.5.

Table 3-5. Preliminary nutrient targets and supplemental indicators for Lake Helena.

Water Quality Targets	Threshold Values
Water Column Chlorophyll *a*	5-year average < 9 μg/L Maximum < 14 μg/L
Total Phosphorus	5-year average < 27 μg/L Maximum < 36 μg/L
Supplemental Indicators	**Recommended Values**
Freshwater aquatic life standard for dissolved oxygen (early life and other life stages)	Circular WQB-7 (15) (2002) 1-day minimum > 5 mg/L
Fish population presence and population estimates data	Stable or improving trends
Anthropogenic nutrient sources[a]	No significant sources identified based on field surveys

Notes: μg/L = micrograms per liter; mg/L = milligrams per liter.
[a]This supplemental indicator is applied only to the verification of impairment determinations. This is not intended to be a water quality goal.

3.3.2.1 Ecoregion Approach

Trophic state is the measure of the productivity of a lake or reservoir, and it is directly related to the level of nutrients (phosphorus and nitrogen) entering the lake or reservoir from its watershed. Lakes tend to become eutrophic (more productive) when nitrogen and phosphorus inputs are high. Eutrophic lakes often have nuisance algal blooms, limited clarity, and low dissolved oxygen concentrations, which can result in impaired aquatic life and recreational uses. Carlson’s Trophic State Index (TSI) attempts to measure the trophic state of a lake by measuring nitrogen, phosphorus, chlorophyll *a*, and depth using Secchi disc depth measurements (Carlson, 1977). MDEQ uses Carlson’s TSI, and these TSI values are compared with standard reference conditions for specific nutrient ecoregions. Lake Helena is in EPA’s nutrient Ecoregion II, sub-ecoregion 17. Lake Helena’s trophic state index varied between 50 and 70 TSI in 2002 and 55 to 79 in 2003 (Appendix D).

In 2003, MDEQ staff analyzed the overall relationship between the lake’s relative depth and Carlson’s TSI for Western Montana lakes (personal communication, M. Suplee, March 2003). The trophic relationship is a logarithmic one, with higher Carlson’s TSI values associated with shallow lakes and lower values associated with deeper lakes. As a preliminary step toward identifying a potential Carlson TSI target for Lake Helena, MDEQ evaluated the following seven lakes in Western Montana:

- Georgetown Lake
- Lake Mary Ronan
- Rogers Lake
- Teepee Lake
- Glen Lake
- Peterson Lake
- Swan Lake

These lakes as a group had a mean Carlson's chlorophyll-*a* TSI of approximately 38 with a 25th percentile of 35. The 25th percentile of all lakes in a region can sometimes be used in place of a reference population because the 25th percentile from the entire population has been shown to roughly approximate the 75th percentile for a reference population. Therefore, the reference TSI value for Lake Helena using this methodology would be 35. Using Carlson's equations, a TSI value of 35 is equal to a water column chlorophyll-*a* concentration of 1.5 µg/L (micrograms per liter) and a total phosphorus concentration of 8.5 µg/L. Therefore, these values are potential nutrient targets for Lake Helena.

3.3.2.2 Modeling Approach

Several potential problems exist with using the ecoregion approach described above to determine nutrient targets for Lake Helena. These problems are associated with the unique nature of the lake and therefore its dissimilarity with the other Montana lakes mentioned in Section 3.3.2.1. Lake Helena is not a natural lake; it is a wetland area that was flooded with the creation of Hauser Reservoir. Inflows to the lake are artificially high because of the input of a significant volume of water used for irrigation purposes, resulting in increased nutrient loadings as well as reduced residence times. The lake also has a relatively large ratio of watershed area to lake area (192), which suggests that natural nutrient loadings would be greater in Lake Helena than in lakes with smaller ratios (the watershed area to lake area ratios for the seven lakes listed above are not available). Finally, the lake's location in the Helena Valley suggests that wind-induced mixing may be an important factor in overall lake conditions.

Because of these concerns, a modeling approach was used to determine potential nutrient targets. The Generalized Watershed Loadings Function (GWLF) watershed model was linked to the BATHTUB lake model to simulate nutrient and chlorophyll-*a* concentrations in Lake Helena. The models were run for two scenarios – existing conditions and "natural" conditions (no anthropogenic sources of nutrients) – for the years 1993 through 2003. Results from the natural scenario indicated that chlorophyll-*a* concentrations in the lake would range from 5.2 to 13.7 µg/L with a long-term average of 9.3 µg/L. Total phosphorus concentrations under natural conditions were predicted to range from 19 µg/L to 35 µg/L with a long-term average of 27 µg/L. The results of the natural scenario are proposed as targets for the Lake Helena watershed and are presented in Table 3-5 on the preceding page. Additional information about model setup, inputs, and results is included in Appendix E.

3.3.2.3 Dissolved Oxygen

Dissolved oxygen is necessary to sustain fish populations. Fish such as trout require more dissolved oxygen than warm-water species. Eutrophic lakes occasionally have levels of dissolved oxygen below the minimum for fish to survive, and fish kills can result. The Montana dissolved oxygen standard is 5.0 mg/L as a 1-day minimum concentration and is used as a supplemental indicator to assess the nutrient impairment of Lake Helena.

3.3.2.4 Fisheries

Fish represent the higher trophic levels in lakes. They serve as a surrogate for many physical and biological parameters such as adequate flow, spawning and rearing habitat, appropriate food sources, and proper environmental conditions. Montana Fish, Wildlife and Parks has been conducting fish surveys and estimating fish populations in Lake Helena. Supplemental information including species presence and general population trend data will be used to provide narrative information for Lake Helena.

3.3.2.5 Nutrient Source Assessment

As stated previously, a visual, screening-level assessment of sediment, nutrients, and metals sources in the Lake Helena watershed was conducted in summer 2003 as a precursor to a more detailed pollution source evaluation. Information on anthropogenic-related sources of nutrients in Lake Helena was considered as a supplemental indicator for making the impairment determination. A proposed threshold for this supplemental indicator is “no significant anthropogenic sources identified” based on standard field survey methods.

3.3.3 Proposed Sediment Targets and Supplemental Indicators for Streams in the Lake Helena TPA

The proposed sediment targets and supplemental indicators are summarized in Table 3-6 and described in detail in the paragraphs that follow.

Table 3-6. Proposed sediment targets and supplemental indicators for streams in the Lake Helena TPA.

Water Quality Targets	Proposed Criteria
Percentage of subsurface fines < 6.4 mm size class, expressed as a reach average, in McNeil core samples collected in trout spawning gravel beds.	(1) The reach average value must be less than or equal to the average value for Helena National Forest reference stream core samples collected in similar riparian land type aggregates or, (2) when the riparian aggregate land type is unknown, the reach average value must be less than or equal to the average value for all Helena National Forest reference stream core samples.[a]
Percentage of subsurface fines < 0.85 mm size class, expressed as a reach average, in McNeil core samples collected in trout spawning gravel beds.	(1) Reach average value must be less than or equal to the average value for Helena National Forest reference stream core samples collected in similar riparian land type aggregates or, (2) when the riparian aggregate land type is unknown, the reach average value must be less than or equal to the average value for all Helena National Forest reference stream core samples.[a]
Supplemental Indicators	**Proposed Criteria**
Channel width/depth ratio	Comparable to reference values.[a]
Bank erosion hazard index (BEHI) score	Comparable to reference values.[a]
Median surface particle size (D_{50})	Comparable to reference values.[a]
Proper Functioning Condition (PFC) riparian assessment	"Proper Functioning Condition" or "Functional – at Risk" with an upward trend.
Suspended sediment concentration	< 10 mg/L at low to moderate flows; ≤ 40 mg/L at all times.
Total suspended solids concentration	< 10 mg/L at low to moderate flows.
Macroinvertebrate clinger taxa richness	≥ 14
Trichoptera taxa richness	≥ 4
Diatom siltation index	Not exceeding a rating of "minor impairment"
Fish population metrics	MFISH rating of "best" or "substantial."[b]
Anthropogenic sediment sources	No significant sources identified based on field surveys.

Note: mm = millimeters.
[a] Specific criteria are defined in Appendix F.
[b] When not limited by other than water quality or sediment-related habitat constraints.

The proposed targets for sediment include reach-averaged fine sediment concentrations of less than the 6.4- millimeter (mm) and 0.85-mm size classes as measured in McNeil core samples collected in trout spawning gravel beds, as described below.

3.3.3.1 McNeil Core Samples – Percentage of Subsurface Substrate Fines

The percentage of subsurface substrate fines is proposed as a target for the sediment-related impairments in the Lake Helena TPA. A McNeil core sampler is a device used to measure size fractions of subsurface substrate particles. The McNeil sampler was originally designed to measure the amount of fine sediment in spawning gravels, but has also been used to monitor substrate fines for cumulative watershed analyses (Bunte and Abt, 2001). Increases in fine subsurface sediment have been linked to land management activities, and research has shown a statistically significant inverse relation between the amount of fine sediment less than 6.4 mm in spawning beds and successful salmonid fry emergence (Reiser and Bjornn, 1979; Chapman and McLeod, 1987; Weaver and Fraley, 1991; McHenry et al., 1994; Rowe et al., 2003). Fines less than 6.4 mm have been referred to as "trapping fines," while fines less than 0.85 mm have been referred to as "intrusive fines" (Rowe et al., 2003). The amount of fines less than 0.85 mm is thought to signal the level of disturbance in a watershed (Young et al., 1991; Magee and McMahon, 1996).

The Helena National Forest has been collecting McNeil core data from spawning gravel beds in streams supporting salmonid fisheries since 1986 (Appendix F). Almost 600 cores have been collected from salmonid fisheries streams located within 13 different riparian land type aggregates. There are 31 riparian land type aggregates common to the landscape of the Helena National Forest and the Lake Helena watershed (Appendix F). McNeil core values for the percentage of fines were stratified by riparian land type aggregates in Helena National Forest in an attempt to account for the geomorphic variability of core sampling sites. Reach-averaged McNeil core reference values were set based on the averages of percentages of fines less than 6.4 mm and less than 0.85 from riparian land type aggregates. In instances where riparian land type aggregates were undefined for McNeil core samples, reference values were set on the basis of the combined averages for the percentages of fines less than 6.4 mm and less than 0.85 mm as computed for all cores.

Reference values for the percentage of fines less than 6.4 mm ranged from 56.8 percent to 28.8 percent, while reference values for the percentage of fines less than 0.85 mm ranged from 19.6 percent to 7.5 percent (Appendix F). The upper range of the percentage of fines for both parameters occurred within the riparian aggregate 27, Friable Loamy Glacial Till and Moraines. This was the only riparian aggregate with seemingly excessive reference values because the next highest values were 35.7 percent and 10.2 percent, respectively. The proposed sediment target values for the Lake Helena watershed streams are based on the Helena National Forest data set. Reach-averaged target values apply only to McNeil core samples collected using the methods developed by the Helena National Forest (Appendix F; personal communication, B. Stuart, August 2003). Typically, six cores per reach are collected in spawning gravels (usually found at pool tailouts) to a depth of 4 inches, a depth that was determined from spawning redd studies in the Intermountain West. All core sample data collected from the Lake Helena 303(d)-listed streams are included in Appendix F.

Site-specific conditions such as recent wildfires within a watershed may warrant the selection of unique indicator values that differ slightly from those presented above, or special interpretation of the data relative to the proposed sediment indicator values. See Appendix F for summary tables of McNeil core data for the Lake Helena watershed.

3.3.3.2 Channel Cross-Section Metrics

Channel cross-section metrics are proposed as a supplemental indicator for the sediment-related impairments in the Lake Helena TPA. The U.S. Forest Service has collected channel cross-section metrics for least-impaired reference stream reaches in an attempt to define expected channel characteristics based on the Rosgen Level II stream classification system (Rosgen and Silvey, 1996). Two reference data sets were acquired: one from the Helena National Forest and one from Pete Bengeyfield of the Beaverhead-Deerlodge National Forest for southwestern Montana and Greater Yellowstone Area streams. The Helena National Forest reference stream data consist of 29 Rosgen Level II classified streams, which were mostly A- and B-type streams (Appendix F). Because of the somewhat limited nature of the Helena National Forest data set, stream type averages were not calculated. Instead, comparisons were made on the basis of similar stream orders and riparian land type aggregates, as well as Rosgen stream types. The southwestern Montana and Greater Yellowstone Area data consist of average values for Rosgen Level I and Level II stream types based on 229 streams (131 are E-type streams, which are not well represented among the 303(d)-listed streams in the Lake Helena watershed) (Appendix F).

Representative reaches of the listed streams and stream segments in the Lake Helena TPA were chosen for cross-sectional surveys (see the 2003 Lake Helena Sampling and Analysis Plan [Tetra Tech and Land & Water Consulting, 2003]). The reach investigations followed protocols established by the Helena National Forest. All cross-sectional measurements collected for Lake Helena streams appearing on the 303(d) list for sediment impairment are included in Appendix F.

Three channel metrics were selected to evaluate the nature and potential for sediment transport and deposition: width-to-depth ratio, bank erosion hazard index, and median surface particle size.

3.3.3.3 Width-to-Depth Ratio

Average bankfull width and bankfull depth are two cross-sectional measurements that are important variables in determining channel pattern. For that reason, they are proposed as supplemental indicators. The ratio of bankfull width to bankfull depth is thought to be indicative of the “quasi-equilibrium” relationship between stream discharge and load transport (Ritter et al., 1995). In general, an increasing width-to-depth ratio is correlated to stream aggradation and bank erosion (Knighton, 1998; Rowe et al., 2003).

Reach-averaged width-to-depth ratios from the Lake Helena 303(d) stream segments were compared with Helena National Forest and/or southwestern Montana and Greater Yellowstone Area reference streams of similar Rosgen stream type. A deviation greater than 25 percent from the reference average was generally considered to indicate excessive deposition of fines. See Appendix F for summary tables of reference stream width-to-depth ratios used for the Lake Helena watershed.

3.3.3.4 Bank Erosion Hazard Index

The bank erosion hazard index (BEHI) is a composite metric of streambank characteristics (bank height, bankfull height, rooting depth, bank angle, surface protection, and bank materials/composition) (Rosgen and Silvey, 1996) and is used as an additional supplemental indicator for sediment impairments. Measurements for each metric, when combined, produce an overall score of bank erosion potential. Low values indicate a low potential for bank erosion.

Reach-averaged BEHI scores for the Lake Helena 303(d) stream segments were compared with southwestern Montana and Greater Yellowstone Area reference streams of similar Rosgen Level I stream type. A deviation of more than 25 percent from the reference average was generally considered to indicate increased potential for bank erosion and instability. See Appendix F for summary tables of reference stream BEHI data used for the Lake Helena watershed.

3.3.3.5 Median Particle Size

Wolman pebble counts, which provide an estimate of the distribution of particles sizes in a stream reach, are proposed as supplemental indicators for sediment. Pebble count data can be interpreted to compare median particle sizes and size class distributions between streams, and to evaluate the percentage of fines smaller than a specific size. For surveyed reaches within the Lake Helena watershed as well as the reference data, the "zigzag" adaptation of the Wolman pebble count was used so that reach features were sampled in a continuum (Bevenger and King, 1995).

Reach-averaged median particle size, D_{50}, from the Lake Helena watershed 303(d)-listed stream segments were compared with Helena National Forest and southwestern Montana and Greater Yellowstone Area reference streams of similar Rosgen level stream types. A deviation from the reference average of less than one size class was generally considered to indicate excessive deposition of surface fines.

3.3.3.6 Riparian Assessment

The Proper Functioning Condition method is a qualitative method for "assessing the physical functioning of riparian-wetland areas" (Prichard, 1998) and is proposed as a supplemental indicator for sediment. The hydrologic processes, riparian vegetation characteristics, and erosion/deposition capacities of streams are evaluated for a selected stream reach. The final rating is a professional judgment call based on responses to a series of yes/no questions. The possible ratings for a reach are "Proper functioning condition" (PFC), "Functional – at risk" (FAR), or "Non-functional" (NF).

Following the Helena National Forest reach survey protocol, Proper Functioning Condition assessments were conducted on representative reaches of the Lake Helena watershed stream segments. The supplemental indicator for sediment water quality was PFC, or FAR with an upward (improving) trend.

3.3.3.7 Suspended Sediment Data

Suspended sediment or suspended solids data were available for seven reference streams in the Lake Helena TPA and were used as supplemental indicators. Reference streams were chosen with the aide of the Helena National Forest, on the basis of riparian land type aggregates. These data have been evaluated where available and were considered as collaborative evidence in support of water quality impairment status conclusions presented in Section 3.5. Suspended sediment and suspended solids data for reference streams and Lake Helena are presented in Appendix F.

Depth-integrated suspended sediment data from the USGS National Water Information System were available for 1989–1990 and 1997–2001 for the following reference streams: Dutchman Creek, McClellan Creek, Minnehaha Creek, Monitor Creek, Moose Creek, South Fork Warm Springs Creek, and Walker Creek (53 values in all). The values represented low- as well as high-flow conditions and produced a range of measurements from 1 to 128 mg/L. The average of all values was 13.8 mg/L, with a median of 6.0 mg/L and a standard deviation of 23.7 mg/L. Further examination of the seasonal distribution of the data suggests that values would not be expected to exceed 10 mg/L during winter, summer, or fall. The 90th percentile value for the entire data set, which included high-flow samples, was 40 mg/L. Based on the distribution of these reference data, a suggested supplemental indicator value for suspended sediment concentration is less than 10 mg/L during low- to moderate-flow periods, while no values should exceed 40 mg/L at any time.

Total suspended solids concentrations were analyzed from grab samples collected in 2003 by Land & Water Consulting from McClellan, Dutchman, South Fork of Warm Springs, Shingle Mill, Walker, and Moose Creeks. All streams were sampled during low-flow conditions and most results were reported as less than 1 mg/L or less than 10 mg/L. The highest recorded value was 2 mg/L on Walker Creek. Based on these reference data, a suggested supplemental indicator value for total suspended solids is less than 10 mg/L. Because no reference data were available for high-flow conditions, the proposed supplemental indicator value of less than 10 mg/L should be applied only during low- to moderate-flow periods.

3.3.3.8 Macroinvertebrates

As described in Section 3.3.1.8, macroinvertebrate data were collected in several of the Lake Helena watershed streams by MDEQ from 1997 to 2001, and by Land & Water Consulting in 2003. Aquatic macroinvertebrates are used in bioassessments because they are important indicators of stream ecosystem health (Bollman, 2003a). The proposed macroinvertebrate supplemental indicators for sediment are intended to integrate multiple stressors and pollutants to provide an assessment of the overall aquatic life use condition, as well as a focused assessment of sediment-caused impairments. Macroinvertebrate data were used as supplemental indicators for making sediment-related impairment determinations.

In addition to the overall index score, individual metrics are proposed to diagnose potential stressors. One metric used by Bollman as an indicator of possible sediment impacts in Mountain and Foothill Valley and Plains streams is the richness of trichoptera taxa, where sites with fewer taxa (a minimum of four taxa) suggest sediment impacts (Bollman, 2000). Many trichoptera taxa construct fixed retreats or have adaptations for attachment to substrates in flowing waters (Merritt and Cummins, 1996). For that reason, the deposition of fine sediment limits habitat suitability for many trichoptera taxa. The presence of fewer than four trichoptera taxa suggests the possibility of sediment impairment.

Clinger taxa richness can also be indicative of possible sediment impacts. A minimum of 14 clinger taxa are expected in least-impaired streams in the Mountain ecoregion (Bollman, 2001). Mountain streams with fewer than 14 clinger taxa are considered influenced by sediment.

The use of macroinvertebrate indices as diagnostic tools to detect potential causes of impairment is a science that is still under development. The results, therefore, should be interpreted with caution. However, given the current state of knowledge, the proposed supplemental macroinvertebrate indicators provide the best available measure of aquatic life support.

3.3.3.9 Periphyton

Similar to macroinvertebrate assessments, periphyton assessments are converted to metric assessments to determine the level of impairment and support of aquatic life beneficial uses. Periphyton assessments are used as supplemental indicators for sediment-related impairments. In addition to the overall biological integrity score, the individual metric of the siltation index is proposed to diagnose potential impairment by sediment. The siltation index evaluates the abundance of motile diatoms in a sample and “assumes a direct correlation between the amount of accumulating sediment on the stream bottom and the percentage of motile species" (Bahls, 1997).

For the Lake Helena watershed, periphyton assessment data were compiled from five different reports (Bahls 1997, 1998, 2001, 2003, and 2004). The assessment data were from five sub-watersheds in the Lake Helena watershed: Sevenmile Creek, Tenmile Creek, North Fork Warm Springs Creek, Spring Creek, and Prickly Pear Creek (lower segments). The proposed supplemental indicator criterion for the siltation index is the criterion that it not exceed the threshold for minor impairment. The impairment threshold criteria are based on metric values measured in least-impaired reference streams and metric values measured in streams that are known to be impaired by various causes and sources of pollution (Bahls, 2004). The threshold for minor sediment impairment is a siltation index value of 20 or more.

3.3.3.10 Fish Population Data

As stated in Section 3.3.2.4, Montana Fish, Wildlife and Parks and the U.S. Forest Service have been conducting fish species inventories and population estimates in many of the streams of the Lake Helena watershed and in Lake Helena proper. Supplemental information pertaining to fish species presence, general population trend data, and habitat quality will be used as supplemental sediment indicators for the Lake Helena watershed. However, the fisheries information and quality ratings that are available will not be used as specific supplemental indicator variables.

3.3.3.11 Anthropogenic Sediment Sources

Consideration of sediment sources is important given that TMDLs are necessary only for impairments caused by anthropogenic sources. In 2003, Tetra Tech, Land & Water Consulting, and the Helena National Forest conducted a preliminary source assessment (Appendix C). A final source assessment will be completed during the next phase of the TMDL process. Results from the preliminary assessment were used as an additional supplemental indicator for evaluating sediment-related impairments. Field inventory, geographic information systems (GIS), and aerial photography were used to provide a screening-level assessment of sediment sources in the Lake Helena watershed.

Although the source assessment was somewhat limited in scope, roads and channel alterations caused by mines, roads, and agriculture appeared to be the largest contributors of sediment in the Lake Helena watershed. The Boulder Batholith, a large intrusive body of quartz monzonite, is the dominant geology in the watershed. Although the area is naturally erosion-prone, land disturbance in the Boulder Batholith appears to have significantly increased erosion rates.

Results of the source assessment were taken into consideration in evaluating sediment-related impairments. This "supplemental indicator" will be applied only to assist in verifying water quality impairment determinations. No specific water quality indicator variables involving sediment sources are proposed.

3.3.4 Metals

For many pollutants with established numeric water quality standards, the water quality standard is used directly as the TMDL target and target. This is the case for the metals of concern in the Lake Helena watershed, which include arsenic, cadmium, copper, lead, and zinc.

The *Circular WQB-7, Montana Numeric Water Quality Standards* contains numeric water quality standards for Montana's surface water and groundwater. The standards in Circular WQB-7 are set at the levels necessary to protect the uses of the waters. They are based on the best available scientific evidence relating the concentration of pollutants to effects on aquatic life and human health. These numeric standards will be used as TMDL targets for metals.

There are three different numeric standards for each metal: acute and chronic toxicity aquatic life standards designed to protect aquatic life uses, and the human health standard, designed to protect drinking water uses. Table 3-7 shows the acute and chronic aquatic life standards and the human health standards applicable to the metals of concern in the Lake Helena watershed. Both the acute and chronic aquatic life standards for cadmium, copper, lead, and zinc are hardness-dependent. The criteria are calculated using the formulas shown in Appendix G of this report.

Circular WQB-7 states that no sample is to exceed the calculated acute aquatic life criteria, and no 4-day period or longer is to exceed the calculated chronic aquatic life criteria. No sample is to exceed the human health criteria.

To determine whether a water body is meeting the established standards, an analysis of the frequency and magnitude of the exceedances of the aquatic life and human health criteria is needed for the metals of concern. An evaluation of (1) the number of samples exceeding the aquatic life and/or human health criteria compared with the total number of samples, (2) the average concentration of all samples compared with the aquatic life and/or human health criteria, and (3) the magnitude of the highest measured concentration is performed to make an impairment determination. If the data are limited, and there are no exceedances of the standards, a preliminary decision is made that the sampled water body segments are not impaired. Those particular segments will need to be closely monitored in the future to address the uncertainty in that determination.

It should be noted that data on both total metals and total recoverable metals were collected in the Lake Helena watershed. The more rigorous "total" digestion method is strong enough to liberate metals bound to more resistant suspended particulates (such as granitics). Metals with strong bonds are not generally considered bioavailable because there are few natural processes that can dissociate them the way the "total" digestion method does. The metals standards in Montana's Circular WQB-7 are therefore based on "total recoverable" metals as referenced in the Code of Federal Regulations (40 CFR Part 136; Appendix B, Section 2.5). Despite this, the analysis presented in this study was made using both "total" and "total recoverable" metals data for two primary reasons: (1) to increase the volume of available data; and (2) because differences between the two methodologies are usually very minor or result in an impairment determination that is simply conservative toward protection of the water resource.

Table 3-7. Montana numeric surface water quality standards for metals.

Parameter	Aquatic Life (acute) (µg/L)[a]	Aquatic Life (chronic) (µg/L)[b]	Human Health (µg/L)[a]
Arsenic (TR)	340	150	18 [d]
Cadmium (TR)	1.05 at 50 mg/L hardness[c]	0.16 at 50 mg/L hardness[c]	5
Copper (TR)	7.3 at 50 mg/L hardness[c]	5.2 at 50 mg/L hardness[c]	1,300
Lead (TR)	82 at 100 mg/L hardness[c]	3.2 at 100 mg/L hardness[c]	15
Zinc (TR)	67 at 50 mg/L hardness[c]	67 at 50 mg/L hardness[c]	2,000

Note: TR = total recoverable.
[a]Maximum allowable concentration.
[b]No 4-day (96-hour) or longer period average concentration may exceed these values.
[c]The standard is dependent on the hardness of the water, measured as the concentration of $CaCO_3$ (mg/L) (see Appendix G for the coefficients to calculate the standard).
[d] The human health standard for arsenic is currently 18 µg/L, but will change to 10 µg/L in 2006.

3.3.5 Thermal Modifications

The proposed temperature targets and supplemental indicators are summarized in (Table 3-8) and are described in detail in the paragraphs that follow.

Table 3-8. Proposed water temperature targets and supplemental indicators for streams in the Lake Helena TPA.

Water Quality Target	Thresholds
Water Temperature: A change in temperature due to anthropogenic sources, or variation from a reference condition.	A-1, B-1 Class Waters: ≤ 1° F when water temperature is < 67 ° F; ≤ 0.5° F when water temperature is > 67 ° F. I Class Waters: No increase in naturally occurring water temperature.
Supplemental Indicators	**Proposed Criteria**
Riparian Assessments: Proper Functioning Condition (PFC) rating and associated source assessment	No significant disturbance of riparian vegetation
Fish population metrics	MFISH rating of “best” or “substantial”[a]

[a]When not limited by other than water quality or habitat constraints.

3.3.5.1 Water Temperature

Several independent studies have shown strong correlations between the health and behavior of cold-water fish (salmonids) and water temperature (Coutant, 1977; Cherry et al., 1977; Bell, 1986; Lee and Rinne, 1980). Increased water temperature can affect fish reproduction and feeding habits. In addition, warmer water temperatures can lead to a shift in fish species from cold-water to warm-water fish. Increases in water temperature are not normally lethal to fish because the fish can avoid areas of warmer water by migrating to other parts of the river. However, prolonged periods of extremely warm water temperatures can be fatal.

The Montana Administrative Rules (ARM) state that for A-1 and B-1 class waters "the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67º Fahrenheit) is 1° (F) and the rate of change cannot exceed 2° F per hour" (ARM 17.30.629). Furthermore, if the natural occurring temperature is greater than 67º F, the maximum allowable increase is 0.5º F (ARM 17.30.622(e), ARM 17.30.623(e)).

For waters classified as "I," no increase in naturally occurring temperature is allowed that will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife (ARM 17.30.628(e)).

Natural conditions, where they could be identified, determined the numeric criteria used as the temperature targets for the suspected thermally modified streams in the Lake Helena TPA.

3.3.5.2 Riparian Assessments

Examinations of the riparian areas were conducted for the suspected thermally impaired stream segments. Shade provided by riparian vegetation reduces the amount of surface area that is exposed to thermal energy. Riparian vegetation can also provide a control on channel form such as width-to-depth ratio. This is important for water temperature concerns because shallow, low-volume water bodies are more easily heated. The suspected thermally modified streams were assessed using the Proper Functioning Condition method (Prichard, 1998). The riparian vegetation characteristics assessed using the Proper Functioning Condition methodology are of particular interest for the suspected thermally modified segments. This supplemental indicator will be applied only to assist in verifying water quality impairment determinations. No specific water quality indicator variables involving thermal sources are proposed.

Consideration of disturbance in the riparian area is important given that TMDLs are necessary only for impairments caused by anthropogenic sources. In 2003, Tetra Tech, Land & Water Consulting, and the Helena National Forest conducted a preliminary source assessment (Appendix C). They used field inventory, GIS, and aerial photography to conduct a screening-level assessment of riparian condition in the Lake Helena TPA. Results of the source assessment were taken into consideration in evaluating temperature-related impairments. This supplemental indicator will only be applied to assist in verifying water quality impairment determinations. No specific water quality indicator variables involving thermal sources are proposed.

3.3.5.3 Fish Population Data

As stated in Section 3.3.2.4, Montana Fish, Wildlife and Parks and the U.S. Forest Service have been conducting fish species inventories and estimating fish populations in many of the streams in the Lake Helena watershed and in Lake Helena proper. Supplemental information pertaining to the presence of fish species, general population trend data, and habitat quality will be used to support the targets and supplemental temperature indicators for the Lake Helena watershed. However, the fisheries information and quality ratings that are available will not be used as specific supplemental indicator variables.

3.3.6 pH

Montana has narrative standards for pH that are linked to the "natural" condition of the stream. This takes into account the fact that streams can have a wide range of natural pH values, and therefore it is difficult to set numeric standards. Extensive research by EPA and others has shown that pH can have direct and indirect effects on stream water chemistry and the biota of aquatic ecosystems. A pH range from 5 to 9 is not directly toxic to fish, but a decline in pH from 6.5 to 5.0 was found to result in a progressive reduction in salmonid egg production and hatching success (USEPA, 1991). The emergence of certain aquatic insects also declines below a pH of 6.5. From this and other data, EPA has concluded that pH should range between 6.5 and 9.0 in order to protect aquatic life (USEPA, 1991). Streams sampled in the Lake Helena watershed in 2003 (except Corbin Creek) had pH values ranging from 6.7 to 8.9, which suggests that the natural pH of streams in this region is within EPA's proposed pH range. Therefore, a minimum pH of 6.5 and a maximum pH of 9 were selected as TMDL targets.

Metals concentrations and pH values are linked by solubility processes in the stream. High metals concentrations, especially high concentrations of iron, can lead to low pH values. Also, low pH values increase the solubility of some metals. Because of this linkage, it is important that both metals concentrations and pH meet water quality standards to protect beneficial uses. The metals criteria in MDEQ Circular WQB-7 are therefore proposed as supplemental indicators for pH (Table 3-9).

Table 3-9. pH targets and supplemental indicators for Lake Helena TPA streams.

Water Quality Targets	Threshold Values
Minimum pH	6.5
Maximum pH	9.0
Supplemental Indicator	**Recommended Value**
Montana Metals Criteria	As documented in MDEQ Circular WQB-7

3.3.7 Salinity/Total Dissolved Solids/Chlorides

Salinity targets and supplemental indicators were chosen based on crop sensitivity to irrigation water and biological response to salinity. Ayers and Westcot (1985) documented the effects of salinity on various crops and yield. For alfalfa (the most sensitive crop assumed to be grown in the Corbin Creek watershed), crop yields are affected by irrigation water with salinity concentrations of more than 1,300 micro-Siemens per centimeter (µS/cm) (2,000 µS/cm soil water assuming a 20 percent leaching fraction). Therefore, an average value of 1,300 µS/cm was chosen as a salinity target for Corbin Creek (Table 3-10).

Salinity can also affect in-stream biological uses, and several studies have documented population shifts or toxicity because of salinity (Klarich and Regele, 1980; McKee and Wolfe, 1963; Mount et al., 1997). Montana Fish, Wildlife and Parks conducted a detailed review of toxicity studies and found relevant toxicity studies for fathead minnows, freshwater crustaceans, walleye, and northern pike. The draft review concluded that 1,500 µS/cm SC levels were protective of these species (Skaar, 2003), and therefore the 1,300 µS/cm target identified for the protection of agricultural uses should also protect aquatic life beneficial uses.

Table 3-10. Salinity targets and supplemental indicators for Corbin Creek.

Water Quality Target	Threshold Value
Average Specific Conductance	1,300 µS/cm

3.3.8 Chlorides

Montana currently does not have numeric standards for chlorides. EPA recommends chloride standards for streams and rivers that are based on the aquatic toxicity for plant, fish, and invertebrate species (USEPA, 1999). EPA recommends an acute standard of 860 mg/L and a chronic standard of 230 mg/L. These standards are proposed here as target values for Lake Helena watershed streams.

Table 3-11. Proposed chloride target values for the Lake Helena TPA.

Water Quality Targets	Threshold Values
Chloride Concentration (maximum)	< 860 mg/L
Chloride Concentration (average)	< 230 mg/L

3.3.9 Priority Organics

DDE (dichlorodiphenyl-dichloroethylene) is a breakdown product of DDT (dichlorodiphenyltrichloroethane), which was once widely used as a pesticide throughout the United States. Although banned, DDT and DDE still exist in the atmosphere and soils. Both bond strongly to soils and break down over a period of 2 to 15 years (ATSDR, 2002). DDE is listed by EPA as a "probable human carcinogen," and has been shown to cause reproductive and liver damage in bird species (USEPA, 1980). The Montana water quality standard for DDE is a maximum of 0.0059 µg/L to protect human health, and this standard is also protective of aquatic life. A maximum DDE concentration of 0.0059 µg/L is proposed as a target for streams in the Lake Helena watershed.

3.4 Current Water Quality Impairment Status

This section presents summaries and evaluations of all available water quality data for water bodies in the Lake Helena watershed appearing on Montana's 1996 and subsequent 303(d) lists. The reviews evaluate all currently available data for each stream or reservoir segment by suspected impairment cause category (for example, metals, nutrients, sediment). The data reviews include new monitoring information that was collected specifically for this purpose in summer 2003 and 2004. The 2003 and 2004 monitoring locations are shown in relation to the 303(d)-listed segments in Figure 3-3. The weight-of-evidence approach described in Section 3.3, an approach that uses a suite of targets and supplemental indicators, has been applied to verify and/or reconsider each of the water quality impairments on the 1996 303(d) list. Supporting documentation is provided for each water body within each of the three major tributary drainages to Lake Helena, and for Lake Helena itself.

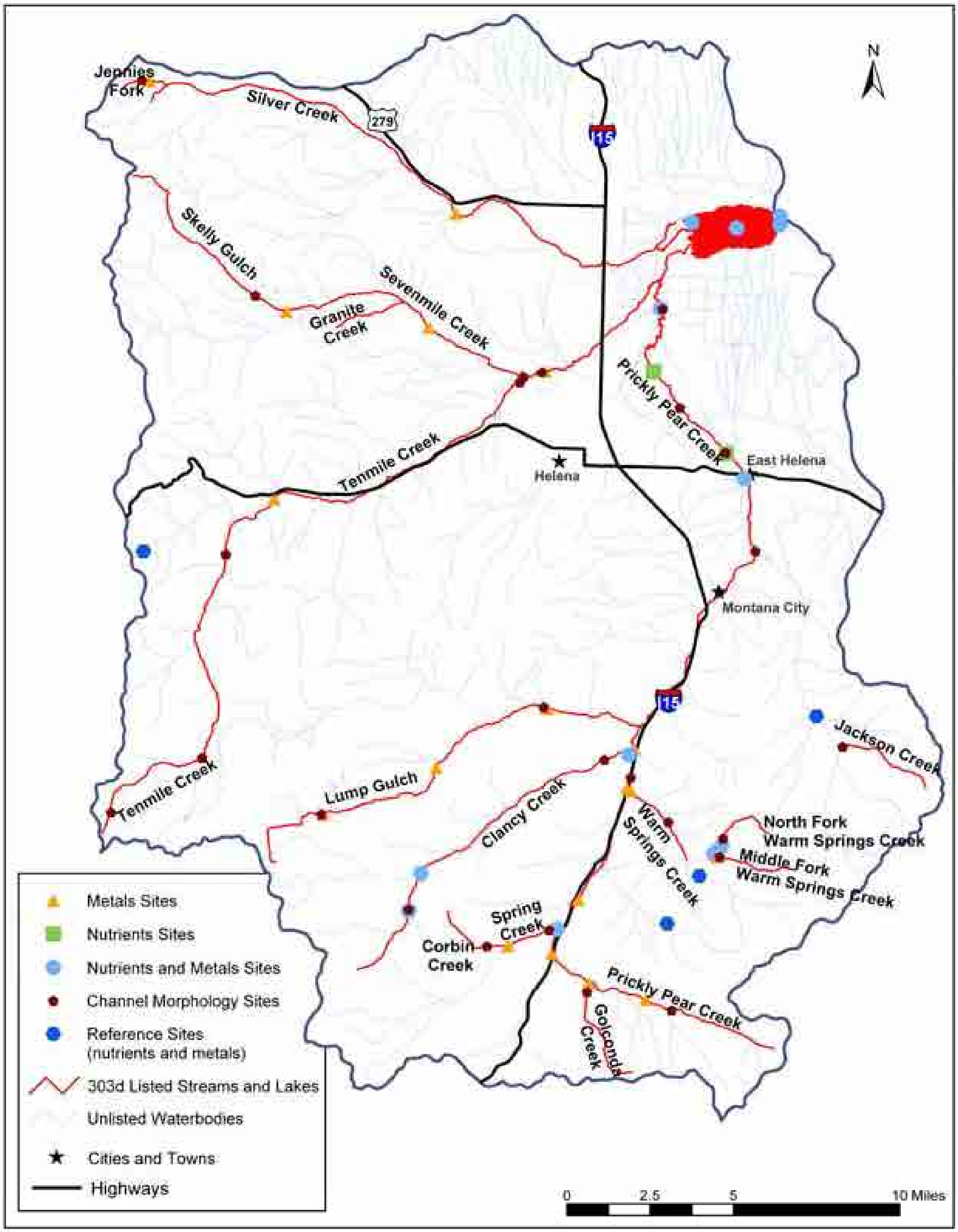

Figure 3-3. 303(d)-listed segments and 2003–2004 water quality monitoring stations in the Lake Helena watershed.

3.4.1 Prickly Pear Creek Drainage

This section presents summaries and evaluations of all available water quality data for water bodies in the Prickly Pear Creek drainage. Maps of the Upper Prickly Pear and Lower Prickly Pear drainage areas are provided in Figure 3-4 and Figure 3-5.

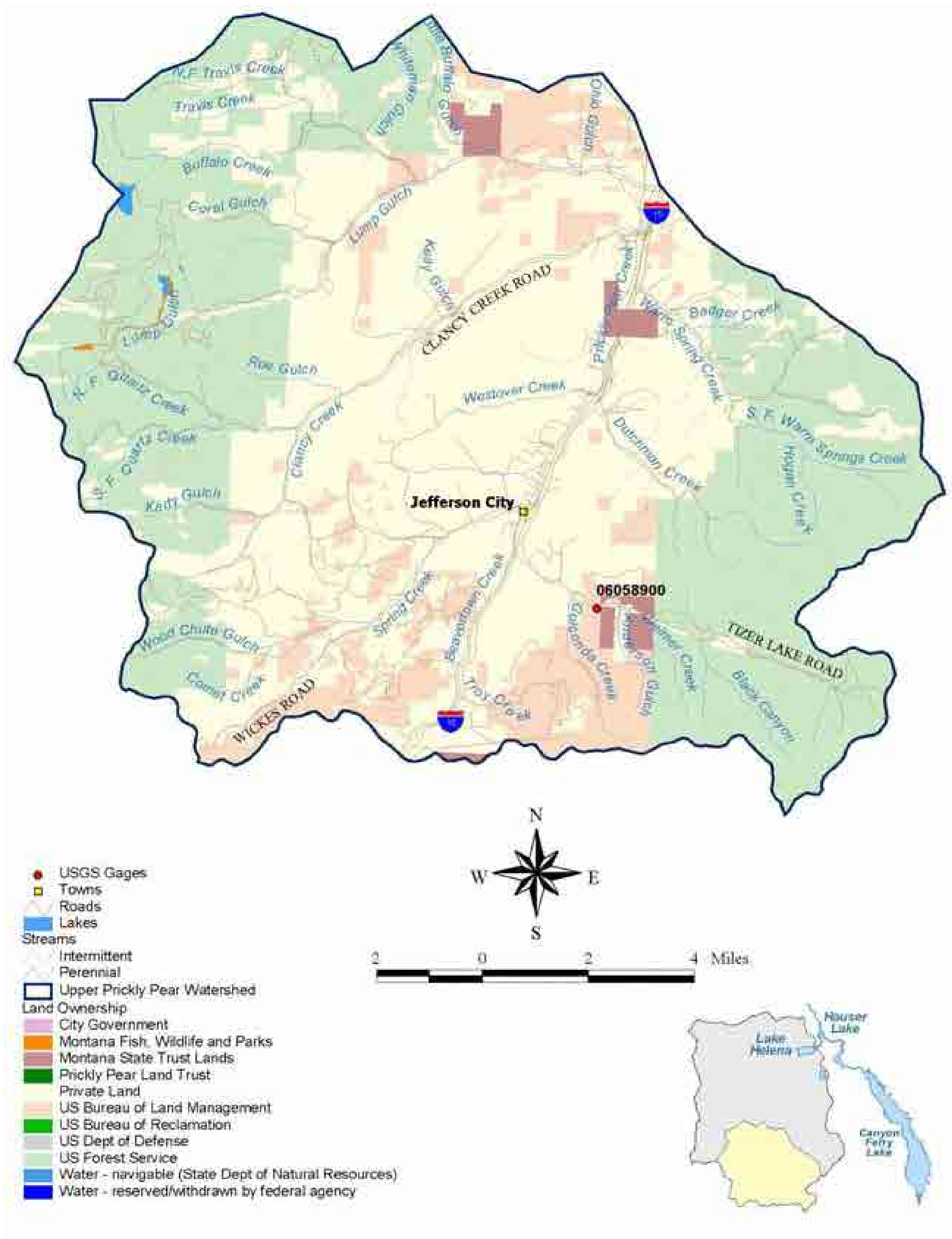

Figure 3-4. Map of the Upper Prickly Pear Creek Watershed.

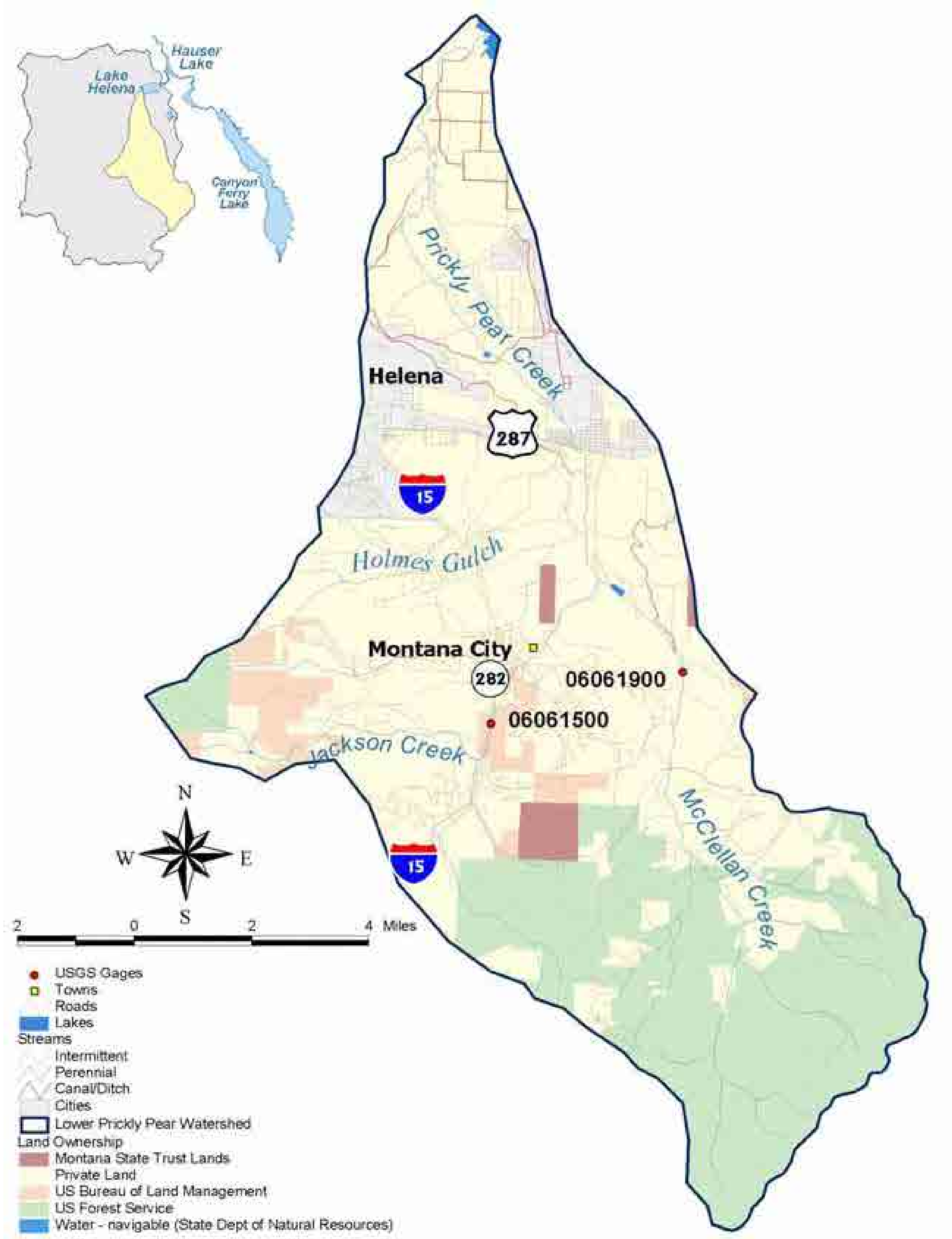

Figure 3-5. Map of the Lower Prickly Pear Creek Watershed.

3.4.1.1 Prickly Pear Creek from the Headwaters to Spring Creek (MT41I006_060)

In 1996, the cold-water fishery uses in this 8.7-mile headwater segment of Prickly Pear Creek were listed as threatened due to suspended solids and metals. The basis for the suspended solids listing is a 1981 report that describes undesirable channel and riparian conditions resulting from historical placer mining. The worst of these conditions begins at the confluence with Golconda Creek. In subsequent years the segment has not been listed for suspended solids. However, fish habitat and habitat alterations have been added to the list as sources of pollution. The rationale for the metals listing is unknown. In 2000, the impaired water uses were changed to include aquatic life and drinking water (non-supporting), and agriculture (partial support). Fisheries uses were upgraded from threatened to fully supporting. A typical view of this segment is shown in the photo below.

A review of the currently available data is provided below. Available sediment-related data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey on the Helena National Forest that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from two sites within the Helena National Forest's administrative boundary, suspended sediment data, and fish population data. Metals data include a total of 11 in-stream water chemistry samples taken between October 2000 and August 2003.

Prickly Pear Creek from headwaters to Spring Creek

Pollution Sources

The 2003 preliminary source assessment identified roads and geology as the primary sediment sources for this section of Prickly Pear Creek. The Helena National Forest conducted a road sediment survey on the forest portion of the creek and identified 11 sites that, based on modeling using the Water Erosion Prediction Project (WEPP) model, contribute approximately 5.2 tons of sediment per year to the stream (USDA, 2004). The aerial photography inventory showed eight road crossings and road encroachment along 30 percent of the stream. The last one-third mile of the stream segment was channelized during construction of Interstate 15. Most of the additional source assessment inventory sites outside the forest consisted of road-related sources, such as problem culverts and road sediment delivery points.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. The field source assessment showed poorly developed soils with gully formations on steep slopes in upland areas and on road cut-and-fill slopes. Deposition of sand was observed in the stream channel at many sites. The aerial photography inventory showed that extensive conifer and deciduous riparian buffers were present on the Helena National Forest portion of the stream. As the valley bottom widths increased downstream, the widths of deciduous riparian buffers tended to decrease and were variable depending on individual ownership and proximity to the Tizer Lake Road. Some logging has occurred on state and private lands, but the sites do not appear to be recent harvests.

Although one placer mine site was observed within the Helena National Forest administrative boundary, extensive channel alterations from historical mining do not begin until below the confluence with Golconda Creek. A historical placer gold dredge operation just above I-15 marks where the stream becomes incised, overly widened, and straightened as a result of the operation. Currently, the placer site is heavily grazed with consequent removal of riparian vegetation and bank trampling.

In summary, sediment sources generated by road runoff and road placement are probably the biggest contributors of sediment to this segment of Prickly Pear Creek. Land disturbance appears to exacerbate erosion in the Boulder Batholith geology and the poorly developed soils of this sub-watershed. Severe channel alterations begin below the confluence with Golconda Creek, which are likely in-channel sources of sediment.

Expected relevant sources of metals in the stream segment are a tributary stream and historical mining activities in the immediate drainage area. Golconda Creek flows into this segment and is likely a significant contributor of metals. Most of the drainage area falls within the Alhambra mining district, although there are sections of Elkhorn and Colorado mining districts in the basin. The Montana Bureau of Mines and Geology (MBMG) Abandoned and Inactive Mines database shows placer, mineral prospect, surface, surface-underground, and underground historical mining activities in the drainage area of the stream. The mining types listed include lode and placer. In the past, these mines produced silver, lead, zinc, manganese, molybdenum, and gold. None of the mines in the drainage area of this segment are listed in the State of Montana’s inventory of High Priority Abandoned Hardrock Mine Sites.

Channel Survey

In 2003 the Helena National Forest conducted a field investigation along this section of Prickly Pear Creek, about 1 mile upstream of the forest’s administrative boundary. The Helena National Forest determined that the stream is a Rosgen stream type A2a+. The width-to-depth ratio was 7.5, which is similar to other reference A-type streams inventoried by the Helena National Forest (Table 3-12). The stream banks were predominately lined with boulders, which led to a “low,” or “very stable” Bank Erosion Hazard Index (BEHI) rating. This BEHI rating is actually better than the average for southwestern Montana and Greater Yellowstone Area least-impaired reference A-type streams, but not unexpected for boulder-dominated stream banks. D_{50} as determined in a zigzag Wolman pebble count consisted of small boulders. Although no Helena National Forest reference streams are specifically A2a+, this large median particle size indicates that excessive deposition of finer-sized particles is probably not occurring at this site.

The channel survey included a Proper Functioning Condition assessment. The Helena National Forest rated this site as attaining Proper Functioning Condition (PFC), but noted some sediment deposition. The riparian land type aggregate assigned to this site is 27, defined as Friable Loamy Glacial Till Moraines. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common and can be excessive.

Table 3-12. Summary of cross-sectional data for Prickly Pear Creek, Segment MT41I006_060.

Parameter	Result	Comparable to Reference
Width/depth ratio	7.5	Yes
BEHI	Low	Yes
D_{50}	Small boulders	NA
PFC	PFC	Yes

McNeil Cores

McNeil core data are available for two sites on this section of Prickly Pear Creek, both of which are within the Helena National Forest's administrative boundary (Table 3-13). The oldest cores (six cores) were collected in 1993 in the southeast quarter of Section 14, Township 7N, Range 3W. The riparian aggregate here was determined to be 25, defined as Compact Loamy Glacial Till Moraines. The average percentage of fines less than the 6.4 mm was 30.8 percent of the samples, with average fine fines (less than 0.85mm) at 11.6 percent. These values are elevated when compared with the means for fines from the reference values for riparian aggregate 25. The percentage of fines less than 6.4 mm for this site is 7 percent greater than the mean for cores from the reference riparian aggregate 25, and the fine fines are 55 percent above the mean.

The second set of McNeil cores were collected in 1995. The exact location of the cores sites (n=9) is unknown; thus, a riparian aggregate land type cannot be established. The average percentage of fines less than 6.4 mm was 37.6 percent, with average fine fines at 11.5 percent. Both values for percentage of fines are 15 percent greater than the means for all Helena National Forest reference core samples combined (which was necessary because the riparian aggregate land type was unknown).

Table 3-13. Summary of McNeil core data for Prickly Pear Creek, Segment MT41I006_060.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
25	1993	30.8	11.6	Fine fines value is elevated.
Unknown	1995	37.6	11.5	Both fines values are elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for three sites along this segment of Prickly Pear Creek, with 14 samples taken from 1989 to 2001. The highest value collected was 15 mg/L in May 2001 at a sampling site above Beavertown Creek. The suspended sediment data had an average of 5.6 mg/L and a median of 4.5 mg/L. All of these values are comparable to suspended sediment values from selected reference streams (Table 3-14).

Table 3-14. Statistical summary of suspended sediment data for Prickly Pear Creek, Segment MT41I006_060.

Mean	5.6 mg/L
Median	4.5 mg/L
Standard deviation	4.6 mg/L
Maximum	15.0 mg/L
Number of samples	14
Number of sample sites	3

In 2003, four visual observations of turbidity were recorded at two sites along this segment of Prickly Pear Creek. All observations reported the water clarity as clear, yet the observations were made during the recessional limb of peak flow or during low-flow conditions.

Macroinvertebrates

No recent data were available at the time of this writing.

Periphyton

No recent data were available at the time of this writing.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' Montana Fisheries Information System (MFISH) and data from the Helena National Forest. Prickly Pear Creek is managed as a trout fishery. Genetically pure westslope cutthroat trout (*Oncorhynchus clarki lewisi*), a species of special concern, are common year-round residents in this segment of Prickly Pear Creek. The overall habitat and sport fishery rating for this section of the creek is "substantial," which is the next rating below "best." A complex scoring system is taken into consideration in order to assign an overall value to the habitat and sport fishery of a particular stream. Points are awarded based on the presence of fish species of special concern, fish populations, spawning habitat quality, biomass, angling access, stream esthetics, and angling use per year.

Metals Concentrations

The project team evaluated a total of 11 in-stream water chemistry samples taken between October 2000 and August 2003. All samples were below the human health and aquatic life criteria for all metals, with one exception. The chronic aquatic life criterion for lead was exceeded in one sample, which is equivalent to 9.1 percent of all samples. Also, the average lead concentration for all available samples was 7.6 percent above the chronic aquatic life criterion level. This evidence suggests this segment does not meet the aquatic life water quality standards and target values for lead.

Although neither the human health nor the aquatic life criteria were exceeded, the highest measured concentrations for cadmium and copper were 82 percent and 73 percent of the chronic aquatic life criteria levels, respectively. These are borderline levels. This evidence suggests this segment meets the human health and aquatic life water quality standards and target values for arsenic, cadmium, copper, and zinc. Cadmium and copper should be closely monitored in the future to confirm this statement.

Prickly Pear Creek Segment MT41I006_060 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width/depth ratio, median surface particle size, BEHI, and Proper Functioning Condition rating), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, fisheries, and heavy metals concentrations in the water column.

The supplemental indicator values for channel metrics and suspended sediment data were met or exceeded. Recent fisheries data suggest that there are reaches of valuable westslope cutthroat trout habitat in this segment of the stream, primarily in the upper 2 to 3 miles of the stream segment. However, values for the percentage of fines in McNeil cores were elevated against the target values.

Results from the 2003 preliminary source assessment revealed that there were active sediment sources affecting this stream segment, and that impairments and channel condition appeared to worsen in a downstream manner. Unfortunately, little physical or chemical data are available for the segment of the stream below the Helena National Forest boundary. Because target McNeil core values are exceeded within the Helena National Forest administrative boundary, it is assumed that they are also exceeded below the forest boundary.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Prickly Pear Creek Segment MT41I006_060 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The available data also suggest that Prickly Pear Creek from headwaters to Spring Creek is impaired by lead. A TMDL will therefore be developed to address the lead impairment.

3.4.1.2 Prickly Pear Creek from Spring Creek to Lump Gulch (MT41I006_050)

In 1996, this 7-mile segment of Prickly Pear Creek was listed as not supporting aquatic life, cold-water fisheries, swimming, and agricultural uses due to suspended solids and siltation. The basis for the listings are five reports dating back to the 1980s that summarize undesirable channel conditions, such as stream channelization, lack of riparian vegetation, and bank erosion. In subsequent years, the segment has been listed as not supporting aquatic life, cold-water fisheries, and drinking water uses, and partially supporting agricultural uses, because of siltation, fish habitat degradation, habitat alterations, bank erosion, and metals. A typical view of this segment is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey on the creek below Alhambra that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, macroinvertebrate data, fish population data, and a total of 11 in-stream water chemistry samples taken between June 2000 and August 2003.

Prickly Pear Creek from Spring Creek to Lump Gulch

Pollution Sources

The 2003 preliminary source assessment identified were roads and riparian grazing as the primary sediment sources for this section of Prickly Pear Creek. Most of the source assessment inventory sites consisted of road sources, such as road sediment delivery points. The aerial photography inventory showed 16 road crossings. Roughly 91 percent of the stream segment has been channelized to accommodate the construction of I-15 and the railroad.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. Deposition of sand was observed in the stream channel at many sites. The aerial photography inventory showed that the widths of deciduous riparian buffers ranged from 30 to 100 feet and were correlated to their distance from roads. This segment is surrounded by private land, and the dominant adjacent land use consists of a transportation corridor.

The majority of this segment of Prickly Pear Creek has been placer mined, and gravel tailings piles line the stream banks in many areas. The stream is incised, overly widened, and straightened as a result of historical mining and the position of roadways. Some parcels of land along this segment are grazed with resultant removal of riparian vegetation, bank trampling, and bank slumping.

In summary, sediment sources generated by road runoff and road placement are probably the biggest contributors of sediment to this segment of Prickly Pear Creek. Tributary streams, such as Spring Creek and Warm Springs Creek, are also likely sediment sources. Localized sources such as grazing are present as well. Severe channel alterations from placer mining and the transportation corridor have probably affected the flow regime along this segment.

Expected relevant sources of metals to the stream segment are upstream sources, tributary streams, and historical mining activities in the immediate drainage area. The segment's upstream reach (Prickly Pear Creek 060) and tributaries (including Spring Creek, Clancy Creek, and Warm Springs Creek) are likely to contribute metals. In addition, during field sampling efforts, spring seeps were noted entering Prickly Pear Creek from placer tailings piles along the stream. The immediate drainage area of the listed segment falls within the Alhambra and Clancy mining districts. The MBMG Abandoned and Inactive Mines database reports mineral location, surface, surface-underground, underground, and other, "unknown" mining activities in the immediate drainage area of the stream segment. The historical mining types include lode and placer. In the past these mines produced gold, silver, copper, lead, zinc, and uranium. None of the mines in the immediate drainage area of this segment are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation along this section of Prickly Pear Creek, just below the Alhambra RV Park. The stream's entrenchment ratio and sinuosity were out of balance with the valley type setting, reflecting channel confinement and straightening. Without channel modifications, the stream reach probably would be a Rosgen stream type C4. The width-to-depth ratio was 18.4, which is comparable to the average for southwestern Montana and Greater Yellowstone Area reference C-type streams (Table 3-15). Reference information was not available for Helena National Forest C-type streams. The BEHI rating was "moderate." The BEHI score was about 25 percent above the average (less stable) for southwestern Montana and Greater Yellowstone Area reference C-type streams, but within the same overall rating category. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse gravels. This particle size is one size-class smaller than the range expected for reference C4 stream types, based on data collected for southwestern Montana and the Greater Yellowstone Area.

The channel survey included a Proper Functioning Condition assessment. Tetra Tech and Land & Water Consulting rated this site as “Non-functional” (NF), noting pool infilling, monotonous riparian vegetation, and severe impairment to channel function resulting from channelization. The riparian land type aggregate assigned to this site is 29, defined as Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fine are common but generally not excessive.

Table 3-15. Summary of cross-sectional data for Prickly Pear Creek, Segment MT41I006_050.

Parameter	Result	Comparable to Reference
Width/depth ratio	18.4	Yes
BEHI	25.4	No
D_{50}	Coarse gravels	No
PFC	NF	No

McNeil Cores

McNeil core data are available for one site on this section of Prickly Pear Creek, which corresponds with the channel survey site. Six cores were collected in 2003. The riparian aggregate here was determined to be 29 (Alluvial Floodplains and Terraces) (Table 3-16). The average percentage of fines less than 6.4 mm was 30.2 percent, with average fine fines (less than 0.85 mm) at 10.2 percent. The percentage of fines less than 6.4 mm for this site is actually lower than the mean from reference cores for this riparian aggregate. But, the percentage of fines less than 0.85 mm is about 26 percent greater than the reference value average.

Table 3-16. Summary of McNeil core data for Prickly Pear Creek, Segment MT41I006_050.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	30.2	10.2	Fine fines value is elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for two sites along this segment of Prickly Pear Creek, with nine samples taken from 2000 to 2001. The highest value recorded was 33 mg/L in May 2001 at the sampling site at the Alhambra RV Park (below Warm Springs Creek) (Table 3-17). The suspended sediment data had an average of 7.9 mg/L with a median of 6.0 mg/L. All these values are comparable to suspended sediment values from selected reference streams.

Table 3-17. Statistical summary of suspended sediment data for Prickly Pear Creek,Segment MT41I006_050.

Mean	7.9 mg/L
Median	6.0 mg/L
Standard deviation	9.8 mg/L
Maximum	33.0 mg/L
Number of samples	9
Number of sample sites	2

In 2003, six visual observations of turbidity were recorded at three sites along this segment of Prickly Pear Creek. All observations reported the water clarity as clear, yet the observations were made during the recessional limb of peak flow or during base flow conditions.

Macroinvertebrates

Biological data were available for one sample taken in June 2001 near Clancy. The habitat rating for this site was "suboptimal" because of sediment deposition, substrate embeddedness, lack of bank stabilizing riparian vegetation, and stream channelization. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2002a). The metric score of 67 percent indicated slight impairment and partial support of aquatic life uses. Sixteen clinger taxa and nine trichoptera taxa were found at the site, but 9 percent of the organisms sampled prefer fine sediment habitats. Although these finding appear to be contradictory, Bollman explains this difference by noting slack as well as swift moving waters were probably sampled.

Periphyton

No recent data were available at the time of this review.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database. Prickly Pear Creek is managed as a trout fishery. While no species of special concern are thought to live in this segment of Prickly Pear Creek, many other fish, such as brown trout, rainbow trout, longnose sucker, and mottled sculpin, are thought to be abundant. The overall habitat and sport fishery rating for this section of the creek is "substantial," which is the next rating below "best."

Metals Concentrations

The project team evaluated a total of 11 in-stream water chemistry samples taken between June 2000 and August 2003. Arsenic concentrations in all samples were below the human health and aquatic life criteria. Although the average arsenic concentration of all samples was 64 percent lower than the human health criterion, the highest measured concentration was 80 percent of the criterion. This is a borderline value. This evidence suggests that the segment meets the human health and aquatic life water quality standards and target values for arsenic, but it should be closely monitored in the future to confirm this statement.

Cadmium concentrations in 18 samples, or the equivalent of 78 percent of samples, exceeded the chronic aquatic life criterion. The average concentration for all samples was 46 percent higher than the chronic aquatic life criterion, and the highest measured concentration was 2.5 times the chronic aquatic life criterion for cadmium. No samples exceeded the human health criterion. This evidence shows that this segment does not meet the aquatic life standards and target value for cadmium.

Copper concentrations in all samples were below the human health and aquatic life criteria. Although, the average copper concentration for all samples was 69 percent lower than the chronic aquatic life criterion, the highest measured concentration was 82 percent of the criterion. This is a borderline value. Overall, this evidence suggests that the segment is not impaired by copper, but it should be closely monitored in the future.

Lead concentrations in five samples, or the equivalent of 22 percent of samples, exceeded the chronic aquatic life criterion. The highest measured lead concentration was 5.9 times the chronic aquatic life criterion. The average of all samples was just five percent lower than the chronic aquatic life criterion. One sample exceeded the human health criterion; the concentration of this sample was 27 percent higher than the human health criterion. This evidence shows that this segment does not meet the aquatic life and human health target values for lead.

Zinc concentrations in 12 samples, or the equivalent of 52 percent of the samples, exceeded the acute and chronic aquatic life criteria for zinc. The average concentration for all samples was four percent higher than the chronic and acute aquatic life criteria for zinc. The highest measured concentration was two times the acute and chronic aquatic life criteria. No samples exceeded the human health criterion for zinc. This evidence shows that this segment does not meet the aquatic life standards and target values for zinc.

Prickly Pear Creek Segment MT41I006_050 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width/depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment concentrations, macroinvertebrates, fisheries, and water chemistry (metals).

The supplemental indicator values for suspended sediment and macroinvertebrates were met or exceeded. The only channel metric meeting the standards was the width-to-depth ratio. A smaller than expected size-class for median particle size might mean that deposition of surface fines is occurring. The BEHI value was elevated indicating that stream banks might be a potential source of sediment, while a Proper Functioning Condition rating of NF suggested that the channel is unable to sustain expected hydrologic, riparian vegetation, and sediment transport capacities. Recent fisheries data suggest that this segment of the stream provides valuable habitat for many fish species. Yet, values for the percentage of fines less than 0.85 mm from McNeil cores were elevated against the target values.

Results from the 2003 preliminary source assessment revealed that there were active sediment sources affecting this stream segment, and that impairments to channel condition were present for most of the length of this segment. Targets and supplemental indicator values such as D_{50}, Proper Functioning Condition rating, and percentage of subsurface fines less than 0.85 mm were not being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Prickly Pear Creek Segment MT41I006_050 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The available evidence also suggests that Prickly Pear Creek from Spring Creek to Lump Gulch is impaired by cadmium, lead, and zinc. TMDLs will therefore be developed to address the cadmium, lead, and zinc impairments.

3.4.1.3 Prickly Pear Creek from Lump Gulch to Wylie Drive (MT41I006_040)

In 1996, the aquatic life, cold-water fishery, and agricultural water uses in this 11-mile segment of Prickly Pear Creek were listed as partially supported because of habitat alterations, flow alterations, and metals. The basis for the listings was four reports dating back to the 1980s that summarized undesirable channel conditions, such as stream channelization and substrate embeddedness, and a total of 11 in-stream water chemistry samples taken between June 1999 and August 2003. In subsequent years, the segment has been listed as not supporting aquatic life, cold-water fishery, and drinking water uses, and partially supporting agricultural uses, because of siltation, habitat alterations, fish habitat degradation, and metals. Although this segment of Prickly Pear Creek is not listed for thermal modifications, data collected from a continuous recording thermograph in 2003 indicate the probability of thermal modifications. A typical view of this segment is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey of the creek below McClellan Creek confluence that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, macroinvertebrate and periphyton data, fish population data, and water chemistry data.

Prickly Pear Creek from Lump Gulch to Wylie Drive

Pollution Sources

The 2003 preliminary source assessment identified roads as the primary sediment sources for this section of Prickly Pear Creek. Most of the source assessment inventory sites consisted of road-related sources, such as road sediment delivery points. The aerial photography inventory showed 17 road crossings. Nearly 57 percent of the stream segment is channelized by I-15, the railroad, secondary roads, ASARCO, and the City of East Helena.

The primary geology of this sub-watershed is the Boulder Batholith, with Tertiary sediments prominent in the valley bottom. Deposition of sand and fine gravels was observed in the stream channel at many sites. The aerial photography inventory showed that gravel bars were visible in the stream in the section between Montana City and East Helena. The widths of deciduous riparian buffers ranged from 0 to 400 feet and were correlated to distance from roads. This segment is surrounded by private land, and the dominant adjacent land use consists of a transportation corridor.

The upper of portion of this segment of Prickly Pear Creek has been placer mined. The stream is incised, overly widened, and straightened as a result of historical mining and the position of roadways. Between Montana City and ASARCO, riparian vegetation is dense, yet the channel remains constricted between the highway and the railroad. Just before reaching the ASARCO facility, the stream is diverted by two canals into a wetland holding pond for the facility before passing through a small dam. The dam is likely a barrier to some fish species, and probably contributes to an overall decrease in stream gradient and an increase in channel embeddedness. The stream is channelized in a series of dikes through the town of East Helena. Just before the Wylie Drive road crossing, channel alterations for the Helena Valley irrigation canal and possibly for flood control are visible.

In summary, road runoff and road placement are probably the biggest contributors of sediment to this segment of Prickly Pear Creek. Tributary streams such as Lump Gulch are also likely sediment sources. The dam at ASARCO might be impeding sediment transport. Severe channel alterations from placer mining, ASARCO, the City of East Helena, the Helena Valley irrigation canal, and the transportation corridor have altered the channel's form.

Expected relevant sources of metals in the stream segment are upstream sources, tributary streams, and historical mining activities in the immediate drainage area. The segment's upstream reach (Prickly Pear Creek 050) and the tributary Lump Gulch are likely to contribute metals. The immediate drainage area falls within the Alhambra, Clancy, and Montana City mining districts. The MBMG Abandoned and Inactive Mines database reports mineral location, placer, processing plant, prospect, surface, surface-underground, and other, unknown mining activities in the immediate drainage area of the stream segment. The historical mining types include lode, mill, placer, quarry, and smelter. In the past these mines produced gold, silver, copper, and lead. None of the mines in the immediate drainage area of this segment are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites. Recent or currently operating processing plants that might have an impact on metals loads to the stream include the ASARCO East Helena Lead Smelter and Kaiser Cement.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation along this section of Prickly Pear Creek, just below the confluence with McClellan Creek. This site was selected as a reference reach for the mainstem of Prickly Pear Creek because it is in better condition than other segments of the stream. However, it is far from pristine. The stream's entrenchment ratio and sinuosity were out of balance with the valley type setting, reflecting channel confinement and straightening.

Without channel modifications, the stream reach probably would be a Rosgen stream type C4. The width-to-depth ratio was 30.5, 44 percent greater than the average for southwestern Montana and Greater Yellowstone Area C-type reference streams (Table 3-18). The "moderate" BEHI score was very close to the averages for southwestern Montana C-type reference streams. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse gravels. This particle size is within the range expected for reference C4 stream types based on data collected for the Greater Yellowstone Area.

The channel survey included an assessment of Proper Functioning Condition. The field crew rated this site as "Functional – at risk" (FAR), noting vigorous riparian vegetation. However, pool development was not well defined. The riparian land type aggregate assigned to this site is 29, defined as Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fine are common but generally not excessive.

Table 3-18. Summary of cross-sectional data for Prickly Pear Creek, Segment MT41I006_040.

Parameter	Result	Comparable to Reference
Width/depth ratio	30.5	No
BEHI	21.7	Yes
D_{50}	Very coarse gravels	Yes
PFC	FAR	NA (trend unknown)

McNeil Cores

McNeil core data is available for one site on this section of Prickly Pear Creek, which corresponds with the channel survey site. Six cores were collected in 2003. The riparian aggregate here was determined to be 29 (Alluvial Floodplains and Terraces) (Table 3-19). The average percentage of fines less than 6.4 mm was 28.3 percent, with average fine fines (< 0.85 mm) at 9.3 percent. The percentage of fines less than 6.4 mm for this site is actually lower than the mean from reference cores for this riparian aggregate. However, the percentage of fines less than 0.85 mm was 15 percent greater than the reference value average.

Table 3-19. Summary of McNeil core data for Prickly Pear Creek, Segment MT41I006_040.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	28.3	9.3	Fine fines value is elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for one site along this segment of Prickly Pear Creek, with 21 samples taken from 1999 to 2002. The highest recorded value was 104 mg/L in April 2001 near Clancy (Table 3-20). The suspended sediment data showed an average of 26.6 mg/L with a median of 11.0 mg/L. These values are about 50 percent greater than the average suspended sediment values from selected reference streams.

In June 2001, one visual observation of turbidity reported the water clarity as clear along this segment of Prickly Pear Creek at Clancy. In 2003, three turbidity observations were recorded along this segment of Prickly Pear Creek at East Helena. One observation reported the water clarity as clear, and two reported the water clarity as slightly turbid. The observations of slight turbidity were made in August and might have been associated with algal growth.

Table 3-20. Statistical summary of suspended sediment data for Prickly Pear Creek, Segment MT41I006_040.

Mean	26.6 mg/L
Median	11.0 mg/L
Standard deviation	32.5 mg/L
Maximum	104 mg/L
Number of samples	21
Number of sample sites	1

Macroinvertebrates

Macroinvertebrate data were available from one sample taken in August 2003 above East Helena. The macroinvertebrate habitat rating for this site was "suboptimal" because bank alterations and an inadequate riparian zone. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman 2003a). The metric score of 56 percent indicated slight impairment and partial support of aquatic life uses. Sixteen clinger taxa and six trichoptera taxa were found at the site, and Bollman concluded that "fine sediment did not limit access to stony substrate habitats" (Bollman, 2003a).

Periphyton

Periphyton data from one sample taken in August 2003 above East Helena were available. Sampling results were compared with reference biocriteria metrics established for the Rocky Mountain Ecoregions of Montana (Bahls, 2004). Diatom metrics indicated moderate impairment and partial support of aquatic life uses. Bahls concluded that the impairment was primarily due to organic loading and secondarily due to sedimentation. The diatom siltation index was close to exceeding the threshold for minor impairment.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database. Prickly Pear Creek is managed as a trout fishery. No species of special concern are thought to live in this segment of Prickly Pear Creek. Brown and rainbow trout and mottled sculpin are thought to be abundant in the upper half of this segment, while longnose and white suckers are though to be abundant in the lower half of this segment. The overall habitat and sport fishery rating for the upper section of this segment is "substantial," while the lower portion of this segment is rated "moderate."

Metals Concentrations

The project team evaluated a total of 11 in-stream water chemistry samples taken between June 1999 and August 2003. Arsenic concentrations in seven of the 11 samples exceeded the human health criterion. The average concentration in all samples was 14.5 percent higher than the human health criterion. The highest measured arsenic concentration was three times the human health criterion. No samples exceeded aquatic life criteria for arsenic. This evidence shows that this segment does not meet the human health standard and target value for arsenic.

Cadmium concentrations in five samples, or the equivalent of 25 percent of all samples, exceeded the chronic aquatic life criterion. The average cadmium concentration of all samples was 35 percent higher than the chronic aquatic life criterion. The highest measured concentration was 4.6 times the chronic aquatic life criterion. No exceedances of the human health criterion for cadmium were observed. This evidence shows that this segment does not meet the aquatic life water quality standard and target threshold for cadmium.

Copper concentrations in four samples, or the equivalent of 20 percent of all samples, exceeded the chronic aquatic life criterion. Of those, the concentrations in three samples also exceeded the acute aquatic life criterion. The highest measured concentration of copper was 2.3 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows that this segment does not meet the aquatic life standard and target threshold for copper.

Lead concentrations in 14 samples, or 70 percent, exceeded the chronic aquatic life criterion. Of those, the concentrations in four samples also exceeded the human health criterion. The highest measured concentration was 18.7 times the chronic aquatic life criterion, and 3.60 times the human health criterion. The average of all samples was 312 percent higher than the chronic aquatic life level. This evidence shows that this segment does not meet the human health standard and aquatic life target value for lead.

Zinc concentrations in six samples, or the equivalent of 30 percent of all samples, exceeded the acute and chronic aquatic life criteria. The highest measured concentration was 1.9 times the acute and chronic aquatic life criteria. No samples exceeded the human health criterion for zinc. This evidence shows that this segment does not meet the aquatic life water quality standards and target value for lead.

Thermal Modifications

In the summer of 2003 a thermograph was deployed in this segment of Prickly Pear Creek, at the sampling site above East Helena (M09PKPRC04). Maximum daily recorded temperatures were greater than or equal to 80 ºF from July 18 to July 22, and the water temperature exceeded 67 ºF every day from July 4 to September 4, 2003 (Figure 3-6).

Table 3-21. Statistical summary of continuous logging water temperature data from July 4 to September 4, 2004 for Prickly Pear Creek, MT41I006_040.

Mean	67.9° F
Median	67.5° F
Standard deviation	4.8° F
Maximum	80.6° F
Number of samples	3024

This segment of Prickly Pear Creek is classified as B-1, and is expected to support a cold-water fishery. 67 ºF is often used as a survival threshold for salmonids. Data from the thermograph deployed in 2003 reveal that average temperature remained above 67 ºF from July 4 to September 4 in 2003.

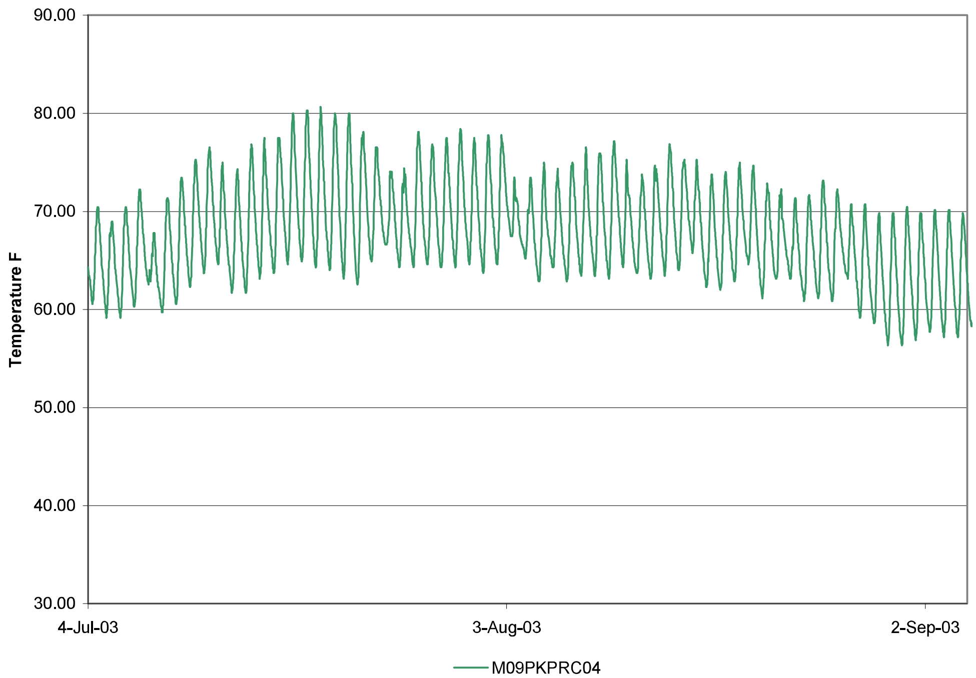

Figure 3-6. Continuous logging water temperature data from July 4 to September 4, 2003 for Prickly Pear Creek, MT41I006_040.

<u>Prickly Pear Creek Segment MT41I006_040 Water Quality Impairment Summary</u>

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, macroinvertebrates, periphyton, fisheries, and water chemistry (metals).

The supplemental indicator values for D_{50}, BEHI, and macroinvertebrates were met or exceeded. The only channel metric that did not meet standards was the width-to-depth ratio. The excessive width-to-depth ratio is probably a reflection of the channel alterations from historical placer mining and might not necessarily represent a widening of the stream course due to excessive sediment loads. However, a Proper Functioning Condition rating of FAR in part reflected that the stream did not appear to be able to transport adequate sediment loads. Suspended sediment values were higher than expected. Although diatom metrics for sedimentation were just below the threshold for minor impairment, Bahls concluded that sedimentation was a major limiting factor at the site. Recent fisheries data suggest that the upper segment of the stream provides valuable habitat for many fish species. Yet, values for the percentage of fines less than 0.85 mm from McNeil cores were elevated against the target values.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment, and that numerous impairments to channel condition occurred for most of the length of this segment. Targets and supplemental values such as width-to-depth ratio, Proper Functioning Condition rating, percentage of subsurface fines less than 0.85 mm, and suspended sediment were not being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Prickly Pear Creek Segment MT41I006_040 are impaired by suspended solids and siltation. A TMDL will therefore be developed to address the sediment impairment.

The available water chemistry data suggest that Prickly Pear Creek from Lump Gulch to the Montana Highway 433 crossing is impaired by arsenic, cadmium, copper, lead, and zinc. TMDLs will therefore be developed to address the arsenic, cadmium, copper, lead, and zinc impairments.

In-stream temperature data were available from a continuous logging thermograph deployed in this segment of Prickly Pear Creek. The weight-of-evidence suggests that Prickly Pear Creek from Lump Gulch to Wylie Drive is impaired by thermal modifications. The temperature target was thought to be exceeded when the thermograph recorded mean temperatures above 67 ºF for the time period of July 4 to September 4, 2003. Following the collection of additional data and further analysis, a TMDL will be developed to address the temperature impairment.

3.4.1.4 Prickly Pear Creek from Wylie Drive to Helena Wastewater Treatment Plant Discharge (MT41I006_030)

Stream segment MT41I006_030 was listed on Montana's 1996 303(d) list as not supporting aquatic life, cold-water fisheries, drinking water, swimming, and agricultural water uses because of siltation, suspended solids, habitat alterations, flow alterations, and metals. This segment is approximately 5 miles in length. In subsequent years, aquatic life, cold-water fisheries, and drinking water have been listed as not supported, while swimming and agricultural water uses have been listed as partially supported, because of thermal modifications, fish habitat degradation, riparian degradation, and nutrients, in addition to the causes of impairment listed in 1996. A typical view of this segment is shown in the photo below.

Prickly Pear Creek from Wylie Drive to Helena Wastewater Treatment Plant Discharge

The basis for the listings are five reports dating back to the 1980s that summarize undesirable channel conditions, such as stream channelization, channel braiding, substrate embeddedness, and removal of riparian vegetation. The supporting data also include the results of in-stream water chemistry sampling conducted between July 2003 and September 2004. A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), two cross-sectional surveys of the creek below Wylie Drive and below Canyon Ferry Road, McNeil core subsurface fines from the reach below Wylie Drive, suspended sediment data, macroinvertebrate and periphyton data, fish population data, synoptic temperature data, SSTEMP stream temperature modeling, and water chemistry data for nutrients, ammonia, dissolved oxygen, and metals. Both cross-sectional surveys included Proper Functioning Condition assessments and Wolman pebble counts.

<u>Pollution Sources</u>

The 2003 preliminary source assessment identified riparian grazing, bare stream banks, and roads as the primary sediment sources for this segment of Prickly Pear Creek. Most of the source assessment inventory sites showed grazing-related sources, such as bank trampling and vegetation removal. The aerial photography inventory showed five road crossings. About 30 percent of the stream segment is channelized for irrigation canals and a gravel mining operation.

The primary geology of this sub-watershed is the Boulder Batholith, with Tertiary and Quaternary sediments prominent in the Helena Valley. The aerial photography inventory showed that gravel bars were visible in the stream near the gravel mining operation. The widths of deciduous riparian buffers ranged from 0 to 230 feet and were correlated to land management practices. This segment is surrounded by private land, and the dominant land use consists of irrigated hay fields and pasture.

In summer 2003, a major irrigation diversion just below the City of East Helena removed most of the water flow from the creek. Another diversion between Wylie Drive and Canyon Ferry Road left the stream dry at Canyon Ferry Road for most of the summer. The irrigation diversions probably affect the flow regime and sediment transport capacity of this segment of Prickly Pear Creek. Most of the major impacts on the channel occur before the Canyon Ferry Road crossing.

In summary, sediment sources generated by localized sources (grazing, eroding stream banks) and road runoff are probably the biggest contributors of sediment to this segment of Prickly Pear Creek. Irrigation diversions severely deplete the flow of this section of Prickly Pear Creek, and probably inhibit transport of sediment. Channel alterations for irrigation networks and a gravel mining operation have altered channel form.

There is a variety of anthropogenic sources of nutrients in this watershed that affect this stream segment. During a July 17, 2003, field visit, the stream smelled very organic above Stansfield Lake. According to the 2003 preliminary source assessment, agricultural nonpoint sources probably contribute nutrients. Diffuse sources of sediment and nutrients from grazing, subdivisions, and rural housing might also affect the stream. Agricultural water diversions severely deplete stream flows in the summer, thereby concentrating nutrients and/or exacerbating their effects. The primary land uses adjacent to the stream are agricultural, including hay fields and pasture. In 2003, irrigation withdrawals left a dry streambed at Canyon Ferry Road from early July through September. Also noted in Prickly Pear Creek from Wylie Drive to the Helena wastewater treatment plant outfall were poor riparian conditions, grazing impacts, and a metallic sheen on the water surface. In summer 2003, the stream was documented as having a flow of less than 0.5 cubic feet per second (cfs) downstream from a major irrigation diversion point.

The segment's upstream reaches (Prickly Pear Creek 040) are likely contributors of metals. In addition, Kendy et al. identified the following potential arsenic sources in the Lake Helena Valley: irrigation water from the Missouri River, aerially deposited particulate emissions from smelter operations, naturally occurring arsenic minerals, arsenic sorbed or coprecipitated to iron oxyhydroxide coatings, and waterborne contaminants from historical mining and industrial activities.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted two field investigations along this section of Prickly Pear Creek, just below Wylie Drive and below Canyon Ferry Road. At both sites, the stream's sinuosity was out of balance with the valley type setting, reflecting straightening of the channel. The entrenchment ratio at Wylie Drive displayed channel confinement, while the entrenchment ratio below Canyon Ferry Road was typical of a C-type stream (unconfined). Without channel modifications, both reaches would probably be Rosgen stream type C4.

At the site below Wylie Drive, the width-to-depth ratio was 30.4, or 43 percent greater than the average for southwestern Montana and Greater Yellowstone Area reference stream C-type streams (Table 3-22). The BEHI rating was low, and actually more stable than the averages for southwestern Montana C-type reference streams. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse gravels. This particle size is within the range expected for reference C4 stream types, based on data collected for southwestern Montana and the Greater Yellowstone Area. Part of the channel survey included an assessment of PFC. Tetra Tech/Land & Water rated the reach below Wylie Drive as "Non-functional"

(NF). The field crew noted that the stream was under-sized for the available channel, had a limited riparian zone, and displayed excess sediment deposition.

At the site below Canyon Ferry Road, the width-to-depth ratio was 47.2, over two times greater than the average for southwestern Montana and Greater Yellowstone Area reference stream C-type streams. The BEHI rating was "moderate." The BEHI score was slightly above the average (less stable) for southwestern Montana and Greater Yellowstone Area reference stream C-type streams, but within 10 percent of the reference value. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse gravels. This particle size is one size-class smaller than the range expected for reference C4 stream types, based on data collected for the Greater Yellowstone Area. Part of the channel survey included a Proper Functioning Condition assessment. The field crew rated the reach below Canyon Ferry Road as "Non-functional" (NF). The main reason for the rating was lack of flow, followed by the lack of diverse riparian vegetation. At the time of the survey, succulent vegetation was growing in the channel.

The riparian land type aggregate assigned to both survey sites is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive.

Table 3-22. Summary of cross-sectional data for Prickly Pear Creek, Segment MT41I006_030.

Site	Parameter	Result	Comparable to Reference
Below Wylie Drive	Width/depth ratio	30.4	No
Below Wylie Drive	BEHI	18	Yes
Below Wylie Drive	D_{50}	Very coarse gravels	Yes
Below Wylie Drive	PFC	NF	No
Below Canyon Ferry Road	Width/depth ratio	47.2	No
Below Canyon Ferry Road	BEHI	22.3	Yes
Below Canyon Ferry Road	D_{50}	Coarse gravels	No
Below Canyon Ferry Road	PFC	NF	No

McNeil Cores

McNeil core data are available for one site on this segment of Prickly Pear Creek, which corresponds to the channel survey site below Wylie Drive. Six cores were collected in 2003. The riparian aggregate here was determined to be 29, Alluvial Floodplains and Terraces (Table 3-23). The average percentage of fines less than 6.4 mm was 25.3percent, with average fine fines (less than 0.85 mm) at 6.1percent. The percentages of fines for both categories of fines are actually lower than the mean from reference cores for this riparian aggregate. The percentages of fines for both categories are about 25 percent less than the reference value averages.

Table 3-23. Summary of McNeil core data for Prickly Pear Creek, Segment MT41I006_030.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	25.3	6.1	Yes

Suspended Sediment Concentrations

Few recent data were available for this segment of Prickly Pear Creek. In the summers of 2003 and 2004, six total suspended solids samples were collected at two sites. The highest value collected was 5.7 mg/L in August 2003 above Stansfield Lake. No values were greater than what would be expected based on values from selected reference streams for suspended solids. However, most of the samples were collected during the receding limb of the hydrograph and during low flows.

In 2003 and 2004, eight visual observations of turbidity were recorded at two sites along this segment of Prickly Pear Creek. Seven observations of turbidity reported the water clarity as clear, and one reported the water clarity as slightly turbid below Wylie Drive. The observation of slight turbidity was reported in August 2003, and might have been influenced by algal growth and livestock in the stream upstream of the sampling site.

Macroinvertebrates

Macroinvertebrate data were available from two sampling events in August 2003. The first sampling site below Wylie Drive had a macroinvertebrate habitat rating of “suboptimal” because of marginal flow status and disruption of bank vegetation. Sampling results were compared with Bollman’s revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2003a). The metric score of 28 percent indicated moderate impairment and partial support of aquatic life uses. Eight clinger taxa and four trichoptera taxa were found at the site, and Bollman concluded that fine sediment might be limiting habitat for macroinvertebrates.

The second sampling site above Stansfield Lake had a habitat rating of “suboptimal” because of marginal flow status and a limited riparian zone. The metric score of 39 percent indicated moderate impairment and partial support of aquatic life uses. Eleven clinger taxa and four trichoptera taxa were found at the site, and once again Bollman concluded that fine sediment might be limiting habitat for macroinvertebrates.

Species composition at both sites suggested water quality was impaired by nutrient enrichment. The elevated biotic index at the Stansfield station could be associated with nutrient enrichment. The functional composition assemblage expected by filter feeders was dominant, suggesting nutrient enrichment (Bollman, 2003a). The HBI (4.99–6.00) from the two stations on this segment indicated some organic to fairly high significant organic pollution in this stream segment (Appendix D).

Periphyton

Periphyton data were also available from the two sampling events in August 2003. Sampling sites corresponded to the sites sampled for aquatic insects. Sampling results were compared with reference biocriteria metrics established for the Rocky Mountain Ecoregions of Montana (Bahls, 2004). At the sampling site below Wylie Drive, diatom metrics indicated minor impairment but full support of aquatic life uses. Bahls concluded that the impairment was primarily due to organic loading. The siltation index was below the threshold for minor impairment. A review of the sample processing notes indicated that little sediment was evident in the sample.

At the sampling site below Wylie Drive, diatom metrics indicated minor impairment and full support of aquatic life uses. Bahls concluded that the impairment was primarily due to organic loading. The siltation index was below the threshold for minor impairment. A review of the sample processing notes indicated that little sediment was evident in this sample as well.

Genera of green algae that were quite tolerant to organic pollution were common to abundant at this location when sampled in 2003. *Gomphonema parvulum* and *Gomphonema clavatum* were among the most abundant species. The latter species is somewhat tolerant of organic pollution. Most of the diatoms indicated eutrophic conditions. Macrophytes were present at the station above Stansfield Lake (M09PRPRC01). Other green algae were abundant here and indicated some organic enrichment. A diatom that is somewhat tolerant of organic pollution was the second most abundant species, and another pollution-tolerant diatom was the next most abundant (Bahls, 2004).

Several filamentous algal blooms were documented during the field visits, and on July 17, 2003, and August 28, 2003, an estimated 60 percent of the stream bottom was covered with algae. Diatom algae were also present in large proportions. Heavy growths of filamentous algae were noted in Prickly Pear Creek below East Helena during a 24-hour dissolved oxygen survey in August 2003. Abundant macrophytes and filamentous green algae growth were present at the Prickly Pear Creek station above Stansfield Lake (M09PRPRC01) just above the City of Helena wastewater outfall in August 2003.

During July and August 2003, three of four benthic algae values collected from Prickly Pear Creek above Stansfield Lake showed very high levels and were above the 37 mg/m^2 supplemental indicator value. Field forms completed during summer 2004 monitoring indicated that microalgae were observed in heavy concentrations (60 percent substrate coverage) at the station above Stansfield Lake. At the station below East Helena, microalgae and macroalgae showed 80 percent substrate coverage. Benthic algae values were very high from these two stations (51–81 mg/m^2) and well above the 37-mg/m^2 supplemental indicator value.

<u>Fish Populations</u>

The project team examined data from the Montana Fish, Wildlife and Parks MFISH database. Prickly Pear Creek is managed as a trout fishery. No species of special concern are thought to live in this segment of Prickly Pear Creek. Brown trout and mottled sculpin are reported to be common to abundant in this segment, and longnose sucker, white sucker, and rainbow trout are all year-round residents. Rainbow trout are rare to abundant in this lower stream segment of Prickly Pear Creek.

The overall habitat and sport fishery rating for the upper section of this segment is “moderate.” Montana Fish, Wildlife and Parks lists this entire segment as a chronic dewatering stream of concern. This designation applies to “streams that support important or contribute to important fisheries that are significantly dewatered by man-caused flow depletions,” and where “dewatering is a significant problem in virtually all years” (MFISH).

<u>Nutrient and Dissolved Oxygen Data</u>

Field measurements taken at the Prickly Pear Creek station below East Helena (M09PKPRC05) in July and August 2003 showed low dissolved oxygen concentrations. At the station above Stansfield Lake (M09PKPRC01), temperature, pH, and turbidity values were normal, dissolved oxygen was in the high range (10.1–13.8 mg/L), and flows were low in July and August 2003. Prickly Pear Creek was dry at the station at Canyon Ferry Road (M09PKPRC03) in July and August 2003.

Field measurements taken at the station below East Helena in late August 2004 showed a dissolved oxygen reading of 8.2 mg/L and a pH of 8.1 at a higher than average stream flow of 22.1 cfs. Stream flows were influenced by heavy rains in the valley the previous week. Flows were elevated above those taken in July and August 2003. Flow levels were approximately 8.2 cfs on August 27, 2004.

No nutrient data were available for the post-1996 period prior to the 2003 sampling events. In 2003, 50 percent of the samples collected (2 of 4) exceeded the total nitrogen target value of 0.34 mg/L at two stations, and 25 percent of the samples (1/4) exceeded the 0.027 mg/L total phosphorus target value. Nitrate + nitrite values in July and August 2003 were above the proposed supplemental indicator level of 0.04 mg/L at the station above Stansfield Lake.

In 2004, two of two samples exceeded the total phosphorus target value of 0.027 mg/L at the two stations in this segment. One sample taken at the station above Stansfield Lake had a soluble reactive phosphorus value above the supplemental indicator level of 0.011 mg/L. Two of two nitrate + nitrite-N values were above the proposed supplemental indicator level of 0.04 mg/L at each of the two stations.

In this stream segment, two 24-hour dissolved oxygen surveys were conducted in August 2003 at two stations (M09PKPRC01 and M09PKPRC05) (Appendix D). During the 24-hour dissolved oxygen survey at Prickly Pear Creek above Stansfield Lake in August 2003, dissolved oxygen fluctuated from a low of 4.6 mg/L at a night to a high of 9.1 mg/L during the mid-afternoon, indicating an abundance of primary productivity and a reduction of dissolved oxygen as a result of plant respiration (Appendix D).

Metals Concentrations

A total of four water samples for metals analysis were taken from this segment between July 2003 and August 2003. Arsenic concentrations in all samples exceeded the human health criterion. The average concentration in all samples was 145 percent higher than the human health criterion. The highest measured concentration was three times the human health criterion. No samples exceeded the aquatic life criteria for arsenic. This evidence shows that this segment does not meet the human health water quality criterion for arsenic.

Lead concentrations in all samples exceeded the chronic aquatic life criterion. The average concentration of all samples was 23 percent higher than the chronic aquatic life criterion. The highest measured concentration was 1.37 times the chronic aquatic life criterion. No samples exceeded the human health criterion for lead. This evidence shows that this segment does not meet the aquatic life chronic toxicity criterion for lead.

All samples were well below the human health and aquatic life (acute and chronic) criteria for cadmium, copper, and zinc. The limited evidence suggests that this segment meets the human health and aquatic life water quality standards for cadmium, lead, and zinc. Because of the limited data, this segment should be closely monitored in the future to confirm this statement.

Thermal Modifications

Limited temperature data were available for this segment of Prickly Pear Creek. During the summers of 2003 and 2004 eight temperature observations were recorded at two stations during synoptic sampling events (Table 3-24). The maximum temperature of 75.6° F was recorded on August 12, 2003, just before 5 p.m. at the sampling site below Wylie Drive (M09PKPRC05). Very low flows were observed in this segment of Prickly Pear Creek during summer 2003. As mentioned earlier, the stream went dry for about one-half mile of this segment near Canyon Ferry Road during the summer irrigation seasons of 2003 and 2004. All the temperatures recorded in 2003 and 2004 at the site above Stansfield Lake (M09PKPRC01, near the end of the segment) were below 70° F, and reflected the stabilizing influence of groundwater discharge on the stream's temperature.

Table 3-24. Statistical summary of synoptic water temperature data for Prickly Pear Creek, MT41I006_030.

Mean	64.9° F
Median	65.0° F
Standard deviation	7.7° F
Maximum	75.6° F
Number of samples	8
Number of sample sites	2

No suitable reference streams were identified for this segment of Prickly Pear Creek because of the stream's I classification. To assess "naturally occurring temperatures" in this segment of Prickly Pear Creek so that the temperature criteria could be more directly applied, SSTEMP modeling was conducted (Bartholow, 2002).

SSTEMP is a simplified, steady-state model capable of predicting the change in temperature along a stream reach. The model simulates the various natural heat flux processes found in a stream such as convection, conduction, and long- and short-wave radiation. Some of the various user inputs to the model are shown below.

- Hydrology: segment inflow, segment outflow, inflow temperature
- Channel geometry: segment length, upstream and downstream elevation, wetted width and depth, Manning's "n"
- Meteorology: segment latitude, average daily air temperature, relative humidity, wind speed, ground temperature, thermal gradient, possible sun (percentage), percentage of shade, time of the year

The model predicts mean, minimum, and maximum temperatures at a specified reach outflow under steady-state conditions. It also assumes that conditions along the reach such as air temperature, shade, and channel shape do not change. See Appendix H for a detailed discussion of the modeling procedures, scenarios, and results.

SSTEMP was used to simulate current conditions in Prickly Pear Creek (under the assumption that the stream flowed for the entire length of the segment) and various restoration conditions (for example, augmented flows). The model was calibrated with flow and temperature data obtained on August 7, 2003, during a 24-hour survey (Figure 3-7). The 24-hour survey occurred during hot, low-flow conditions in which the most pronounced changes in temperature (critical conditions) were expected to occur. The calibration model for segment MT41I006_030 produced a mean temperature of 68.7 ^{o} F. This result is within 1 percent of the measured value of 69.4 ^{o} F (Appendix H, Table 6).

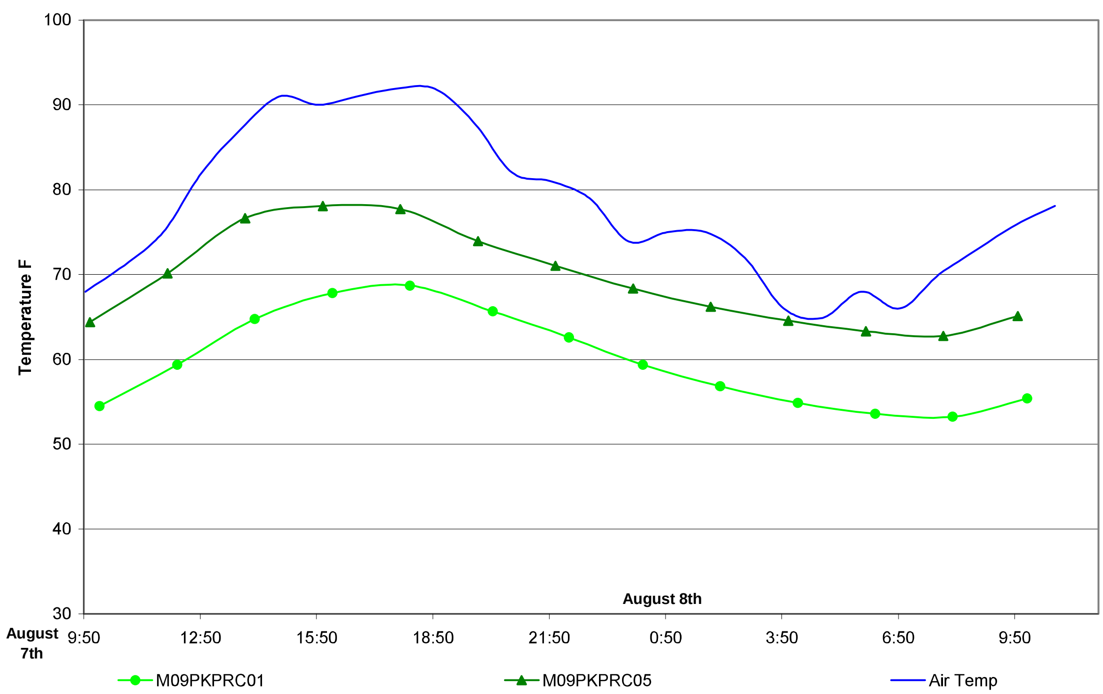

Figure 3-7. Diurnal water temperatures recorded on August 7–8, 2003 in Prickly Pear Creek, MT41I006_030

The model was then run for various flow conditions to predict water temperatures under various simulated scenarios. The model predicted a mean temperate of 64.3 ^{o}F under "natural conditions" which is 4.4 degrees less than the current mean temperature (Table 3-25). (The assumptions used for assessing "natural conditions" are described in Appendix H). This difference of 4.4^{o} F is above the standard that allows for only a 1-degree increase in water temperature.

Table 3-25. Current water temperature conditions versus natural conditions for Prickly Pear Creek, MT41I006_030.

Segment	Current Temperature (Mean)	Calibration Model Uncertainty (Mean)	Natural Temperature (Mean)	Natural Model Uncertainty (Mean)	Difference from Natural Value (Best and Worst Case)
MT41I006_030	68.7 ^{o} F	± 1.0 ^{o} F	64.3 ^{o} F	± 0.8 ^{o} F	**+4.4** ^{o} F (2.6 to 6.3)

Prickly Pear Creek Segment MT41I006_030 Water Quality Impairment Summary

The project reviewed data on potential pollution sources, channel metrics, (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, macroinvertebrates, periphyton, fisheries, stream temperatures, SSTEMP modeling, and water chemistry and dissolved oxygen.

The supplemental indicator values for D_{50} (median particle size) and BEHI were met or exceeded at the upstream sampling site. D_{50} at the downstream sampling site was smaller than expected, and might be a reflection of the effects of reduced bedload transport capacity due to artificially reduced flows. Only the channel metric of width-to-depth ratio did not meet standards at either site. The excessive width-to-depth ratios are probably a reflection of a widening of the stream course due to aggradation, and/or channel alterations for irrigation. A PFC rating of "Non-functional" (NF) at both sites reflected that the stream is unable to sustain expected hydrologic characteristics, riparian vegetation, and sediment transport capacities. Values for both classes of fines from McNeil cores were below the target values. Suspended sediment values were not adequate to make a determination. The results from the macroinvertebrates and diatom samples were contradictory. Recent fisheries data suggest that this segment of the stream provides limited habitat for few fish species.

The 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment, and that impairments to channel condition occurred for most of the length of this segment. Chronic dewatering of this segment presented a challenge for the interpretation of impairment status. However, supplemental indicator values such as width-to-depth ratio, D_{50}, Proper Functioning Condition rating, and macroinvertebrate indices were not being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Prickly Pear Creek Segment MT41I006_030 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The weight of evidence suggests that Prickly Pear Creek from Wylie Drive to the Helena wastewater treatment plant discharge is also impaired by nutrients. The available in-stream chemistry data indicate that total nitrogen, nitrate and nitrite, total phosphorus, and soluble reactive phosphorus concentrations exceed the proposed targets and supplemental indicator values. Periphyton density was also measured to be more than the proposed indicator value and large diurnal dissolved oxygen fluctuations were observed, indicating the presence of excessive algae. Furthermore, the macroinvertebrate data suggest that the aquatic community is stressed, partly due to nutrient enrichment. Potential nutrient sources include grazing, agricultural activities, and rural and subdivision developments. The loads from these sources are due to dewatering of the stream and the lack of healthy riparian vegetation. A TMDL will therefore be developed to address the nutrient impairment.

The available water chemistry data for metals suggest that Prickly Pear Creek from its crossing with Montana Highway 433 to the Helena wastewater treatment plant discharge ditch is also impaired by arsenic and lead. TMDLs will therefore be developed to address the arsenic and lead impairments.

Although limited in-stream temperature data were available, the weight of evidence suggests that Prickly Pear Creek from Wylie Drive to the Helena wastewater treatment plant discharge is impaired by thermal modifications. The temperature target was thought to be exceeded when the SSTEMP modeling analysis estimated mean water temperatures to be between 2 ºF and 4 ºF higher than natural. Results of the riparian assessments indicate that there are areas along this segment of Prickly Pear Creek with limited riparian zones. Neither of the two survey sites were rated as being in Proper Functioning Condition, in part because of the characteristics and/or lack of riparian vegetation. Again, recent fisheries data suggest that this segment of the stream provides limited habitat for few fish species. Pending the collection of additional data and further analysis, a TMDL will therefore be developed to address the temperature impairment.

3.4.1.5 Prickly Pear Creek from Helena WWTP Discharge Ditch to Lake Helena (MT41I006_020)

Stream segment MT41I006_020 was listed on Montana's 1996 303(d) list as not supporting aquatic life, cold-water fisheries, drinking water, swimming, and agricultural water uses because of siltation, suspended solids, habitat alterations, flow alterations, metals, nutrients, and un-ionized ammonia (the latter changed to total ammonia in 2002 following revisions of the Montana water quality standards). This segment is approximately 6 miles in length. In subsequent years, agricultural water uses were upgraded to full support, while thermal modifications, fish habitat degradation, and bank erosion were added to the suspected causes of impairment. A typical view of this segment is shown in the photo below.

The basis for the listings was three reports dating back to the late 1970s and early 1980s that summarized undesirable channel conditions, such as bank erosion, substrate embeddedness and removal of riparian vegetation. The supporting data also include the results of in-stream water chemistry and biological sampling conducted between July 2003 and September 2004.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey on the creek above Sierra Road that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, macroinvertebrate and periphyton data, fish population data, synoptic temperature data, SSTEMP stream temperature modeling, and water chemistry data for nutrients, ammonia, dissolved oxygen, and metals.

Prickly Pear Creek from Helena WWTP discharge ditch to Lake Helena

Pollution Sources

The 2003 preliminary source assessment identified localized and nonpoint agricultural sources, bare stream banks, and roads as the primary sediment sources for this segment of Prickly Pear Creek. Most of the source assessment inventory sites showed grazing-related sources, such as bank trampling and vegetation removal. The aerial photography inventory showed four road crossings. Major channelization of this segment was not apparent.

The primary geology of this sub-watershed is the Boulder Batholith, with Tertiary and Quaternary sediments prominent in the Helena Valley. The aerial photography inventory showed that failing stream banks were evident in areas with little to no riparian vegetation. At the mouth of the creek, deltaic sediment deposition was visible in Lake Helena. The widths of deciduous riparian buffers ranged from 0 to 215 feet and were correlated to land management practices. This segment is surrounded by private land, and the dominant land use consists of irrigated hay fields and pasture.

Upstream dewatering affects this reach of Prickly Pear Creek with groundwater discharge and irrigation return flow making a significant contribution to summer flow levels. Again, it is thought that the artificial dewatering of the channel affects the flow regime and sediment transport capacity of this segment of Prickly Pear Creek.

This stream segment is also affected by nutrients and metals. Irrigation return flows, grazing practices, a mixture of other agricultural nonpoint sources, upstream sources, and the Helena wastewater treatment plant contribute nutrients to this segment of Prickly Pear Creek. Diffuse sediment and nutrient sources from rural housing might also affect the stream. The Helena wastewater treatment plant outfall and groundwater discharges contribute to stream flow in this segment. Riparian condition and stream bank stability were poor in the reach just below the Helena wastewater treatment plant discharge. Poor grazing management practices were documented where excess nutrients, trampled banks, and a lack of riparian vegetation were observed. Before intercepting discharge from the wastewater treatment plant, groundwater recharge makes up the majority of flow in the stream.

The segment's upstream reaches (Prickly Pear Creek 030) are likely contributors of metals. In addition, Kendy et al. (1998) identified the following potential arsenic sources in the Lake Helena Valley: irrigation water from the Missouri River, aerially deposited particulate emissions from smelter operations, naturally occurring arsenic minerals, arsenic sorbed or coprecipitated to iron oxyhydroxide coatings, and waterborne contaminants from historical mining and industrial activities.

Channel Survey

In 2003, Tetra Tech and Land & Water Consulting conducted a field investigation along this section of Prickly Pear Creek, above Sierra Road. The stream's entrenchment ratio and sinuosity were out of balance with the valley type setting, reflecting channel confinement and straightening. Currently an F5, without channel modifications, the stream reach probably would be a Rosgen stream type C4. The width-to-depth ratio was 16.8, which is 21 percent less than the average for southwestern Montana and Greater Yellowstone Area C-type reference streams (Table 3-26). The BEHI rating was "high." The BEHI score was 84 percent higher (less stable) than the average for southwestern Montana and Greater Yellowstone Area C-type reference streams. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse sand. Although sands are the dominant substrate at this site, it is the professional opinion of the surveyors that the stream should naturally have gravels as the dominant substrate. Very coarse sand is four size-classes smaller than the range expected for C4-type reference streams, based on data collected for southwestern Montana and the Greater Yellowstone Area.

Part of the channel survey included an assessment of Proper Functioning Condition. Tetra Tech and Land & Water Consulting rated this site as "Non-functional" (NF), noting riprapped banks and lack of diverse or stabilizing riparian vegetation. The riparian land type aggregate assigned to this site is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive.

Table 3-26. Summary of cross-sectional data for Prickly Pear Creek, Segment MT41I006_020.

Parameter	Result	Comparable to Reference
Width/depth ratio	16.8	No
BEHI	37.3	No
D_{50}	Very coarse sands	No
PFC	NF	No

McNeil Cores

McNeil core data are available for one site on this segment of Prickly Pear Creek, which corresponds with the channel survey site. Six cores were collected in 2003. The riparian aggregate here was determined to be 29 (Alluvial Floodplains and Terraces) (Table 3-27). The average percentage of fines less than 6.4 mm was 42.3 percent, with average fine fines (less than 0.85mm) at 10.5 percent. These values are elevated by comparison with the means for fines from reference cores for riparian aggregate 29. The percentage of fines less than 6.4 mm for this site is about 25 percent greater than the reference value average, while the fine fines are 30 percent above the reference value average.

Table 3-27. Summary of McNeil core data for Prickly Pear Creek, Segment MT41I006_020.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	42.3	10.5	Both fines values are elevated.

Suspended Sediment Concentrations

Few recent data were available for this segment of Prickly Pear Creek. In summer 2003 and summer and fall 2004, six total suspended solids samples were collected at one site. The highest value collected was 44 mg/L in July 2003 at Sierra Road. This value is about four times greater than what would be expected based on low-flow values from selected reference streams for total suspended solids.

In 2003 and 2004, seven turbidity observations were recorded along this segment of Prickly Pear Creek at one site. Two turbidity observations reported the water clarity as turbid, two reported the water clarity as slightly turbid, and three reported the water clarity as clear.

Macroinvertebrates

Macroinvertebrate data from one sample taken in August 2003 above Sierra Road were available. The habitat rating for this site was marginal due to lower than expected stream flows, lack of in-stream habitat, and a limited riparian zone. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2003a). The metric score of 33 percent indicated moderate impairment and partial support of aquatic life uses. Twelve clinger taxa and four trichoptera taxa were found at the site, and Bollman concluded that "fine sediment deposition may have limited benthic habitat availability" (2003a).

Sampling site M09PKPRC02 above the Tenmile Creek confluence was moderately impaired and partially supported uses according to the 2003 macroinvertebrate report (Bollman, 2003a). The insect assemblage suggested nutrient enrichment. Water quality continued to be degraded downstream above Tenmile Creek. Nutrient enrichment was evidenced by prolific filter feeders and an abundance of tolerant animals, including mayflies, and microcaddisflies which are commonly associated with filamentous algae. The HBI score (5.04) indicated some organic pollution (Bollman, 2003a).

Periphyton

Periphyton data were available from one sample taken in August 2003 at a location on Prickly Pear Creek above Tenmile Creek (Sierra Road). Sampling results were compared with reference biocriteria metrics established for the Rocky Mountain Ecoregions of Montana (Bahls, 2004). Diatom metrics indicated moderate impairment and partial support of aquatic life uses. Bahls concluded that the primary cause of impairment was sedimentation. The siltation index exceeded the threshold for moderate impairment. Sampling notes indicated that considerable sediment was present.

Field notes taken on August 28, 2003 indicated substrate coverage was approximately 100 percent, with very homogeneous brown diatom algae and a few filamentous green algae. The 2003 periphyton survey results indicated moderate impairment at Prickly Pear Creek above Tenmile Creek. The primary cause of impairment was identified as sedimentation and the secondary cause as excessive organic loading. This site was dominated by filamentous green algae and diatom species tolerant of nutrient enrichment. Diatoms were extremely numerous. The dominant diatom species here was *Nitzschia amphibia*. This is a highly motile diatom that is somewhat tolerant of organic pollution. The next three most abundant species above Tenmile Creek were also tolerant of organic loading. Macrophytes were also common. The presence of filamentous green algae indicated elevated nutrient concentrations. This site was the only site that had red algae. Among the genera of freshwater red algae, *Audouinella* is the most tolerant of organic pollution. The site supported only eight genera of non-diatom algae, which was the smallest number among Prickly Pear Creek sites sampled in 2003. Most diatoms indicated eutrophic conditions at the Prickly Pear Creek site above Tenmile Creek (Bahls, 2004).

Field notes recorded during monitoring activities on July 27, 2004 at the Prickly Pear Creek station above Tenmile Creek indicated that macroalgae densities were again high with approximately 40 percent of substrate coverage. At the end of August 2004, macroalgae substrate coverage was also heavy with approximately 50 percent coverage. This had declined to 45 percent coverage by mid-September 2004, and levels of filamentous algae were described as heavy.

Fish Populations

The project team examined data from the Montana Fish, Wildlife and Parks' MFISH database. Prickly Pear Creek is managed as a trout fishery. No species of special concern are thought to live in this segment of Prickly Pear Creek. Longnose and white suckers are the only species of fish though to be abundant in this segment. The overall habitat and sport fishery rating for this segment is "moderate." Montana Fish, Wildlife and Parks lists most of this segment as a chronic dewatering stream of concern.

Nutrient-related Data

Field parameter measurements in July and August 2003 at the Prickly Pear Creek station above Tenmile Creek showed moderately high specific conductance values of 592 µS/cm to 623 µS/cm and dissolved oxygen readings ranging from 9.7 to 14.0 mg/L. Stream flows did not vary widely and were measured at 15.7 to 17.5 cfs during July and August (Appendix D).

Field parameter measurements from July to the middle of September 2004 at this same station showed very high dissolved oxygen readings (13.1–14.5 mg/L) and moderate flows ranging from 8.4 cfs on July 27, 2004, to 22.1 cfs at the end of August (the latter due to rainstorms the previous week). Flows remained in the moderate range in the month of September 2004 (18.8–31.4 cfs) (Appendix D). The higher flows occurred toward the end of the month and could have been due to the cessation of irrigation with wastewater effluent from the City of Helena or the termination of irrigation water withdrawals from Prickly Pear Creek.

No post-1996 ammonia-nitrogen data were available prior to the 2003–2004 sampling efforts. The City of Helena wastewater treatment plant was upgraded in June 2001. The original listing for this segment of Prickly Pear Creek was based on historical data for monitoring stations located below the treatment plant discharge before the facility was upgraded. Two total ammonia samples taken on July 17, 2003, and August 8, 2003, at Prickly Pear Creek above Tenmile Creek were below Montana's acute and chronic total ammonia nitrogen standards for early life fish stages (Appendix D). Four other total ammonia samples (taken on July 27, August 27, and September 9 and 24, 2004, at this same station on Prickly Pear Creek) were also below Montana's acute and chronic total ammonia nitrogen standards for early life fish stages (Appendix D).

No data for other nutrient variables were available for the post-1996 period until the 2003–2004 sampling efforts. One station, Prickly Pear Creek above Tenmile Creek, showed exceedances in all samples during the 2003 monitoring for total Kjeldahl nitrogen, total nitrogen, and total phosphate (Nitrate + nitrite-N values were also above the supplemental indicator value of 0.04 mg/L in July and August 2003. Soluble reactive phosphorus was extremely high (0.556–0.587 mg/L) and well above the supplemental indicator value of 0.011 mg/L in July and August 2003 (Appendix D). Very large diurnal fluctuations were documented at this station during the 24-hour dissolved oxygen sampling in August 2003 (Appendix D). Twenty-four-hour dissolved oxygen values ranged from a low of 4.9 mg/L late at night to a high of 17.9 mg/L in the mid-afternoon. Total suspended solids values were high in mid-July 2003 (44 mg/L) and well above the supplemental indicator value of 23 mg/L. The 2003 periphyton chlorophyll-*a* values were very high, ranging from 113 to 332 mg/m^2. The supplemental indicator value for periphyton chlorophyll *a* was established at 37 mg/m^2 (Appendix D).

During each of the 2004 sampling events, Prickly Pear Creek above Tenmile Creek showed exceedances of all of the nutrient targets and supplemental indicators, with the exception of total ammonia. total Kjeldahl nitrogen concentrations ranged from 0.398 to 0.46 mg/L, total nitrogen ranged from 1.37 to 2.6 mg/L, and total phosphorus ranged from 0.458 to3.45 mg/L. Nitrate + nitrite-N varied from 0.99 to 2.21 mg/L and soluble reactive phosphorus was ranged from 0.281 to 0.348 mg/L, which are above the supplemental indicator value thresholds (Appendix D). The 2004 periphyton chlorophyll-*a* measurements were also very high and ranged from 44.2 to 89.9 mg/m^2 from August through September 2004 (Appendix D).

Metals Concentrations

Only two in-stream water chemistry samples taken between July and August 2003 were available for evaluation. Arsenic concentrations in both samples exceeded the human health criterion. One sample exceeded the chronic aquatic life criterion for cadmium. The concentration in this sample was 1.8 times the chronic human health criterion. One sample exceeded the human health and chronic aquatic life criteria for lead. This sample was 2.8 times the chronic aquatic life criterion, and 1.73 times the human health criterion. Both samples were below the human health and aquatic life criteria for copper and zinc. The limited evidence suggests that this segment meets the human health and aquatic life criteria for copper and zinc. Because of the limited data, this segment should be closely monitored in the future to confirm this statement.

Thermal Modifications

Limited temperature data were available for this segment of Prickly Pear Creek. Six temperature observations were recorded at one station during synoptic sampling events in the summers of 1995, 2003, and 2004 (Table 3-28). A maximum temperature of 73.4° F was recorded on July 17, 2003, at 1:30 p.m. at the Prickly Pear Creek sampling site above Tenmile Creek (Sierra Road, M09PKPRC02). All the temperatures recorded in 2004 were below 70° F, whereas all the temperatures recorded in 2003 were above 70° F. This reflected the difference between the summer temperatures of 2003 (extremely hot) and 2004 (mild).

Table 3-28. Statistical summary of synoptic water temperature data for Prickly Pear Creek, MT41I006_030.

Mean	66.0° F
Median	68.7° F
Standard deviation	7.7° F
Maximum	73.4° F
Number of samples	6
Number of sample sites	1

No suitable reference streams were identified for this segment of Prickly Pear Creek primarily because of the stream's I classification. In order to assess "naturally occurring temperatures" in this segment of Prickly Pear Creek so that the temperature criteria could be more directly applied, SSTEMP modeling was conducted (Bartholow, 2002). See Appendix H for a detailed discussion of the modeling procedures, scenarios, and results.

SSTEMP was used to simulate current conditions in Prickly Pear Creek and various restoration conditions (for example, increased riparian vegetation density). The model was calibrated with flow and temperature data obtained on August 7, 2003, during a 24-hour survey (Figure 3-8). The survey occurred during hot, low-flow conditions when the most pronounced changes in temperature would be expected (critical conditions). The calibration model for segment MT41I006_020 produced a mean temperature of 64.1 ^{o} F. This result is within 1 percent of the measured value of 65.0^{o} F (Appendix H, Table 6).

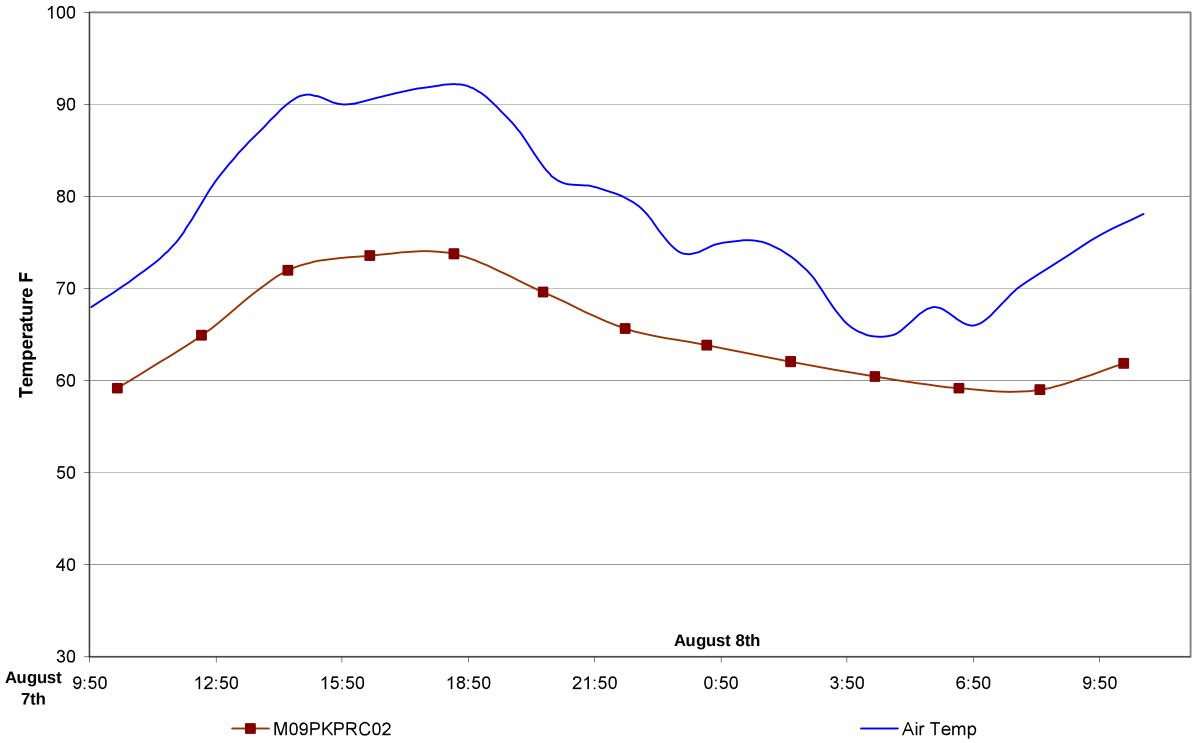

Figure 3-8. Diurnal water temperatures recorded on August 7–8, 2003 in Prickly Pear Creek, MT41I006_020

The model was then run for various flow conditions to predict water temperatures under various simulated scenarios, including "natural" conditions. The model predicted a mean temperature under natural conditions of 63.9° F, which is 0.2 degrees less than the current mean temperature (Table 3-29). This difference of 0.2° F does not violate the temperature standard for class B-1 streams (streams naturally less than 67° F). However, once model uncertainty is accounted for, the worst-case scenario predicts that the stream could be as much as 3.2 degrees above its natural temperature.

Table 3-29. Current water temperature conditions versus natural conditions for Prickly Pear Creek, MT41I006_030.

Segment	Current Temperature (Mean)	Calibration Model Uncertainty (Mean)	Natural Temperature (Mean)	Natural Model Uncertainty (Mean)	Difference from Natural Value (Best and Worst Case)
MT41I006_020	64.1 ° F	± 1.8 ° F	63.9 ° F	± 1.2 ° F	-0.2 ° F (2.8 to **3.2**)

Prickly Pear Creek Segment MT41I006_020 Water Quality Impairment Summary

The project team has reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition rating), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, macroinvertebrates, periphyton, fisheries, stream temperatures, SSTEMP modeling, and water chemistry and dissolved oxygen.

No targets or supplemental sediment indicators were met. Width-to-depth ratio was less than expected and is probably a reflection of channel alterations or flow depletion. D_{50} at the survey site was much smaller than expected, and might be a reflection of the effects of reduced bedload transport capacity caused by artificially reduced flows and/or excessive deposition of fine sediments. The BEHI rating of high indicated that the stream banks are likely sources of sediment in the stream and might not be capable of withstanding high flows. A Proper Functioning Condition rating of "Non-functional" (NF) at the channel survey site reflected that the stream is unable to sustain expected hydrologic characteristics, riparian vegetation, and sediment transport capacities. Values for both classes of fines from McNeil cores were above the target values. Suspended sediment values were not adequate to make a determination. The results of the macroinvertebrate and diatom samples indicate impairment by sedimentation. Recent fisheries data suggest that this segment of the stream provides limited habitat for few fish species.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment. Although chronic dewatering of this segment could present a challenge for the interpretation of impairment status, no targets and few supplemental sediment indicators were being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in this segment are impaired by siltation and suspended solids. A TMDL will therefore be developed to address the sediment impairment.

The weight of evidence suggests that Prickly Pear Creek from the Helena wastewater treatment plant discharge ditch to Lake Helena is impaired by nutrients. The available in-stream chemistry data indicate that total nitrogen, total Kjeldahl nitrogen, nitrate and nitrite, total phosphorus, and soluble reactive phosphorus concentrations exceed the proposed targets and supplemental indicators. Periphyton chlorophyll *a* was also measured at greater than the proposed indicator value, and large diurnal dissolved oxygen fluctuations were observed, indicating the presence of excessive algae. Furthermore, the macroinvertebrate and periphyton data suggest that the aquatic community is stressed, partly due to nutrient enrichment. Potential nutrient sources include irrigation return flows, grazing, discharge from the wastewater treatment plant, agricultural activities, and rural developments. A TMDL will therefore be developed to address the nutrient impairment. All of the samples taken for total ammonia-nitrogen in 2003 and 2004 were below Montana's acute and chronic total ammonia nitrogen standards for early life fish stages (Appendix D), reflecting a resolution of this former problem as a result of wastewater treatment plant upgrades and summer irrigation usage of much of the plant's effluent. Therefore, a TMDL will not be developed to address total ammonia.

Relative to metals, the very limited available evidence suggests that Prickly Pear Creek from the Helena wastewater treatment plant discharge ditch to Lake Helena is impaired by arsenic, cadmium, and lead. TMDLs will therefore be developed to address the arsenic, cadmium, and lead impairments.

Very limited in-stream temperature data were available for this segment of Prickly Pear Creek. However, the weight of evidence suggests that Prickly Pear Creek from Wylie Drive to the Helena wastewater treatment plant discharge is impaired due to thermal modifications. When uncertainty is factored into the SSTEMP modeling analysis, the temperature target could be exceeded by 3 ºF above the natural temperature. Results of the riparian assessments indicate that there are areas along this segment of Prickly Pear Creek with limited riparian zones. The stream survey site was rated as "Non-functional" (NF), in part due to the characteristics of the riparian vegetation. Pending the collection of additional data and further analysis, a TMDL will therefore be developed to address the temperature impairment.

3.4.1.6 Golconda Creek from the Headwaters to the Mouth (MT41I006_070)

In 1996, the cold-water fishery, aquatic life, drinking water, and body contact recreational uses in the 3.7 miles of Golconda Creek were listed as not supported because of suspended solids, turbidity, metals, and unknown toxicity. One basis for the listing was a citizen complaint in 1989 that the creek would turn milky white during high flows. The source of the turbidity was found to be tailings piles at the headwaters of a tributary stream to Golconda Creek. In subsequent years, the segment has been listed for siltation, channel incisement, other habitat alterations, and metals (including specific reference to arsenic, lead, and mercury). The unknown toxicity listing was removed from the 303(d) lists once the sources of milky turbidity were discovered (the tailings piles). A typical view of Golconda Creek is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey 1.5 miles above the mouth that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, fish population data, and the results of four in-stream water chemistry samples taken between October 2000 and August 2003.

Golconda Creek

Pollution Sources

The 2003 preliminary source assessment identified roads, geology, tributary streams, and mining operations as the primary sediment sources for Golconda Creek. The aerial photography inventory showed two road crossings and road encroachment along 20 percent of the stream.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. The field source assessment revealed poorly developed soils with gully formations on steep slopes in upland areas and on road cut-and-fill slopes. Deposition of sand was observed in the stream channel at the field sampling sites. The aerial photography inventory showed that extensive conifer and deciduous riparian buffers were present in the headwaters and along most of the stream managed by the BLM. Closer to the mouth, the widths of riparian buffers are reduced by development and landscaping in the floodplain. Some clear-cut logging has occurred on BLM lands in the vicinity of tributary streams to the west of Golconda Creek, but the sites do not appear to be recent harvest operations.

No evidence of placer mining was observed, but a large mine dump of waste rock was visible just upslope from the creek near the mouth on private property. Most of the creek is surrounded by BLM lands that are managed for grazing. The last half-mile of the creek is surrounded by private property that is developed for rural home sites.

In summary, sediment sources generated by road runoff and erosive geology are probably the biggest contributors of sediment to Golconda Creek. Land disturbance appears to exacerbate erosion in the Boulder Batholith geology and the poorly developed soils of this sub-watershed.

Expected relevant sources of metals in the stream are the historical mining activities in the watershed. During source assessment efforts, old mining areas were observed in tributary drainages to the west of the main stem of Golconda Creek, and significant mining disturbances were observed on private lands near the main stem. The entire drainage area of the stream falls within the Alhambra mining district of Montana. The MBMG Abandoned and Inactive Mines database reports surface-underground, prospect, and underground mining activities in the watershed. The historical mining types include lode mining. In the past these mines produced copper, silver, lead, gold, and zinc. The State of Montana's inventory of mine sites shows three mines in the drainage: Buckeye, Golconda, and Big Chief. The last of these three is closest to the stream and once produced lead, zinc, gold, and silver. None of the mines in the basin is listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation on Golconda Creek, about 1.5 miles above the mouth. The field crew determined the stream to be a Rosgen stream type B4a. The width-to-depth ratio was 9.4, which is comparable to B4a and A4 reference streams that the Helena National Forest has inventoried (Table 3-30). The BEHI rating was "moderate." The BEHI score was slightly above the average (less stable) for southwestern Montana and Greater Yellowstone Area A- and B-type reference streams, but within 15 percent of the reference values. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse gravels. This median particle size is within the range expected for A4 and B4 reference stream types, based on data collected for the Helena National Forest and southwestern Montana and the Greater Yellowstone Area.

Part of the channel survey included a Proper Functioning Condition assessment. The field crew rated this site as "Proper Functioning Condition" (PFC), but noted some sediment deposition. The riparian land type aggregate assigned to this site is 11, defined as Granitic Rock – Rolling Uplands. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common and can be excessive.

Table 3-30. Summary of cross-sectional data for Golconda Creek, MT41I006_070.

Parameter	Result	Comparable to Reference
Width/depth ratio	9.4	Yes
BEHI	23.7	Yes
D_{50}	Very coarse gravels	Yes
PFC	PFC	Yes

McNeil Cores

McNeil core data are available for one site on Golconda Creek, which corresponds to the channel survey site. Six cores were collected. The riparian aggregate here was determined to be 11, Granitic Rock – Rolling Uplands (Table 3-31). The average percentage of fines less than 6.4 mm was 35.6 percent, with average fine fines (less than 0.85 mm) at 12.4 percent. The percentage of fines less than 6.4 mm for this site is about equal to the mean from reference cores for this riparian aggregate, but the fine fines are 22 percent above the mean.

Table 3-31. Summary of McNeil core data for Golconda Creek, MT41I006_070.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
11	2003	35.6	12.4	Fine fines value is elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Few data were available for Golconda Creek. Two samples for suspended sediment were collected at one site in 2000 and 2001. The highest value collected was 3 mg/L in May 2001.

In 2003, two turbidity observations were recorded for Golconda Creek at one site above the mouth. Both observations reported the water clarity as clear, yet the observations were made during the recessional limb of peak flow and also during low flow.

Macroinvertebrates

No recent data are available.

Periphyton

No recent data are available.

Fish Populations

The project team examined data from the Montana Fish, Wildlife and Parks' MFISH database. Montana Fish, Wildlife and Parks has no listing information or management strategy for Golconda Creek.

Metals Concentrations

Cadmium concentrations in all samples exceeded the chronic aquatic life criterion. The average cadmium concentration in all samples was 63.8 percent higher than the chronic aquatic life criterion. The highest measured value was 2.3 times the chronic aquatic life criterion. No samples exceeded the human health criterion for cadmium. This evidence shows that this segment does not meet the aquatic life criterion for cadmium.

Lead concentrations in all samples exceeded the chronic aquatic life criterion. The average of all samples was 627 percent higher than the chronic aquatic life criterion. The highest measured value was 16.2 times the chronic aquatic life criterion for lead. No samples exceeded the human health criterion for lead. This evidence shows that this segment does not meet the aquatic life criterion for lead.

All samples were below the human health and aquatic life criteria for arsenic, copper, and zinc. The highest measured concentration of zinc was 78 percent of the chronic aquatic life criterion. This is a borderline value. This evidence suggests that this segment meets the human health and aquatic life criteria for arsenic, copper, and zinc. Because of the limited data, this segment should be closely monitored in the future to confirm this statement.

Golconda Creek MT41I006_070 Water Quality Impairment Summary

The project team has reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, fisheries, and water column metals concentrations.

Comparisons against the targets and supplemental indicators are mixed. Supplemental indicators for all channel metrics were met. A Proper Functioning Condition rating of PFC reflects that the stream is able to sustain expected hydrologic characteristics, riparian vegetation, and sediment transport capacities. The percentage of fines less than 0.85 mm from McNeil cores was slightly above the target value, but the percentage of fines less than 6.4 mm was about equal to the target value. Suspended sediment data were not adequate to make a determination.

Results from the 2003 preliminary source assessment revealed that eroding sediment sources affecting the stream were enhanced by the erosive granitic geology. Best management practices for roads were warranted along the upper end of Golconda Road. Most of the targets and supplemental indicators were being met. The value for fine fines was two-tenths of a percentage point outside the 95 percent confidence interval for the mean, and the median value was within the 95 percent confidence interval.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Golconda Creek are not impaired by sediment. A TMDL therefore will not be developed to address sediment impairment.

The limited water chemistry data suggest that Golconda Creek is impaired by cadmium and lead. TMDLs will therefore be developed to address the cadmium and lead impairments.

3.4.1.7 Corbin Creek from the Headwaters to the Mouth (MT41I006_090)

In 1996, the aquatic life, cold-water fishery, drinking water, recreational, and agricultural uses in the 2.5 miles of Corbin Creek were listed as non-supported because of suspended solids, metals, pH, salinity/total dissolved solids/chlorides, and other inorganics. The basis for the 1996 listing was a series of reports dating from the 1980s to 1990s that described severe impairments of the stream from abandoned mines and riparian grazing. In subsequent years, agricultural water uses were upgraded from non-supporting to partially supporting, and thermal modifications and habitat alterations were added to the list of impairment causes for Corbin Creek. Salinity, total dissolved solids, and chlorides did not appear as impairment causes on either the 2002 or 2004 303(d) lists. A typical view of Corbin Creek is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey about a half-mile above the mouth that included a Proper Functioning Condition assessment and Wolman pebble counts, suspended sediment data, fish population data, synoptic temperature data, and the results of two in-stream water chemistry samples taken between July and August 2003. Earlier water chemistry data that were available for Corbin Creek were not included in the analysis because they do not reflect current water quality conditions.

Corbin Creek

Pollution Sources

The 2003 preliminary source assessment identified roads, grazing, geology, and mine reclamation as the primary sediment sources for Corbin Creek. The aerial photography inventory showed six road crossings and road encroachment along 17 percent of the stream. The stream is channelized though the town of Corbin. Field source assessment sites consisted primarily of road and grazing sources.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. During the field source assessment, gully and rill erosion on steep slopes and on road cut-and-fill slopes were observed transporting sediment directly to the stream. Excessive deposition of sand was observed in the stream channel. The aerial photography inventory showed that sparse riparian buffers were present only in the headwaters portion of the stream. Most of the creek is surrounded by private lands, which are managed for grazing. The last one-quarter mile of the creek flows through the small town of Corbin.

Extensive channel alterations from historical mining and mine reclamation begin up the southern headwater tributary. The stream is incised, overly widened, and straightened. In an effort to remove toxic mine spoils and related contaminants, the Montana State Mine Waste Cleanup Bureau reclaimed a half-mile of the channel about a mile above the mouth. There has been little re-growth of riparian vegetation. During field sampling in summer 2003, the creek was dry at the mouth beginning in early July. Upstream, flow was observed at less than 1 cfs for most of the season.

In summary, sediment sources generated by road runoff, grazing, and channel alterations from mine reclamation are probably the biggest contributors of sediment to Corbin Creek. Land disturbance appears to exacerbate erosion in the Boulder Batholith geology and the poorly developed soils of this sub-watershed. Severe channel alterations begin after the first road crossing and continue on to the mouth.

Expected significant contributors of metals to the stream segment are historical hard rock mining activities in the watershed. Most of the drainage area of the stream falls within the Colorado mining district of Montana, with a small part of the headwaters in the Clancy district. The MBMG Abandoned and Inactive Mines database reports mineral location, surface, surface-underground, and underground mining activities in the watershed. The historical mining types include placer mining. In the past, these mines produced copper, silver, lead, zinc, and gold. Two of the mines in the basin are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites: Bertha and Alta mines – both in the Colorado mining district portion of the watershed. As was mentioned earlier, recent reclamation efforts have taken place in the watershed.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation on Corbin Creek, about one-half mile above the mouth. The field crew determined the stream to be a Rosgen stream type B5a, but without disturbance it should probably have been a B4a. The width-to-depth ratio was 30.9, which is about two times greater than other Ba-type reference streams that the Helena National Forest has inventoried, as well as other A- and B-type reference streams that have been inventoried for southwestern Montana and the Greater Yellowstone Area (Table 3-32). This is probably a reflection of the channel alterations from mine reclamation. The BEHI rating was "high," which is 80 percent above the average (less stable) for southwestern Montana and Greater Yellowstone Area reference stream A- and B-type streams. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse sands. There are no similar A5 or B5 reference streams to compare this value with. However, as mentioned before, it is the professional opinion of the surveyors that the stream should naturally have gravels as the dominant substrate.

Part of the channel survey included an assessment of Proper Functioning Condition. The field crew rated this site as “Non-functional” (NF), citing excessive sediment deposition, lack of flow, and lack of riparian vegetation. The riparian land type aggregate assigned to this site is 11, Granitic Rock – Rolling Uplands. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common and can be excessive.

Table 3-32. Summary of cross-sectional data for Corbin Creek, MT41I006_090.

Parameter	Result	Comparable to Reference
Width/depth ratio	30.9	No
BEHI	38.6	No
D_{50}	Coarse sands	NA
PFC	NF	No

McNeil Cores

McNeil core data are not available for Corbin Creek. No cores were taken, based on the professional judgment that fish do not inhabit the stream.

Suspended Sediment Concentrations

High turbidity levels in Corbin Creek documented prior to the 1996 303(d) listing were thought to originate from suspended solids or excessive aluminum concentrations. Turbidity values from sampling in April 1980 were as high as 480 Jackson Candle Units.

There are no recent suspended sediment data for Corbin Creek. In 2003, two turbidity observations were recorded on Corbin Creek at one site above the mouth. The first observation in July reported the water as slightly turbid with a rust-colored tint. The second observation reported the water clarity as clear.

Macroinvertebrates

No recent data are available.

Periphyton

No recent data are available.

Fish Populations

Data were examined from the Montana Fish, Wildlife and Parks’ MFISH database. Montana Fish, Wildlife and Parks has no listing or management strategy for Corbin Creek and the Helena National Forest has not documented fish presence either.

Metals Concentrations

The results of only two recent sample analyses made between July and August 2003 were available for review. Samples taken previously were not evaluated because they do not reflect current conditions of the stream.

One of the samples exceeded the human health criterion for arsenic. The arsenic concentration in this sample was 1.3 times the human health criterion for arsenic. Both samples were below the aquatic life criteria for arsenic. This evidence suggests that this segment does not meet the human health criterion for arsenic.

Cadmium concentrations in both samples exceeded the human health and aquatic life (chronic and acute) criteria. The average of both samples was 141 percent, 3,255 percent, and 660 percent higher than the aquatic life acute, aquatic life chronic, and human health criteria, respectively. The highest measured concentration was 52 times the chronic aquatic life criterion. This value was 11.8 times the human health criterion. This evidence shows that this segment does not meet the human health and aquatic life standards for cadmium.

Copper concentrations in both samples exceeded the acute and chronic aquatic life criteria. The average of all samples was 397 percent and 797 percent higher than the aquatic life acute and chronic criteria, respectively. The highest measured concentration was 16 times the chronic aquatic life criterion. None of the samples exceeded the human health criterion. This evidence shows that this segment does not meet the aquatic life standards for copper.

One sample exceeded both the human health and the chronic aquatic life criteria for lead. This sample was 3.6 times the human health criterion, and 1.5 times the chronic aquatic life criterion. The average of all samples was 120 percent higher than the human health criterion, and just 10 percent lower than the chronic aquatic life criterion. This evidence shows that this segment does not meet the human health or aquatic life standards for lead.

Zinc concentrations in both samples exceeded the human health and chronic and acute aquatic life criteria. The average concentration of both samples was 3,831 percent, 3,831 percent, and 1,137 percent higher than the aquatic life acute, aquatic life chronic, and human health criteria for zinc. The highest measured concentration was 67.9 times the chronic and acute aquatic life criteria, and 21.4 times the human health criterion. This evidence shows that this segment does not meet the human health or aquatic life standards for zinc.

Thermal Modifications

Very limited temperature data were available for Corbin Creek. In summer 2003, two temperature observations were recorded at one station during synoptic sampling events. The maximum temperature of 78.8 °F was recorded on August 18, 2003, just before 4 p.m. at the sampling site above the town of Corbin. A thermograph was deployed in Corbin Creek, but the stream went dry at the thermograph site within 2 weeks of deployment. The actual date the stream went dry is unknown, and thus the data were not considered. Extremely low flows were observed in Corbin Creek during the summer of 2003, with all measured flows well under 0.5 cfs.

"Naturally occurring temperatures" were not assessed in Corbin Creek in part because of the unique unnatural circumstances that mining and mine reclamation have imposed on Corbin Creek, and also because of the fact that fish do not inhabit the stream.

Salinity/Total Dissolved Solids/Chlorides

Very little recent salinity data were available for Corbin Creek. The two salinity samples obtained in 2003 (1,171 and 1,915 µS/cm) indicated that the salinity targets are exceeded. However, 2003 was a very dry year with little flow and the samples might not represent normal conditions in the creek. Figure 3-9 compares the samples obtained at several streams in the Lake Helena watershed in 2003. Even though all the streams had very low flow, only Corbin Creek exceeded the average and maximum targets. In addition, the maximum salinity in Corbin Creek was more than twice any other salinity concentration (Table 3-33). Together, this information suggests that Corbin Creek is impaired because of salinity and total dissolved solids.

As discussed above, beneficial uses are impaired by metals (arsenic, cadmium, copper, lead, and zinc) in Corbin Creek. Metals are usually one small portion of the total dissolved solids in a stream. However, high metals concentrations (as seen in Corbin Creek) also result in elevated total dissolved solids and salinity. The metals data shows that trace metals make up an unusually large proportion of the total dissolved solids in Corbin Creek (Table 3-34). Arsenic, cadmium, copper, lead, and zinc make up almost 2 percent of the total dissolved solids – three orders of magnitude more than in other streams in the Lake Helena watershed. Iron (although not sampled) is also most likely very high as well, because red precipitates were noted in the stream during sampling.

In conclusion, the available data suggest that Corbin Creek is impaired by salinity and total dissolved solids but not chlorides. Furthermore, the impairment is likely associated with the extremely high trace metals concentrations rather than high concentrations of sulfates, sodium, or chlorides.

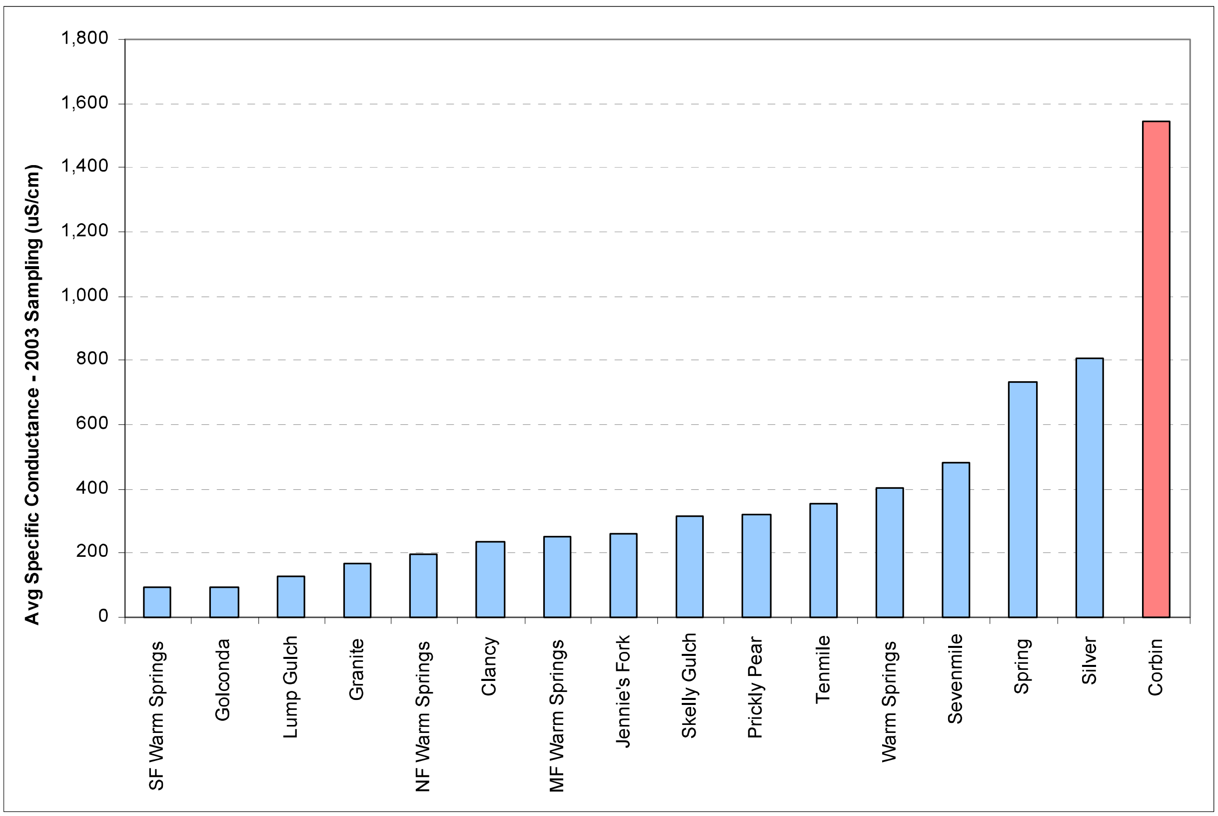

Figure 3-9. Average salinity in selected streams in the Lake Helena watershed in 2003.

Table 3-33. Summary of salinity data in selected streams in the Lake Helena watershed (µS/cm).

Major Water Body	Count	Min	Max	Avg
Clancy Creek	6	192	289	236
Corbin Creek	**2**	**1,171**	**1,915**	**1,543**
Golconda Creek	2	89	103	96
Granite Creek	2	140	195	167
Jennie's Fork	2	254	269	262
Lump Gulch	6	79	176	126
Prickly Pear Creek	22	71	623	319
Sevenmile Creek	4	402	554	481
Silver Creek	2	772	838	805
Skelly Gulch	2	313	318	316
Spring Creek	3	666	773	735
Tenmile Creek	3	156	506	356
Warm Springs Creek	2	338	467	403
Warm Springs Creek Middle Fork	2	227	272	250
Warm Springs Creek North Fork	3	185	211	195
Warm Springs Creek South Fork	1	91	91	91

Table 3-34. Average metals concentrations in selected streams in the Lake Helena watershed, 2003 sampling (µg/L)

Major Water Body	Arsenic	Cadmium	Copper	Lead	Zinc	Sum
Clancy Creek	14.8	0.6	5.0	4.5	93.0	**98**
Corbin Creek	7.0	38.0	427.5	33.0	24,735.0	**24,768**
Golconda Creek	1.0	0.2	1.0	4.5	27.0	**32**
Granite Creek	1.5	0.1	1.0	1.0	1.0	**2**
Jennie's Fork	4.0	0.1	4.5	9.5	41.5	**51**
Lump Gulch	2.2	0.3	1.2	1.0	87.2	**88**
Prickly Pear Creek	8.0	0.3	2.2	4.3	50.9	**55**
Sevenmile Creek	17.3	0.1	1.0	1.0	1.0	**2**
Silver Creek	15.5	0.1	5.0	3.5	1.0	**5**
Skelly Gulch	9.5	0.1	1.0	1.0	1.0	**2**
Spring Creek	22.5	1.4	34.5	68.0	235.5	**304**
Tenmile Creek	20.3	0.3	1.3	1.0	42.3	**43**
Warm Springs Creek	14.5	0.1	1.0	1.0	7.0	**8**
Warm Springs Creek - Middle Fork	42.0	0.7	1.0	1.5	179.5	**181**
Warm Springs Creek - North Fork	3.7	0.1	1.0	1.0	1.0	**2**
Warm Springs Creek - South Fork	6.0	0.1	1.0	1.0	1.0	**2**
Median	**8.8**	**0.2**	**1.1**	**1.3**	**34.3**	**37**

Corbin Creek MT41I006_090 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), fisheries, stream temperature data, and water chemistry. Because Corbin Creek does not currently support fish, it would be inappropriate at this point in time to set TMDL target values based on the percentage of subsurface fines. However, once toxicant levels are reduced in the stream, Corbin Creek should be expected to sustain a fish population and the application of the McNeil core targets could be appropriate.

Although data for the target sediment variables are unavailable, no supplemental indicator threshold values are being met. An extremely high width-to-depth ratio suggests the probability of hydromodification associated with channel alterations and possibly mine reclamation. D_{50} at the survey site was estimated to be an order of size-class smaller than expected, and is probably a reflection of excessive deposition of fine sediments as well as an indication of the extreme channel alterations that have occurred. A Proper Functioning Condition rating of “Non-functional” reflects that the stream is unable to sustain expected hydrologic characteristics, riparian vegetation, and sediment transport capacities. A “high” BEHI rating indicated that the stream banks are likely sources of sediment to the stream and might not be capable of withstanding high flows. Suspended sediment data values were not adequate to make a determination.

Results from the 2003 preliminary source assessment revealed that actively eroding sediment sources were affecting the stream. These sources were enhanced by the erosive granitic geology. Regarding sediment inputs, an almost total lack of riparian vegetation indicates that runoff is minimally filtered before entering the stream, and that stream banks are potentially unstable. An apparent loss of channel maintaining flows has negative implications for sediment load transport.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Corbin Creek are impaired by siltation and possibly suspended solids. A TMDL will therefore be developed to address the sediment impairment.

Despite the very limited number of available water chemistry samples, there is overwhelming evidence that suggests Corbin Creek is impaired by arsenic, cadmium, copper, lead, and zinc. TMDLs will be developed to address the arsenic, cadmium, copper, lead, and zinc impairments.

At this time, insufficient information is available to make a decision on thermal impairments in Corbin Creek. However, the available data suggest that impairments due to metals and siltation currently far outweigh any concerns posed by thermal modifications. The stream survey site was rated as Non-functional, in part because of an almost total lack of riparian vegetation. Fisheries data suggest that the stream is not inhabited by fish. It is not recommended that a TMDL for temperature be prepared at this time. Once pollutant levels are reduced in the stream, Corbin Creek should be able to sustain a fish population and the application of the B-1 temperature targets would be appropriate.

The available data suggest that Corbin Creek is impaired by salinity and total dissolved solids but not by chlorides. Furthermore, the impairment is likely associated with extremely high trace metals concentrations rather than high concentrations of sulfates, sodium, or chlorides. The project team finds that a specific TMDL to address salinity and total dissolved solids issues is not warranted pending implementation of a metals TMDL.

3.4.1.8 Spring Creek from Corbin Creek to the Mouth (MT41I006_080)

In 1996, this 1.7-mile segment of Spring Creek was listed as not supporting its designated aquatic life, cold-water fishery, drinking water, recreation, and agricultural water uses because of suspended solids, habitat alterations, nutrients, metals, and pH. The basis for the listing was elevated concentrations of metals, total suspended solids, and turbidity in grab samples collected from 1974 to 1981, and a report that described turbid water conditions in the stream during storm events only below the confluence with Corbin Creek. In subsequent years, recreational water uses were upgraded from non-supporting to partially supporting, and dewatering, fish habitat degradation, and riparian degradation were added to the list of impairment causes. A typical view of Spring Creek from Corbin Creek to the mouth is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey about three-quarters of a mile above the mouth that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, fisheries rating information, water chemistry analysis results, and macroinvertebrate and periphyton bioassessment information.

Spring Creek from Corbin Creek to the mouth

Pollution Sources

The 2003 preliminary source assessment identified grazing, geology, and mine reclamation as the primary sediment sources for this segment of Spring Creek. Head cutting was observed at the mouth of the stream. The aerial photography inventory showed three road crossings and road encroachment along 14 percent of the stream. Virtually the entire segment of the creek above the town of Jefferson City has been channelized by mine reclamation.

The primary geology of this sub-watershed is the Boulder Batholith, with Quaternary alluvium present in the valley. Sands and fine gravels were prominent substrate materials in the stream channel. The aerial photography and field inventories determined that riparian buffers were virtually absent. Most of the creek is surrounded by private lands that are used for grazing and rural housing. The last one-quarter mile of the creek flows through the small town of Jefferson City.

Extensive channel alterations from mine reclamation begin near the confluence with Corbin Creek. In an effort to remove toxic mine spoils and related contaminants, the Montana Tunnels Mine reclaimed most of the listed portion of Spring Creek. The channel is basically a ditch and the stream is incised and straightened. There is little bank stabilizing riparian vegetation. During field sampling in summer 2003, the stream was observed to leave its constructed channel for a small section about a quarter of a mile below Corbin Creek. Just above where the listed segment begins on Spring Creek, the Montana Tunnels Mine has a holding pond and water transfer station for pumping water up to its operation. This has led to channel incisement and dewatering at the mouth (dry in July during the source assessment). Also noted were an overall lack of riparian vegetation, grazing pasture along the section before Jefferson City, and tailings piles lining the banks throughout the town of Jefferson City. The field sampling and aerial photo analysis in 2003 led to the conclusion that the likelihood for discharges from septic tank fields was low.

Grazing and channel alterations from mine reclamation are probably the biggest contributors of sediment to Spring Creek. Historical lode mining, road construction, mine reclamation work, inter-basin water transfers from Prickly Pear Creek, water withdrawals from the Montana Tunnels Mine, and livestock grazing have altered stream morphology and aquatic habitat. Diffuse sediment and nutrient sources associated with rural home sites might also affect the stream. More localized impacts are present along Spring Creek in the town of Jefferson City.

Expected relevant sources of metals to the stream segment are a tributary stream, inter-basin water transfers from Prickly Pear Creek, and historical mining activities in the immediate drainage area. Flow from Corbin Creek and historical mill tailings deposits are likely contributors of metals to the stream. Most of the drainage area falls within the Colorado mining district, although there is a small section in the Clancy mining district. The MBMG Abandoned and Inactive Mines database shows mineral location and underground mining activities in the drainage area of the stream. The historical mining types include lode, placer, and mill. In the past these mines produced silver, copper, lead, zinc, gold, and uranium. Within the basin, the Corbin Flats Mine is listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites. Three other mines in the Colorado mining district and upstream of the listed segment are also listed in State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites: Washington, Bluebird, and the Wickes Smelter.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation along this section of Spring Creek, about three-quarters of a mile above the mouth. The field crew determined that the stream did not fit a Rosgen stream type classification, but would probably be an E4 or C4 channel without alterations. Sinuosity was low indicating channel straightening, and the entrenchment ratio was large enough to indicate non-confinement. The width-to-depth ratio was 9.6, which is typical of incised E-type channels (Table 3-35). The BEHI rating was borderline between "moderate" and "high." D_{50} as determined in a zigzag Wolman pebble count consisted of fine gravels.

The channel survey included an assessment of Proper Functioning Condition. The field crew rated this site as "Non-functional" (NF), noting excessive fines, lack of riparian vegetation, and channel alterations. The riparian land type aggregate assigned to this site is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive. However, influence from the granitic geology could elevate the fines values slightly.

Table 3-35. Summary of cross-sectional data for Spring Creek, MT41I006_080.

Parameter	Result	Comparable to Reference
Width/depth ratio	9.6	NA
BEHI	29.6	NA
D_{50}	Fine gravels	NA
PFC	NF	No

McNeil Cores

McNeil core data are available for one site on this segment of Spring Creek, which corresponds to the channel survey site. Six cores were collected. The riparian aggregate here was determined to be 29, Alluvial Floodplains and Terraces. The average percentage of fines less than 6.4 mm was 69.6 percent, with average fine fines (less than 0.85 mm) at 21.2 percent (Table 3-36). These values are extremely elevated against the means for fines from reference cores for riparian aggregate 29. The percentage of fines less than 6.4 mm for this site is 105 percent greater than the reference value average, while the fine fines are 162 percent above the reference value average.

Table 3-36. Summary of McNeil core data for Spring Creek, MT41I006_080.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	69.6	21.2	Both fines values are elevated.

Suspended Sediment Concentrations

Few recent data were available for this segment of Spring Creek. The USGS National Water Information System had two records for suspended sediment from sampling at two sites in 2000. The highest value collected was 18 mg/L in October at a location near the mouth. This value is greater than what would be expected based on values from selected reference streams for suspended sediment. However, it is possible that the sampling was affected by runoff.

Six total suspended solids samples were collected near the mouth in the summer of 2003 and summer and fall of 2004. The highest value collected was 84 mg/L in August 2003. This value is much greater than what would be expected based on values from selected reference streams for suspended solids. The August 2003 sample was not collected during a runoff event, but it is suspected that the Montana Tunnels Mine was releasing water at the time.

In 2003 and 2004, seven visual observations of water turbidity levels were made at three sites along this segment of Spring Creek. Five turbidity observations reported the water clarity as clear, one reported the water clarity as slightly turbid, and one recorded the water clarity as turbid. The observation of slight turbidity was reported in mid-July 2003, and the observation of turbidity was reported in early August 2003.

Macroinvertebrates

Macroinvertebrate data collected in August 2003 indicated that Spring Creek near Jefferson City was moderately impaired and did not support designated uses. The macroinvertebrate habitat rating for this site was "poor" because of unstable stream banks, altered channel morphology, and an inadequate riparian zone. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2003a). The metric score of 22 percent indicated moderate impairment and non-support of aquatic life uses. Five clinger taxa and one trichoptera taxa were found at the site, and Bollman concluded that fine sediment was most likely limiting benthic habitat (2003a).

Midges, other flies, and tubificid worms dominated the aquatic invertebrate sample collected from Spring Creek at Jefferson City. Nutrient enrichment might have resulted in hypoxic sediments. The HBI (5.61) indicated the presence of fairly significant organic pollution. On August 7–8, 2003, field notes indicated some algal growth and mosses in the stream. On August 28, 2003, field notes indicated that diatoms were present in all slower areas of the stream comprising perhaps 40 percent of the substrate. During July 27, 2004, field notes indicated significant quantities of macrophytes growing in the stream channel immediately upstream of the sampling site.

Periphyton

Periphyton data were available from one sample taken in August 2003 at a location just above Jefferson City. Sampling results were compared with reference biocriteria metrics established for the Rocky Mountain Ecoregions of Montana (Bahls, 2004). Diatom metrics indicated minor impairment and full support of aquatic life uses. Bahls concluded that the impairment was primarily due to organic loading and secondarily due to heavy metals and excessive sedimentation. The siltation index exceeded the threshold for minor impairment. Sample notes indicate that "heavy sediment" was present in the sample.

The 14 major diatom species from Spring Creek represented pollution-tolerant classes 3, 2, and 1, and are either sensitive to organic pollution, somewhat tolerant of organic pollution, or very tolerant of organic pollution. Three of the remaining seven major diatom species in Spring Creek are very tolerant of organic pollution (pollution tolerance class 1) and the other four are somewhat tolerant of organic pollution (Appendix D).

Fish Populations

The project team examined data from the Montana Fish, Wildlife and Parks' MFISH database. Spring Creek is managed as a trout fishery, yet there were no fish species or population trend data available for Spring Creek in the MFISH database or from the Helena National Forest. The overall habitat and sport fishery rating for Spring Creek in MFISH is "limited," which is the lowest rating possible.

Nutrient-related Data

Field measurements taken in July and August 2003 at station M09SPRGC01 showed normal pH and dissolved oxygen values (7.6–8.1 and 7.6–9.0 mg/L, respectively), while specific conductance was moderately high (666–773 µS/cm). Stream flows were minimal (0.1–0.84 cfs), and the water had a slight level of turbidity (Appendix D).

Four field measurements taken from July through September 2004 at the same location showed similar results. pH values ranged from 7.7 to 8.2, dissolved oxygen ranged from 6.1 to 9.8 mg/L, and stream flows were recorded at from 0.1 to 0.25 cfs. Turbidity levels were reported as clear from July through the end of September 2004 (Appendix D).

Water chemistry data for this site in July and August 2003 showed exceedances of target values for total Kjeldahl nitrogen (one of two samples), total nitrogen (two of two samples), and total phosphorus (two of two samples) (Appendix D). Total phosphorus was recorded at 0.205 mg/L and total nitrogen at 1.05 mg/L on August 11, 2003. Nitrate + nitrite-N and soluble reactive phosphorus values were also above the supplemental indicator values in July and August 2003. A total suspended solids concentration of 84 mg/L was also above the supplemental indicator value of 23 mg/L in August 2003 (Appendix D).

During summer 2004, no exceedances of total nitrogen or total Kjeldahl nitrogen target values were seen in four separate samples. One analysis for total phosphorus, reported at 0.050 mg/L, exceeded the target value of 0.027 mg/L on July 27, 2004 (Appendix D). No individual soluble reactive phosphorus measurements during summer 2004 were elevated relative to the supplemental indicator values. Two of four nitrate + nitrite-N were measurements were high, and exceeded the supplemental indicator values. These occurred in late August and early September 2004. One total suspended solids value (41.5 mg/L) from this station was also above the supplemental indicator level of 23 mg/L in July 2004 (Appendix D). Periphyton chlorophyll-*a* values were low (0.022–15.5 mg/m^2) in July–September 2004 and well below any level of concern.

There were no large fluctuations of dissolved oxygen during a 24-hour survey conducted on August 7–8, 2003 (Appendix D). Dissolved oxygen concentrations ranged from 8.1 to 9.4 mg/L.

Metals Concentrations

The project team evaluated a limited total of four in-stream water chemistry samples taken between October 2000 and August 2003. Arsenic concentrations in three samples exceeded the human health criterion. The average of all samples was 60 percent higher than the human health criterion. The highest measured concentration was 3.2 times the human health criterion. No samples exceeded the aquatic life criteria for arsenic. This evidence shows that this segment does not meet the human health criterion for arsenic.

Cadmium concentrations in all samples exceeded the chronic aquatic life criterion. The average concentration of all samples was 111 percent higher than the chronic aquatic life criterion. The highest measured concentration was three times the chronic aquatic life criterion. No exceedances of the cadmium human health criterion were observed. This evidence shows that this segment does not meet the chronic aquatic life criterion for cadmium.

One sample, or 25 percent of all samples, exceeded both the acute and the chronic aquatic life criteria for copper. The concentration of this sample was 2.2 times the chronic aquatic life criterion. No samples exceeded the human health criterion for copper. This evidence shows that this segment does not meet the aquatic life standards for copper.

Lead concentrations in two samples (50 percent of all samples) exceeded the human health and chronic aquatic life criteria. The average lead concentration in all samples was 234 percent higher than the chronic aquatic life criterion, and 232 percent higher than the human health criterion. The highest measured concentration was 8.3 times the human health criterion. This sample was also 8.3 times the chronic aquatic life criterion for lead. This evidence shows that this segment does not meet the human health or aquatic life criteria for lead.

One sample (25 percent of all samples) exceeded the acute and chronic aquatic life criteria for zinc. This sample was just 1.02 times the acute and chronic aquatic life criteria. No samples exceeded the human health criterion for zinc. This evidence suggests this segment does not meet the aquatic life criteria for zinc. Because of the limited data, this segment should be closely monitored in the future to confirm this statement.

Spring Creek Segment MT41I006_080 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics(width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, macroinvertebrates, periphyton, fish habitat ratings, and water chemistry and dissolved oxygen.

The target and supplemental indicator values for all sediment measures were not met. Channel metrics were not comparable to reference streams, and that in itself signals potential problems for channel condition. D_{50} at the survey site was estimated to be one size-class smaller than expected, and is probably a reflection of excessive deposition of fine sediments as well as an indication of the extreme channel alterations that have occurred. The BEHI rating of “high” indicated that the stream banks are likely sources of sediment in the stream and might not be capable of withstanding high flows. A Proper Functioning Condition rating of “Non-functional” (NF) reflected that the stream is unable to sustain expected hydrologic characteristics, riparian vegetation, and sediment transport capacities. Values for both classes of fines from McNeil cores were above the target values. Suspended sediment data were not adequate to make a determination. The results of the macroinvertebrate and diatom samples both indicate impairment by sedimentation. Recent fisheries data suggest that this segment of the stream provides poor fish habitat.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment. No targets and few supplemental indicator values were being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Spring Creek Segment MT41I006_050 are impaired by siltation and possibly suspended solids. A TMDL will therefore be developed to address the sediment impairment.

The weight of evidence suggests that Spring Creek from Corbin Creek to the mouth has enough available data to warrant an impairment listing for nutrients. Six water chemistry samples were taken from July through August 2003 and from July to September 2004 during very low to moderate flow conditions. The available in-stream chemistry data indicated that total nitrogen, total Kjeldahl nitrogen, nitrate + nitrite-nitrogen, total phosphorus, and soluble reactive phosphorus concentrations exceeded the proposed target and supplemental indicator threshold values. No large fluctuations in dissolved oxygen were observed in a 24-hour period, which would have indicated the presence of excessive algal growths.

However, large macrophyte growths were noted upstream of the sampling site in 2004. In addition, metals loading to Spring Creek from Corbin Creek and associated algal toxicity might have prevented the development of nuisance algal growths in this segment of Spring Creek. The 2003 macroinvertebrate and periphyton data suggested minor to moderate impairment due to nutrient enrichment. Potential nutrient sources include sediment, rural home developments, pasture lands, dewatering, and an overall lack of riparian vegetation. A TMDL will be developed to address the nutrient listing.

The limited recent metals data suggest that Spring Creek from Corbin Creek to the mouth is impaired by arsenic, cadmium, copper, lead, and zinc. TMDLs will therefore be developed to address the arsenic, cadmium, copper, lead, and zinc impairments.

3.4.1.9 Middle Fork Warm Springs Creek from the Headwaters to the Mouth (MT41I006_100)

Middle Fork Warm Springs Creek is a tributary of Warm Springs Creek, which is a tributary of Prickly Pear Creek. The listed segment (MT41I006_100)of the Middle Fork extends for 2.7 miles from the headwaters to the mouth. In 1996, the cold-water fishery and aquatic life uses in the Middle Fork Warm Springs Creek were listed as partially supported because of siltation, habitat alterations, and metals. The basis for the listing is unknown. However, a habitat survey performed in 2001 reported substrate embeddedness, erosion-prone banks, and excessive road sediment inputs. In 2000, the stream was listed only for metals, while in 2002 siltation and other habitat alterations were again added as contributing causes of impairment. The 2000 and 2002 303(d) lists showed aquatic life, cold-water fishery, and drinking water uses as non-supported, and included arsenic, copper, and zinc as specific metals-related causes. A typical view of this segment is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey on the Helena National Forest (Helena National Forest) that included a Proper Functioning Condition assessment and pebble counts, McNeil core subsurface fines from two sites within the Helena National Forest, suspended sediment data, macroinvertebrate data, fish population measures, and water chemistry data.

Middle Fork Warm Springs Creek

Pollution Sources

The 2003 preliminary source assessment identified roads, waste rock tailings in the creek, and geology as the primary sediment and possibly metals sources for the Middle Fork of Warm Springs Creek. The Helena National Forest conducted a road sediment survey on the forest portion of the creek and identified 13 sites that, based on modeling using the Water Erosion Prediction Project (WEPP), contribute approximately 11.6 tons of sediment per year to the stream (USDA, 2004). The aerial photography inventory showed two road crossings and road encroachment along 56 percent of the stream. Most of the source assessment inventory sites consisted of road and mine sources.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. During the field source assessment, mine spoils were documented in the stream and floodplain, and areas of stream aggradation were observed. Channel incision was observed downstream of a breached mining dam. The aerial photography inventory showed that riparian buffers were extensive except where mine spoils prevented vegetative growth or where the road encroached on the stream. Extensive logging has occurred on private land within the Helena National Forest administrative boundary, but the site does not appear to be a recent harvest.

In summary, sources associated with roads and mine spoils are probably the biggest contributors of pollution to the Middle Fork of Warm Springs Creek. Land disturbance appears to exacerbate erosion in the Boulder Batholith geology and poorly developed soils of this sub-watershed. Severe channel alterations from mining occur near the headwaters of the stream and continue for a little over a mile downstream.

Expected significant contributors of metals to the stream segment are historical hard rock mining activities in the sub-watershed. A large tailings mine dump, observed in the middle of the stream during source assessment visits to the watershed, prevented vegetation growth and disrupted the natural channel.

Water in upper Middle Fork of Warm Springs Creek had a metallic sheen that might have been associated with the presence of metals ions. The headwaters of the creek fall within the McClellan mining district while the rest is within the Alhambra mining district. The MBMG Abandoned and Inactive Mines database reports surface, underground, mineral location, and prospect mining activities in the watershed. The historical mining types include placer, lode, and mill. In the past these mines produced gold, silver, lead, and copper. Two of the mines in the upstream section of the sub-watershed, Middle Fork Warm Springs (Alhambra district) and Solar Silver (Warm Springs district), are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites and are slated for cleanup. The state's inventory shows 12 other mines in this watershed.

Channel Survey

In 2003 the Helena National Forest conducted a field investigation on the Middle Fork of Warm Springs Creek, just above the confluence with the North Fork, and determined the stream to be a Rosgen stream type B5, but probably a B4 without channel disturbance. The width-to-depth ratio was 7.3, which is typical of incised channels and not comparable to reference B-type channels (Table 3-37). The BEHI rating was "low," and is actually better than the average for southwestern Montana B-type reference streams. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse sands. Although no Helena National Forest or Greater Yellowstone Area reference streams are specifically B5, this small median particle size probably indicates that excessive deposition of finer sized particles is occurring at this site.

The channel survey included an assessment of Proper Functioning Condition. The Helena National Forest rated this site "Functional – at risk" (FAR), and noted that the stream is attaining a new capacity. The riparian land type aggregate assigned to this site is 11, Granitic Rock – Rolling Uplands. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common and can be excessive.

Table 3-37. Summary of cross-sectional data for Middle Fork Warm Springs Creek, MT41I006_100.

Parameter	Result	Comparable to Reference
Width/depth ratio	7.3	No
BEHI	12.7	Yes
D_{50}	Very coarse sands	NA
PFC	FAR	Yes, upward trend

McNeil Cores

McNeil core data are available for two sites on the Middle Fork of Warm Springs Creek, both of which are within the Helena National Forest's administrative boundary. The oldest cores (six cores) were collected in 1993 in the southeastern quarter of Section 30, Township 8N, Range 2W. The riparian aggregate here was determined to be 11, Granitic Rock – Rolling Uplands (Table 3-38). The average percentage of fines less than 6.4 mm was 40 percent, with average fine fines (less than 0.85 mm) at 15.4 percent. These values are elevated against the means for fines from reference cores for riparian aggregate 11. The percentage of fines less than 6.4 mm for this site is 12 percent greater than the mean for reference riparian aggregate 11 cores, while the fine fines are 51 percent greater.

The second set of McNeil cores was collected in 2003 and corresponds to the channel survey site. Six cores were collected, and the riparian aggregate was once again determined to be 11. The average percentage of fines less than 6.4 mm was 71.3 percent, with the average fine fines at 16.9 percent. Results for the averages of both categories of fines are extremely elevated against the means for fines from reference cores for riparian aggregate 11. The percentage of fines less than 6.4 mm for this site is 99 percent greater the mean for reference riparian aggregate 11 cores, while the fine fines are 66 percent greater.

Table 3-38. Summary of McNeil core data for Middle Fork Warm Springs Creek, MT41I006_100.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
11	1993	40	15.4	Both fines values are elevated.
11	2003	71.3	16.9	Both fines values are elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for four sites along the creek, with 11 samples taken in 2000–2001. The highest value collected was 34 mg/L in June 2000 at the sampling site above the confluence with the North Fork (Table 3-39). The suspended sediment data had an average of 10.8 mg/L with a median of 7.0 mg/L. All of these values are comparable to values from selected reference streams for suspended sediment.

Table 3-39. Statistical summary of suspended sediment data for Middle Fork Warm Springs Creek, MT41I006_100.

Mean	10.8 mg/L
Median	7.0 mg/L
Standard deviation	10.5 mg/L
Maximum	34.0 mg/L
Number of samples	11
Number of sample sites	4

In August 2001, MDEQ staff collected one total suspended solids sample near the confluence with the North Fork. The total suspended solids value was less than 10 mg/L. In 2003, two visual observations of turbidity were recorded above the confluence with the North Fork. All observations reported the water clarity as clear, yet the observations were made during the recessional limb of peak flow and also during low flow.

Macroinvertebrates

Biological data from one sample taken in August 2001 near the Middle Fork's confluence with the North Fork were available. The macroinvertebrate habitat rating for this site was "optimal." Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2002b). The metric score of 94 percent indicated non-impairment and full support of aquatic life uses. Seventeen clinger taxa and seven trichoptera taxa were found at the site. Bollman concluded that fine sediments did not impair access to benthic habitat.

Periphyton

No recent data were available at the time of this writing.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database, and from the Helena National Forest. The Middle Fork of Warm Springs Creek is managed as a trout fishery. Brook trout are the only fish species thought to be common year-round residents of the creek. The overall habitat and sport fishery rating for this segment of the creek is "moderate."

Metals Concentrations

The project team evaluated a total of 27 in-stream water chemistry samples taken between June 2000 and August 2003. Arsenic concentrations in 25 of the 27 samples exceeded the human health criterion. The average concentration of all samples was 271 percent higher than the human health criterion. The highest measured concentration was 8.7 times the human health criterion for arsenic. No exceedances of the aquatic life criteria were observed. This evidence shows that this segment does not meet the human health standard for arsenic.

Cadmium concentrations in 26 samples, or the equivalent of 96 percent of all samples, exceeded the chronic aquatic life criterion. Of these, two also exceeded the acute aquatic life criterion, and one exceeded the human health criterion. The average concentration was 379 percent higher than the chronic aquatic life criterion. The highest measured concentration was 38 times the chronic aquatic life criterion, and 2.26 times the human health criterion. This evidence shows this segment does not meet the human health or aquatic life standards for cadmium.

Copper concentrations in all samples where below the human health and aquatic life criteria. This evidence suggests that this segment meets the human health and aquatic life standards for copper.

Lead concentrations in six samples, or the equivalent of 22 percent of all samples, exceeded the chronic aquatic life criterion. Of these, two also exceeded the human health criterion. The average of all samples was 12 percent higher than the chronic aquatic life criterion. The highest measured concentration was 8.2 times the chronic aquatic life criterion, and 2.0 times the human health criterion. This evidence shows that this segment does not meet the human health or aquatic life criteria for lead.

Zinc concentrations in 24 samples, or 89 percent of all samples, exceeded the acute and chronic aquatic life criteria. Of these, one sample also exceeded the human health criterion. The average concentration of all samples was 175 percent higher than the acute and chronic aquatic life criteria. The highest measured concentration was 25 times the acute and chronic aquatic life criteria, and 1.7 times the human health criterion. This evidence shows that this segment does not meet the human health or aquatic life criteria for zinc.

Middle Fork Warm Springs Creek MT41I006_100 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics(width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, macroinvertebrates, fisheries, and water chemistry.

No targets and few supplemental indicator values were met for sediment impairments. Although the Helena National Forest survey crew felt that the stream was attaining a new level of capability, many channel metrics were not comparable to reference streams. For instance, the BEHI rating of “low” was a reflection of the vigorous riparian vegetation observed at the sample site. However, the small width-to-depth ratio indicated channel incision and the D_{50} at the survey site was estimated to be smaller than expected. A Proper Functioning Condition rating of “Functional – at risk” (FAR) reflected that the stream was starting to adjust to channel alterations, but was not yet maintaining expected characteristics. Values for both sets of McNeil core samples exceeded target values, with the most recent cores displaying extreme deposition of fines in subsurface substrates. Suspended sediment values did not appear to exceed supplemental indicator values. In addition, the results from the macroinvertebrates sample did not indicate impairment from sedimentation. Recent fisheries data suggest that this segment of the stream provides moderate fish habitat.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment. No target values were being met and supplemental indicators revealed mixed results.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in the Middle Fork of Warm Springs Creek MT41I006_100 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The available water chemistry data suggest that the Middle Fork Warm Spring Creek is impaired by arsenic, cadmium, lead, and zinc. TMDLs will therefore be developed to address the arsenic, cadmium, lead, and zinc impairments.

3.4.1.10 North Fork Warm Springs Creek from the Headwaters to the Mouth (MT41I006_180)

The North Fork of Warm Springs Creek was added to the 303(d) list in 1998. The segment, which extends for 3.5 miles from its headwaters to the mouth, was originally listed as partially supporting its designated aquatic life and cold-water fishery uses because of siltation. However, its status changed in 2002 when it was listed as partially supporting cold-water fishery use and not supporting drinking water use because of metals, arsenic, bank erosion, fish habitat degradation, other habitat alterations, and organic enrichment/low dissolved oxygen. A typical view of the North Fork of Warm Springs Creek is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey on the Helena National Forest (Helena National Forest) that included a Proper Functioning Condition assessment and Wolman pebble counts, suspended sediment data, macroinvertebrate and periphyton data, fish population measures, and water chemistry monitoring results.

North Fork Warm Springs Creek

Pollution Sources

Most of the stream flows through a section of the Helena National Forest Elkhorn Management Unit. This area of the Elkhorn is managed for big game habitat and optimal water quality. The stream also flows through a section of private land, which has some dispersed housing along the creek.

The 2003 preliminary source assessment identified roads and geology as the primary sediment sources for this segment of the North Fork of Warm Springs Creek. The Helena National Forest conducted a road sediment survey on the forest portion of the creek and identified 27 sites that, based on modeling using the Water Erosion Prediction Project (WEPP) model, contribute approximately 15 tons of sediment per year to the stream (USDA, 2004). The aerial photography inventory showed two road crossings and road encroachment along 26 percent of the stream.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. The channel inventory showed deposition of sand in the stream channel. At the end of July 2003, the creek went dry at the mouth and was observed to carry flow to Warm Springs Creek only after rain. The aerial photography inventory showed that extensive conifer and deciduous riparian buffers were present on the Helena National Forest portion of the stream, but were limited in width on a small section of private property below the headwaters. Field sampling showed that the lower portion of the stream had healthy riparian vegetation. In summary, road runoff is probably the biggest contributor of sediment to the North Fork of Warm Springs Creek.

This stream segment is also affected by metals and habitat alterations. Expected significant contributors of metals to the stream segment are historical mining activities in the watershed. The majority of the drainage area of the stream falls within the Alhambra mining district. The MBMG Abandoned and Inactive Mines database reports underground mining activities in the watershed. The historical mining types include lode mining. In the past these mines produced gold, silver, lead, and copper. The state's inventory of mines shows two hard rock mines close to the headwaters and one mine close to the mouth of the stream. None of the mines in the basin is listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites.

Channel Survey

In 2003 the Helena National Forest conducted a field investigation on the North Fork of Warm Springs Creek, about one-half mile upstream of the mouth, and determined the stream to be a Rosgen stream type B4a. The width-to-depth ratio was 16.2, which is similar to other reference Ba-type streams that the Helena National Forest has inventoried (Table 3-40). The BEHI rating was in the mid-range of "moderate," which is about 17 percent greater than the average for B-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of very fine gravels. The two B4a Helena National Forest reference streams had D_{50} particle sizes one and three size-classes larger than very fine gravels, while southwestern Montana and the Greater Yellowstone Area reference B4 streams average four size-classes larger.

The channel survey included a Proper Functioning Condition assessment. The Helena National Forest rated this site as "Functional – at risk" (FAR), citing excess sediment deposition and channel instability. The riparian land type aggregate assigned to this site is 11, Granitic Rock – Rolling Uplands. Surface and subsurface fines are common and can be excessive in this riparian aggregate, according to the Helena National Forest data.

Table 3-40. Summary of cross-sectional data for North Fork Warm Springs Creek, MT41I006_180.

Parameter	Result	Comparable to Reference
Width/depth ratio	16.2	Yes
BEHI	24	Yes
D_{50}	Very fine gravels	No
PFC	FAR	NA (trend not apparent)

McNeil Cores

No recent data are available.

Suspended Sediment Concentrations

Few recent data were available for the North Fork of Warm Springs Creek. The USGS National Water Information System had two records for suspended sediment from one sampling site taken in 2000 and 2001. The highest value collected was 5 mg/L in May 2001. Five total suspended solids samples were collected from two sites in the summer of 2003 and summer and fall of 2004. The highest value collected was 4.35 mg/L in August 2004. Three turbidity observations were recorded in 2003 and 2004. All observations reported the water clarity as clear, yet the observations were made during the recessional limb of peak flow and also during low flow.

Macroinvertebrates

Macroinvertebrate data from one sample taken in July 2000 above the mouth were available. The habitat rating for this site was “suboptimal” because of substrate embeddedness and sediment deposition. Sampling results were compared with Bollman’s revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2000). The metric score of 94 percent indicated non-impairment and full support of aquatic life uses. Fourteen clinger taxa and six trichoptera taxa were found at the site, and Bollman concluded that fine sediment probably does not limit benthic access to stony substrate habitats (Bollman, 2000).

Periphyton

Periphyton data from one sample taken in July 2000 above the mouth were available. Sampling results were compared with reference biocriteria metrics established for the Rocky Mountain Ecoregions of Montana (Bahls, 2001). Diatom metrics indicated moderate impairment and partial support of aquatic life uses. Bahls concluded that the impairment was due to heavy metals, excessive sedimentation, and organic loading. The siltation index exceeded the threshold for moderate impairment. However, Bahls concluded that the sediment impairment could be partially due to natural causes, including an erosive natural geology and the Warm Springs wildfire of 1988.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks’ MFISH database and from the Helena National Forest. The North Fork of Warm Springs Creek is managed as a trout fishery. However, no data exist on fish population estimates. The overall habitat and sport fishery rating for this section of the creek is “limited,” which is the lowest rating.

The U.S. Forest Service's fish distribution map for the Helena National Forest (USFS, 2003) indicates that brook trout were surveyed in this stream. There were no additional fisheries data available from the MFISH database.

Nutrient-related Data

Only a small amount of attached algae was observed in the North Fork of Warm Springs Creek during an August 2003 24-hour dissolved oxygen survey. Field measurements for dissolved oxygen made in July and August 2003 ranged from 7.8 to 10.2 mg/L (Appendix D). No violations of state dissolved oxygen standards for early life stages or other life stages of brook trout were documented in July and August 2003 when the dissolved oxygen sampling and field measurements were made.

No nutrient data were available for the post-1996 period prior to sampling in 2003. Out of 26 dissolved oxygen measurements taken during a 24-hour dissolved oxygen survey on August 7–8, 2003, no readings were below 6 mg/L. Individual dissolved oxygen measurements ranged between 6.0 and 7.8 mg/L. There were no large fluctuations noted during the 24-hour dissolved oxygen survey at monitoring stations near the mouth (M09WSNFC01) and above the Middle Fork (M09WSNFC02) (Appendix D). Nitrogen concentrations measured during summer 2003 did not appear to be a problem and both total Kjeldahl nitrogen and total nitrogen values were below the target values. Three total phosphorus values measured in 2003 ranged from 0.028 to 0.031 mg/L and were slightly above the target value 0.027 mg/L. 2003 total suspended solids values were low (1.15–1.51 mg/L), and were well below the supplemental indicator value of 23 mg/L (Appendix D).

The North Fork of Warm Springs Creek was sampled again at one station above the Middle Fork (M09WSNFC02) on August 27 and September 24, 2004. Field notes from these sampling efforts indicated there was more abundant riparian vegetation along the stream in 2004 than in 2003. Field measurements for dissolved oxygen showed concentrations ranging from 8.5 to 9.5 mg/L. Slightly higher flows were also recorded in the North Fork in 2004 (0.1–0.16 cfs) than in 2003. These higher flows were most likely due to recent rain. Algal and macrophyte growth in the stream in 2004 ranged from light to moderate according to the field notes. Periphyton chlorophyll-*a* values ranged from 26 to 27.4 mg/m^2 and were below the target value of 37 mg/m^2.

No target values for total phosphorus, total Kjeldahl nitrogen, or total nitrogen were exceeded in 2004 in samples collected in the North Fork of Warm Springs Creek above the Middle Fork. Nitrate + nitrite-N values were low as well, although two analyses for soluble reactive phosphorus were slightly elevated relative to the supplemental indicator thresholds.

Metals Concentrations

A total of seven in-stream water chemistry samples taken between October 2000 and August 2003 were evaluated. Arsenic concentrations in one sample (14.3 percent of all samples) exceeded the human health criterion. The concentration of this sample was 2.4 times the human health criterion. No samples exceeded the aquatic life criteria for arsenic. This evidence suggests that this segment does not meet the human health standard for arsenic.

Cadmium concentrations in one sample (14.3 percent of all samples) exceeded the chronic aquatic life criterion for cadmium. The concentration for this sample was 2.1 times the chronic aquatic life criterion. No samples exceeded the human health criterion for cadmium. This evidence suggests that this segment does not meet the aquatic life water quality standards for cadmium.

Copper concentrations in all samples were below the human health and aquatic life criteria. This evidence suggests that this segment meets the human health and aquatic life water quality standards for copper.

Lead concentrations in all samples were below the human health and aquatic life criteria. The highest measured value was 80 percent of the chronic aquatic life criterion. This is a borderline value. This evidence suggests this segment meets the aquatic life and human health standards for lead.

Zinc concentrations in one sample (14.3 percent of all samples) exceeded the acute and chronic aquatic life criteria. The zinc concentration in this sample was 1.6 times the acute and chronic aquatic life criteria. No samples exceeded the human health criterion. This evidence suggests this segment does not meet the aquatic life standards for zinc.

North Fork Warm Springs Creek MT41I006_180 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), suspended sediments, macroinvertebrates, periphyton, fisheries, and water chemistry.

No data are available for the target sediment parameters, and results from the supplemental indicator values are mixed. The supplemental indicator D_{50} was not met. D_{50} at the survey site was potentially at least one size-class smaller than expected, and might be a reflection of excessive deposition of fine sediments. However, data collected by the Helena National Forest for a B type reference stream in the same riparian aggregate also had the same D_{50}, but the gradient was about one degree less. The Proper Functioning Condition rating of “Functional – at risk” (FAR) was given mainly on the basis of excess sediment deposition. Suspended sediment data values were not adequate to make a determination. The results of the macroinvertebrate and diatom samples were contradictory. Recent fisheries data suggest that this stream provides limited habitat for few fish species.

Results of the 2003 Helena National Forest road sediment survey indicate that the Warm Springs Creek Road could contribute up to 15 tons of sediment to the creek annually. Although target sediment data are unavailable, many supplemental indicator values support the conclusion of impairment by sedimentation.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in the North Fork of Warm Springs Creek are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The weight-of-evidence suggests that the North Fork of Warm Springs Creek (from the headwaters to the mouth) is not impaired by low dissolved oxygen or organic enrichment. The available in-stream dissolved oxygen data (more than 30 samples) from July and August 2003 indicate no large diurnal fluctuations of dissolved oxygen from two stations on this segment. Field notes indicate very little algae or aquatic growth during any of the sampling efforts. The lower portion of the stream was characterized as having healthy riparian vegetation during the source assessment work. The macroinvertebrate data also indicate that the biology fully supports designated uses. Therefore, a TMDL will not be developed to address low dissolved oxygen or organic enrichment.

The available water chemistry data suggest that the North Fork of Warm Springs Creek is impaired by arsenic, cadmium, and zinc. TMDLs will therefore be developed to address the arsenic, cadmium, and zinc impairments.

3.4.1.11 Warm Springs Creek from the Middle Fork to the Mouth (MT41I006_110)

In 1996, this 3-mile segment of Warm Springs Creek was listed as partially supporting aquatic life and cold-water fishery uses because of suspended solids and metals. The basis for the original listing is unknown. However, MDEQ habitat assessments conducted in 1999 and 2001 indicated that pool infilling and embeddedness are common. In subsequent years, the segment was listed as not supporting drinking water use and partially supporting aquatic life and cold-water fishery uses. Impairment causes included metals (arsenic, lead, and cadmium) and siltation. A typical view of this segment is shown in the photo below.

A review of the available data is provided below. These data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey about a mile and a half above the mouth that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, macroinvertebrate and fish population data, and a total of eight in-stream water chemistry samples taken between October 2000 and August 2003.

Warm Springs Creek

Pollution Sources

The 2003 preliminary source assessment identified roads and geology as the primary sediment sources for this segment of Warm Springs Creek. The aerial photography inventory showed 11 road crossings and road encroachment along 4 percent of the stream. Channelization at the mouth of the stream occurs due to I-15. Source assessment inventory sites consisted primarily of road sediment delivery sites.

The primary geology of this sub-watershed is the Boulder Batholith, with Quaternary alluvium present in the valley. Deposition of sand was observed in the stream channel during the channel inventory and pool infilling was common. The aerial photography inventory showed that deciduous riparian buffers were variable depending on landowner and typically ranged from 30 to 145 feet. Most of the creek is surrounded by private lands used for rural housing. In summary, road runoff is probably the biggest contributor of sediment to Warm Springs Creek.

Expected relevant sources of metals in the stream segment are tributary streams, possible natural hot springs, and historical mining activities in the immediate drainage area. The tributaries, the North Fork and Middle Fork of Warm Springs, are likely significant contributors of metals. The immediate drainage area of this stream falls within the Alhambra mining district. The MBMG Abandoned and Inactive Mines database shows hot spring, mineral location, and underground mining activities in the drainage area of the stream. The historical mining types include lode and placer mining. In the past these mines produced gold, silver, lead, copper, and zinc. The Alhambra Hot Springs Mine is listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation on Warm Springs Creek, about 1.5 miles above the mouth. The field crew determined the stream to be a Rosgen stream type C4. The width-to-depth ratio was 17.2, which is comparable to C-type reference streams for southwestern Montana and the Greater Yellowstone Area (Table 3-41). The BEHI rating was in the upper range of "moderate," which is 29 percent greater than C-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse gravels. The D_{50} was one size-class smaller than for the C-type reference streams in the southwestern Montana and Greater Yellowstone Area.

Part of the channel survey included a Proper Functioning Condition assessment. The field crew rated this site as "Functional – at risk" (FAR), citing excess sediment deposition, lack of pools, and channel alterations (culverts, riprap). The riparian land type aggregate assigned to this site is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive. However, the influence of the granitic geology could elevate the fines values slightly.

Table 3-41. Summary of cross-sectional data for Warm Springs Creek, MT41I006_110.

Parameter	Result	Comparable to Reference
Width/depth ratio	17.2	Yes
BEHI	26.3	No
D_{50}	Coarse gravels	No
PFC	FAR	Yes

McNeil Cores

McNeil core data are available for one site on this segment of Warm Springs Creek—the channel survey site. Only three cores were collected due to the difficulty of locating sites with spawning characteristics. The riparian aggregate here was determined to be 29, Alluvial (Borolls) Floodplains and Terraces (Table 3-42). The average percentage of fines less than 6.4 mm was 39.9 percent, with average fine fines (less than 0.85 mm) at 12.9 percent. The percentage of fines less than 6.4 mm for this site is 18 percent greater than the reference value average, while the fine fines are 59 percent above the reference value average.

Table 3-42. Summary of McNeil core data for Warm Springs Creek, MT41I006_110.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	39.9	12.9	Both fines values are elevated.

Suspended Sediment Concentrations

Few recent data were available for Warm Springs Creek. The USGS National Water Information System had three records for suspended sediment from one site near the mouth sampled in 2000 and 2001. The highest value collected was 14 mg/L in October 2000. MDEQ staff collected one total suspended solids sample near the mouth in August 2001. The value was more than 10 mg/L. Two turbidity observations were recorded during summer sampling in 2003. All observations reported the water clarity as clear, yet the observations were made during the recessional limb of peak flow and also during low flow.

Macroinvertebrates

Macroinvertebrate data from one sample taken in August of 2001 above the mouth were available. The habitat rating for this site was "suboptimal" because of substrate embeddedness and channel alteration. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2002b). The metric score of 33 percent indicated moderate impairment and partial support of aquatic life uses. Clinger richness was not given. Seven trichoptera taxa were found at the site. Bollman concluded that fine sediment probably does not limit benthic access to stony substrate habitats (2002b).

Periphyton

No recent data are available.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database, and from the Helena National Forest. Warm Springs Creek is managed as a trout fishery, and eastern brook trout are the only species thought to be common. The overall habitat and sport fishery rating for this section of the creek is "moderate."

Metals Concentrations

The project team evaluated a total of eight in-stream water chemistry samples taken between October 2000 and August 2003. Arsenic concentrations in seven of the eight samples exceeded the human health criterion. The average concentration of all samples was 34 percent higher than the human health criterion. The highest measured arsenic concentration was 1.6 times the human health criterion. No exceedances of the aquatic life criteria were observed for arsenic. This evidence suggests that this segment does not meet the human health water quality standard for arsenic.

One sample (12.5 percent of all samples) exceeded the chronic aquatic life criterion for cadmium. This sample was 1.6 times the chronic aquatic life criterion. No exceedances of the human health criterion were observed for cadmium. The limited evidence suggests that this segment does not meet the aquatic life water quality standards for cadmium.

No samples were found to exceed either the human health or the aquatic life criteria for copper. The limited evidence suggests that this segment meets the human health and aquatic life criteria for copper. This segment should be monitored closely in the future to confirm this statement.

One sample (12.5 percent of all samples) exceeded the chronic aquatic life criterion for lead. This sample was 1.2 times the chronic aquatic life criterion. No exceedances of the human health criterion were observed for lead. The limited evidence suggests that this segment does not meet the aquatic life standard for lead.

One sample (12.5 percent of all samples) exceeded the acute and chronic aquatic life criteria for zinc. The concentration was 1.13 times the acute and chronic aquatic life criteria levels. No exceedances of the human health criterion were observed for zinc. This evidence suggests that this segment does not meet the aquatic life water quality standards for zinc.

Warm Springs Creek MT41I006_110 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics(width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediment, macroinvertebrates, fisheries, and water chemistry.

The target sediment values are not being met and results from the supplemental indicator values are mixed. Supplemental indicators for the channel metrics of BEHI and D_{50} were not met. An elevated BEHI rating indicates that stream banks might be a source of sediment to the stream. D_{50} at the survey site was one size-class smaller than expected and might be a reflection of excessive deposition of fine sediments. The Proper Functioning Condition rating of “Functional – at risk” (FAR) was given mainly on the basis of excessive sediment deposition. Suspended sediment data were not adequate to make a determination. The results of the macroinvertebrates sample suggest non-impairment by fine sediments, yet the corresponding habitat survey scores were low because of embeddedness. Recent fisheries data suggest that this stream provides moderate habitat for few fish species.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment. No target values were being met and supplemental indicators revealed mixed results.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Warm Springs Creek are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The available water chemistry analysis results suggest that Warm Springs Creek from Middle Fork to the mouth is impaired by arsenic, cadmium, lead, and zinc. TMDLs will therefore be developed to address the arsenic, cadmium, lead, and zinc impairments.

3.4.1.12 Clancy Creek from the Headwaters to the Mouth (MT41I006_120)

Stream segment MT41I006_100, approximately 11.6 miles in length, was listed as partially supporting aquatic life, cold-water fishery, drinking water, and recreational uses on Montana's 1996 303(d) list. In subsequent years, the list was modified to show aquatic life, cold-water fishery, and drinking water uses as non-supporting. Impairment causes in 1996 included siltation, suspended solids, habitat alterations, nutrients, and metals. Channel incisement and lead, arsenic, and mercury were added to the list of impairment causes in later 303(d) lists. A typical view of Clancy Creek is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), two cross-sectional surveys on the creek below the Gregory Mine and above the town of Clancy, McNeil core subsurface fines from both survey sites, suspended sediment data, macroinvertebrate data, fish population measures, and a total of 18 in-stream water chemistry samples taken between June 2000 and August 2003. Both cross-sectional surveys included a Proper Functioning Condition assessment, and Wolman pebble counts.

Clancy Creek

Pollution Sources

The 2003 preliminary source assessment identified roads, grazing, geology, and mine waste as the primary sediment sources for this segment of Clancy Creek. Most of the source assessment inventory sites consisted of road and grazing sites. The aerial photography inventory showed eight road crossings and road encroachment along 12 percent of the stream. About 47 percent of the stream segment is channelized from historical placer mining operations and from I-15 for a small section near the mouth.

The primary geology of this sub-watershed is the Boulder Batholith, with Quaternary sediments prominent in the lower floodplains. The aerial photography inventory showed that hard rock mining and grazing sources were most notable in the upper portion of the segment. Below Quartz Creek, severe alterations from placer mining begin and continue almost to the town of Clancy. The stream has been widened, straightened, and incised as a result of placer mining, which might have altered the stream's hydrology in addition to its morphology. The widths of deciduous riparian buffers ranged from 0 to 115 feet and were correlated to land management practices, including hay cultivation, placer tailings mounds, and development close to the stream. Private property borders most of the stream, and the BLM is the only other landowner. The primary land use is grazing, with a deferred rotation grazing system on BLM lands. There is also evidence of past beaver activity. From the confluence of Quartz Creek to the mouth, the primary land uses are hay fields and pasture, and rural housing.

In summer 2003, extensive gully and rill erosion was observed on the upper portions of Clancy Creek Road delivering sediment directly to the stream. This segment is surrounded by private land, with the dominant land uses of pasture and hay fields, and rural housing. The last one-half mile of the creek flows through the small town of Clancy. In summary, road runoff and localized sources (grazing, tailings piles) are probably the biggest contributors of sediment to Clancy Creek. Placer mining operations have altered the channel's form.

Expected significant contributors of metals to the stream segment are historical mining activities in the upper watershed. The source assessment showed that, among the 303(d)-listed segments in the Lake Helena TPA, placer mine tailings are the most extensive on Clancy Creek. The headwaters of the watershed fall within the Colorado mining district while the rest is within the Clancy mining district. The MBMG Abandoned and Inactive Mines database reports mineral location, placer, underground, and surface-underground mining activities in the watershed. The historical mining types include placer, lode, and mill. In the past these mines produced manganese, lead, silver, copper, zinc, and gold. Three mines in the headwaters—Gregory, Argentine, and Crawley Camp—are within the Colorado district and are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites. The state's inventory shows at least 10 other mines in the headwaters area of this watershed.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted two field investigations along Clancy Creek, just below the Gregory Mine and above the town of Clancy.

At the site below the Gregory Mine, the field crew determined the stream to be a Rosgen stream type B4. The width-to-depth ratio was 9.8, which is less than most of the reference stream data for Helena National Forest reference B4 stream types and less than the average of southwestern Montana and Greater Yellowstone Area B-type streams. The width-to-depth ratio does reflect channel incision and is more typical of A- and G-type streams. The BEHI rating was in the lower range of "moderate," but was 15 percent above the average for B-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse gravels. The

D_{50} was comparable to other Helena National Forest B4 reference streams, and was one size-class smaller than in southwestern Montana and Greater Yellowstone Area B-type reference streams.

The channel survey included an assessment of Proper Functioning Condition. Tetra Tech and Land & Water Consulting rated the reach below the Gregory Mine as “Non-functional” (NF). The field crew noted that road, grazing, and mining impacts were present. The riparian land type aggregate assigned to this survey site is 18, defined as Volcanic Rock – Rolling Uplands. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface fines are not very common and subsurface fines are common but generally not excessive.

At the site above the town of Clancy, the field crew determined the stream to be a Rosgen stream type B4c. The stream is probably recovering from an F4 channel form, and would probably be a C4 stream under natural conditions. The width-to-depth ratio was 28, more than 30 percent greater than the average for southwestern Montana and Greater Yellowstone Area C-type reference streams and more than 50 percent greater than the reference B-type average (Table 3-43). The BEHI rating was “moderate.” The BEHI rating was in the lower range of moderate, and was within 10 percent of the average for C-type reference streams in southwestern Montana and the Greater Yellowstone Area and 12 percent of the average for B-type streams. D_{50} as determined in a zigzag Wolman pebble count consisted of fine gravels. The D_{50} was three size-classes under southwestern Montana and Greater Yellowstone Area reference C4 and B4-type streams.

The channel survey included a Proper Functioning Condition assessment. The field crew rated the reach above Clancy as “Non-functional” (NF). The main reason for the rating was severe channel alteration from placer mining, followed by riparian impacts from grazing. The riparian land type aggregate assigned to the survey sites is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive.

Table 3-43. Summary of cross-sectional data for Clancy Creek, MT41I006_120.

Site	Parameter	Result	Comparable to Reference
Below the Gregory Mine	Width/depth ratio	9.8	No
Below the Gregory Mine	BEHI	23.5	Yes
Below the Gregory Mine	D_{50}	Coarse gravels	Yes
Below the Gregory Mine	PFC	NF	No
Above Clancy	Width/depth ratio	28	No
Above Clancy	BEHI	22.9	Yes
Above Clancy	D_{50}	Fine gravels	No
Above Clancy	PFC	NF	No

McNeil Cores

McNeil core data are available for two sites on Clancy Creek—the channel survey sites. Six cores were collected at the site below the Gregory mine. The riparian aggregate here was determined to be 18, Volcanic Rock – Rolling Uplands (Table 3-44). The average percentage of fines less than 6.4 mm was 30.5 percent, with average fine fines (less than 0.85 mm) at 7.4 percent. These values are slightly below the range expected based on the means for fines from all reference cores collected by the Helena National Forest (there are no reference cores specifically from aggregate 18).

The second set of McNeil cores was collected at the site above Clancy. Six cores were collected, and the riparian aggregate was determined to be 29, Alluvial Floodplains and Terraces. The average percentage of fines less than 6.4 mm was 49.7 percent, with average fine fines at 17.5 percent. Results for the averages of both categories of fines are extremely elevated against the means for fines from reference cores for riparian aggregate 29. The percentage of fines less than 6.4 mm for this site is 47 percent greater than the mean for reference riparian aggregate 29 cores, while the fine fines are 116 percent greater.

Table 3-44. Summary of McNeil core data for Clancy Creek, MT41I006_120.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
18	2003	30.5	7.4	Yes
29	2003	49.7	17.5	Both fines values are elevated.

Suspended Sediment Concentrations

Few recent data were available from the USGS National Water Information System for Clancy Creek. From 2000 to 2001, nine suspended sediment samples were collected at three sites. The highest value collected was 26 mg/L in May 2001 near the town of Clancy. The MDEQ gathered total suspended solids data from 2001 to 2003, collecting eight samples at three sites. The highest value was 35 mg/L in August 2001 just upstream of the town of Clancy. Although the data set is limited, no values were greater than what would be expected based on suspended sediment values from selected reference streams. In 2003, six turbidity observations were recorded on Clancy Creek at three sites. All observations reported the water clarity as clear.

Macroinvertebrates

Macroinvertebrate data from one sample taken in August 2001 near the headwaters were available. The macroinvertebrate habitat rating for this site was "optimal." Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2001). The metric score of 56 percent indicated slight impairment and partial support of aquatic life uses. Five clinger taxa and four trichoptera taxa were found at the site, and Bollman concluded that fine sediment might be limiting habitat for macroinvertebrates. In addition, the macroinvertebrate survey suggested water quality might be impaired by nutrients associated with large organic debris (leaves, grass blades, or twigs), reducing the numbers of mayflies (Bollman, 2003a).

Periphyton

No recent data were available; however, the 2001 MDEQ stream reach assessment form reported the results of a visual assessment of aquatic plant growth, which consisted predominantly of diatom algae.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database and data from the Helena National Forest. Clancy Creek is managed as a trout fishery. Brook trout are common year-round residents in Clancy Creek below the confluence with Kady Gulch, while genetically pure westslope cutthroat trout, a species of special concern, have been found in the upper 2 miles of the stream. The

Helena National Forest's fisheries data concur with the MFISH data. The overall habitat and sport fishery rating for Clancy Creek is "moderate."

Nutrient-related Data

The available post-1996 data did not have sufficient temporal and spatial resolution for a determination regarding possible nutrient impairments in Clancy Creek. Several total Kjeldahl nitrogen and total nitrogen measurements (two of eight available) and total phosphorus measurements (three of eight) were elevated in 2001 relative to the target values (Appendix D). In summer 2003, only one total phosphorus measurement of six taken was above the total phosphorus target value, and the rest of the nutrient variables (total nitrogen and soluble reactive phosphorus) were measured at concentrations below the target and supplemental indicator values (Appendix D).

During an August 2003 24-hour dissolved oxygen survey in lower Clancy Creek (M09CLNCC04), field notations reported good flow conditions (approximately 3 cfs) and limited algal growth. No large diurnal fluctuations in dissolved oxygen were recorded and individual measurements ranged from 7.3 to 9.1 mg/L. Six periphyton chlorophyll-*a* samples collected in 2003 yielded measurements ranging from 5.0 to 40 mg/m^2. Total suspended solids values in six samples were all below the supplemental indicator threshold and these ranged from less than 1 to 9.5 mg/L (Appendix D).

The dissolved oxygen survey in August 2003 showed no violations of dissolved oxygen standards designed to protect early life stages or other life stages of cutthroat trout in the upper sections of this creek (Appendix D). The readings were also below dissolved oxygen thresholds for early life stages or other life stages of brook trout.

Metals Concentrations

The project team evaluated a total of 18 in-stream water chemistry samples taken between June 2000 and August 2003. Arsenic concentrations in seven samples exceeded the human health criterion. The average concentration in all samples was 28 percent higher than the human health criterion. The highest measured concentration was 3.7 times the human health criterion for arsenic. No samples exceeded the aquatic life criteria for arsenic. This evidence suggests this segment does not meet the human health criterion for arsenic.

Cadmium concentrations in six samples (33 percent of all samples) exceeded the chronic aquatic life criterion. The average concentration of all samples was 68 percent higher than the chronic aquatic life criterion. The highest measured concentration was 7.1 times the chronic criterion for cadmium. No exceedances of the human health criterion were observed. This evidence shows this segment does not meet the aquatic life criterion for cadmium.

Lead concentrations in three samples (17 percent of all samples) exceeded the chronic aquatic life criterion. Of these, one also exceeded the human health criterion. The average concentration for all samples was just 11 percent below the chronic aquatic life criterion. The highest measured concentration observed was 5.7 times the chronic aquatic life criterion, and 1.3 times the human health criterion. This evidence shows that this segment does not meet the human health or aquatic life criteria for lead.

Zinc concentrations in five samples (28 percent of all samples) exceeded the acute and chronic aquatic life criteria. The highest measured concentration was 2.5 times the acute and chronic aquatic life criteria. No exceedances of the human health criterion were observed. This evidence shows this segment does not meet the aquatic life criteria for zinc.

Clancy Creek MT41I006_120 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, macroinvertebrates, fisheries, and water chemistry.

The data suggest that sediment impairments in Clancy Creek increase in a downstream direction. At the upstream site, all targets and many supplemental indicator values were met or exceeded. The Proper Functioning Condition rating of “Non-functional” (NF) was mainly made because the stream was not meeting expected hydrologic and riparian characteristics. Yet, the macroinvertebrate sample collected in the headwaters indicated a possibility of impairment by fine sediments. At the lower survey site target values and many supplemental indicator values were not met. The only channel metric to meet standards was BEHI. However, the excessive width-to-depth ratio is probably a reflection of the channel alterations from historical placer mining and does not necessarily represent a widening of the stream course due to excessive sediment loads. However, a smaller than expected D_{50} and a Proper Functioning Condition rating of NF both indicate sediment transport issues. Available suspended sediment data were inadequate for a determination, but the highest recorded values were measured near the mouth. Recent fisheries data suggest that the upper portion of the stream provides habitat for westslope cutthroat trout.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment. Numerous impairments to channel condition occurred along many reaches of the channel. At the sampling site above Clancy, targets and supplemental indicator values were not being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Clancy Creek Segment MT41I006_120 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The weight of evidence suggests that Clancy Creek (from the headwaters to the mouth) is not impaired by nutrients. Only one total phosphorus sample of six samples collected at three stations in this segment in July and August 2003 was above the total phosphorus target value. The remaining nutrient samples collected from these three stations in 2003 (total nitrogen, total phosphorus, soluble reactive phosphorus) were under the target or supplemental indicator values. The available in-stream dissolved oxygen data from July and August 2003 indicate no large diurnal fluctuations of dissolved oxygen at one station on this segment. Five periphyton chlorophyll-*a* values and six total suspended solids samples were below the proposed supplemental indicator value ranges. Therefore, a TMDL will not be developed to address low dissolved oxygen or organic enrichment.

The available water chemistry data suggest that Clancy Creek is impaired by arsenic, cadmium, copper, lead, and zinc. TMDLs will therefore be developed to address the arsenic, cadmium, copper, lead, and zinc impairments.

3.4.1.13 Lump Gulch from the Headwaters to the Mouth (MT41I006_130)

In 1996, the cold-water fishery, aquatic life, and drinking water uses in the 14.5 miles of Lump Gulch were listed as partially supported because of suspended solids and metals. In subsequent years, Lump Gulch was listed as not supporting cold-water fishery, aquatic life, and drinking water uses, and cadmium, mercury, copper, lead, and zinc were added to the list of metals. Suspended solids were removed as a suspected cause of impairment. The basis for the listing is from inventories performed in 1980 and 1994 that describe eroding stream banks and anthropogenic sediment inputs to the stream. An Environmental Impact Statement released in 2000 by the Helena National Forest described a thousand-fold increase in sediment inputs over natural conditions because of human-caused disturbance (based on models). Water chemistry data supported the metals listings. A typical view of Lump Gulch is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), two cross-sectional surveys on the creek above the confluence with the Park Lake drainage and below Little Buffalo Gulch, McNeil core subsurface fines from three survey sites, suspended sediment data, fish population information, and water chemistry data from a total of 29 samples taken between June 2000 and August 2003. Both cross-sectional surveys included a Proper Functioning Condition assessment and Wolman pebble counts.

Lump Gulch

Pollution Sources

The 2003 preliminary source assessment identified roads, grazing, geology, and mine waste as the primary sediment sources for Lump Gulch. The Helena National Forest conducted a road sediment survey on the forest portion of the creek and identified five sites that, based on modeling using the Water Erosion Prediction Project (WEPP) model, contribute approximately 3 tons of sediment per year to the stream (USDA, 2004). Most of the source assessment inventory sites consisted of road and mine sources. The aerial photography inventory showed 17 road crossings and road encroachment along 22 percent of the stream.

The primary geology of this sub-watershed is the Boulder Batholith, with Quaternary sediments prominent in the lower floodplains. The aerial photography inventory revealed that hard rock mining, grazing, and logging sources were notable on the Helena National Forest portion of the segment. The channel has been altered as a result of historical mining, and is incised and artificially embanked in many areas in the upper half of the stream. Below the Helena National Forest's administrative boundary, housing development is prominent and riparian buffer widths decrease.

In summary, road runoff and localized sources (grazing, tailings piles) are probably the biggest contributors of sediment to Lump Gulch. Historical hard rock mining operations have altered the channel's form.

Expected significant contributors of metals to the stream segment are historical mining activities in the upper watershed. The headwaters of the watershed fall within the Clancy mining district. The MBMG Abandoned and Inactive Mines database reports mineral location, placer, surface, and underground mining activities in the watershed. The historical mining types include placer, lode, and mill. In the past these mines produced lead, copper, zinc, silver, gold, and uranium. In the headwaters area there are over 10 historical hard rock mines, including 4 sites in Frohner Basin and the Clancy district— Nellie Grant, Frohner (two mines), and General Grant—that are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites. The aerial photography assessment showed the drainage to be disrupted by historical mining dams at the Frohner Meadows Mine. The Helena National Forest documented along this stretch of the stream included road sediment delivery points, mine waste rock dumps, a mining dam, and channel incision.

Channel Survey

In 2003 Tetra Tech, Land & Water Consulting, and the Helena National Forest conducted two field investigations along Lump Gulch, above the confluence with the Park Lake drainage and below Little Buffalo Gulch.

At the site above the confluence with the Park Lake drainage, the Helena National Forest determined the stream to be a Rosgen stream type B4a. The width-to-depth ratio was 21.3, which is greater than reference stream data for Helena National Forest B4a reference stream types and 59 percent greater than the average for southwestern Montana and Greater Yellowstone Area B-type streams. The BEHI rating was in the lower range of "moderate," and about equal to the average for B-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse gravels. The D_{50} was comparable to other Helena National Forest B4a reference streams, and southwestern Montana and Greater Yellowstone Area B reference streams.

The channel survey included a Proper Functioning Condition assessment. The Helena National Forest rated the reach above Park Lake as "Functional – at risk" (FAR), noting that the stream is recovering from channel alterations. The field crew noted that the stream was incised with areas of vertical unstable banks, and that pool infilling was occurring. The riparian land type aggregate assigned to this survey site is 27, Friable Loamy Glacial Till Moraines. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface fines are common and subsurface fines can be excessive.

At the site below Little Buffalo Gulch, the field crew determined the stream to be a Rosgen stream type B4c. The width-to-depth ratio was 12.2, which is comparable to reference stream data for Helena National Forest B4 reference stream types and as well as the average for southwestern Montana and Greater Yellowstone Area B-type streams (Table 3-45). The BEHI rating was in the lower range of “moderate” and within 5 percent of the average for B-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of fine gravels. The D_{50} was smaller than most Helena National Forest B4 s reference stream types and three size-classes smaller than southwestern Montana and Greater Yellowstone Area B4-type reference streams.

Part of the channel survey included a Proper Functioning Condition assessment. The field crew rated the reach below Little Buffalo Gulch as “Functional – at risk” (FAR). The stream was noted as being incised but stabilizing, with a fair amount of sediment deposition. The riparian land type aggregate assigned to the survey sites is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive. However, the influence of the granitic geology could elevate the fines values slightly.

Table 3-45. Summary of cross-sectional data for Lump Gulch, MT41I006_130.

Site	Parameter	Result	Comparable to Reference
Above Park Lake	Width/depth ratio	21.3	No
Above Park Lake	BEHI	21	Yes
Above Park Lake	D_{50}	Very coarse gravels	Yes
Above Park Lake	PFC	FAR	Yes
Below Little Buffalo Gulch	Width/depth ratio	12.2	Yes
Below Little Buffalo Gulch	BEHI	21.5	Yes
Below Little Buffalo Gulch	D_{50}	Fine gravels	No
Below Little Buffalo Gulch	PFC	FAR	Yes

McNeil Cores

McNeil core data are available for three sites on Lump Gulch, two of which are within the Helena National Forest’s administrative boundary. The oldest cores (six cores) were collected in 1989. The exact location of the core sites is unknown; therefore, a riparian aggregate cannot be determined (Table 3-46). The average percentage of fines less than 6.4 mm was 51.5 percent, with average fine fines at 17.7 percent. The percentage of fines less than 6.4 mm for this site is 57 percent greater than the mean for all reference cores collected by the Helena National Forest, and the fine fines are 77 percent above the mean.

The Helena National Forest collected the second set of McNeil cores (three cores) in 2003 at the field survey site above Park Lake. The riparian aggregate here was determined to be 27, defined as Friable

Loamy Glacial Till Moraines. The average percentage of fines less than 6.4 mm was 44.6 percent, with average fine fines (less than 0.85 mm) at 7.1 percent. These values are over 20 percent less than the means for fines from reference cores for riparian aggregate 27.

The third set of McNeil cores was collected at the site below Little Buffalo Gulch. Six cores were collected, and the riparian aggregate was determined to be 29, Alluvial Floodplains and Terraces. The average percentage of fines less than 6.4 mm was 45.5 percent, with average fine fines at 17.8 percent. The averages for both categories of fines are elevated against the means for fines from reference cores for riparian aggregate 29. The percentage of fines less than 6.4 mm for this site is 34 percent greater the mean for reference riparian aggregate 29 cores, while the fine fines are 12 percent greater.

Table 3-46. Summary of McNeil core data for Lump Gulch, MT41I006_130.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
Unknown	1989	51.5	17.7	Both fines values are elevated.
27	2003	44.6	7.1	Yes
29	2003	45.5	17.8	Both fines values are elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for nine sites on Lump Gulch, with 25 samples taken from 2000 to 2001. The highest value collected was 23 mg/L in May 2001 at the sampling site above Frohner Meadows (Table 3-47). The suspended sediment data had an average of 4.8 mg/L with a median of 3.0 mg/L. All of these values are comparable to values from selected reference streams for suspended sediment.

Table 3-47. Statistical summary of suspended sediment data for Lump Gulch, MT41I006_130.

Mean	4.8 mg/L
Median	3.0 mg/L
Standard deviation	5.2 mg/L
Maximum	23.0 mg/L
Number of samples	25
Number of sample sites	9

In 2003, six turbidity observations were recorded at three sites along Lump Gulch. Five observations reported the water clarity as clear. The July observation above Park Lake reported the water as slightly turbid with an orange tint. The observations were made during the recessional limb of peak flow and also during low flow.

Macroinvertebrates

No recent data are available.

Periphyton

No recent data are available.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database and data from the Helena National Forest. Lump Gulch is managed as a trout fishery. According to MFISH, brook trout and mottled sculpin are common year-round residents in the lower 5 miles of Lump Gulch, while genetically pure westslope cutthroat trout, a species of special concern, and rainbow/cutthroat hybrids have been found in the upper 6 miles of the stream. The Helena National Forest estimates that brook trout occupy Lump Gulch for as much as 11 miles upstream from the mouth. The overall habitat and sport fishery rating for Lump Gulch is "moderate."

Metals Concentrations

The project team evaluated a total of 29 samples taken between June 2000 and August 2003. Arsenic concentrations in all samples were below the human health and aquatic life criteria. This evidence shows this segment meets the human health and aquatic life criteria for arsenic.

Cadmium concentrations in 12 samples (41 percent of the available samples) exceeded the chronic aquatic life criterion. Of these, four also exceeded the acute aquatic life criterion. The average of all samples was 218 percent higher than the chronic aquatic life criterion. The highest measured concentration was 20.7 times the chronic aquatic life criterion. This evidence shows this segment does not meet the aquatic life criteria for cadmium.

Copper concentrations in two samples (seven percent of all samples) exceeded the chronic aquatic life criterion. The highest measured concentration was 1.10 times the chronic aquatic life criterion. No samples were above the human health criterion. This evidence suggests that this segment does not meet the aquatic life water quality standards for copper.

Lead concentrations in three samples (10 percent of all samples) exceeded the chronic aquatic life criterion for lead. The highest measured concentration was 2.24 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows this segment does not meet the aquatic life standards for lead.

Zinc concentrations in 14 samples (48 percent of all samples) exceeded the acute and chronic aquatic life criteria for zinc. The average concentration of all samples was 160 percent higher than the acute and chronic aquatic life criteria. The highest measured concentration was 23 times the acute and chronic aquatic life criteria. No samples exceeded the human health criterion. This evidence shows this segment does not meet the aquatic life standards for zinc.

Lump Gulch MT41I006_130 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, fisheries, and water chemistry.

Results from the data assessment are mixed, but the majority of target values were not met. At the upper sample site, target values were met and most supplemental values were met except for the width-to-depth ratio. The elevated width-to-depth ratio is probably a reflection of the severe channel alterations that have occurred from mining, and does not necessarily reflect stream aggradation. However, the fines data collected at an unknown sampling location in the upper portion of Lump Gulch did not meet subsurface fines target thresholds. At the lower sample site, targets were exceeded but many supplemental indicator values were met. A smaller than expected D_{50} at this site could indicate deposition of surface fines, which was noted during the Proper Functioning Condition assessment. Suspended sediment values were comparable to reference conditions. Recent fisheries data suggest that the upper portion of the stream provides habitat for westslope cutthroat trout and rainbow/cutthroat hybrids.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment. Numerous impairments to channel condition occurred along many reaches of the channel. The majority of target values were not being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Lump Gulch Segment MT41I006_130 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The more recent water chemistry data suggest that Lump Gulch is impaired by cadmium, copper, lead, and zinc. TMDLs will therefore be developed to address the cadmium, copper, lead, and zinc impairments.

3.4.1.14 Jackson Creek from the Headwaters to the Mouth (MT41I006_190)

In 1998, the cold-water fishery and aquatic life uses in the 2.5 miles of Jackson Creek were listed as partially supported because of siltation. The basis for the listing is unknown, and in 1998 and subsequent years the stream was removed from the 303(d) list because of insufficient credible data. A typical view of Jackson Creek is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey above the mouth that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, and fisheries population information.

Jackson Creek

Pollution Sources

The 2003 preliminary source assessment identified fire effects, geology, and roads as the primary sediment sources for Jackson Creek. The aerial photography inventory showed 10 road crossings and road encroachment along 4 percent of the stream. No source assessment sites were taken in the field because of access constraints.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. Deposition of sand was observed in the stream channel at the field sampling site. In 1988, the whole drainage was burned over in the Warm Springs wildfire. The aerial photography assessment, which was based on 1999 vintage, post-fire photos, showed that most vegetation present in the sub-watershed was restricted to riparian areas. The headwaters area has extremely rugged terrain with exposed rock outcrops and rock slides. There is some dispersed housing near the creek on the private land close to the creek's mouth.

In summary, fire effects and erosive geology are probably the biggest contributors of sediment to Jackson Creek. Land disturbance appears to exacerbate erosion in the Boulder Batholith geology and the poorly developed soils of this sub-watershed.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation on Jackson Creek, above the mouth. The field crew determined the stream to be a Rosgen stream type B4a. The width-to-depth ratio was 15.7, which is comparable to a B4a, and other B4 reference streams that the Helena National Forest has inventoried. The BEHI rating was "moderate" (Table 3-48). The BEHI score is about equal to the average for southwestern Montana and Greater Yellowstone Area A- and B-type reference streams. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse gravels. This median particle size is comparable to Helena National Forest B4a and B4 reference streams and one size-class smaller than the range expected for southwestern Montana and the Greater Yellowstone Area B4 reference streams.

The channel survey included a Proper Functioning Condition assessment. The field crew rated this site as "Proper Functioning Condition" (PFC), but noted some sediment deposition. The riparian land type aggregate assigned to this site is 10, defined as Granitic Rock – Mountain Slopes and Ridges. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common and can be excessive.

Table 3-48. Summary of cross-sectional data for Jackson Creek, MT41I006_190.

Parameter	Result	Comparable to Reference
Width/depth ratio	15.7	Yes
BEHI	21.2	Yes
D_{50}	Coarse gravels	Yes
PFC	PFC	Yes

McNeil Cores

McNeil core data are available for one site on Jackson Creek—the channel survey site. Six cores were collected. The riparian land type aggregate here was determined to be 10, Granitic Rock – Mountain Slopes and Ridges (Table 3-49). The average percentage of fines less than 6.4 mm was 38.6 percent, with average fine fines (less than 0.85mm) at 13.3 percent. The percentage of fines less than 6.4 mm for this site is 8 percent greater than the mean for reference riparian aggregate cores, and the fine fines are 30 percent above the mean.

Table 3-49. Summary of McNeil core data for Jackson Creek, MT41I006_190.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
10	2003	38.6	13.3	Both fines values are elevated.

Suspended Sediment Concentrations

Few recent data were available for Jackson Creek. The MDEQ collected two samples for total suspended sediment in 2000 and 2001 near the mouth. The highest value collected was 5.4 mg/L in September 2001.

Macroinvertebrates

Macroinvertebrate data from one sample taken in September of 2002 above the mouth were available. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2003b). Eighteen clinger taxa and eight trichoptera taxa were found at the site, and Bollman concluded that fine sediment did not limit benthic habitat.

Periphyton

Periphyton data from one sample taken in August of 2002 above the mouth were available. Sampling results were compared with reference biocriteria metrics established for the Rocky Mountain Ecoregions of Montana (Bahls, 2003). Diatom metrics indicated minor impairment and partial support of aquatic life use. Bahls concluded that the impairment was primarily due to organic loading and possibly metals. However, the siltation index did exceed the threshold for moderate impairment.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database and data from the Helena National Forest. MFISH has no listing or management strategy for Jackson Creek. The Helena National Forest estimates that brook trout occupy Jackson Creek to about 1.5 miles upstream from the mouth.

Jackson Creek MT41I006_190 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, macroinvertebrates, periphyton, and fisheries.

Comparisons to the targets and supplemental indicator values are mixed. Supplemental indicators for all channel metrics were met. A Proper Functioning Condition rating of PFC reflects that the stream is able to sustain expected hydrologic characteristics, riparian vegetation, and sediment transport capacities. Values for fines less than 0.85 mm from McNeil cores were slightly above the target values, but values for fines less than 6.4 mm were about equal to target reference values. Suspended sediment data values were not adequate to make a determination. Biological data results were contradictory, but neither report concluded that sediment posed a limit to aquatic life. Recent fisheries data suggest that the stream provides habitat for few fish species.

Results from the 2003 preliminary source assessment revealed that sediment sources affecting the stream were primarily caused by natural sources (the 1988 Warm Springs Fire). Most of the supplemental indicator values were being met, and the target value exceedance was not extremely aberrant.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Jackson Creek are not impaired by siltation. Therefore a TMDL will not be developed to address sediment impairment.

3.4.2 Tenmile Creek Drainage

This section presents summaries and evaluations of all available water quality data for water bodies in the Tenmile Creek drainage. Maps of the Upper Tenmile and Lower Tenmile drainage areas are provided in Figure 3-10 and Figure 3-11.

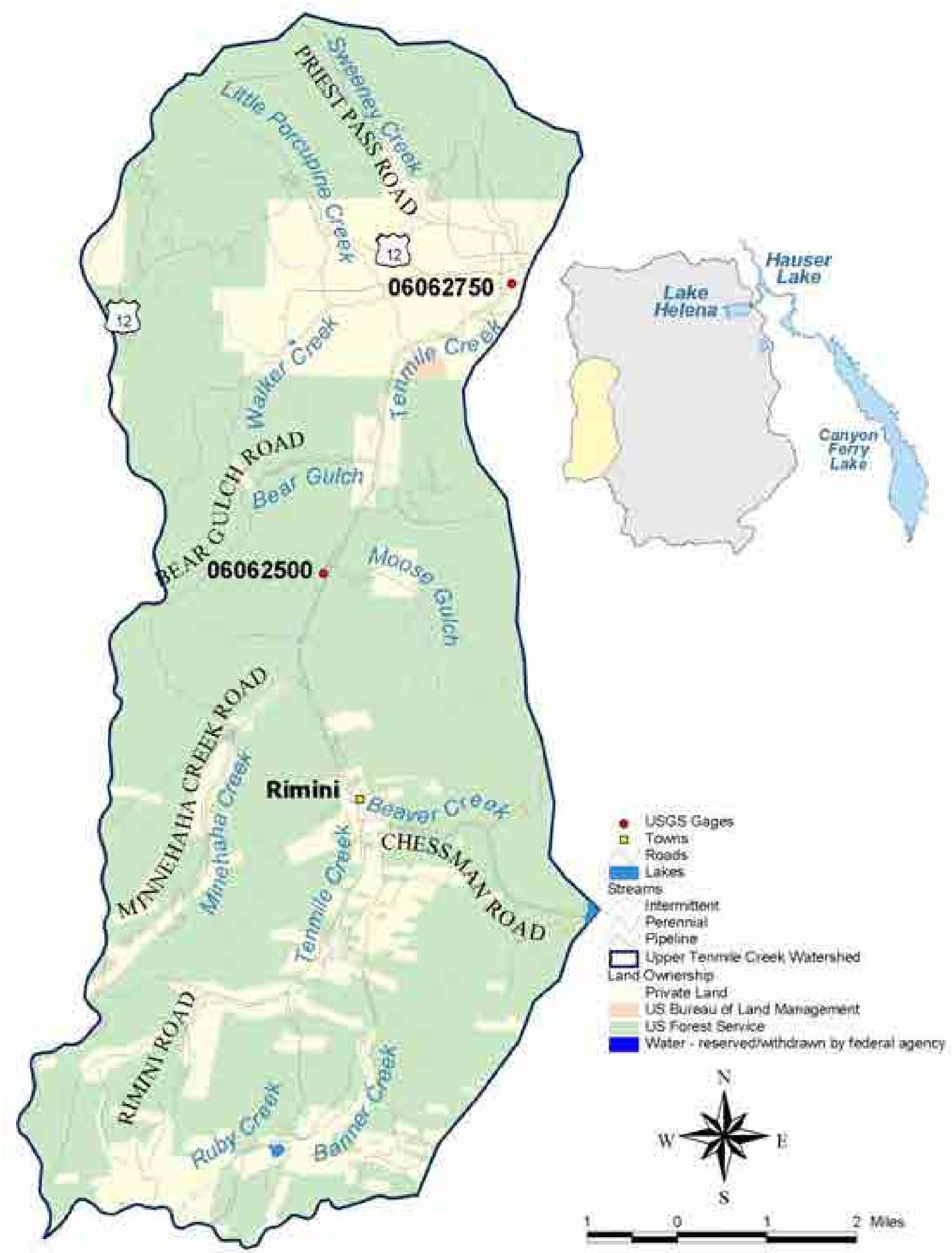

Figure 3-10. Upper Tenmile Creek Watershed.

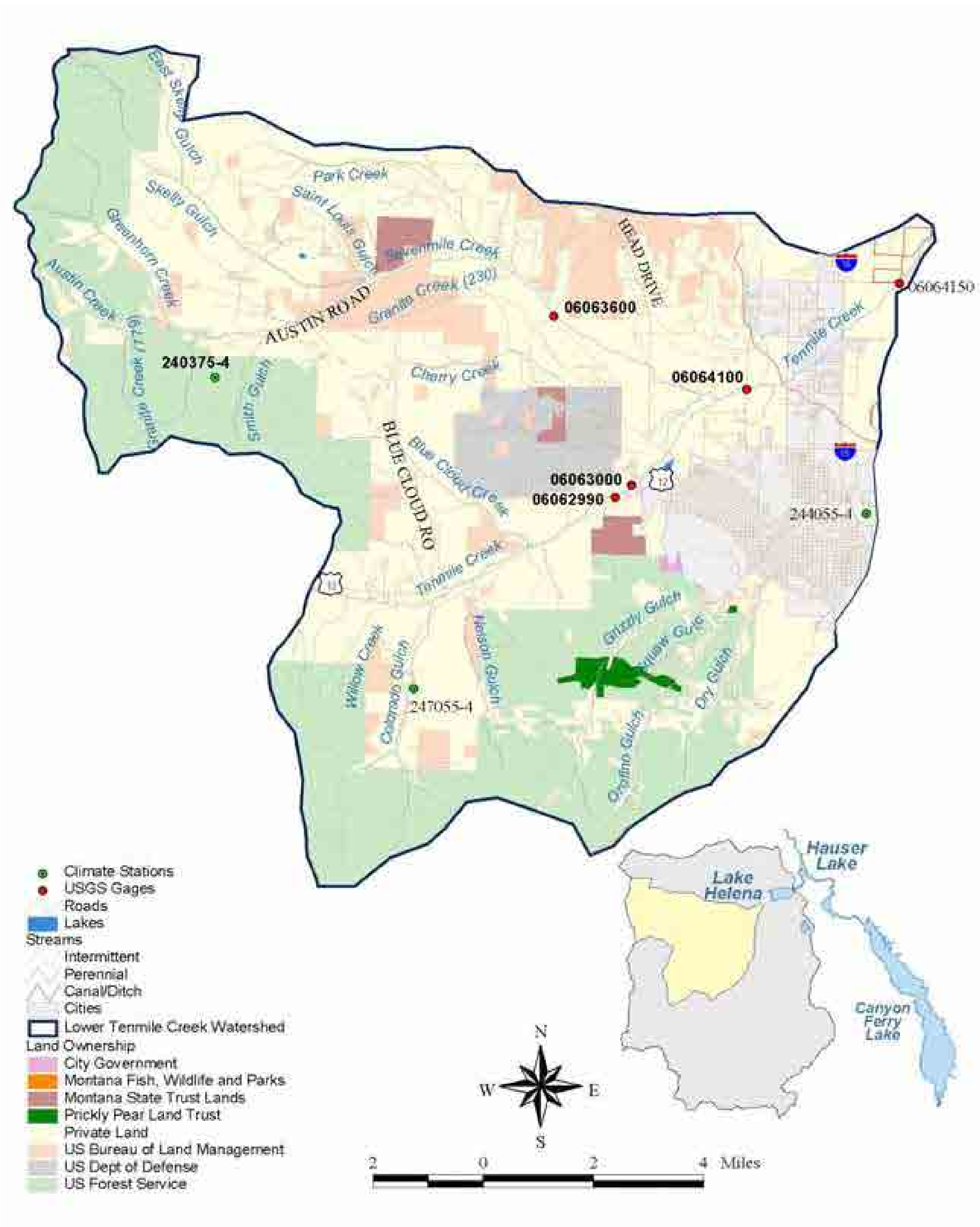

Figure 3-11. Lower Tenmile Creek Watershed.

3.4.2.1 Tenmile Creek from the Headwaters to Helena Public Water Supply Intake above Rimini (MT41I006_141)

In 1996, the aquatic life, cold-water fishery, drinking water, and recreational uses of this 6-mile segment of Tenmile Creek were listed as only partially supported because of siltation, habitat alterations, flow alterations, metals, and pH. In subsequent 303(d) lists, the segment was listed as not supporting its designated aquatic life, cold-water fishery, and drinking water uses, while recreational uses were reassessed at a level of full support. The list of impairment causes was expanded to include turbidity, and the specific metals cadmium, arsenic, lead, zinc, and copper. A typical view of this segment is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), two cross-sectional surveys on the creek in the headwaters and above the confluence with Banner Creek, McNeil core subsurface fines from one survey site, suspended sediment data, macroinvertebrate and periphyton data, fish population measures, and a total of 34 in-stream water chemistry samples taken between May 1997 and September 2001. Both cross-sectional surveys included a Proper Functioning Condition assessment, and Wolman pebble counts.

Tenmile Creek from headwaters to Helena public water supply intake above Rimini

Pollution Sources

The 2003 preliminary source assessment identified roads and channel alterations as the primary sediment sources for this segment of Tenmile Creek. The Helena National Forest conducted a road sediment survey on the forest portion of the creek and identified seven sites on the segment that, based on modeling using the Water Erosion Prediction Project (WEPP) model, contribute approximately 0.76 ton of sediment per year to the stream (USDA, 2004). Another 14 sites on tributary streams to this segment were estimated to contribute 8.7 tons of sediment annually. Most of the source assessment inventory sites were road and mine sites. The aerial photography inventory showed five road crossings and road encroachment along 35 percent of the stream.

The primary geology of this sub-watershed is the Boulder Batholith. The aerial photography inventory showed that upslope logging and exposed stream banks were notable on this portion of Tenmile Creek. Stream incisement was noticeable. Riparian buffer widths were variable due to moderate road encroachment (Rimini Road and secondary Helena National Forest roads), and from private land uses.

In summary, road runoff and localized sources (channel alterations) are probably the biggest contributors of sediment to Tenmile Creek. Historical mining operations and road placement have altered the channel's form.

Expected relevant sources of metals to the stream segment are historical hard rock mining activities in the immediate drainage area. The drainage area of this segment of the stream falls within the Rimini mining district. The MBMG Abandoned and Inactive Mines database shows mineral location, placer, surface, surface-underground, underground, and other unknown mining activities in the drainage area of the stream. The historical mining types include lode, mill, and placer. In the past these mines produced gold, silver, lead, copper, manganese, zinc, and arsenic. Of the more than 20 mines present in the headwaters area, 12 are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites: Valley Forge/Susie, Red Water, Red Mountain, Tenmile Mine, National Extension, Monte Cristo, Se Se S13, Queensbury, Peerless Jenny/King, Monitor Creek Tailings, Peter, and Woodrow Wilson. The Helena National Forest documented placer tailings and historical mining dams during the source assessment.

EPA added the Upper Tenmile Creek Mining Area to the Superfund National Priorities List on October 22, 1999. Superfund mine waste removals began in the 1999 field season and continued through 2002 (USEPA, 2003). EPA has completed the cleanup in the high priority areas (Red Mountain, Bunker Hill, Susie Peerless/Jenny/King, and part of the Upper Valley Forge Mine sites) and will address 70 remaining mine sites. Cooperating agencies have combined resources to expedite a watershed cleanup with the U.S. Forest Service taking the lead role in cleaning up wastes on its property within the Superfund Site boundary (Beatrice, Justice, and Armstrong Mines). Cleanup expenses are shared by EPA and the Forest Service where individual mines involve both federal and private lands (upper Valley Forge Mine). EPA and the Forest Service also share construction and maintenance costs of joint mine waste repository (USEPA, 2003).

Channel Survey

In 2003 the Helena National Forest conducted two field investigations along this segment of Tenmile Creek: (1) in the headwaters, and (2) above the confluence with Banner Creek.

At the site in the headwaters, the Helena National Forest determined the stream to be a Rosgen stream type E4b. The width-to-depth ratio was 5.2, which is slightly less than the ration for the one E4 Helena

National Forest reference stream but 33 percent greater than the average of southwestern Montana and Greater Yellowstone Area E-type reference streams (Table 3-50). The BEHI rating was "low" and equal to the average for E-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse gravels. The D_{50} was in the same size-class as other E4 reference streams for southwestern Montana and the Greater Yellowstone Area.

The channel survey included a Proper Functioning Condition assessment. The Helena National Forest rated the headwaters reach as "Proper Functioning Condition" (PFC), noting that the site could be used as a reference reach. The riparian land type aggregate assigned to this survey site is 24, defined as Granitic Glacial Till Moraines. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface fines and subsurface fines are common but usually not excessive.

At the site above Banner Creek, the field crew determined the stream to be a Rosgen stream type B3. The width-to-depth ratio was 23.8, which is elevated against reference stream data for Helena National Forest B3 and B3a reference streams and 78 percent greater than the average for southwestern Montana and Greater Yellowstone Area B-type reference streams. The stream banks were predominately lined with boulders, which led to a "low" or very stable BEHI rating. This BEHI rating is actually better than the average for southwestern Montana and Greater Yellowstone Area B-type reference streams, but should be expected for boulder-dominated stream banks. D_{50} as determined in a zigzag Wolman pebble count consisted of small cobbles. The D_{50} was comparable to Helena National Forest B3 reference streams and southwestern Montana and Greater Yellowstone Area B-type reference streams.

The channel survey included a Proper Functioning Condition assessment. The field crew rated the reach above Banner Creek as "Functional – at risk" (FAR). The stream was noted as being incised, with a fair amount of sediment deposition. The riparian land type aggregate assigned to the survey site is 22, Granitic Rock – Glaciated Mountain Slopes. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common and can be excessive.

Table 3-50. Summary of cross-sectional data for Tenmile Creek, Segment MT41I006_141.

Site	Parameter	Result	Comparable to Reference
Headwaters	Width/depth ratio	5.2	Yes
Headwaters	BEHI	Low	Yes
Headwaters	D_{50}	Coarse gravels	Yes
Headwaters	PFC	PFC	Yes
Above Banner Creek	Width/depth ratio	23.8	No
Above Banner Creek	BEHI	Low	Yes
Above Banner Creek	D_{50}	Small cobbles	Yes
Above Banner Creek	PFC	FAR	NA, trend not apparent

McNeil Cores

McNeil core data are available for one site on this segment of Tenmile Creek— the survey site above Banner Creek. Six cores were collected, and the riparian aggregate here was determined to be 22, Granitic Rock – Glaciated Mountain Slopes (Table 3-51). The average percentage of fines less than 6.4

mm was 39.1 percent, with average fine fines (less than 0.85 mm) at 7.4 percent. The percentage of fines less than 6.4 mm for this site is 20 percent greater than the mean for all Helena National Forest reference cores (there are no reference cores for riparian aggregate 22), while the fine fines are 26 percent below the mean.

Table 3-51. Summary of McNeil core data for Tenmile Creek, Segment MT41I006_141.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
22	2003	39.1	7.4	Fines < 6.4 mm value is elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for four sites on this segment of Tenmile Creek, with 32 samples taken from 1997 to 2001. The highest value collected was 31 mg/L in May 1997 at the sampling site below Spring Creek (Table 3-52). The suspended sediment data had an average of 9.5 mg/L with a median of 7 mg/L. All of these values are comparable to values from selected reference streams for suspended sediment.

Table 3-52. Statistical summary of suspended sediment data for Tenmile Creek, Segment MT41I006_141.

Mean	9.5 mg/L
Median	7.0 mg/L
Standard deviation	9.3 mg/L
Maximum	31.0 mg/L
Number of samples	32
Number of sample sites	4

Macroinvertebrates

Macroinvertebrate data were available from two bioassessment reports. The first report evaluated data collected in a location on Tenmile Creek below Banner Creek over a 3-year period from 1997 to 1999. Sampling results were evaluated using the MDEQ's Rapid Bioassessment Protocols (McGuire, 2000). The 3-year average metric score indicated non-impairment and full support of aquatic life uses. Clinger richness was not reported, but an average of 13.5 trichoptera taxa were found at the site.

The second report evaluated macroinvertebrates collected below the confluence with Monitor Creek in July 2001. The site had a habitat rating of "optimal." Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2001). The metric score of 83 percent indicated non-impairment and full support of aquatic life use. Twelve clinger taxa and eight trichoptera taxa were found at the site. The assessment report suggested that road sediment might limit benthic habitat potential despite the optimal habitat rating.

Periphyton

Periphyton data were available for three sample locations on upper Tenmile Creek. Sampling occurred in September 1998 above Banner Creek, below Banner Creek, and at the City of Helena's water diversion. Diatom metrics progressed from ratings of minor impairment at the upstream location to severe impairment at the downstream site. None of the suspected impairment causes included sedimentation and the siltation index was below the threshold for minor impairment at all sites.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database and data from the Helena National Forest. Tenmile Creek is managed as a trout fishery. According to MFISH, mottled sculpin are the only fish species thought to be common year-round residents in this segment of Tenmile Creek. The Helena National Forest estimates that brook trout occupy this segment of Tenmile Creek about a mile below the headwaters, while rainbow trout have been found 5 miles below the headwaters. The overall habitat and sport fishery rating for Tenmile Creek is "moderate."

Metals Concentrations

The project team evaluated a total of 34 in-stream water chemistry samples taken between May 1997 and Sept 2001. Arsenic concentrations in eight samples exceeded the human health criterion. Of those, one was also above the chronic aquatic life criterion. The average arsenic concentration in all samples was 71 percent higher than the human health criterion. The highest measured concentration was 16.7 times the human health criterion, and 1.10 times the chronic aquatic life criterion. This evidence shows that this segment does not meet the human health criterion for arsenic.

Cadmium concentrations in 28 samples (82 percent of the samples evaluated) exceeded the chronic aquatic life criterion. Of those, 24 also exceeded the acute aquatic life criterion, and three exceeded the human health criterion. The average value of all samples was 358 percent and 2,382 percent higher than the acute and chronic aquatic life criteria, respectively. The highest measured value was 321 times the chronic aquatic life criterion, and 6.0 times the human health criterion. This evidence shows this segment does not meet the human health and aquatic life standards for cadmium.

Copper concentrations in 32 samples (94 percent of the samples) exceeded the chronic aquatic life criterion. All of those were also above the acute aquatic life criterion. The average value of all samples was 499 percent and 697 percent higher than the acute and chronic aquatic life criteria, respectively. The highest measured value was 73 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows that this segment does not meet the aquatic life standards for copper.

Lead concentrations in 29 samples (85 percent of the samples) exceeded the chronic aquatic life criterion. Of those, four samples also exceeded the acute aquatic life criterion and 3 samples exceeded the human health criterion. The average value of all samples was 1,393 percent higher than the chronic aquatic life criterion. The highest measured value was 139 times the chronic aquatic life criterion and 4.7 times the human health criterion. This evidence shows that this segment does not meet the human health or aquatic life criteria for lead.

Zinc concentrations in 30 samples (88 percent of the samples) exceeded the acute and chronic aquatic life criteria for zinc. One sample exceeded the human health criterion. The average value of all samples was 789 percent higher than the acute and chronic aquatic life criteria. The highest measured value was 86 times the acute and chronic aquatic life criteria, and 1.6 times the human health criterion. This evidence shows that this segment does not meet the human health and aquatic life criteria for zinc.

Tenmile Creek MT41I006_141 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85mm, suspended sediments, macroinvertebrates, periphyton, fisheries, and water chemistry.

Comparisons with the sediment targets and supplemental indicator values produced inconsistent conclusions. At the upper survey site, all supplemental values were met and the site was recommended as a reference reach. At the lower sample site, target values were only exceeded for the percentage of fines less than 6.4mm and all supplemental indicator values were met except for width-to-depth ratio. The percentage of fines less than 6.4 mm for the lower site was not excessively elevated against the mean for all Helena National Forest reference cores. The elevated width-to-depth ratio is probably a reflection of the severe channel alterations caused by mining, and does not necessarily reflect stream aggradation. Suspended sediment data values were comparable to reference. Biological indicators suggest non-impairment from sedimentation. Recent fisheries data suggest that the stream provides habitat for few fish species, but fish habitat is most likely limited by metals toxicity.

Results from the 2003 preliminary source assessment revealed that eroding sediment sources affecting the stream were enhanced by the erosive granitic geology. Most of the targets and supplemental values were being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Tenmile Creek segment MT41I006_141 are not impaired by siltation or suspended solids. A TMDL will therefore not be developed for sediment.

The available water chemistry analysis results suggest that Tenmile Creek from the headwaters to the Helena public water supply intake above Rimini is impaired by arsenic, cadmium, copper, lead, and zinc. TMDLs will therefore be developed to address the arsenic, cadmium, copper, lead, and zinc impairments.

3.4.2.2 Tenmile Creek from Helena Public Water Supply Intake above Rimini to Helena Water Treatment Plant (MT41I006_142)

Segment MT41I006_142 of Tenmile Creek extends 7.7 miles from the Helena public water supply intake above Rimini to the Helena Water Treatment Plant. In 1996, the aquatic life, cold-water fishery, drinking water, and recreational uses of this 7.7-mile segment of Tenmile Creek were listed as only partially supported because of siltation, habitat alterations, flow alterations, metals, and pH. In subsequent 303(d) lists, the former uses plus agricultural and industrial uses were rated as not supported because of siltation (2002 list), and because of flow alterations and metals, specifically arsenic, cadmium, copper, lead, and zinc (2000 and 2002 lists). A typical view of this segment is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey on the creek below Bear Gulch that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the reach surveyed in 2003, suspended sediment data, macroinvertebrate and periphyton data, fish population information, and a total of 20 in-stream water chemistry samples taken between May 1997 and July 2003.

Tenmile Creek from Helena PWS intake above Rimini to Helena WTP

Pollution Sources

The 2003 preliminary source assessment identified roads and riparian grazing as the primary sediment sources for this segment of Tenmile Creek. The Helena National Forest conducted a road sediment survey on the forest portion of the creek and identified 11 sites that, based on modeling using the Water Erosion Prediction Project (WEPP) model, contribute approximately 1.3 tons of sediment per year to the stream (USDA, 2004). Most of the source assessment inventory sites consisted of road sites. The aerial photography inventory showed 20 road crossings and road encroachment along 50 percent of the stream segment. The stream channel has been straightened in proximity to the Rimini Road, as evidenced by at least seven meander cutoffs.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. Quaternary alluvium is present in the lower floodplain. Direct sediment delivery to the stream from the Rimini Road was observed in many locations as well as deposition of sand in the stream channel. The aerial photography inventory revealed evident stream incisement, eroding stream banks, and lack of flow. Intermittent logging has occurred in the hill slopes surrounding tributary streams. The widths of riparian buffers were limited because of encroachment from the Rimini Road.

In summary, road runoff and road placement are probably the biggest contributors of sediment to this segment of Tenmile Creek. Channel alterations from road placement and flow withdrawal by the City of Helena have affected channel form and the flow regime along this segment.

Expected relevant sources of metals in this stream segment include adjacent abandoned mines and pollutant inputs from the stream's headwaters area (Tenmile Creek 141). The immediate drainage area falls within the Rimini mining district. The MBMG Abandoned and Inactive Mines database reports mineral location, underground, and other, "unknown" mining activities in the drainage area of the stream. The historical mining types include lode and placer. In the past these mines produced gold, silver, lead, and zinc. Four mines are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites: Bear Gulch, Upper Valley Forge, Beatrice, and Armstrong Mine.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation along this section of Tenmile Creek, below the Bear Gulch confluence. The stream's entrenchment ratio and sinuosity were out of balance with the valley type setting, reflecting channel confinement and straightening. Without channel modifications, the stream reach probably would be a Rosgen stream type B4c. The width-to-depth ratio was 15.8, which is comparable to other Helena National Forest B4 reference streams and 18 percent greater than the average for southwestern Montana and Greater Yellowstone Area B-type reference streams (Table 3-53). The BEHI rating was "low," which is actually better than the average for southwestern Montana and Greater Yellowstone Area B-type reference streams. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse gravels. This particle size is within the range expected for B4-type reference streams, based on data collected by the Helena National Forest and for southwestern Montana and the Greater Yellowstone Area.

The channel survey included a Proper Functioning Condition assessment. Tetra Tech and Land & Water Consulting rated this site as "Functional – at risk" (FAR), noting that the stream was under-sized for the available channel. Sediment deposition was observed as was a limited riparian zone. The riparian land type aggregate assigned to this site is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive.

Table 3-53. Summary of cross-sectional data for Tenmile Creek, Segment MT41I006_142.

Parameter	Result	Comparable to Reference
Width/depth ratio	15.8	Yes
BEHI	11.2	Yes
D_{50}	Very coarse gravels	Yes
PFC	FAR	Yes (flow issues)

McNeil Cores

McNeil core data are available for one site on this segment of Tenmile Creek—the channel survey site. Six cores were collected in 2003. The riparian aggregate here was determined to be 29, Alluvial Floodplains and Terraces (Table 3-54). The average percentage of fines less than 6.4 mm was 38 percent, with average fine fines (less than 0.85 mm) at 10.3 percent. The percentage of fines less than 6.4 mm for this site is 12 percent greater than the mean for Helena National Forest reference cores, and the fine fines are 27 percent above the mean.

Table 3-54. Summary of McNeil core data for Tenmile Creek, Segment MT41I006_142.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	38	10.3	Both fines values are elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for two sites along this segment of Tenmile Creek. Eighteen samples were taken from 1997 to 2001. The highest observed value was 34 mg/L in May of 1997 at the sampling site at the water treatment plant (end of the segment) (Table 3-55). The suspended sediment data had an average of 8.8 mg/L with a median of 5.0 mg/L. All of these values are comparable to suspended sediment values for selected reference streams.

Table 3-55. Statistical summary of suspended sediment data for Tenmile Creek, Segment MT41I006_142.

Mean	8.8 mg/L
Median	5.0 mg/L
Standard deviation	9.0 mg/L
Maximum	34.0 mg/L
Number of samples	18
Number of sample sites	2

In 2003, two turbidity observations were recorded at the water treatment plant. One observation reported the water clarity as clear, and the August observation reported that the stream was dry.

Macroinvertebrates

Macroinvertebrate data were available from one bioassessment report prepared in 2000. Sampling occurred on this segment of Tenmile over a 3-year period from 1997 to 1999 at sites in Rimini, at the Mill

Creek confluence, and below Moose Creek. Sampling results were evaluated using the MDEQ's Rapid Bioassessment Protocols (McGuire, 2000). The 3-year average metric scores for all sites varied from non-impairment to slight impairment, with full support of aquatic life uses indicated at the upper and lower sites, and partial support suggested at the Mill Creek confluence. Clinger richness was not reported and 3-year averages for trichoptera taxa richness ranged from 5.7 to 14.7. The highest trichoptera taxa richness was reported at the site below Moose Creek. Water quality and biointegrity were concluded to be impaired by metals.

<u>Periphyton</u>

Periphyton data were available from two bioassessment reports. The first report evaluated periphyton data collected on Tenmile Creek in July 1997 at a location near the Helena water treatment plant. The diatom metric values indicated minor impairment and partial support of aquatic life use. This conclusion was based on indications of metals impairment from the Rocky Mountain Ecoregion bioassessment protocols (Bahls, 1997). However, in comparison with ecoregional reference sites, siltation was listed as an additional limiting factor. The siltation index was above the threshold for minor impairment.

A second bioassessment reported on sampling that occurred in September 1998 at locations below Spring Creek, at the Chessman Reservoir turnoff, above Minnehaha Creek, above Moose Creek, and at the Helena water treatment plant. Diatom metrics suggested impairment ranging from severe to minor in an upstream to downstream direction. The assessment, which relied on the Rocky Mountain Ecoregion protocols, did not include sedimentation as a cause of impairment. However, in comparison with a reference site above Banner Creek, the sites above Moose Creek and at the water treatment plant were limited primarily because of siltation. The site below Spring Creek showed siltation as the third most important limiting factor (Bahls, 1998). The siltation index was below the threshold for minor impairment at the Chessman Reservoir turnoff and above Minnehaha Creek. The siltation index value was above the threshold for minor impairment below Spring Creek, above the threshold for moderate impairment above Moose Creek, and above the threshold for severe impairment near the Helena water treatment plant.

<u>Fish Populations</u>

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database and data from the Helena National Forest. Tenmile Creek is managed as a trout fishery. According to MFISH, mottled sculpin are the only fish species thought to be common year-round residents in this segment of Tenmile Creek. The Helena National Forest estimates that both rainbow and brook trout occupy this segment of Tenmile Creek. The overall habitat and sport fishery rating for Tenmile Creek is "moderate."

<u>Metals Concentrations</u>

The project team evaluated a total of 20 in-stream water chemistry samples taken between May 1997 and July 2003. Arsenic concentrations in 18 samples were above the human health criterion. The average concentration in all samples was 71.5 percent higher than the human health criterion. The highest measured concentration was three times the human health criterion. No samples exceeded the aquatic life criteria. This evidence shows this segment does not meet the human health standard for arsenic.

Cadmium concentrations in 17 samples (85 percent of the samples) exceeded the chronic aquatic life criterion. Of those, 8 also exceeded the acute aquatic life criterion. The average value of all samples was 20 percent and 664 percent higher than the acute and chronic aquatic life criteria, respectively. The highest measured value was 19 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows this segment does not meet the aquatic life water quality standards for cadmium.

Copper concentrations in14 samples (70 percent of the samples) exceeded the chronic aquatic life criterion. All but one of those were also above the acute aquatic life criterion. The average value of all samples was 185 percent and 300 percent higher than the acute and chronic aquatic life criteria, respectively. The highest measured value was 20 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows this segment does not meet the aquatic life criteria for copper.

Lead concentrations in 12 samples (60 percent of the samples) exceeded the chronic aquatic life criterion for lead. The average value of all samples was 358 percent higher than the chronic aquatic life criterion. The highest measured value was 12 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows this segment does not meet the aquatic life criteria for lead.

Zinc concentrations in 20 samples (100 percent of the samples) exceeded the acute and chronic aquatic life criteria. The average value of all samples was 231 percent higher than the acute and chronic aquatic life criteria. The highest measured value was 11 times the acute and chronic aquatic life criteria. No samples exceeded the human health criterion. This evidence shows this segment does not meet the aquatic life standards for zinc.

Tenmile Creek Segment MT41I006_142 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, macroinvertebrates, periphyton, fisheries, and water chemistry.

Results from the target and supplemental indicator values are mixed. The supplemental indicator values for all channel metrics were met. Macroinvertebrate results were somewhat contradictory, but the value for clinger richness was lower than desired at the water treatment plant. Periphyton indicators suggest impairment by siltation, which increases in a downstream manner. Recent fisheries data suggest that the stream provides habitat for few fish species. The fines values were in excess of both target values.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment, and that impairments to channel condition occurred for most of the length of this segment. Water withdrawals by the City of Helena affect the flow regime and sediment transport capacity of this segment of Tenmile Creek because the stream segment was observed dry or occupying less than half its channel during the summer of 2003. Target values and various biological metrics are not being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Tenmile Creek Segment MT41I006_142 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

Based on a review of the water chemistry analysis results, Tenmile Creek from the Helena public water supply intake to the Helena water treatment plant is impaired by arsenic, cadmium, copper, lead, and zinc. TMDLs will be developed to address the arsenic, cadmium, lead, and zinc impairments.

3.4.2.3 Tenmile Creek from Helena Water Treatment Plant to the Mouth (MT41I006_143)

Segment MT41I006_143 of Tenmile Creek extends 15.9 miles from the Helena water treatment plant to the mouth where it meets Prickly Pear Creek. In 1996, aquatic life, cold-water fishery, drinking water, and recreational uses were listed as partially supported because of siltation, habitat alterations, flow alterations, metals, and pH. In 2000, the segment was listed as not supporting aquatic life, cold-water fishery, and drinking water uses and as partially supporting recreation. In 2002, the segment was listed as partially supporting aquatic life and cold-water fishery uses and as not supporting drinking water uses. Suspected causes of impairment in 2000 and 2002 included flow alterations, habitat alterations, metals (specifically arsenic, cadmium, lead, copper, mercury, and zinc). Siltation was also a suspected cause of impairment in 2000 but not 2002. Nutrients were added to the causes of impairment in 2002. A typical view of this segment is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), two cross-sectional surveys on the creek above the confluence with Sevenmile Creek and above Green Meadow Drive, including a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from two survey sites, suspended sediment data, macroinvertebrate and periphyton data, fish population information, and a total of 52 in-stream water chemistry samples taken between June1997 and December 2003.

Tenmile Creek from Helena WTP to mouth

Pollution Sources

The 2003 preliminary source assessment identified roads, grazing, and farming practices as the primary sediment sources for this segment of Tenmile Creek. Most of the source assessment inventory sites consisted of road sites. The aerial photography inventory showed 22 road crossings. Stream channelization along 16 percent of the segment occurs from construction of Highway 12 and I-15.

The primary geology of this sub-watershed is the Boulder Batholith, with Quaternary sediments prominent in the floodplain. The aerial photography inventory showed that exposed and eroding stream banks were visible. The beginning and end of the stream segment are predominantly impacted by agricultural practices (straightening for irrigation, grazing, and cultivation in the riparian zone), while the middle segment of the stream is surrounded by dense subdivision development.

In summary, roads and localized sources (grazing, removal of riparian vegetation) are probably the biggest contributors of sediment to this segment of Tenmile Creek. Irrigation diversions and municipal withdrawals severely deplete the flow of this section of Tenmile Creek, and probably inhibit the transport of sediment.

This segment is also affected by nutrients and metals. Irrigation diversions, grazing practices, and upstream sources contribute nutrients. Diffuse nutrient sources from rural housing and subdivisions might also affect the stream. Expected relevant sources of metals to the stream segment are upstream sources and historical mining activities in the immediate drainage area. The segment's upstream reach (Tenmile Creek 142) also contributes metals. The immediate drainage area falls within the Blue Cloud, Helena, and Scratchgravel Hills mining districts. The MBMG Abandoned and Inactive Mines database reports hot springs, mineral location, placer, surface, surface-underground, underground, and other unknown mining activities in the immediate drainage area of the stream. The historical mining types include lode, mill, and placer. In the past these mines produced gold, silver, copper, lead, uranium, arsenic, and zinc. Six mines are listed in the State of Montana’s inventory of High Priority Abandoned Hardrock Mine Sites: Franklin (Scratchgravel), Joslyn Street Tailings (Helena district) , Lower Tenmile Mine (Rimini), Davis Gulch II (Helena), Spring Hill Tailings (Helena), and Lady Luck (Helena).

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted two field investigations along Tenmile Creek: (1) above the confluence with the Sevenmile Creek, and (2) above Green Meadow Drive.

The site above the confluence with Sevenmile Creek was chosen as a “reference” condition for the main stem of Tenmile, but the site is not a true reference reach. The stream’s entrenchment ratio and sinuosity were out of balance with the valley type setting, reflecting channel confinement and straightening. Without channel modifications, the stream reach probably would be a Rosgen stream type C4. The width-to-depth ratio was 39.5, which is 86 percent greater than the average for reference stream data for southwestern Montana and Greater Yellowstone Area C-type reference streams (Table 3-56). The BEHI rating was in the mid-range of “moderate,” and 27 percent greater than the average for C-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of coarse gravels. The D_{50} was one size-class less than expected based on southwestern Montana and Greater Yellowstone Area C4 reference streams.

Part of the channel survey included a Proper Functioning Condition assessment. The field crew rated the reach above Sevenmile as “Functional – at risk” (FAR), noting that the stream has healthy and diverse riparian vegetation. However, the field crew also noted that the stream was riprapped and that pool infilling was occurring. The riparian land type aggregate assigned to this survey site is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive.

At the site above Green Meadow Drive, the field crew determined the stream to be a straightened Rosgen stream type C4. The width-to-depth ratio was 25, which is about 18 percent greater than the average for southwestern Montana and Greater Yellowstone Area C-type reference streams. The BEHI rating was "high," and 79 percent above the average for C-type reference streams for southwestern Montana and the Greater Yellowstone Area. D_{50} as determined in a zigzag Wolman pebble count consisted of very coarse gravels. The D_{50} was comparable to southwestern Montana and Greater Yellowstone Area C-type reference streams.

The channel survey included a Proper Functioning Condition assessment. The field crew rated the reach below above Green Meadow Drive as "Functional – at risk" (FAR) verging on "Non-functional" (NF). The field crew noted that the stream had eroding banks, excess sediment deposition, and a limited riparian area. The riparian land type aggregate assigned to the survey sites is also 29, Alluvial (Borolls) Floodplains and Terraces.

Table 3-56. Summary of cross-sectional data for Tenmile Creek, Segment MT41I006_143.

Site	Parameter	Result	Comparable to Reference
Above Sevenmile	Width/depth ratio	39.5	No
Above Sevenmile	BEHI	25.7	No
Above Sevenmile	D_{50}	Coarse gravels	No
Above Sevenmile	PFC	FAR	NA, trend not apparent
Above Green Meadow Drive	Width/depth ratio	25	Yes
Above Green Meadow Drive	BEHI	36.4	No
Above Green Meadow Drive	D_{50}	Very coarse gravels	Yes
Above Green Meadow Drive	PFC	FAR/NF	No

McNeil Cores

McNeil core data are available for two sites on this segment of Tenmile Creek—the field survey sites. At the site above Sevenmile Creek, six cores were collected. The riparian aggregate here was determined to be 29, Alluvial Floodplains and Terraces (Table 3-57). The average percentage of fines less than 6.4 mm was 25.1 percent, with average fine fines (less than 0.85 mm) at 7.2 percent. The percentage of fines less than 6.4 mm for this site is 35 percent less than the mean for reference riparian aggregate 29 cores, while the fine fines are 11 percent less.

Six cores were collected above Green Meadow Drive, and the riparian aggregate was determined to be 29. The average percentage of fines less than 6.4 mm was 26.5 percent, with average fine fines at 10.4 percent. The percentage of fines less than 6.4 mm for this site is 22 percent less than the mean for reference riparian aggregate 29 cores, while the fine fines are 28 percent greater.

Table 3-57. Summary of McNeil core data for Tenmile Creek, Segment MT41I006_143.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	25.1	7.2	Yes
29	2003	26.5	10.4	Fine fines value is elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for four sites on this segment of Tenmile Creek, and 35 samples were taken from 1997 to 2003 (Table 3-58). The highest value collected was 1270 mg/L in March 2003 at the sampling site at Green Meadow Drive. The suspended sediment data had an average of 48.7 mg/L with a median of 6.0 mg/L. These values are not comparable to values from selected reference streams for suspended sediment.

Table 3-58. Statistical summary of suspended sediment data for Tenmile Creek, Segment MT41I006_143.

Mean	48.7 mg/L
Median	6.0 mg/L
Standard deviation	213.0 mg/L
Maximum	1,270.0 mg/L
Number of samples	35
Number of sample sites	4

In 2003, two turbidity observations were recorded at Green Meadow Drive. Both observations reported the water clarity as clear. However, the observations were made during the recessional limb of peak flow and also during low flow.

Macroinvertebrates

Macroinvertebrate data were available from three reports. The first report sampled this segment of Tenmile in July 1997 below Colorado Gulch, at the Williams Street Bridge, at Green Meadow Drive, and at Sierra Road East. Sampling results were evaluated using the MDEQ's Rapid Bioassessment Protocols (Eakin, 1998). All sites were rated as non-impaired and fully supporting aquatic life uses. No values for clinger or trichoptera richness were given. Eakin concluded that "poor bank stability and underdeveloped riparian vegetation may be influencing the condition of the macroinvertebrate community in Tenmile Creek below Colorado Gulch" (1998). The 1997 MDEQ macroinvertebrate survey also indicated eutrophication (Eakin, 1998).

The second report sampled this segment of Tenmile over a 3-year period from 1997 to 1999 at the water treatment plant. Sampling results were evaluated using the MDEQ's Rapid Bioassessment Protocols (McGuire, 2000). The 3-year average metric score for this site was non-impairment with full support of aquatic life use. Clinger richness was not given; the 3-year average for trichoptera taxa was 14.3.

The third report sampled macroinvertebrates near the confluence with Sevenmile Creek in July 2001. The habitat rating for this site was "optimal," but points were lost because of sediment deposition and pool variability. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2001). The metric score of 44 percent indicated moderate impairment and partial support of aquatic life use. Eight clinger taxa and five trichoptera taxa were found at the site.

Periphyton

Periphyton data from one report were available. Sampling occurred in July 1997 below Colorado Gulch, at Williams Street Bridge, at Green Meadow Drive, and at Sierra Drive. Diatom metrics varied from minor to severe impairment in a downstream manner. Impairment conclusions were made according to Rocky Mountain Ecoregion protocols (Bahls, 1997). The siltation index was above the threshold for minor impairment below Colorado Gulch. The siltation index was above the threshold for moderate impairment at Williams Street Bridge and at Green Meadow Drive, and above the threshold for severe impairment at Sierra Drive.

The 1997 periphyton assessment also indicated light to heavy algal growth in sites in lower Tenmile Creek (Bahls, 1997). The 2001 MDEQ stream reach assessment form indicated some profuse algal growth in the stream.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database and data from the Helena National Forest. Tenmile Creek is managed as a trout fishery. According to MFISH, mottled sculpin and rainbow trout are the only fish species thought to be common year-round residents in this segment of Tenmile Creek. Sucker, brook trout, and longnose sucker were considered to be rare. The Helena National Forest estimates that both rainbow and brook trout occupy this segment of Tenmile Creek from the beginning of the segment to the confluence with Blue Cloud Creek. The overall habitat and sport fishery rating for Tenmile Creek is "moderate." Montana Fish, Wildlife and Parks lists this segment of Tenmile Creek as a chronic dewatering stream of concern.

Nutrient Concentrations

Numerous analyses for total phosphorus (30 of 43 records), total Kjeldahl nitrogen (13 of 26 records), and total nitrogen (19 of 26 records) from the 1997–2003 period of record exceeded the Lake Helena watershed nutrient target values (Appendix D). The database reflected sampling by the USGS and MDEQ at several locations within this segment of Tenmile Creek.

Metals Concentrations

The project team evaluated a total of 52 in-stream water chemistry samples taken between June1997 and December 2003. Arsenic concentrations in 46 samples were above the human health criterion. The average concentration was 51 percent higher than the human health criterion. The highest measured concentration was three times the human health criterion. No samples exceeded the aquatic life criteria. This evidence suggests this segment does not meet the human health criterion for arsenic.

Cadmium concentrations from 23 samples (44 percent of the samples) exceeded the chronic aquatic life criterion. The highest measured value was 5.2 times the chronic aquatic life criterion. The average value of all samples was 19 percent higher than the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows that this segment does not meet the aquatic life water quality standards for cadmium.

Copper concentrations in 12 samples (23 percent of the samples) exceeded the chronic aquatic life criterion. Of those, four were also above the acute aquatic life criterion. The highest measured value was 8.2 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence shows that this segment does not meet the aquatic life standards for copper.

Lead concentrations in 14 samples (27 percent of the samples) exceeded the chronic aquatic life criterion. Of those, two samples exceeded the human health criterion. The average value of all samples was 28 percent higher than the chronic aquatic life criterion. The highest measured value was 20 times the chronic aquatic life criterion, and 4.6 times the human health criterion. This evidence shows that this segment does not meet the aquatic life or human health standards for copper.

Zinc concentrations in six samples (12 percent of the samples) exceeded the acute and chronic aquatic life criteria for zinc. The highest measured value was 11 times the acute and chronic aquatic life criteria. No samples exceeded the human health criterion. This evidence shows that this segment does not meet the aquatic life criteria for zinc.

Tenmile Creek Segment MT41I006_143 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, fisheries, and water chemistry.

Results from the sediment data assessment are mixed. At the upper channel survey site target values were met, but no supplemental values were met. The elevated width-to-depth ratio and BEHI rating, along with a smaller than expected size-class for median particle size, is probably a reflection of stream aggradation and/or channel alterations from riprap. At the lower sample site, width-to-depth ratio and D_{50} were the only supplemental indicator values within the expected range, but the target value of percentage of fine fines was elevated. Suspended sediment data revealed some extremely high values, as well as a higher than expected mean value. Macroinvertebrate results were somewhat inconclusive, but the one value for clinger richness was lower than desired and comments from two of the reports indicated problems with sediment deposition. Periphyton indicators suggested impairment from siltation, which increases in a downstream manner. Recent fisheries data suggest that the stream provides habitat for few fish species, and chronic dewatering is a problem.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment. Municipal and irrigation diversions affect the flow regime and sediment transport capacity of this segment of Tenmile Creek. The majority of supplemental indicator values were not being met, and target values were not met for fine fines at one of the sample sites.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Tenmile Creek Segment MT41I006_143 are impaired by siltation and suspended solids. A TMDL will therefore be developed to address the sediment impairment.

The weight of evidence suggests that Tenmile Creek (from the Helena water treatment plant to the creek's mouth) is impaired by nutrients. Numerous analyses for total phosphorus, total Kjeldahl nitrogen, and total nitrogen of samples taken from various stations on this stream segment are above the nutrient target values for the entire period of record (May 1997–December 2003). Agricultural operations and sediment have altered stream morphology. Irrigation diversions, grazing practices, and upstream sources contribute nutrients. Dewatering has affected the natural hydrology of the stream. Diffuse and possible nutrient sources associated with rural housing and subdivisions affect the stream. The 1997 and 2001 macroinvertebrate and periphyton surveys indicate eutrophication, and light to heavy algal growths. A 2001 stream reach assessment form indicated profuse algal growths in the stream. Therefore, a TMDL will be developed to address nutrients.

In reviewing the available water chemistry analysis results for metals, the evidence suggests that Tenmile Creek from the Helena water treatment plant to the mouth is impaired by arsenic, cadmium, copper, lead, and zinc. TMDLs will be developed to address the arsenic, cadmium, copper, lead, and zinc impairments.

3.4.2.4 Skelly Gulch (Tributary of Greenhorn Creek) (MT41I006_220)

Skelly Gulch is a tributary of Greenhorn Creek, which drains to Sevenmile Creek. In 1996, the 7.7-mile segment from the headwaters to the confluence with Greenhorn Creek was listed as partially supporting aquatic life and cold-water fishery uses because of siltation. In 2002, metals were added to the suspected causes of impairment. A typical view of Skelly Gulch is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey 2.5 miles above the mouth that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from two sites, suspended sediment data, macroinvertebrate data, fish population information, and a limited total of three in-stream water chemistry samples taken between July 2001 and August 2003.

Skelly Gulch

Pollution Sources

The 2003 preliminary source assessment identified roads and localized sources (including grazing and placer mine-associated alterations) as the primary sediment sources for Skelly Gulch. The Helena National Forest conducted a road sediment survey on the forest portion of the creek and identified a single site that, based on modeling using the Water Erosion Prediction Project (WEPP) model, contributes approximately 0.8 ton of sediment per year to the stream (USDA, 2004). The aerial photography inventory showed11 road crossings and road encroachment along 17 percent of the stream.

The primary geologies of this sub-watershed are Cambrian and pre-Cambrian sedimentary rocks, which consist primarily of shale and argillite. The aerial photography inventory showed old clear-cut timber harvests in the headwaters relatively close to the stream course. Riparian buffer areas were extensive, except where limited by minor road encroachment. For the preliminary source assessment, channel incision, channelization from placer mining, bank trampling, and loss of riparian vegetation due to livestock grazing were recorded on the Helena National Forest portion of the stream. Below the forest boundary, the primary sources affecting the stream were roads, beaver ponds, and housing development.

In summary, roads and localized sources are probably the biggest contributors of sediment to Skelly Gulch. Near the mouth of the stream, a culvert was observed to be plugged by beaver dams, thereby creating an area of excessive sedimentation.

Expected relevant sources of metals to the stream are historical hard rock mining activities in the watershed. The segment's drainage area falls within the Austin mining district. The MBMG Abandoned and Inactive Mines database reports mineral location, placer, underground and other "unknown" mining activities in the drainage area of the stream. The historical mining types include lode and placer. In the past these mines produced gold, silver, copper, lead, iron, manganese, and arsenic. None of the mines in the immediate drainage area of this segment are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites. The Helena National Forest documented evidence of placer mining and one mine waste rock dump within the stream bankfull width during the source assessment.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting staff conducted a field investigation on Skelly Gulch at a location about 2 miles above the mouth. The field crew determined the stream to be a Rosgen stream type C4b. The width-to-depth ratio of 13.6 was about 30 percent less than that for the southwestern Montana and Greater Yellowstone Area C-type streams, but similar to other B-type reference streams in the region (Table 3-59). The BEHI rating was in the mid-range of "moderate," which is about 22 percent greater than the average for southwestern Montana and Greater Yellowstone Area C-type reference streams. However, the higher than expected rating is probably due to the presence of undercut banks, which are important fish habitat components. D_{50} as determined in a zigzag Wolman pebble count consisted of medium gravels. D_{50} was two size-classes less than expected based southwestern Montana and Greater Yellowstone Area C4 reference streams, as well as the one Helena National Forest B4 reference stream inventoried in a similar riparian aggregate.

Part of the channel survey included a PFC assessment. The field crew rated this site as "Proper Functioning Condition" (PFC), but noted some sediment deposition. The riparian land type aggregate assigned to this site is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive.

Table 3-59. Summary of cross-sectional data for Skelly Gulch, MT41I006_220.

Parameter	Result	Comparable to Reference
Width/depth ratio	13.6	Yes
BEHI	24.7	Yes
D_{50}	Medium gravels	No
PFC	PFC	Yes

McNeil Cores

McNeil core data are available for two sites on Skelly Gulch. The oldest cores (four cores) were collected in 1991 in the southeast quarter of Section 24, Township 11N, Range 6W. The riparian aggregate here was determined to be 3, defined as Metasedimentary Rock – Mountain Slopes and Ridges (Table 3-60). The average percentage of fines less than 6.4 mm was 36.4 percent, with average fine fines (less than 0.85 mm) at 14.0 percent. These values are elevated against the means for fines from reference cores for riparian aggregate 3. The percentage of fines less than 6.4 mm for this site is 3 percent greater than the mean for reference cores from riparian aggregate 3, and the fine fines are 65 percent above the mean.

The second set of McNeil cores (six cores) was collected in 2003 at the channel survey site. The riparian aggregate here was determined to be 29, Alluvial (Borolls) Floodplains and Terraces. The average percentage of fines less than 6.4 mm was 41.4 percent, with average fine fines (less than 0.85mm) at 16.0 percent. These values are elevated against the means for fines from reference cores for riparian aggregate 29. The percentage of fines less than 6.4 mm for this site is 22 percent greater than the mean for reference riparian aggregate 29 cores, and the fine fines are 98 percent above the mean.

Table 3-60. Summary of McNeil core data for Skelly Gulch, MT41I006_220.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
3	1991	36.4	14.0	Fine fines value is elevated.
29	2003	41.4	16.0	Both fines values are elevated.

Suspended Sediment Concentrations

Few recent data were available for Skelly Gulch. MDEQ has one sample for total suspended solids collected in July 2001 about one-half mile above the mouth. The reported value was less than 10 mg/L. In 2003, two turbidity observations were recorded at the same sampling site. Both turbidity observations reported the water clarity as clear.

Macroinvertebrates

Macroinvertebrate data were available from one sample taken in July 2001 at a location above the mouth. The habitat rating for this site was "optimal." Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2001). The metric score of 78 percent indicated slight impairment and full support of aquatic life use. Sixteen clinger taxa and eight trichoptera taxa were found at the site, and Bollman concluded that fine sediment did not limit benthic habitat.

Periphyton

No recent data are available.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database and data from the Helena National Forest. Skelly Gulch is managed as a trout fishery. The Helena National Forest has documented genetically pure westslope cutthroat trout, a species of special concern, in the upper 3.5 miles of Skelly Gulch. Eastern brook trout have been documented in the lower 2.5 miles of the creek. The overall habitat and sport fishery rating for this section of the creek is "substantial," which is the next rating below "best."

Metals Concentrations

A limited total of three in-stream water chemistry samples taken between July 2001 and August 2003 were evaluated. No exceedances of either the human health or aquatic life criteria for arsenic, cadmium, copper, lead, or zinc were observed in the samples. The maximum measured concentration for arsenic was right at the human health criterion level. The average was just three percent lower than the human health criterion.

Skelly Gulch MT41I006_220 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, macroinvertebrates, fisheries, and water chemistry.

All of the sediment supplemental indicator values for channel metrics, except D_{50} , were met. A smaller than expected D_{50} is probably indicative of excessive deposition of surface fines. Suspended sediment data were inadequate to make a determination. Macroinvertebrate supplemental indicator threshold values were exceeded. Recent fisheries data suggest that there are reaches of valuable westslope cutthroat trout habitat in Skelly Gulch, primarily in the upper 4 miles of the stream. However the percentage of fines from McNeil core samples, taken at two sites, were elevated when compared with the target values.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting this stream segment, and that impairments tended to be localized. Target McNeil core values were exceeded.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Skelly Gulch MT41I006_220 are impaired by siltation. A TMDL will therefore be developed to address the sediment impairment.

The limited water column metals concentration data suggest Skelly Gulch is not impaired by arsenic, cadmium, copper, lead, or zinc. Given the limited number of samples available, it is recommended that this stream be monitored closely to confirm these statements.

3.4.2.5 Sevenmile Creek from the Headwaters to the Mouth (MT41I006_160)

Sevenmile Creek is a tributary of Tenmile Creek. It extends for 7.8 miles from its headwaters to the mouth (MT41I006_160). Montana's 1996 303(d) list rated this stream segment as threatened relative to cold-water fishery use because of siltation and habitat alterations. In 2002, the stream was listed as partially supporting aquatic life and cold-water fishery uses because of siltation, other habitat alterations, riparian degradation, flow alterations, nutrients, and metals. A typical view of Sevenmile Creek is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey on the stream above the confluence with the Tenmile Creek that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core subsurface fines from the channel survey site, suspended sediment data, macroinvertebrate and periphyton data, fish population information, and a total of 21 in-stream water chemistry samples taken between June 1997 and December 2003.

Sevenmile Creek

Pollution Sources

The 2003 preliminary source assessment identified roads and farming practices as the primary sediment sources for Sevenmile Creek. The aerial photography inventory showed five road crossings. Stream channelization along 13 percent of the stream occurs from the railway and Birdseye Road in the upper reaches of the stream.

The primary geologies of this sub-watershed are Cambrian and pre-Cambrian sedimentary rocks, with Quaternary sediments prominent in the floodplain. The aerial photography inventory showed that stream incision and eroding stream banks were visible. The beginning of the stream segment is predominantly affected by channelization from the railroad. Below Birdseye Road, agricultural impacts on the creek are visible (straightening for irrigation, irrigation diversions and return flows, and cultivation in the riparian zone).

In summary, roads and localized sources (cultivation in the riparian zone, eroding stream banks) are probably the biggest contributors of sediment to Sevenmile Creek. Irrigation withdrawals deplete the flow of Sevenmile Creek, and probably inhibit transport of sediment.

Sevenmile Creek is identified as a source of eutrophication in Tenmile Creek. This segment is approximately 8 miles in length and is affected by sediment, habitat and channel alterations, metals, nutrients, and possibly hydromodification/dewatering. Roads, upstream sources, and bare stream banks contribute sediment to the stream. Channelization from roads, railways, and agricultural operations has altered the stream’s morphology and possibly its hydrology. Irrigation return flows, grazing practices, and upstream sources contribute nutrients. Irrigation water withdrawals affect aquatic habitat and stream hydrology. Diffuse sediment sources and possibly nutrient sources from rural housing might also affect the stream. Private property borders most of the stream. Intermittent parcels of BLM lands are also present. The primary land uses are a transportation corridor, hay fields and pasture, and rural housing. Stream incisement and eroding stream banks were visible about one and one-quarter miles downstream from the Austin Road crossing. Riparian buffer widths were variable depending on land management practices. Nearer to the stream’s mouth, there is a noticeable increase in subdivision developments but none are immediately proximal to the stream. Features that were documented in 2003 using GPS information included road sediment delivery points, an animal confinement area, an irrigation diversion, and suspected wastewater seepage from Fort Harrison’s defunct sewage treatment facility. Although healthy riparian vegetation was observed, stream dewatering appears to be a significant problem.

Expected significant contributors of metals to the stream segment are upstream sources and historical mining activities. Skelly Gulch is a tributary stream that might be a relevant source of metals. Most of the drainage area falls within the Scratchgravel Hills and Austin mining districts. The MBMG Abandoned and Inactive Mines database reports mineral location, placer, surface, surface-underground, and underground mining activities in the watershed. The historical mining types include placer, lode, and stockpile. In the past these mines produced gold, iron, lead, silver, and copper. None of the mines in the immediate drainage area of this segment are listed in the State of Montana’s inventory of High Priority Abandoned Hardrock Mine Sites.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation along Sevenmile Creek, above the confluence with the Tenmile Creek. The stream’s entrenchment ratio and sinuosity were out of balance with the valley type setting, reflecting channel confinement and straightening. The field crew determined that the stream did not fit a Rosgen stream type classification, but would probably be an E4 or

C4 channel without alterations. The width-to-depth ratio was 9.4, which is typical of E-type channels (Table 3-61). The BEHI rating was in the upper-range of "high," and reflects bank instability. D_{50} as determined in a zigzag Wolman pebble count consisted of medium gravels. The D_{50} was actually greater than expected given the prevalence of sand and silt on the stream bottom.

Part of the channel survey included a Proper Functioning Condition assessment. The field crew rated the reach above the mouth as "Functional – at risk" (FAR), noting that the stream has healthy and diverse riparian vegetation (predominantly on the left bank). However, the field crew noted that the stream was choked with sediment and that cutbanks were prevalent on the right bank of the stream. The riparian land type aggregate assigned to this survey site is 29, Alluvial (Borolls) Floodplains and Terraces. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common but generally not excessive.

Table 3-61. Summary of cross-sectional data for Sevenmile Creek, MT41I006_160.

Site	Parameter	Result	Comparable to Reference
Above mouth	Width/depth ratio	9.4	NA
Above mouth	BEHI	37.1	NA
Above mouth	D_{50}	Medium gravels	NA
Above mouth	PFC	FAR	No, trend not apparent

McNeil Cores

McNeil core data are available for one site on Sevenmile Creek—the field survey site. Spawning size gravels and pool tailouts were sparse, thus only two cores were collected. The riparian aggregate here was determined to be 29, Alluvial Floodplains and Terraces (Table 3-62). The average percentage of fines less than 6.4 mm was 41 percent, with average fine fines (less than 0.85mm) at 15.8 percent. The percentage of fines less than 6.4 mm for this site are 21 percent greater than the mean for reference riparian aggregate 29 cores, while the fine fines are 95 percent greater.

Table 3-62. Summary of McNeil core data for Sevenmile Creek, MT41I006_160.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
29	2003	41	15.8	Both fines values are elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from the USGS National Water Information System. Data were available for one site near the mouth on Sevenmile Creek, with 10 samples taken from 1997 to 2003 (Table 3-63). The highest value collected was 1790 mg/L in March 2003. The suspended sediment data had an average of 197.5 mg/L with a median of 21.5 mg/L. These values are not comparable to values from selected reference streams for suspended sediment.

Table 3-63. Statistical summary of suspended sediment data for Sevenmile Creek, MT41I006_160.

Mean	197.5 mg/L
Median	21.5 mg/L
Standard deviation	559.7 mg/L
Maximum	1,790.0 mg/L
Number of samples	10
Number of sample sites	1

In 2003, four turbidity observations were recorded on Sevenmile Creek at Birdseye Road and near the mouth. All observations reported the water clarity as clear, except for one reading of slight turbidity near the mouth in July. However, the observations were made during the recessional limb of peak flow and also during low flow.

Macroinvertebrates

Macroinvertebrate data were available from two reports. The first report described the results of sampling in July 1997 at a location near the mouth. Sampling results were evaluated using the MDEQ's Rapid Bioassessment Protocols (Eakin, 1998). The site was rated as moderately impaired and partially supporting aquatic life use. No values for clinger or trichoptera richness were given. Eakin concluded that "existing data did indicate that sedimentation was a problem with Sevenmile Creek" (1998).

The second report described the results of a July 2001 sampling effort, also near the stream's mouth on Tenmile Creek. The habitat rating for this site was "optimal," but some points were lost due to sediment deposition and pool variability. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2001). The metric score of 28 percent indicated moderate impairment and partial support of aquatic life uses. Five clinger taxa and eight trichoptera taxa were found at the site. "Sediment tolerant taxa formed a large proportion of the taxa collected" (Bollman, 2001).

The macroinvertebrate assessments also concluded that nutrient enrichment was evident, and the abundance and composition of the macroinvertebrate community was partially a response to increased nutrients and/or organic inputs.

Periphyton

Periphyton data were available from one report. Sampling occurred in July 1997 near the mouth of Sevenmile Creek. Diatom metrics indicated severe impairment and poor biological integrity. Impairment conclusions were made according to Rocky Mountain Ecoregion protocols (Bahls, 1997). The siltation index exceeded the threshold for severe impairment, and was the major limiting factor.

The 1997 MDEQ periphyton assessment for several stations on this stream segment indicated heavy algal growth, and the stream supported algae indicating nutrient enrichment (Bahls, 1997).

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database. Sevenmile Creek is managed as a trout fishery. According to MFISH, no fish species are thought to be common year-round residents of Sevenmile Creek, while brook, brown, and rainbow trout were considered to be rare. The overall habitat and sport fishery rating for Sevenmile Creek is "moderate."

Nutrient Concentrations

Numerous total Kjeldahl nitrogen (7 of 10 records), total nitrogen (8 of 10 records), and total phosphorus (all 14 records) exceedances of Lake Helena watershed target values were documented within the available 1997–2003 period of record (Appendix D). The available data represented sampling by the USGS and MDEQ at various stations within this stream segment.

Metals Concentrations

The project team evaluated a total of 21 in-stream water chemistry samples taken between June 1997 and December 2003. Arsenic concentrations in 18 samples exceeded the human health criterion for arsenic. The average concentration of all samples was 54 percent higher than the human health criterion. The highest measured concentration was 2.8 times the human health criterion. No samples exceeded the aquatic life criteria. This evidence suggests this segment does not meet the human health criterion for arsenic.

The cadmium concentration in five percent of the samples exceeded the chronic aquatic life criterion. The average value of all samples was 77 percent below the chronic aquatic life criterion. The highest measured value was 1.67 times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence suggests this segment meets the human health and aquatic life water quality standards for cadmium.

Copper concentrations in two samples (10 percent of the samples) exceeded the chronic aquatic life criterion. One of them was also above the acute aquatic life criterion. The highest measured value was four times the chronic aquatic life criterion. No samples exceeded the human health criterion. This evidence suggests this segment does not meet the aquatic life criteria for copper.

The lead concentration in one sample (five percent of the samples) exceeded the chronic aquatic life criterion. This sample also exceeded the human health criterion. The highest measured value was 6.5 times the chronic aquatic life criterion, and 4.5 times the human health criterion. This evidence suggests this segment does not meet the human health or aquatic life standards for lead.

All samples were below the human health and aquatic life criteria for zinc. This evidence shows that this segment meets the aquatic life and human health criteria for zinc.

Sevenmile Creek MT41I006_160 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition), McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, macroinvertebrates; periphyton; fisheries; and water chemistry.

No target or supplemental indicator values were met. Channel metrics were not comparable to reference streams, and that in itself signals problems for channel condition. Values for both classes of fines from McNeil cores were above the target values. Suspended sediment data values were higher than expected and extreme values were present. The results from the macroinvertebrate and diatom samples indicate impairment by sedimentation. Recent fisheries data suggest that this segment of the stream provides limited habitat for few fish species.

Results from the 2003 preliminary source assessment revealed that there were actively eroding sediment sources affecting the stream. No targets and few supplemental indicator values were being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Sevenmile Creek Segment MT41I006_160 are impaired by suspended solids and siltation. A TMDL will therefore be developed to address the sediment impairment.

The weight of evidence suggests that Sevenmile Creek (from headwaters to mouth) is impaired by nutrients. Numerous total phosphorus, total Kjeldahl nitrogen, and total nitrogen samples are above nutrient target values throughout the period of record (June 1997–December 2003) at various water quality stations on this stream segment. Sevenmile Creek is a source of eutrophication to Tenmile Creek. Irrigation return flows, grazing practices, and upstream sources contribute nutrients to the stream. Diffuse sediment sources and possible nutrient sources from rural housing may also affect the stream. It is possible that wastewater is seeping from Fort Harrison's defunct sewage treatment facility. Dewatering is significant. The 1997 periphyton report indicated heavy algal growth, and the stream supported algae, indicating nutrient enrichment. The 1997 and 2001 macroinvertebrate surveys indicated partial support of uses, and nutrient enrichment is evident. Therefore, a TMDL will be developed to address nutrients.

The available water chemistry data suggest that Sevenmile Creek is impaired due to copper and lead. TMDLs will be developed to address the copper and lead impairments.

3.4.2.6 Granite Creek from headwaters to mouth (Austin Creek – Greenhorn Creek – Sevenmile Creek) (MT41I006_179)

Granite Creek is a tributary to Austin Creek. It extends for 1.6 miles from its headwaters to the mouth (MT41I006_179). This Granite Creek shares its name with a separate 303(d)-listed segment located further downstream within the same Sevenmile Creek sub-basin (segment MT41I006_230). Figure 3-11 shows the location of both water bodies. Montana's 1996 303(d) list rated the Granite Creek tributary to Austin Creek (segment 179) as threatened relative to cold-water fishery use because of habitat alterations. Additional monitoring of the stream was performed in 2002 and 2003. Based on a detailed review of these data, Granite Creek was listed as fully supporting all of its designated uses on the 2004 303(d) list. A typical view of Granite Creek is shown in the photo below.

A review of the current data for segment 179 is provided below. Available data include results from a 2003 preliminary source assessment survey, macroinvertebrate and periphyton bioassessments for 2002, and a total of three in-stream water chemistry samples taken between September 2002 and August 2003.

Granite Creek (MT41I006_179)

<u>Pollution Sources</u>

Based on 2003 field observations and aerial photo and literature reviews, Granite Creek has sustained at least minor impacts from sediment and from habitat and channel alterations. Periodic runoff from unimproved roads likely contributes some sediment to Granite Creek. The granitic geology of the watershed also is likely to exacerbate sediment delivery rates to the stream. Historical placer mining appears to have altered the stream's natural channel morphology and possibly its hydrology. Most of the stream length is on the Helena National Forest with about one-sixth of a mile of private property located near the stream's mouth. The Helena National Forest manages the area for wildlife, limited timber harvest, and grazing. There is one private residence on the private parcel near the mouth. Rosgen stream type progresses from A to Ba through the 1.6 mile stream reach. The aerial photography assessment showed an extensive riparian area along with minor encroachment from an unimproved road. Small clear-cut operations have occurred in the headwaters area, but these were not in proximity to the stream corridor. Potential pollution sources visible on recent aerial photos were viewed as minor when compared with many of the other 303(d)-listed streams in the Lake Helena watershed.

The Helena National Forest also assessed Granite Creek for potential pollution sources. This assessment documented several road sediment delivery points, placer mine tailings, and an incised stream channel.

During field monitoring activities in 2003, the lower portion of the stream was noted as having rigorous riparian vegetation.

The immediate drainage area of the listed segment falls within the Austin mining district. Despite the present evidence of historical mining activity in this drainage, neither the MBMG Abandoned and Inactive Mines database nor the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites includes any mines in this watershed.

Macroinvertebrates

Macroinvertebrate data were available from one September 2002 sampling event. The evaluation of habitat parameters produced a rating of "optimal." Sampling results were compared to Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2003). Granite Creek supported a diverse and sensitive macroinvertebrate assemblage characteristic of an unimpaired montane stream. A bioassessment score of 94 percent indicated non-impairment and full support of aquatic life uses (Bollman, 2003b). The bioassessment suggested a clean, cold-water environment, and the presence of 20 clinger taxa and 10 caddisfly taxa implied the ample presence of hard substrates unimpaired by sediment deposition. Similarly, the assessment concluded that reach-scale habitat features such as riparian zone function, natural channel morphology, and stream bank integrity were likely intact because six stonefly taxa were collected.

Periphyton

Periphyton data were available from one August 2002 sampling effort (Bahls, 2003). The project evaluated the data using numeric biocriteria developed for reference streams in the Rocky Mountain Ecoregions of Montana. Granite Creek exhibited good biological integrity and full support of its designated aquatic life uses, although both the pollution index and the sedimentation index approached their respective thresholds for minor impairment. The filamentous green alga *Cladophora* was abundant in Granite Creek in 2002, which might have indicated stable flows, firm substrates, and plentiful nutrient concentrations. The presence of *Nostoc*, a bluegreen alga, suggested that nitrogen was likely the limiting nutrient with respect to algal growth potential. This information, together with a predominance of diatom algae species requiring only moderate levels of dissolved oxygen, suggested moderately nutrient enriched conditions in Granite Creek during 2002.

Metals Concentrations

The project team evaluated a total of three in-stream water chemistry samples taken between summer 2002 and summer 2003. All samples were below the human health and aquatic life criteria for arsenic, copper, lead, cadmium, and zinc. Most samples were below detection limits for the metals of concern, and those that were above the detection limits were still well below the human health and aquatic life criteria. This evidence suggests that this segment meets the human health and aquatic life criteria for arsenic, copper, lead, cadmium, and zinc. Because of the data are limited, this segment should be closely monitored in the future to confirm this statement.

Granite Creek MT41I006_179 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, macroinvertebrates, periphyton, and water chemistry. In general, the team's assessment of the available data is consistent with MDEQ's conclusions of full support of all designated water uses in the Granite Creek tributary to Austin Creek. Granite Creek was originally listed as threatened because of habitat alterations. This cause of impairment does not require the development of a TMDL according to EPA guidance and EPA policy. Furthermore, given its 2004 designation of full use support, a TMDL is not warranted. However, this should not preclude the pursuit of voluntary measures to address the existing, though relatively minor, impairments in the Granite Creek drainage as well as periodic monitoring of its water quality status.

3.4.2.7 Granite Creek from the Headwaters to the Mouth (Sevenmile Creek) (MT41I006_230)

This Granite Creek is a direct tributary of Sevenmile Creek, extending for approximately 2 miles from its headwaters to its confluence with Sevenmile Creek (MT41I006_230) (see Figure 3-11). Montana's 1996 303(d) list did not include a listing for this stream segment. MDEQ's 2002 303(d) assessment concluded that this Granite Creek did not support drinking water use because of arsenic, cadmium, and metals. All other designated uses were not assessed. However, due to an erroneous legal description attached to the water analysis data sheet, the assessment results were associated with the Granite Creek tributary to Austin Creek, segment 41I006_179. This error was discovered and corrected on the 2004 303(d) list. Impaired uses and causes remained the same as in 2002.

Available water quality assessment information for Granite Creek segment 41I006_230 is very limited. It consists of a single set of water analysis results from 1983, information from the MBMG Abandoned and Inactive Mines database, correspondence from the BLM, and observations made during an October 2004 field survey. These data are described in the following paragraphs. A typical view of Granite Creek is shown in the photo below.

Granite Creek (MT41I006_230)

Pollution Sources

EPA and Land & Water staff performed a field reconnaissance of the Granite Creek drainage in October 2004 with the goal of examining potential pollution sources and performing chemical, physical, and biological water quality monitoring. The stream was dry for its entire 2-mile length and there was no indication of recent flow. A stock dam located on the lower end of the creek, described as the location where the 1983 water sample had been collected, was breached.

The entire Granite Creek watershed was inspected. Granite Creek did not have surface flow at any location within its entire length during the October 2004 site visit, but a very small quantity of standing water was observed at several locations perhaps corresponding to alluvial groundwater elevations. Much of the Granite Creek channel, especially in its lower reaches and again in the headwaters area, lacked indications of more than brief seasonal flow. Riparian vegetation was not present in these areas. In the middle reaches the riparian zone was populated with aspen and a mixture of other vegetation. The defined stream channel was less than a foot wide. Stock dams had been constructed across the stream corridor in at least two locations and the lowermost of these was breached in its central portion. The dams appeared to have been non-functional for a considerable length of time. The Granite Creek watershed has only a few hundred feet of total elevation and most of the land area is open grassland where a limited snowpack would be expected to melt rapidly each spring season.

Present land use in the Granite Creek watershed is grazing/rangeland and limited recreation. The upper half of the watershed is managed by the BLM and the lower half is private ranchland. The BLM lands are grazed under private grazing leases. The soils are thin, rocky, and arid. In the upper portion of the drainage the geology changes to include outcroppings of the Boulder Batholith formation. A number of granite spires rise up from the valley bottom and adjacent slopes. An abandoned small-scale open-pit mine, a caved adit, and an ore processing facility, most likely a small scale cyanide heap leach operation, are located on BLM lands in the upper third of the Granite Creek drainage. Part of the excavation is located in immediate proximity to the dry creek channel. The facility is described as the Granite Creek Mine in the MBMG Abandoned and Inactive Mines database. This facility was apparently active in the past century but not in recent years. The foundation of a large building with an underdrain system might have been used as an ore leach pad. Several PVC-cased wells are present down-gradient from the mill and above the operation near the stream channel. Obvious processed tailings material was not noted, but it was difficult to differentiate between ore and tailings. Little material appeared to have been crushed or sorted but some granitic sand was noted in a flat area immediately downslope of the concrete foundation. It is not known whether this operation contributed to the original 1996 impaired designation for Granite Creek. BLM is in the process of cleaning up the site as resources become available (Personal communication, 2004, Joan Gabelman)

Other potential sources of impairment in the Granite Creek drainage were limited to agricultural nonpoint sources associated with livestock grazing on BLM and private lands. It was apparent in the 2004 field survey that Granite Creek is an ephemeral water body that sustains only seasonal flow.

Metals Concentrations

The basis for the original 2002 listing was a chemical analysis performed on a single sample collected upstream from a stock water dam in November 1983. The circumstances under which the sample was collected are not known. The agency collecting the sample and the analytical laboratory are also unknown, which may call into question the representativeness and quality of the analytical results. The results showed concentrations of arsenic, lead, and cadmium that were well in excess of the drinking water standards, while the latter two variables also exceeded the aquatic life criteria.

Granite Creek MT41I006_230 Water Quality Impairment Summary

The basis for Granite Creek's 303(d) listing was a single outdated chemical analysis performed by an unknown laboratory, which might not be accurate or representative of the source. MDEQ's stated rationale for retaining Granite Creek on the 303(d) list despite the limited available data is to ensure reassessment (personal communication, 2004, Allan Nixon). Given Granite Creek's ephemeral nature, reassessment will be contingent upon the presence of surface flow. Until monitoring can be conducted to verify the present-day status of this water body and the nature and magnitude of any impairments, TMDL development efforts are not warranted.

3.4.3 Silver Creek Drainage

This section presents summaries and evaluations of all available water quality data for water bodies in the Silver Creek drainage. A map of the Silver Creek drainage area is provided in Figure 3-11.

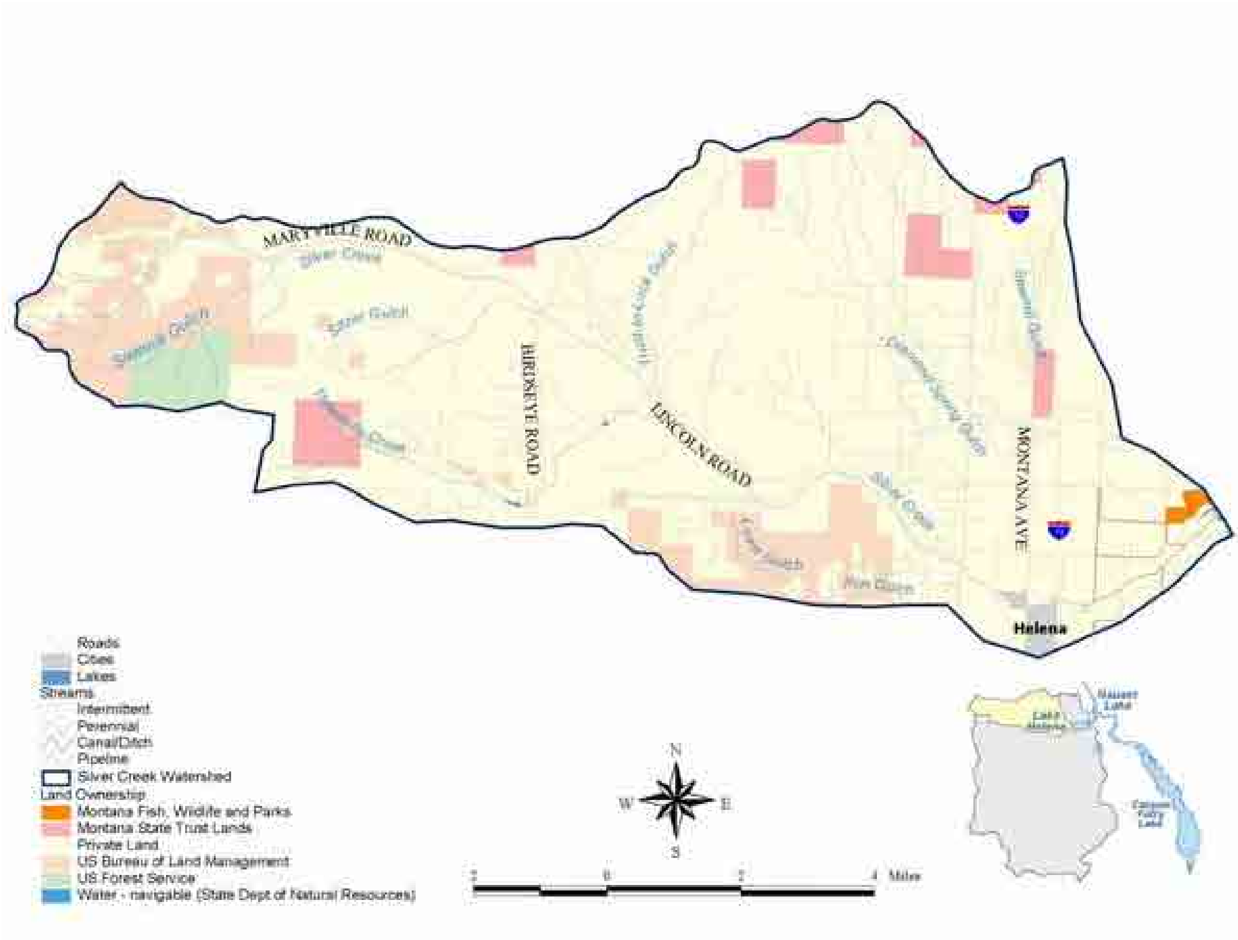

Figure 3-12. Map of the Silver Creek Watershed.

3.4.3.1 Jennie's Fork from the Headwaters to the Mouth (MT41I006_210)

Jennie's Fork is a tributary of Silver Creek. It extends for 1.2 miles from its headwaters to the mouth. In 1996, Jennie's Fork was listed as not supporting its designated aquatic life, cold-water fishery, drinking water, and recreational uses. In subsequent years, it was rated as fully supporting its designated uses, except aquatic life and cold-water fishery uses, which could not be assessed adequate data were lacking. Suspected causes of impairment in Jennie's Fork have included siltation and metals (1996 303(d) list). A typical view of Jennie's Fork is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), a cross-sectional survey below the Great Divide Ski Area that included a Proper Functioning Condition assessment and Wolman pebble counts, McNeil core substrate fines from the reach surveyed in 2003, suspended sediment data, macroinvertebrate and periphyton data, fish population information, and a limited total of four in-stream water chemistry samples taken between August 2001 and August 2003.

Jennie's Fork

Pollution Sources

The 2003 preliminary source assessment identified roads and geology as the primary sediment sources for Jennie's Fork. The aerial photography inventory showed four road crossings and road encroachment along 56 percent of the stream. Source assessment sites consisted primarily of road sites.

The primary geology of this sub-watershed is the Boulder Batholith, which consists of highly erodible quartz monzonite. During the field source assessment, poorly developed soils with gully formations on steep slopes were noted. Deposition of sand was observed in the stream channel at the field sampling sites. The aerial photography assessment showed variable width riparian buffers. There is an extremely high density of roads in the watershed, particularly in the vicinity of the ski resort. The stream flows underground in a series of culverts through most of the ski area. During the field survey it was noted that at least three channels carry flow during spring runoff due to an under-sized culvert. Cattle and horses were observed grazing below the ski area parking lot, and have trampled the stream banks and destroyed riparian vegetation.

In summary, road runoff and erosive geology are probably the biggest contributors of sediment to Jennie's Fork. Land disturbance appears to exacerbate erosion in the Boulder Batholith geology and the poorly developed soils of this sub-watershed.

Expected significant contributors of metals to the stream segment are historical hard rock mining activities in the upper watershed. The watershed falls within the Marysville mining district. The MBMG Abandoned and Inactive Mines database reports mineral location mining activities in the watershed. The historical mining type is lode mining. In the past these mines produced gold, silver, and lead. One mine in the watershed, Bald Mountain, is listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites. During the source assessment, it was learned that Jennie's Fork's point of origin is a mine shaft on Mount Belmont. The state has done significant reclamation work at this location and mining was active at this particular site until the late 1990s.

Channel Survey

In 2003 Tetra Tech and Land & Water Consulting conducted a field investigation on Jennie's Fork below the ski area parking lot. The field crew determined the stream to be a Rosgen stream type A4a+. The width-to-depth ratio was 4.3, which is about half the value for Helena National Forest and southwestern Montana and the Greater Yellowstone Area A4 reference stream (Table 3-64). This is probably a result of the stream leaving its channel during runoff events and/or reduction of flow to fill a cistern at the bottom of the ski hill. The BEHI rating was "moderate." The BEHI score was slightly above the average (less stable) for southwestern Montana and Greater Yellowstone Area A-type reference streams, but within 10 percent of the reference value. D_{50} as determined in a zigzag Wolman pebble count consisted of medium gravels. This median particle size is about two size-classes smaller than the range expected for A4 reference stream, based on data collected for the Helena National Forest and southwestern Montana and the Greater Yellowstone Area.

Part of the channel survey included a Proper Functioning Condition assessment. The field crew rated the reach as "Functional – at risk" (FAR), primarily because of the presence of riparian vegetation and energy dissipating characteristics. But the field crew noted that sand deposition was excessive. The riparian land type aggregate assigned to this site is 10, Granitic Rock – Mountain Slopes and Ridges. According to Helena National Forest data collected for streams occurring in this riparian aggregate, surface and subsurface fines are common and can be excessive.

Table 3-64. Summary of cross-sectional data for Jennie's Fork, MT41I006_210.

Parameter	Result	Comparable to Reference
Width/depth ratio	4.3	No
BEHI	22.7	Yes
D_{50}	Medium gravels	No
PFC	FAR	No

McNeil Cores

McNeil core data are available for one site on Jennie's Fork— the channel survey site. Six cores were collected. The riparian aggregate here was determined to be 10, Granitic Rock – Mountain Slopes and Ridges (Table 3-65). The average percentage of fines less than 6.4 mm was 41.2 percent, with average fine fines (less than 0.85 mm) at 16.3 percent. The percentage of fines less than 6.4 mm for this site is about 15 percent greater than the mean from reference cores for this riparian aggregate, while the fine fines are 60 percent above the mean.

Table 3-65. Summary of McNeil core data for Jennie's Fork, MT41I006_210.

Land Type Aggregate	Year	% Fines < 6.4 mm	% Fines < 0.85 mm	Comparable to Reference
10	2003	41.2	16.3	Both fines values are elevated.

Suspended Sediment Concentrations

Recent suspended sediment data were acquired from MDEQ. Few data were available for Jennie's Fork. Two samples for total suspended solids were collected below the Great Divide Ski Area in 2001 and 2002. The highest value collected was 26.5 mg/L in September of 2002.

In September of 2002, a turbidity observation accompanying the total suspended solids sample reported the water clarity as clear. In 2003, two turbidity observations were recorded on Jennie's Fork below the ski area. One observation reported the water clarity as clear, and the other reported the water clarity as slightly turbid. The observation of slight turbidity was reported in August, and may have been a result of livestock in the creek upstream from the sampling site.

Macroinvertebrates

Macroinvertebrate data from one sample taken in September 2002 below the ski area parking lot were available. Sampling results were compared with Bollman's revised bioassessment metrics for the Montana Valley and Foothill Prairies Ecoregion (Bollman, 2003b). The site was rated as moderately impaired and partially supporting aquatic life uses. Nine clinger taxa and four trichoptera taxa were found at the site, and Bollman concluded that fine sediment deposition might limit benthic habitat.

Periphyton

Periphyton data from one sample taken in August 2002 below the ski area parking lot were available. Sampling results were compared with reference biocriteria metrics established for the Rocky Mountain Ecoregions of Montana (Bahls, 2003). Diatom metrics indicated minor impairment and full support of aquatic life uses. Bahls concluded that the impairment was primarily due to organic loading and secondarily due to siltation. The siltation index exceeded the threshold for minor impairment. Sample notes indicated that the sample was silty.

Fish Populations

The project team examined data were in the Montana Fish, Wildlife and Parks' MFISH database. Montana Fish, Wildlife and Parks has no listing or management strategy for Jennie's Fork.

Metals Concentrations

The project team evaluated a limited total of four in-stream water chemistry samples taken between August 2001 and August 2003. No sample analysis results exceeded either the human health or aquatic life criteria for arsenic, cadmium, copper, or zinc. One sample (25 percent of the samples) exceeded the chronic aquatic life and human health criteria for lead. The average of all lead samples was 19 percent higher than the chronic aquatic life criterion. The highest measured value was 3.5 times the chronic aquatic life criterion, and 1.1 times the human health criterion. This evidence suggests this segment does not meet the human health and aquatic life standards for lead.

Jennie's Fork MT41I006_210 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, channel metrics (width-to-depth ratio, median surface particle size, BEHI, and Proper Functioning Condition) McNeil core subsurface fines less than 6.4 mm and less than 0.85 mm, suspended sediments, macroinvertebrates, periphyton, fisheries, and water chemistry.

No targets and few supplemental indicator values were met. Channel metrics, except for BEHI, were not comparable to reference streams. D_{50} at the survey site was at least one size-class smaller than expected, and is probably a reflection of excessive deposition of fine sediments. Values for both classes of fines from McNeil cores were above the target values. Suspended sediment data were inadequate to make a determination. The results from the macroinvertebrate and diatom samples indicate impairment by sedimentation. The lack of fisheries data suggests that this stream provides limited habitat for few fish species.

Results from the 2003 preliminary source assessment revealed that eroding sediment sources affecting the stream were enhanced by the erosive granitic geology. Best management practices for roads are warranted at the Great Divide Ski Area. No targets and few supplemental values are being met.

Based on the weight of evidence, the cold-water fishery and aquatic life beneficial uses in Jennie’s Fork are impaired by siltation. A TMDL therefore will be developed to address sediment impairment.

The limited water column sample analysis results suggest Jennie’s Fork is impaired by lead. A TMDL will be developed to address the lead impairment.

3.4.3.2 Silver Creek from the Headwaters to the Mouth (MT41I006_150)

Silver Creek is a 21.6-mile-long stream that drains directly to Lake Helena (MT41I006_150). Montana's 1996 303(d) list indicated that Silver Creek did not support aquatic life, cold-water fishery, and recreational uses because of metals, flow alterations, habitat alterations, and priority organics. In 2000 and 2002, drinking water and industrial water uses were added to the list of non-supported or partially supported uses, while the causes of impairment remained essentially the same. A typical view of Silver Creek is shown in the photo below.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), the results of four in-stream water chemistry samples, and fish tissue sampling results from 2003 (Appendix I).

Silver Creek

Pollution Sources

Expected significant contributors of metals to the stream segment are upstream sources and historical hard rock mining activities in the upper watershed. Jennie's Fork is a tributary and contributes to the metals loads. The sub-watershed falls within the Marysville, Scratchgravel Hills, and Austin mining districts. The MBMG Abandoned and Inactive Mines database reports mineral location, placer, prospect, surface, surface-underground, and underground mining activities in the watershed. The historical mining types include lode, mill, and placer. In the past these mines produced gold, silver, manganese, lead, iron, copper, and zinc. Five mine sites in the watershed are listed in the State of Montana's inventory of High Priority Abandoned Hardrock Mine Sites and fall within the Marysville district: Goldsil Mill Site, Drumlummon Mine/Mine Site, Argo Mill Site, Drumlummon Mine/Mill Site, and Belmont.

Metals Concentrations

The project team evaluated a total of four in-stream water chemistry samples taken between August 2001 and August 2003. Arsenic concentrations in three out of four samples exceeded the human health criterion. The average concentration of all samples was 42 percent higher than the human health criterion. The highest concentration was 2.3 times higher than the human health criterion. The evidence suggests that this segment does not meet the human health standard for arsenic.

All samples were below the human health and aquatic life criteria for cadmium, copper, lead, and zinc. The highest measured copper concentration was 80 percent of the chronic aquatic life criterion level. This is a borderline level.

Fish Tissue

Silver Creek was closed to harvest of sport fish in the 1980s because of mercury levels exceeding guidelines for human consumption. Sources of mercury in the watershed were believed to be associated with historical mercury amalgamation operations in the Marysville mining area. Concentrations of mercury ranged from 1.6 to 3.0 micrograms per gram (μg/g) in fish muscle tissue. Published guidelines for human consumption of mercury-contaminated fish recommend that when fish contain from 2.81 to 4.5 μg/g of mercury, no more than one meal per month should be eaten by adult men and adult women above child-bearing age. Women of child-bearing age, children age six and younger, and nursing mothers should not consume any fish containing these levels of mercury (MDPHHS, 2002). In summer 2003, Silver Creek trout were resampled for mercury analysis. Similar results were seen with mercury concentrations ranging from 1.47 to 3.23 μg/g.

Priority Organics

Silver Creek was listed as impaired on the Montana 303(d) list because of priority organics. Additional information from MDEQ identified DDE as the priority organic pollutant of concern. A second sample was collected on Silver Creek for reanalysis of DDE and 18 priority organics on August 21, 2003. The results of this analysis showed that concentrations of DDE and all of the other organic compounds were present in concentrations below the respective limits of analytical detection.

Silver Creek MT41I006_150 Water Quality Impairment Summary

The available water chemistry data suggest that Silver Creek is impaired for arsenic. A TMDL will be developed to address the arsenic impairment.

The available fish tissue data suggest that Silver Creek is impaired for mercury. A TMDL will be developed to address the mercury-related impairments.

Recent analysis data suggest that Silver Creek does not continue to sustain impairments associated with priority organic contaminants. It does not appear that a TMDL will be required for DDE.

3.4.4 Lake Helena (MT41I007_010)

This section presents summaries and evaluations of all available water quality data for Lake Helena proper. The location of Lake Helena is shown in relation to its watershed in Figure 2-1.

Lake Helena is approximately 2,100 acres in size and is the ultimate receiving water body for streams draining the 620-square-mile Lake Helena watershed. The Lake Helena portion of the Helena Valley originally consisted of a wetland complex that ranged in size from 3,600 to 7,800 acres (Wetlands Community Partnership, 2001). In 1907, Hauser Dam and Reservoir were constructed on the Missouri River north of Helena. Water backing up behind the dam inundated the lower reaches of Prickly Pear Creek and the surrounding wetlands, thereby creating Lake Helena. In 1945, an earthen causeway and control structures were installed to allow independent regulation of water levels in Hauser Reservoir and Lake Helena (Shields et al., 1995). The Lake Helena Causeway now separates Lake Helena from what is known as the Causeway Arm of Hauser Reservoir. Each of these two reservoir segments is listed as a separate segment on the Montana 303(d) list.

Lake Helena (MT41I007_010) was listed on the 1996 303(d) list as partially supporting aquatic life and cold-water fishery uses because of suspended solids, nutrients, metals, and thermal modifications. In subsequent 303(d) lists, Lake Helena was listed as not supporting drinking water uses because of metals, including lead and arsenic. Listings for aquatic life, cold-water fisheries, and primary contact recreation were removed because sufficient credible data were lacking.

A review of the current data is provided below. Available data include results from the 2003 preliminary source assessment survey (Appendix C), suspended sediment data, fish population information, synoptic temperature data, a total of 16 water chemistry samples (two additional samples for arsenic only) taken between June 2000 and August 2003, Secchi disc readings, and lake bottom sediment metals data.

Pollution Sources

The primary pollutant sources identified as affecting Lake Helena during a 2003 pollution source assessment were tributary streams, a variety of nonpoint pollution sources, and natural geologic factors. Tributary streams, diffuse nonpoint sources, and natural sources were documented as contributing sediment, nutrients, and metals to Lake Helena. These observations and conclusions were based on literature reviews, interpretation of available aerial photographs, and analysis of a variety of chemical, physical, and biological samples.

The lowest elevations in the Helena Valley are occupied by Lake Helena, which lies over Quaternary alluvial valley bottom sediment deposits. Lake Helena is a very shallow water body with an average depth of 5.2 feet. The surface area is approximately 3.2 square miles, or 2,072 acres. The limnology of the lake is strongly influenced by a large watershed area to lake area (see Appendix E). The water surface elevation of Lake Helena is partly controlled by Hauser Dam on the Missouri River and a control structure at the Lake Helena Causeway. The water level in Hauser Lake upstream from Hauser Dam is managed for power generation, flood control, and recreational uses. Flow from the Missouri River into and out of Hauser Reservoir is coordinated by the operation of upstream and downstream hydroelectric dams (Canyon Ferry Dam and Holter Dam, respectively). Lake Helena does not continuously discharge water to Hauser Reservoir. On occasion, depending on the respective water levels of the two reservoirs, flow direction can reverse, with Hauser Reservoir discharging water to Lake Helena (Shields et. al., 1995).

Hydrologic inputs to Lake Helena include the major tributary streams (Prickly Pear Creek, Tenmile Creek, and to a lesser extent, Silver Creek), groundwater discharge, tile drainage associated with the Helena Valley Irrigation District (HVID), treated wastewater discharges from the cities of Helena and East Helena (discharged to Prickly Pear Creek), and the Missouri River through direct or indirect discharges from the Helena Valley Irrigation Canal and from occasional backflows from Hauser Reservoir to Lake Helena (Kendy et al., 1998). In the summer, the lower reaches of both Prickly Pear and Tenmile Creeks are severely dewatered due to irrigation withdrawals, and their direct discharges to Lake Helena are negligible. Most of Silver Creek's small volume of flow never reaches the Helena Valley because of channel losses to groundwater and irrigation withdrawals. Silver Creek becomes a channelized ditch in its lower reaches and groundwater tile drainage discharging from the west and north portions of the Helena Valley comprise most or all of its flow. During the summer season, when a large volume of Missouri River water is imported into the Helena Valley to irrigate crops, direct discharges from the main Helena Valley Irrigation Canal and an extensive series of lateral canals provide most of the inflow to Lake Helena. An additional but unquantified volume of Missouri River water enters Lake Helena through groundwater discharges from irrigated fields within the Helena Valley Irrigation District. During the 2003 irrigation season (April 1 to September 30), an average daily flow of 231 cfs was discharged from the Missouri River Helena Valley Regulating Reservoir through the HVID canal system (Personal communication, 2004, Jim Foster). Most of this water can be assumed to eventually reach Lake Helena, minus evapotranspiration losses from irrigated fields. In contrast, average daily flows for Prickly Pear Creek (near Clancy), McClellan Creek (near the mouth), and Tenmile Creek (near the mouth) for the April 1 to September 30 time frame total about 143 cfs (USGS, 2004).

Lake Helena is surrounded by private lands, with the exception of a small public waterfowl preserve operated by Montana Fish, Wildlife and Parks that is located along the northwestern shore. Pacific Power and Light (PP&L) has a 603-acre easement along the west and south shoreline areas of the lake to accommodate fluctuating water levels that result from the operations of Hauser Dam. Private parcels along the western and southern edges of the lake consist of ranches and large residential lots with livestock pasture and hay fields that extend to the lake's edge. On the north and east shores of the lake, recent subdivision development has resulted in the construction of many homes on 1-acre (mostly near the causeway) or 20-acre lots. Interestingly, when the Lewis and Clark County cadastral land ownership GIS layer is overlain on a current aerial photo of the area, many of the subdivided lots on the north shore of Lake Helena have half of their parcels inundated by water.

Waterborne contaminants originating within many of the 303(d)-listed stream drainages are ultimately transported to Lake Helena. Diffuse pollution sources associated with rural housing, agricultural practices, and natural sources also affect the lake. Although the area was once a substantial wetland, most of the riparian vegetation is now restricted to the portion of shoreline where Prickly Pear Creek and the Silver Creek Ditch enter the lake. This corresponds to the area protected by the PP&L easement. The Missouri River irrigation water interbasin transfer might contribute to an increase in arsenic loading to Lake Helena, while surplus irrigation water discharges, return flows, and tile drainage might be sources of nutrient loading. During a 2003 pollution source assessment, open drains discharging tile drainage and excess irrigation water to Lake Helena were observed to contain high densities of aquatic plants and large numbers of dead carp. The majority of the Lake Helena watershed drains an area with granitic geology and a naturally high capacity for erosion and production of sediment. Aerial photographs reviewed as part of the 2003 source assessment showed a deltaic formation in Lake Helena where Prickly Pear Creek discharges to it. Field monitoring activities documented a shifting stream substrate composed of granite sands in much of lower Prickly Pear Creek. Other natural sources such as windy conditions contribute to shoreline erosion, especially along the east shoreline near the Lake Helena Causeway. Historical aerial deposition of metals and other contaminants from the ASARCO East Helena lead smelter is another potential but unquantified source of impairment in Lake Helena.

Suspended Sediment Concentrations

Recent total suspended solids data were acquired from PP&L, as well as 2003 field sampling. Data were available for four sites on the lake, and nine samples were taken in 2003. The highest value collected was 45 mg/L in August at the shallowest sampling site on the east (windward) side of the lake (Table 3-66). The total suspended solids data had an average of 24.6 mg/L with a median of 22.0 mg/L. There are no reference data with which to compare these values.

Table 3-66. Statistical summary of suspended sediment data for Lake Helena, MT41I007_010.

Mean	24.6 mg/L
Median	22.0 mg/L
Standard deviation	13.8 mg/L
Maximum	45.0 mg/L
Number of samples	9
Number of sample sites	4

Thirteen turbidity observations were recorded at four sites on Lake Helena from 2002 to 2003. Eight observations reported the water clarity as opaque and five observations reported the water clarity as slightly turbid. The observations of opacity reported during the 2003 sampling were described as being mostly due to algal blooms.

Aquatic Plants

From the August 2002 EPA/MDEQ Lake Helena water quality survey of Lake Helena, *Potamogeton crispusan* (an introduced species) is widespread in the lake and should be considered a co-dominate plant with *Potamogeton pectinatus*. *Potamogeton pectinatus* is clearly the most abundant plant in the lake and was found at virtually every site. All these species are common aquatic plants with wide distribution that are tolerant of slow moving or brackish water. On the western end of the lake where Tenmile and Silver Creeks enter, the aquatic vegetation was the densest. The thick vegetation prevented staff from accessing that area in the lake on a powerboat in 2002. Vegetation was found in the deeper water, but it was more sporadic.

Fish Populations

The project team examined data in the Montana Fish, Wildlife and Parks' MFISH database. Lake Helena is managed as a trout fishery. According to the MFISH database, many fish species, such as mottled sculpin, mountain whitefish, rainbow trout, Utah chub, walleye, kokanee salmon, brown trout, and fathead minnow, are thought to be common year-round residents of the lake. According to MFISH, common carp, longnose, and white sucker, and yellow perch are also abundant in the lake.

Nutrient-related Data

Post-1996 nutrient and nutrient-related data were limited to two sampling occasions (August 9, 2002, and January 21, 2003) until the focused monitoring effort in summer 2003. Land & Water and Montana Fish, Wildlife and Parks staff collected samples at seven stations on Lake Helena from June through August 2003. From these samples, 13 of 14 total phosphorus analyses exceeded the Lake Helena target values. In addition, 67 percent (8 of 12) of lake water chlorophyll-*a* samples collected between August 9, 2002, and August 29, 2003, exceeded the supplemental indicator value (0.0022 mg/L) (Appendix D).

Algal blooms were noted as being present in the lake during lake sampling events in 2003. Field measurements by Land & Water and Montana Fish, Wildlife and Parks in 2002–2003 showed specific conductance readings ranging from 267 to 465 µS/cm during June and August indicating substantial dissolved solids in the water. Dissolved oxygen readings ranged from a low of 1.8 to 11.7 mg/L at the beginning and end of the 2002 and 2003 summer seasons. Dissolved oxygen concentrations exceeded 133 percent of saturation in some samples (Appendix D).

In January 2003, PP&L Montana staff made dissolved oxygen measurements in Lake Helena near the Lake Helena Causeway and 150 yards off the Montana Fish, Wildlife and Parks boat launch near the mouth of the Silver Creek ditch. The readings ranged from 16 to 20 mg/L at the end of January 2003 (Appendix D). MDEQ staff have reported that during winter conditions when there is limited snow cover on the lake ice, supersaturated conditions can occur in Lake Helena. This is due to photosynthesis and a lack of surface turbulence (Personal communication, 2003, A. Horpestad, MDEQ).

Secchi Depth

Montana Fish, Wildlife and Parks and Land & Water Consulting took Secchi disc readings at four stations in Lake Helena in 2003. All Secchi disc readings were low (less than 1.70 feet at all four stations, except one reading of 3.5 feet at a water depth of 7 feet). These Secchi disc readings indicated low visibility in the lake (Appendix D).

Metals Concentrations

The project team evaluated a total of 14 in-inlake water chemistry samples (two more for just arsenic) taken between June 2000 and August 2003. Arsenic concentrations for 15 out of the 16 samples exceeded the human health criterion for arsenic. The average concentration in all samples was 145 percent higher than the human health criterion. The highest measured concentration was 4.6 times the human health criterion. No samples exceeded the aquatic life criteria. This evidence suggests this segment does not meet the human health standard for arsenic.

Lead concentrations in six samples (43 percent of the samples taken) exceeded the chronic aquatic life criterion. The highest concentration was 1.8 times the chronic aquatic life criterion. The average concentration of all samples was just 4.1 percent lower than the chronic aquatic life criterion. This evidence suggests this segment does not meet the chronic aquatic life standard for lead.

No samples exceeded the human health or aquatic life criteria for cadmium, copper, or zinc. The highest measured concentration of cadmium was 75 percent of the chronic aquatic life criterion. This is a borderline value.

Lake Bottom Sediment Data

A single composite core sample of lake bottom sediment material was collected at each of four lake locations in August 2003 and analyzed in the laboratory for total recoverable metals concentrations. The lab analyses indicated that concentrations of some metals were elevated in the lake bottom sediments. Specifically, the maximum concentrations of arsenic observed were in excess of levels linked to sediment toxicity (MacDonald et al., 2000). In addition, cadmium, copper, lead, and zinc all were present in sufficient concentrations to be of concern relative to aquatic life uses (MacDonald et al., 2000). The measured concentrations of aluminum and iron were also elevated, but fewer studies were available to discern the potential for toxic effects. Some research has shown that excessive amounts of iron in sediments actually serve to make other metals more biologically available. The Bureau of Reclamation evaluated Lake Helena bottom sediment data collected by Kendy et al. of the USGS (1998) in their preparation of an environmental assessment for the renewal of the Canyon Ferry water leasing contracts. They concluded that levels of arsenic, chromium, copper, lead, mercury, and zinc were elevated and comparable to sediment metal levels collected in wetlands impacted by mining (USBR, 2004b).

Site-specific conditions play a large role in the bioavailability of metals in the sediments. Without further study, it is difficult to assess the environmental hazard posed by the observed concentrations. The amount of organic material in the sediment (total organic carbon) and acid-volatile sulfide concentrations both affect the bioavailability of metals. Because Lake Helena is fairly shallow and subjected to frequent mixing by wind, it is unlikely that acid-volatile sulfide, which forms under anoxic conditions, is present in significant concentrations. However, measuring these compounds in the sediments would help to evaluate the bioavailability of these metals.

Performing sediment toxicity tests using EPA methods and amphipods or other common toxicity test species is the best method to determine bioavailability and toxicity of sediment metals to aquatic life. A well designed study that samples and tests representative portions of the lake sediment can be a great help in determining which areas of the lake contain toxic sediments. This information can then be used to establish specific management goals for the system.

Thermal Modifications

Temperature data for Lake Helena were limited to synoptic sampling efforts. During the summers of 2002 and 2003, 21 temperature observations were recorded at 11 stations (Table 3-67). The maximum temperature of 68.4 °F was recorded on August 29, 2003, just after 9 a.m. at the sampling site near the lake's center (M09LHLNC01). Some of the data were collected with a Hydrolab™ instrument and temperatures were recorded at various depth intervals. Hydrolab™ data values were averaged to one value per site, and these averages were incorporated into the results of the summary table below, Table 3-67. Hydrolab™ temperature readings ranged over depths of two to seven feet, with as much as a 4.5 °F temperature difference recorded per site.

Table 3-67. Statistical summary of synoptic temperature data for Lake Helena, MT41I007_010.

Mean	64.0° F
Median	62.8° F
Standard deviation	2.7° F
Maximum	68.4° F
Number of samples	21
Number of sample sites	11

"Naturally occurring temperatures" were not assessed in Lake Helena in part due to the unique nature of the lake (the flooded arm of Hauser Lake). SSTEMP modeling performed on other suspected thermally impaired stream segments in the Lake Helena watershed was not an appropriate tool for assessing temperature issues in Lake Helena.

Lake Helena MT41I007_010 Water Quality Impairment Summary

The project team reviewed data on potential pollution sources, suspended sediments, fisheries, lake temperature, and water chemistry (including nutrient, dissolved oxygen, and metals concentrations).

At this time, insufficient information is available to evaluate the degree of potential sediment impairment in Lake Helena, if any. A suitable reference lake would be needed to evaluate the sediment impairment of Lake Helena. Given the lack of suspended sediment data, it is not recommended that a TMDL be prepared at this time.

The weight of evidence suggests that Lake Helena is impaired by nutrients. Numerous total phosphorus, total nitrogen, and chlorophyll-*a* samples collected from various stations in the lake showed concentrations above the nutrient target or supplemental indicator values throughout the period of record. Tributary streams contribute sediment and nutrients. Rural housing and agricultural practices affect the lake. The lake is surrounded by development, and irrigation return ditches that flow into the lake have been documented as being choked with algae. Algal blooms were observed in the lake in June and August 2003. There were also large dissolved oxygen fluctuations ranging from a low of 1.8 mg/L to over 16 mg/L. Secchi disc readings also indicated low light visibility due to suspended materials in the water. A TMDL will be developed to address nutrients in Lake Helena.

The available water chemistry analysis results strongly suggest that Lake Helena is impaired by arsenic and lead. Lake bottom sediment data suggest unnatural metals enrichment, but further confirmation of the magnitude and spatial extent of the problem is warranted. TMDLs will be developed to address the arsenic and lead impairments in Lake Helena.

At this time, insufficient information is available to make a call on thermal impairments in Lake Helena. A suitable reference lake is needed to evaluate the possibility of thermal modifications. It is not recommended that a temperature TMDL be prepared at this time.

3.5 Conclusions of the Lake Helena Watershed Water Quality Impairment Status Review

Table 3-68 below summarizes the conclusions of the Lake Helena watershed water quality impairment status review discussed in the preceding pages. The table describes our interpretation of the present water quality status based on a thorough review of the available data, and lists the stream segments and the pollutant types that will need to be addressed in the forthcoming Lake Helena water quality restoration plan and TMDLs.

Table 3-68. Water quality status of suspected impaired water bodies and required TMDLs in the Lake Helena watershed.

Water Body Name and Number	Suspected Impairment Causes	Conclusions	Proposed Action
Clancy Creek, MT41I006_120	Sediment	Impaired	A TMDL will be written.
	Nutrients	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Corbin Creek, MT41I006_090	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
	Temperature	Unknown	A TMDL will not be written at this time.
	Salinity/total dissolved solids/chlorides	Impaired for salinity and total dissolved solids. Not impaired for chloride.	A TMDL will not be written. Impairments will be addressed by the metals TMDL.
Golconda Creek, MT41I006_070	Sediment	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for cadmium and lead.
Granite Creek, MT41I006_179	Habitat alterations	Not impaired	A TMDL will not be written.
Granite Creek, MT41I006_230	Metals	Unknown	A TMDL will not be written at this time.
Jackson Creek, MT41I006_190	Sediment	Not impaired	A TMDL will not be written.
Jennie's Fork, MT41I006_210	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for lead.

Water Body Name and Number	Suspected Impairment Causes	Conclusions	Proposed Action
Lake Helena, MT41I007_010	Sediment	Unknown	A TMDL will not be written at this time.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic and lead.
	Temperature	Unknown	A TMDL will not be written at this time.
Lump Gulch, MT41I006_130	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for cadmium, copper, lead, and zinc.
Middle Fork Warm Springs Creek, MT41I006_100	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, lead, and zinc.
North Fork Warm Springs Creek, MT41I006_180	Sediment	Impaired	A TMDL will be written.
	Low dissolved oxygen, organic enrichment	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, and zinc.
Prickly Pear Creek, MT41I006_060	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for lead.
Prickly Pear Creek, MT41I006_050	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for cadmium, lead, and zinc.
Prickly Pear Creek, MT41I006_040	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
	Temperature[a]	Impaired	A TMDL will be written.
Prickly Pear Creek, MT41I006_030	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic and lead.
	Temperature	Impaired	A TMDL will be written.

Water Body Name and Number	Suspected Impairment Causes	Conclusions	Proposed Action
Prickly Pear Creek, MT41I006_020	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Total Ammonia	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, and lead.
	Temperature	Impaired	A TMDL will be written.
Prickly Pear Creek, MT41I006_010	Metals	Not evaluated	TMDL needs will be addressed as part of the Hauser Reservoir TMDL.
Sevenmile Creek, MT41I006_160	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for copper and lead.
Silver Creek, MT41I006_150	Metals	Impaired	A TMDL will be written for arsenic and mercury.
	Priority organics	Not impaired	A TMDL will not be written.
Skelly Gulch, MT41I006_220	Sediment	Impaired	A TMDL will be written.
	Metals	Not impaired	A TMDL will not be written.
Spring Creek, MT41I006_080	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Tenmile Creek, MT41I006_141	Sediment	Not impaired	A TMDL will not be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Tenmile Creek, MT41I006_142	Sediment	Impaired	A TMDL will be written.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Tenmile Creek, MT41I006_143	Sediment	Impaired	A TMDL will be written.
	Nutrients	Impaired	A TMDL will be written for nitrogen and phosphorus.
	Metals	Impaired	A TMDL will be written for arsenic, cadmium, copper, lead, and zinc.
Warm Springs Creek,	Sediment	Impaired	A TMDL will be written.

Water Body Name and Number	Suspected Impairment Causes	Conclusions	Proposed Action
MT41I006_110	Metals	Impaired	A TMDL will be written for arsenic, cadmium, lead, and zinc.

[a] Impairment causes that have not been reflected on past 303(d) lists but that were identified during this review.

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4.0 REFERENCES

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Montana DEQ - Water Quality Standards Attainment Record

Reporting Cycle: 2018 **Assessment Record:** MT41I006_050 .pdf **Status:** Unassigned

ASSESSMENT UNIT INFORMATION

Reporting Cycle: 2018

Assessment Unit: MT41I006_050

Waterbody Name: Prickly Pear Creek

Location Description: PRICKLY PEAR CREEK, Spring Creek to Lump Gulch

Water Type:	Size (Miles/Acres)	Use Class:
RIVER	7.05 MILES	B-1

Hydrologic Unit Code: 10030101

HUC Name: Upper Missouri

Watershed: Upper Missouri

Basin: Upper Missouri

TMDL Planning Area: Lake Helena

Ecoregion: Middle Rockies

County: Jefferson County

Lat/Long AU Start (U/S): 46.388354 / -112.026021

Lat/Long AU End (D/S): 46.478176 / -111.980219

MONITORING INFORMATION

Date Assessment Started: 12/05/2013

Assessed By: Makarowski, Kathryn

Montana DEQ - Water Quality Standards Attainment Record

Reporting Cycle: 2018 **Assessment Record:** MT41I006_050 .pdf **Status:** Unassigned

CITATIONS

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Workman, Dennis L. (1974), Evaluation of Improvements on Prickly Pear Creek	Assessment Record	fish		
Ingman, Gary L. (1978), A Study of the Biological Impact of the Helena Sewage Treatment Plant Discharge on Prickly Pear Creek	DEQ Metcalf Stacks	General; algae; chlorophyll; macroinvertebrates	riparian &/or instream surveys & physical features	General; metals
Bahls, Loren L. ; Ingman, Gary L. ; Horpestad, Abe A. (1979), Biological Water Quality Monitoring: Southwest Montana, 1977-1978	DEQ Metcalf Stacks	algae; chlorophyll; macroinvertebrates	riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; major nutrients; quantitative physical data
Wood, Charles (1981), Prickly Pear Creek: A Report on Man's Debilitating Impacts for Use by the Prickly Pear Task Force, WQB Report No. 81-2	DEQ Metcalf Stacks	algae; fish; macroinvertebrates	riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data; toxicity tests
Husby, Peter ; Moore, Gerald (1982), Riparian Vegetation Survey of Prickly Pear Creek	DEQ Metcalf Stacks		photo points; riparian &/or instream surveys & physical features	quantitative physical data
La Point, Thomas W. ; Melancon, Susan ; Baldigo, Barry P. ; Janik, Jeffry J. ; Morris, Marsha K. ; Kinney, Wesley L. (1982), Investigation of Methods for Site Specific Water Quality Assessment Prickly Pear Creek, Montana	DEQ Metcalf Stacks	algae; fish; macroinvertebrates		common ions, pH, conductivity, miscellaneous; metals; toxicity tests
Streamworks (1984), Prickly Pear Creek: A Stream Corridor Management Plan	DEQ Metcalf Stacks	fish	riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; metals; quantitative physical data
U.S. Environmental Protection Agency (1986), Letter to Drynan on 9/11/1986	Assessment Record		Land use; riparian &/or instream surveys	major nutrients

Citation	Location	Biological Data	Habitat Data	Chemistry Data
			& physical features	
Baldigo, Barry P. ; Baker, John R. ; Kinney, Wesley L. ; Fillinger, Mike (1987), Seasonal Variability in Prickly Pear Creek Water Quality and Macroinvertebrate Communities: Project Summary	DEQ Metcalf Stacks	macroinvertebrates	riparian &/or instream surveys & physical features	metals; quantitative physical data
Montana Department of Fish, Wildlife, and Parks (1989), Application for Reservations of Water in the Missouri River Basin Above Fort Peck Dam. Volume 1: Summary, Purpose, Need, Amount, Public Interest, Management Plan, and Appendices	DEQ Metcalf Stacks	fish	General; riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; major nutrients; quantitative physical data
Montana Department of Fish, Wildlife, and Parks (1991), Dewatered Streams List, 1991	DEQ Metcalf Stacks		riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; quantitative physical data
Unknown (1991), Prickly Pear Creek Ammonia Study: December 3, 1991	Assessment Record	macroinvertebrates		common ions, pH, conductivity, miscellaneous; major nutrients; quantitative physical data
Briar, David W. ; Madison, James (1992), Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana, Water-Resources Investigations Report 92-4023	DEQ Metcalf Stacks			General; common ions, pH, conductivity, miscellaneous; quantitative physical data
(1998), DEQ Field Assessment Form	Assessment Record	algae; chlorophyll	photo points; riparian &/or instream surveys & physical features	Rosgen type; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals;

Citation	Location	Biological Data	Habitat Data	Chemistry Data
				quantitative physical data; toxicity tests
Kendy, Eloise ; Olsen, Bill ; Malloy, John C. (1998), Field Screening of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Helena Valley, West-Central Montana, 1995, Water-Resources Investigations Report 97-4214	DEQ Metcalf Stacks	algae; fish		benthic sediment data; bioaccumulation; common ions, pH, conductivity, miscellaneous; major nutrients; metals; organics; quantitative physical data
Shields, Ronald R. ; White, Melvin K. ; Ladd, Patricia B. ; Chambers, Clarence L. ; Dodge, Kent A. (1998), Water Resources Data: Montana Water Year 1997, USGS Water-Data Report MT-97-1	DEQ Metcalf Stacks	fish		benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data
Montana Department of Fish, Wildlife, and Parks (1999), Montana Rivers Information System (MRIS)	Assessment Record	algae; fish; macroinvertebrates; wildlife	Land use; riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; quantitative physical data
U.S. Geological Survey (199n), USGS Water Data for the Nation - NWIS	Assessment Record	algae; chlorophyll; fecal coliforms; fish; other bacteriological data	Land use; riparian &/or instream surveys & physical features	benthic sediment data; bioaccumulation; common ions, pH, conductivity, miscellaneous; major nutrients; metals; organics; quantitative physical data
Bollman, Wease (2002), Aquatic Invertebrates and	DEQ Metcalf Stacks	General;	General	

Montana DEQ - Water Quality Standards Attainment Record

Reporting Cycle: 2018 **Assessment Record:** MT41I006_050 .pdf **Status:** Unassigned

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Habitat at a Fixed Station on Prickly Pear Creek, Jefferson County, Montana: June 19, 2001		macroinvertebrates		
Bollman, Wease (2003), Aquatic Invertebrates and Habitat at a Fixed Station on Prickly Pear Creek, Jefferson County, Montana: June 27, 2002, M09PRPEC01 02-S100-M	DEQ Metcalf Stacks	macroinvertebrates		
Montana Department of Environmental Quality (2004), Statewide Monitoring 2001-2004 Data [Electronic Resource]	DEQ Metcalf Multimedia Case	chlorophyll; macroinvertebrates; other bacteriological data	photo points; riparian &/or instream surveys & physical features	General; common ions, pH, conductivity, miscellaneous
Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2006), STORET/Storease Data Archive [Electronic Resource]	DEQ Metcalf Multimedia Case	General; algae; chlorophyll; fecal coliforms; fish; macroinvertebrates; other bacteriological data	General; Land use; riparian &/or instream surveys & physical features	General; Rosgen type; benthic sediment data; common ions, pH, conductivity, miscellaneous; imagery data; major nutrients; metals; organics; quantitative physical data
Montana State Library Natural Resouce Information System ; Montana State University (2006), Montana View at http://montanaview.org/	DEQ PPA Data Archive	chlorophyll; fecal coliforms; macroinvertebrates; other bacteriological data	photo points; riparian &/or instream surveys & physical features	benthic sediment data; bioaccumulation; common ions, pH, conductivity, miscellaneous; imagery data; major nutrients; metals; organics; quantitative physical data
U.S. Environmental Protection Agency (2006), Framework Water Quality Restoration Plan and Total Maximum Daily Loads for the Lake Helena	DEQ Metcalf Multimedia Case			benthic sediment data; metals

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Watershed Planning Area: Volume II-Final Report [Electronic Resource]				
(200n), Montana Interagency Stream Fishery Data for the Upper Missouri River Basin	DEQ PPA Data Archive	fish	Land use; photo points; riparian &/or instream surveys & physical features	quantitative physical data
Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2011), Water Quality Assessment Method, WQPBWQM-001	DEQ Metcalf Stacks			benthic sediment data; major nutrients; metals; quantitative physical data
Montana Department of Environmental Quality (2012), Montana Numeric Water Quality Standards: Circular DEQ-7, Circular DEQ-7	DEQ Metcalf Stacks			common ions, pH, conductivity, miscellaneous; major nutrients; metals; organics
Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2013), 2012 Field Season STORET Data Archive [Electronic Resource]	DEQ Metcalf Multimedia Case	algae; chlorophyll; e-coli; macroinvertebrates	riparian &/or instream surveys & physical features	benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data

Comments:

DATA MATRIX
Biological Data

Comments:

Clancy

Data Type	Comments	Ref Num	Citation
chlorophyll	2001 MT DEQ Statewide Monitoring : Chlorophyll a results: 23 mg/sq m	10237	Montana Department of Environmental Quality (2004), Statewide Monitoring 2001-2004 Data [Electronic Resource]
chlorophyll	2001 MT DEQ Statewide Monitoring : Chlorophyll a results: 5.4 mg/sq m	10237	Montana Department of Environmental Quality (2004), Statewide Monitoring 2001-2004 Data [Electronic Resource]
macroinvertebrates	Bioassessment score: 12 out of a maximum of 18 = 67%. Impairment Classification: Slight, Use-Support: Partial Support. "The low biotic index value (2.88) suggests that water quality was essentially unimpaired at this site, though mayfly taxa richness (4) was somewhat lower than expected. Fine sediment deposition appears to have been present at the site, although areas of clean substrates were indicated as well, suggesting that both slack or low flow areas as well as fast moving waters were sampled. ...the taxonomic composition of the sample suggests that water quality was good."	284	Bollman, Wease (2002), Aquatic Invertebrates and Habitat at a Fixed Station on Prickly Pear Creek, Jefferson County, Montana: June 19, 2001
macroinvertebrates	Bioassessment score: 6 out of a maximum of 18 = 33%, Impairment Classification: Moderately Impaired, Use Support: Partial-Support. The biotic index value (3.54) was within expected limits for an unimpaired valley or foothill stream, but mayfly taxa richness (3) was lower than expected. ..may be associated with sampling method; thus these results are diffecult to interpret. Fine sediment indicators in the data gave results suggesting that the site was not substantially impaired by deposition; 16 clinger taxa and 8 caddisfly taxa were collected. Instream habitats were probably diverse and abundant, since overall taxa richness (29) was high. Long-lived taxa were well-represented, indicating the presence of	10520	Bollman, Wease (2003), Aquatic Invertebrates and Habitat at a Fixed Station on Prickly Pear Creek, Jefferson County, Montana: June 27, 2002, M09PRPEC01 02-S100-M

Data Type	Comments	Ref Num	Citation
	year-round surface flow at the site. The contrib. of shredder taxa was particularly high. Water quality indicators amount he sampled fauna gave inconclusive results. Instream habitats likely were unimpaired. The impairment classification assigned to this site by the bioassessment method employed seems to be inappropriate. The score may underestimate the quality of the fauna; differences in sampling methodology may account for this. "		

below Spring Creek confluence

Data Type	Comments	Ref Num	Citation
algae	Shannon-Weaver diatom diversity is bad below the mouth of Spring Cr. . "Diatom diversity and water quality were best above Spring Creek and worst below Spring Creek."	2060	Wood, Charles (1981), Prickly Pear Creek: A Report on Man's Debilitating Impacts for Use by the Prickly Pear Task Force, WQB Report No. 81-2
fish	brook trout 250/acre	2059	Streamworks (1984), Prickly Pear Creek: A Stream Corridor Management Plan
fish	dead fish in 24 hrs	2059	Streamworks (1984), Prickly Pear Creek: A Stream Corridor Management Plan
fish	pop estimates : rainbow most common, then brown	226	Montana Department of Fish, Wildlife, and Parks (1989), Application for Reservations of Water in the Missouri River Basin Above Fort Peck Dam. Volume 1: Summary, Purpose, Need, Amount, Public Interest, Management Plan, and Appendices
fish	westslope cutthroat present; Rainbow, Brown abundant, Brook uncommon	11349	Montana Department of Fish, Wildlife, and Parks (1999), Montana Rivers Information System (MRIS)
macroinvertebrates	SW diversity = FAIR to EXCELLENT	2060	Wood, Charles (1981), Prickly Pear Creek: A Report on Man's Debilitating Impacts for Use by

Data Type	Comments	Ref Num	Citation
			the Prickly Pear Task Force, WQB Report No. 81-2
macroinvertebrates	poor SW diversity, lowest relative richness	2255	Baldigo, Barry P. ; Baker, John R. ; Kinney, Wesley L. ; Fillinger, Mike (1987), Seasonal Variability in Prickly Pear Creek Water Quality and Macroinvertebrate Communities: Project Summary

4 mi ds of Spring Crk confluence

Data Type	Comments	Ref Num	Citation
fish	dead fish in 96 hrs	2059	Streamworks (1984), Prickly Pear Creek: A Stream Corridor Management Plan

General Comments

Data Type	Comments	Ref Num	Citation
algae	Autotrophic index = 165. Peri SW = 2.74. e = 0.39, diversity low	86	Ingman, Gary L. (1978), A Study of the Biological Impact of the Helena Sewage Treatment Plant Discharge on Prickly Pear Creek
fish	1970s data	11538	Workman, Dennis L. (1974), Evaluation of Improvements on Prickly Pear Creek
fish	1981 electrofishing abundance data : sculpin not found until 7 miles below Spring Creek (intolerant of metals)	780	La Point, Thomas W. ; Melancon, Susan ; Baldigo, Barry P. ; Janik, Jeffry J. ; Morris, Marsha K. ; Kinney, Wesley L. (1982), Investigation of Methods for Site Specific Water Quality Assessment Prickly Pear Creek, Montana

DATA MATRIX

Habitat Data

Comments:

below Spring Creek confluence

Data Type	Comments	Ref Num	Citation
riparian &/or instream surveys & physical features	Survey of 31 miles of PPCr., from Lake Helena to the headwaters. Found >12,000 feet of stream bank alterations, 37,163 feet of rip rap, 5 rock jetties, 58 car bodies, 6,693 feet of river gravel moved by machinery , 2276 feet of other alterations (fencelines, dredge tailings, etc.), 22 irrigation take-offs, 9 irrigation returns, 1 illegal sewage discharge from a house, 22,712 feet of eroding banks, 6,745 feet of mass wasting, 319 feet of other potential mass wasting sites, 365 feet of debris jams, 48 channel obstructions or fish barriers. This reach of the stream especially lacked a stable riparian which resulted in bank erosion, and was channellized extensively. It is difficult for vegetation to become established in dredge tailings through this reach. Gondola Cr. and Spring Cr. contribute a great deal of fine sediment to the stream.	2060	Wood, Charles (1981), Prickly Pear Creek: A Report on Man's Debilitating Impacts for Use by the Prickly Pear Task Force, WQB Report No. 81-2
riparian &/or instream surveys & physical features	Surveyed after the 1981 flood : impaired (channelization by hiway, RR encroachment; lack of rip veg; raw placer tailings)	2196	Husby, Peter ; Moore, Gerald (1982), Riparian Vegetation Survey of Prickly Pear Creek
riparian &/or instream surveys & physical features	1983 Survey : imp:metals toxicity; channelization fr hiway, RR; mine dumps; rip rap; sed fr Clancy Crk; EB	2059	Streamworks (1984), Prickly Pear Creek: A Stream Corridor Management Plan
riparian &/or instream surveys & physical features	1986 E/I Classification Rational: imp:metals toxicity, channelization, mine dumps	11537	U.S. Environmental Protection Agency (1986), Letter to Drynan on 9/11/1986
riparian &/or instream surveys & physical features	General observations: sediment from erodible soils, placer, development; request 22 cfs min. instream Q (all year)	226	Montana Department of Fish, Wildlife, and Parks (1989), Application for Reservations of Water in the Missouri River Basin Above Fort Peck Dam. Volume 1: Summary, Purpose, Need, Amount,

Data Type	Comments	Ref Num	Citation
			Public Interest, Management Plan, and Appendices
riparian &/or instream surveys & physical features	5% beaver ponds	4655	(200n), Montana Interagency Stream Fishery Data for the Upper Missouri River Basin

General Comments

Data Type	Comments	Ref Num	Citation
photo points	Photos taken after 1981 flood	2196	Husby, Peter ; Moore, Gerald (1982), Riparian Vegetation Survey of Prickly Pear Creek
riparian &/or instream surveys & physical features	1995 observations	1152	Kendy, Eloise ; Olsen, Bill ; Malloy, John C. (1998), Field Screening of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Helena Valley, West-Central Montana, 1995, Water-Resources Investigations Report 97-4214

DATA MATRIX

Chemistry Data

Comments: Metals: All water chemistry samples analyzed for Cd, Pb and Zn (n = 6), and for As and Cu (n = 8) were collected using DEQ approved sampling protocols. Total recoverable fractions were analyzed. Water column data for metals were evaluated against numeric water quality standards (acute, chronic, and human health) according to the DEQ assessment method for metals. Arsenic: No aquatic life or human health standard exceedances. Cadmium: four chronic aquatic life standard exceedances and no human health standard exceedances. Copper: No aquatic life or human health standard exceedances. Lead: No aquatic life or human health standard exceedances. Zinc: one chronic aquatic life standard exceedance and no human health standard exceedances. Insufficient data to assess for aluminum, iron, lead and silver, but no aquatic life or human health standard exceedances for any of these metals in existing data.

Entire assessment unit, Spring Cr. to Lump Gulch

Data Type	Comments	Ref Num	Citation
common ions, pH, conductivity, miscellaneous	Two pH measurements in 2003 = 7.1 and 8.1. Six hardness measurements in 2003, range = 92.34 and 143.64 mg/L.	10255	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2006), STORET/Storease Data Archive [Electronic Resource]
common ions, pH, conductivity, miscellaneous	Two pH measurements = 7.86 and 8.07. Two hardness measurements = 76 and 86 mg/L.	14219	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2013), 2012 Field Season STORET Data Archive [Electronic Resource]
metals	Six samples were collected in 2003 and analyzed for Al, As, Cd, Cu, Pb and Zn. Four cadmium samples exceed the chronic aquatic life standard, and one zinc sample exceeds the chronic aquatic life standard	10255	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2006), STORET/Storease Data Archive [Electronic Resource]
metals	Refer to the TMDL document (http://deq.mt.gov/wqinfo/TMDL/finalReports.mcpx) for more information and status of this waterbody segment.	11938	U.S. Environmental Protection Agency (2006), Framework Water Quality Restoration Plan and Total Maximum Daily Loads for the Lake Helena Watershed Planning Area: Volume II-Final Report [Electronic Resource]

Data Type	Comments	Ref Num	Citation
metals	This document contains the assessment method with which metals data was analyzed for beneficial use determination.	13227	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2011), Water Quality Assessment Method, WQPBWQM-001
metals	This document contains the numeric aquatic life and human health standards used to evaluate data and determine metals impairment status.	13619	Montana Department of Environmental Quality (2012), Montana Numeric Water Quality Standards: Circular DEQ-7, Circular DEQ-7
metals	Two samples were collected and analyzed for arsenic and copper. No aquatic life or human health exceedances.	14219	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2013), 2012 Field Season STORET Data Archive [Electronic Resource]
quantitative physical data	Two flow measurements in 2003 = 0.34 and 3 cfs.	10255	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2006), STORET/Storease Data Archive [Electronic Resource]
quantitative physical data	Two flow measurements = 15.08 and 36.34 cfs.	14219	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (2013), 2012 Field Season STORET Data Archive [Electronic Resource]

Clancy

Data Type	Comments	Ref Num	Citation
common ions, pH, conductivity, miscellaneous	Horiba meter readings: pH : 6.6, Specific Conductivity: 140 mS/cm, Water Temp: 9 C, D.O.: 14.9 mg/l	10237	Montana Department of Environmental Quality (2004), Statewide Monitoring 2001-2004 Data [Electronic Resource]
common ions, pH,	Horiba meter readings: pH : 67.3, Specific Conductivity: 145	10237	Montana Department of Environmental Quality

Data Type	Comments	Ref Num	Citation
conductivity, miscellaneous	mS/cm, Water Temp: 13.1 C, D.O.: 10.7 mg/l		(2004), Statewide Monitoring 2001-2004 Data [Electronic Resource]
major nutrients	USGS nutrient data recorded since 01/01/2000 indicates Phosphorus concentrations in the water column may be elevated. Recorded Phosphorus values (mg/l) near Clancy from 3/21/00 to 10/23/01 : 0.04, 0.039, 0.015, 0.041, 0.021, 0.008, 0.006 mg/l. Four of these values exceed the nutrient standard for the Upper Clark Fork River for Phosphorus of 20 ug/l.	2772	U.S. Geological Survey (199n), USGS Water Data for the Nation - NWIS
metals	Human Health Standard exceedence for Lead (result: 18 ug/l) in sample dated 6/16/00, near Clancy. 2000-2002: Acute Aquatic Life Standard exceedences for Zinc in samples taken at Alhambra, near Clancy, near Jefferson City. Acute Aquatic Life Standard exceedences for Copper in samples taken near Clancy. Chronic Aquatic Life Standard exceedences for Cadmium, Zinc, Copper and Lead.	2772	U.S. Geological Survey (199n), USGS Water Data for the Nation - NWIS

below Spring Creek confluence

Data Type	Comments	Ref Num	Citation
major nutrients	Quarterly 1979 & Spring 1980 grabs : >0.05 ppm P	2060	Wood, Charles (1981), Prickly Pear Creek: A Report on Man's Debilitating Impacts for Use by the Prickly Pear Task Force, WQB Report No. 81-2
metals	Quarterly 1979 & Spring 1980 grabs : Pb, Cu, Zn aq. Life excd.; Fe, DW & aq. Life excd.; Mn DW std excd.	2060	Wood, Charles (1981), Prickly Pear Creek: A Report on Man's Debilitating Impacts for Use by the Prickly Pear Task Force, WQB Report No. 81-2
metals	7/82, 12/82, 4/83, 10/83 grabs : Cd, Pb DW & aq life excd; Zn, Cu, Ag aq life excd; As DW excd.	2255	Baldigo, Barry P. ; Baker, John R. ; Kinney, Wesley L. ; Fillinger, Mike (1987), Seasonal Variability in Prickly Pear Creek Water Quality

Data Type	Comments	Ref Num	Citation
			and Macroinvertebrate Communities: Project Summary
metals	grabs to 1996 : numerous Pb, As, Cd, Cu DW & aq. Life exceedences; Zn aq. Life std excd. (over whole segment)	2471	Montana State Library Natural Resouce Information System ; Montana State University (2006), Montana View at http://montanaview.org/
quantitative physical data	from wet perim, 22cfs requested min in stream Q	226	Montana Department of Fish, Wildlife, and Parks (1989), Application for Reservations of Water in the Missouri River Basin Above Fort Peck Dam. Volume 1: Summary, Purpose, Need, Amount, Public Interest, Management Plan, and Appendices

General Comments

Data Type	Comments	Ref Num	Citation
major nutrients	1995 grabs	1152	Kendy, Eloise ; Olsen, Bill ; Malloy, John C. (1998), Field Screening of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Helena Valley, West-Central Montana, 1995, Water-Resources Investigations Report 97-4214
metals	1995 grabs	1152	Kendy, Eloise ; Olsen, Bill ; Malloy, John C. (1998), Field Screening of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Helena Valley, West-Central Montana, 1995, Water-Resources Investigations Report 97-4214

Reporting Cycle: 2018 **Assessment Record:** MT41I006_050 .pdf **Status:** Unassigned

DQA SUMMARY

Aquatic Life & Fishes

Nutrients	NOT ASSESSED
Metals	PASS
Sediment	NOT ASSESSED
Temperature	NOT ASSESSED
Other	NOT ASSESSED

Drinking Water

Metals	PASS
Other	NOT ASSESSED

Recreation

Nutrients	NOT ASSESSED
E.coli	NOT ASSESSED
Other	NOT ASSESSED

Agriculture

Common	NOT ASSESSED
Other	NOT ASSESSED

ASSESSMENT HISTORY

Cycle 2006

Not assessed this cycle

Cycle 2008

Not assessed this cycle

Cycle 2010

Not assessed this cycle

Cycle 2012

Not assessed this cycle

Cycle 2014

Assessment was performed according to the DEQ metals assessment method to update the 2014 303(d) list. Arsenic and copper are removed as causes of impairment affecting the Aquatic Life/Fishes and Drinking Water beneficial uses due to non-impairment. Cadmium, lead and zinc remain listed for Aquatic Life/Fishes, and cadmium and lead remain listed for Drinking Water.

Arsenic, cadmium, copper, lead and zinc are removed from the Agriculture beneficial use; DEQ's assessment process reflects metals impairments via associations with Aquatic Life/Fishes and/or Drinking Water as the most sensitive uses.

Cycle 2016

Not assessed this cycle

Cycle 2018

Not assessed this cycle

Overall Condition of Segment

Metals: Assessment using DEQ's metals assessment method was performed. Sufficient data exists to demonstrate that this segment is no longer considered impaired by arsenic and copper and these pollutants are removed from both the Aquatic Life/Fishes and Drinking Water beneficial uses. Insufficient data exists to change listing status for lead so it remains as a cause of impairment affecting both Aquatic Life/Fishes and Drinking Water. Cadmium and zinc have limited datasets but exhibit aquatic life standard exceedances and so remain listed for Aquatic Life/Fishes. Insufficient cadmium data exists to change the cadmium listing status for Drinking Water so it remains listed.

Pre-2014 comments: Aquatic Life & Cold Water Fishery: CHEMISTRY - severe impairment: 2000-2002 USGS data: Acute Aquatic Life Standard exceedences of > 25% of the std. value for Zinc in samples taken at Alhambra, near Clancy and near Jefferson City. Chronic Aquatic Life Standard exceedences of > 50% of the std. value for Cadmium, Zinc and Lead. HABITAT - severe impairment due to extensive bank erosion, siltation, channelization & channel alteration due to placer mining. BIOLOGY - 2002 macroinvertebrate report: Impairment Classification: Slight, Use-Support: Partial Support. "The low biotic index value (2.88) suggests that water quality was essentially unimpaired at this site." Agriculture: high toxicant (metals) concentrations discourage use for livestock water. Industrial: no high salinity or sustained high turbidity levels documented. Drinking Water: USGS water chemistry data includes Human Health exceedence for Pb in June, 2000. 1982-1983 grab samples exceeded the HH Std. for As. Primary Contact (recreation): no nuisance algal blooms, high fecal counts or dewatering doumented for this stream segment.

USE SUPPORT DECISION

Use Class B-1

Trophic Status: **Trophic Trend:**

Uses	DQA	Method, Data, and Information Used	Assessment Type and Confidence	Use Support	Partial Flag	Use Support Certainty	Threatened
Aquatic Life	Pass	220	BIOLOGICAL-GOOD, HABITAT-FAIR, PHYSICAL/CHEMICAL-GOOD	Not Fully Supporting	No	High	No
Agricultural				Not Assessed	No		No
Drinking Water	Pass	220	PHYSICAL/CHEMICAL-GOOD	Not Fully Supporting	No	High	No
Primary Contact Recreation				Not Assessed	No		No

Method Number and Description
220-Non-fixed station physical/chemical monitoring (conventional pollutant only)

Montana DEQ - Water Quality Standards Attainment Record

Reporting Cycle: 2018 **Assessment Record:** MT41I006_050 .pdf **Status:** Unassigned

IMPAIRMENT INFORMATION

Uses	Cause (Confidence): Source(Confirmed)	Observed Effects
Aquatic Life	84 (): 56 (N), 125 (N) 127 (High): 2 (N), 56 (N), 82 (N), 105 (N) 267 (Low): 2 (N), 56 (N), 82 (N), 105 (N) 344 (): 105 (N), 125 (N) 371 (): 82 (N), 105 (N), 125 (N) 423 (Medium): 2 (N), 56 (N), 82 (N), 105 (N)	
Agricultural		
Drinking Water	127 (Low): 2 (N), 56 (N), 82 (N), 105 (N) 267 (Low): 2 (N), 56 (N), 82 (N), 105 (N)	
Primary Contact Recreation		

Cause Number and Description	Source Number and Description	Observed Effect Number and Description
84-Alteration in stream-side or littoral vegetative covers 127-Cadmium 267-Lead 344-Physical substrate habitat alterations 371-Sedimentation/Siltation 423-Zinc	2-Acid Mine Drainage 56-Impacts from Abandoned Mine Lands (Inactive) 82-Mine Tailings 105-Placer Mining 125-Streambank Modifications/destabilization	

DELISTING / STATUS CHANGES

Cause	Reason for Change	Date of Change
Arsenic	Applicable WQS attained, according to new assessment method	12/09/2013

Cause	Reason for Change	Date of Change
Cadmium	TMDL Approved or established by EPA (4A)	09/27/2006
Copper	Applicable WQS attained, according to new assessment method	12/09/2013
Lead	TMDL Approved or established by EPA (4A)	09/27/2006
Sedimentation/Siltation	TMDL Approved or established by EPA (4A)	09/27/2006
Zinc	TMDL Approved or established by EPA (4A)	09/27/2006

CATEGORY INFORMATION

Previous Cycle

Cycle 2016

Category 4A - All TMDLs needed to rectify all identified threats or impairments have been completed and approved.

User Defined Category N/A

Current Cycle

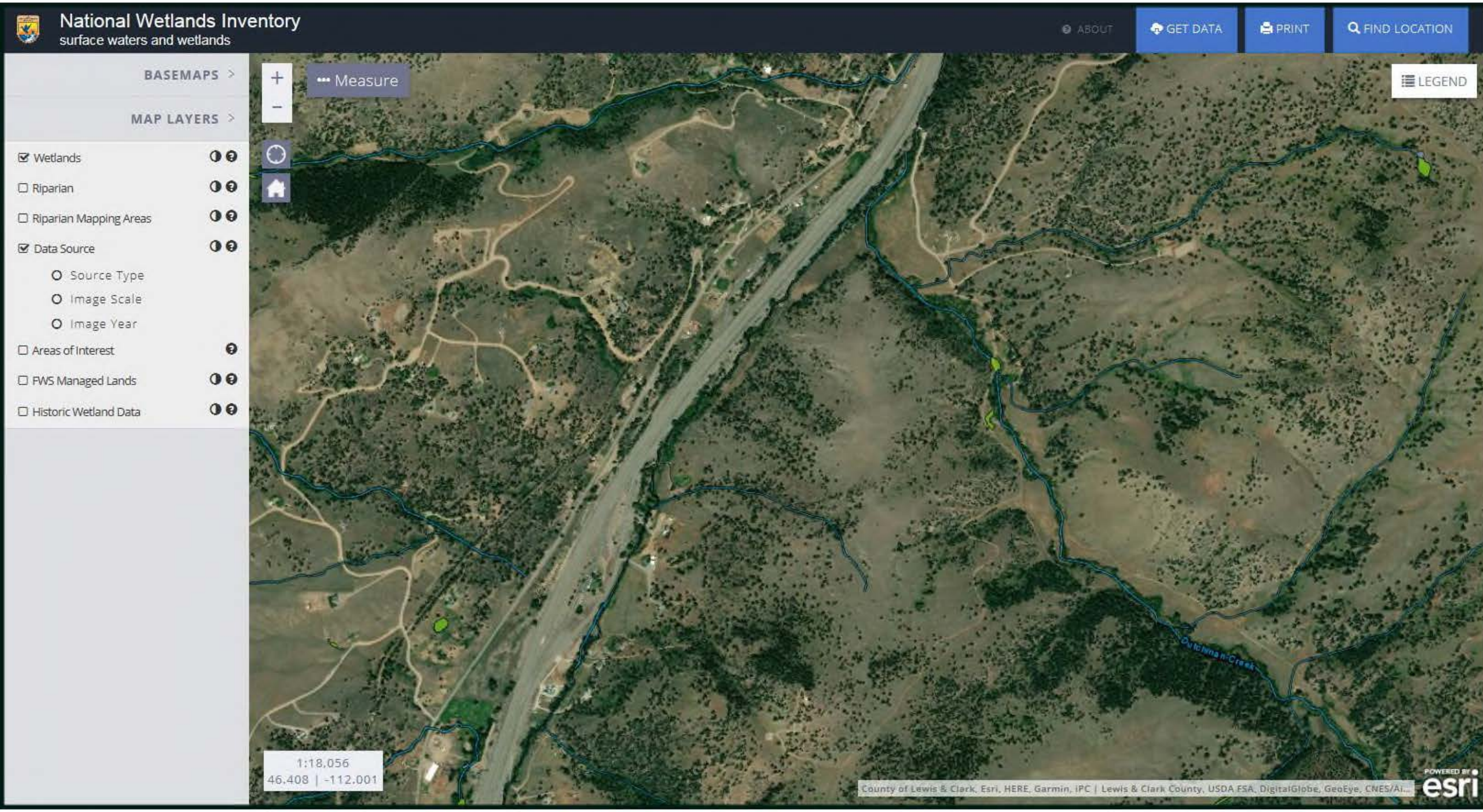
Cycle 2018

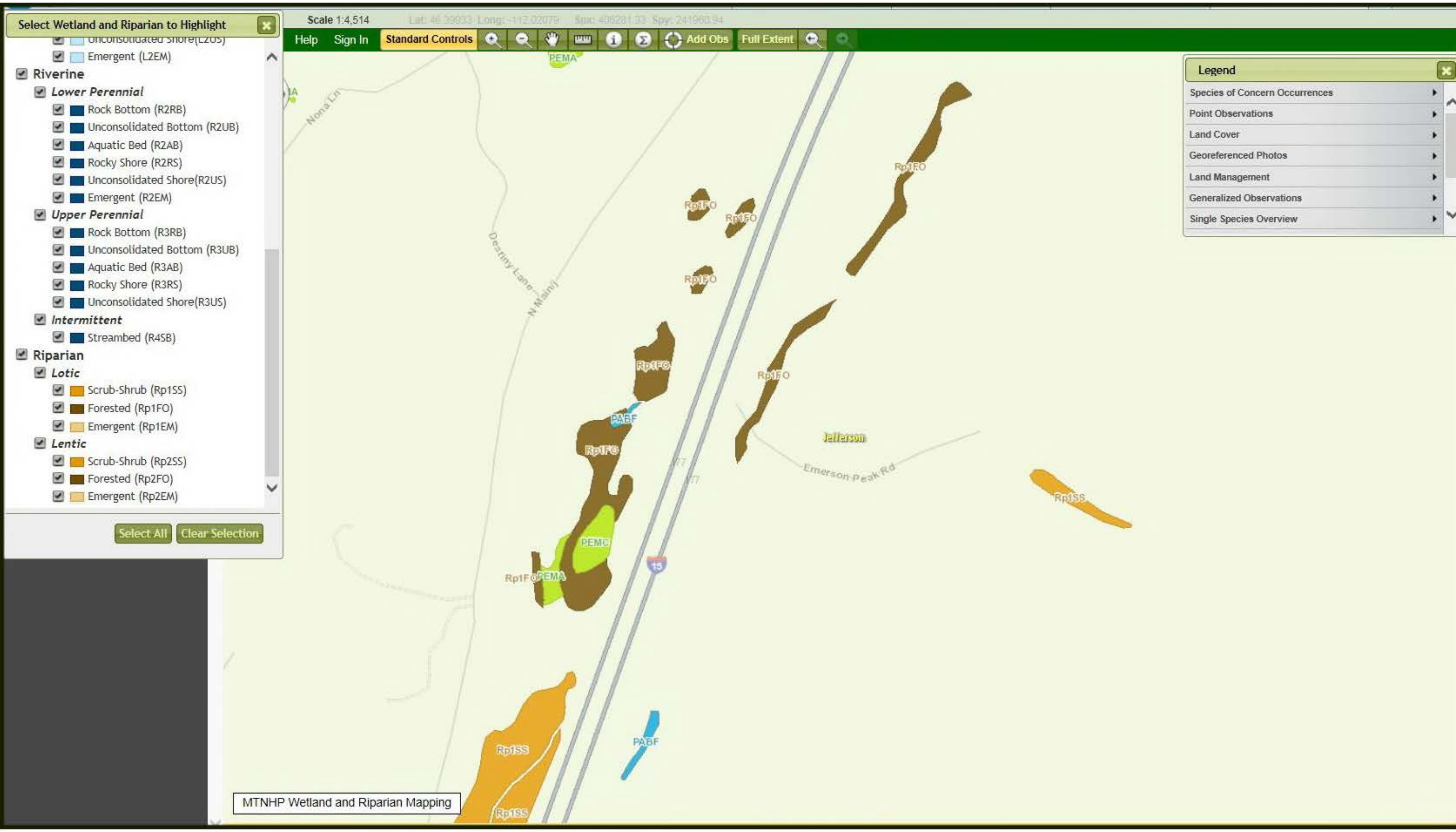
Category 4A - All TMDLs needed to rectify all identified threats or impairments have been completed and approved.

User Defined Category N/A

Appendix J: Wetlands and Waterways

Jefferson City
Safety Rest Area Study


National Wetlands Inventory
surface waters and wetlands
ABOUT
GET DATA
PRINT
FIND LOCATION
BASEMAPS
MAP LAYERS
Wetlands
Riparian
Riparian Mapping Areas
Data Source
Source Type
Image Scale
Image Year
Areas of Interest
FWS Managed Lands
Historic Wetland Data
Measure
LEGEND
1:18,056
46.408 | -112.001
County of Lewis & Clark, Esri, HERE, Garmin, iPC | Lewis & Clark County, USDA FSA, DigitalGlobe, GeoEye, CNES/Ai...
esri



Select Wetland and Riparian to Highlight
Emergent (L2EM)
Riverine
Lower Perennial
Rock Bottom (R2RB)
Unconsolidated Bottom (R2UB)
Aquatic Bed (R2AB)
Rocky Shore (R2RS)
Unconsolidated Shore(R2US)
Emergent (R2EM)
Upper Perennial
Rock Bottom (R3RB)
Unconsolidated Bottom (R3UB)
Aquatic Bed (R3AB)
Rocky Shore (R3RS)
Unconsolidated Shore(R3US)
Intermittent
Streambed (R4SB)
Riparian
Lotic
Scrub-Shrub (Rp1SS)
Forested (Rp1FO)
Emergent (Rp1EM)
Lentic
Scrub-Shrub (Rp2SS)
Forested (Rp2FO)
Emergent (Rp2EM)
Select All
Clear Selection
Scale 1:4,514
Help
Sign In
Standard Controls
Add Obs
Full Extent
Legend
Species of Concern Occurrences
Point Observations
Land Cover
Georeferenced Photos
Land Management
Generalized Observations
Single Species Overview
Rp1FO
PEMA
PABF
PEMC
Rp1SS
Jefferson
Emerson Peak Rd
Destiny Lane
N Main
Nona Ln
15
MTNHP Wetland and Riparian Mapping

Appendix K: Hazardous Materials

Jefferson City
Safety Rest Area Study

Gas Pipelines and MDEQ Mapping Data

Legend

Gas Transmission Pipelines

500 m
1000 ft

Pipelines depicted on this map represent gas transmission and hazardous liquid lines only. Gas gathering and gas distribution systems are not represented.

This map should never be used as a substitute for contacting a one-call center prior to excavation activities. Please call 811 before any digging occurs.

Questions regarding this map or its contents can be directed to npms@dot.gov.

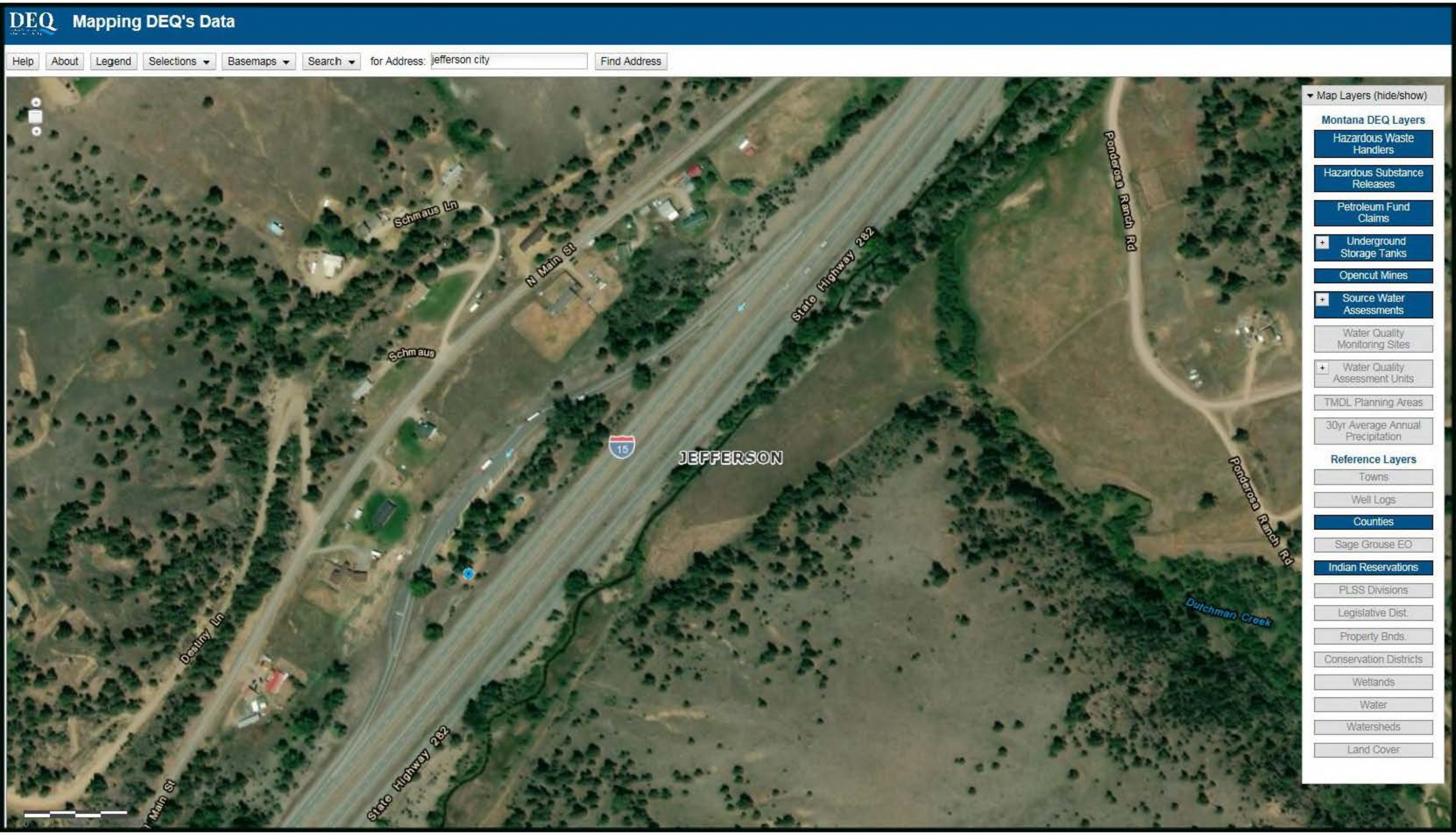
Projection: Geographic

Datum: NAD83

Map produced by the Public Viewer application at www.npms.phmsa.dot.gov

Date Printed: Mar 29, 2019

811 Know what's below. Call before you dig.



DEQ
Mapping DEQ's Data
Help
About
Legend
Selections
Basemaps
Search
for Address:
jefferson city
Find Address
Map Layers (hide/show)
Montana DEQ Layers
Hazardous Waste Handlers
Hazardous Substance Releases
Petroleum Fund Claims
Underground Storage Tanks
Opencut Mines
Source Water Assessments
Water Quality Monitoring Sites
Water Quality Assessment Units
TMDL Planning Areas
30yr Average Annual Precipitation
Reference Layers
Towns
Well Logs
Counties
Sage Grouse EO
Indian Reservations
PLSS Divisions
Legislative Dist.
Property Bnds.
Conservation Districts
Wetlands
Water
Watersheds
Land Cover
Schmaus Ln
N Main St
Schmaus
State Highway 282
15
JEFFERSON
Ponderosa Ranch Rd
Dutchman Creek
Destiny Ln

Asbestos and Lead-based Paint Inspection

NORTHERN INDUSTRIAL HYGIENE, INC.

201 S. 30th Street
Billings, Montana 59101
Phone: 406/245-7766
FAX: 406/254-1428

May 24, 2019

Mr. Christopher J. DeVerniero P.E.
Senior Transportation Planner
DOWL
1300 Cedar Street
Helena, MT 59601

RE: Letter Report
Asbestos and Lead-based Paint Inspections
I-15 North and South Bound Rest Stops
Near Jefferson City, Montana
Northern Project Number 399-826

Dear Mr. DeVerniero:

This letter report provides the summarized results of the asbestos and lead-based paint inspections performed by Todd Schneider (MTA-5179) of Northern Industrial Hygiene, Inc. (Northern) on May 10 and 14, 2019 at the above referenced sites. These inspections were performed to identify potential hazardous materials that may be present in the buildings prior to demolition or remodel. These inspections included the interior, the exterior, and the roofs.

Overview of Buildings

The buildings inspected are public roadway rest stops along I-15 near Jefferson City, Montana. Although separate inspections were conducted at each site, the buildings are mirror images. Each rest stop consists of a main building which houses a men's restroom, a women's restroom and a maintenance closet. Each site also contains a storage shed and two pavilions with picnic benches. The rest stops were constructed in the early 1970's.

Typical interior building materials of the main buildings include a ceramic tile or concrete floor, ceramic tile and/or wood finished walls and a wood ceiling. Some walls contained batted fiberglass insulation.

Exterior building finish materials consist of a concrete foundation and walking path, wood walls and a metal roof.

The storage sheds interior consists of a concrete floor, wood walls and a wood ceiling. Their exteriors consist of a concrete foundation, wood walls and an asphalt shingle roof.

The pavilions consist of a concrete foundation and walking paths, wood support beams and a metal roof.

Typical interior painted building components consist of walls, ceilings, doors and door casings.

Typical exterior painted building components consist of walls, vent covers, soffit, fascia, pavilion supports, picnic tables, sight history information sign and parking blocks.

The main buildings have uninsulated domestic water lines and uninsulated heating vents.

The storage sheds and pavilions had no water lines or heating units.

Asbestos Overview

Asbestos is a trade name for a group of fibrous naturally occurring minerals that were used widely in building materials because of its ability to bind, resist chemicals, insulate, and fireproof. Exposure to elevated levels of asbestos fibers has been documented to cause a variety of diseases including asbestosis and cancer. Consequently, the application, removal, and disposal of asbestos-containing materials is regulated by several agencies.

Asbestos in most building materials poses little threat to human health as long as the asbestos fibers are securely bound within the building material. However, as the materials deteriorate because of time or exposure, or are disturbed because of human or other activities, the potential increases for the fibers to become airborne. When this occurs, the risk to human health increases significantly when the fibers are inhaled.

The NESHAP defines ACM as a material containing greater than (>) 1% asbestos and assigns ACM to three categories: regulated asbestos-containing material (RACM), Category I, and Category II. RACM is defined as an ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure (friable). RACM also includes: Category I and Category II materials that will be (or have been) subjected to sanding, grinding, cutting or abrading, or; Category II materials that have a high probability of becoming (or have become) crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition/renovation operations. Category I ACMs are non-friable packings, gaskets, resilient floor covering, and asphalt roofing products. Category II ACMs are non-friable materials, excluding Category I non-friable ACMs, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

The NESHAP requires that the building owner or operator provide notification at least 10 working days prior to commencing renovation activities that will disturb more than 160 square feet (SF) or 260 linear feet (LF) of RACM, or prior to any demolition activities.

The NESHAP also requires that RACM be removed prior to renovation/demolition activities that will disturb the material.

The MDEQ adopted the NESHAP by reference and requires the building owner/operator to apply for an Asbestos Abatement Permit at least 5 working days prior to commencing asbestos abatement project involving > 10 SF but less than (<) 160 SF in surface area or >3 LF but < 260 LF of RACM. The permit application must be submitted at least ten working days prior to commencing an asbestos abatement project involving >160 SF or 260 LF of RACM or prior to any demolition. Notification of the MDEQ satisfies the NESHAP notification requirement.

The MDEQ requires that personnel conducting permitted asbestos abatement projects be accredited by the State of Montana. The MDEQ also requires an asbestos abatement design be prepared by a State of Montana accredited asbestos project designer for projects requiring an Asbestos Abatement Project Permit.

The Occupational Safety and Health Administration (OSHA) requires that employees that will be exposed to any amount of asbestos be trained in accordance with the provisions of 29 CFR 1926.1101. The OSHA standard also requires that employee exposure to asbestos fibers not exceed either the permissible exposure limit (PEL) of 0.1 fibers per cubic centimeter (f/cc) of air for an eight (8) hour time-weighted average (TWA) or the excursion limit (EL) of 1.0 f/cc for any thirty (30) minute work period.

Lead-Based Paint Overview

Lead is found in the paint on the inside and outside of many buildings. Most buildings constructed prior to World War II had lead-based paint applied to the interior or exterior surfaces. Some paints introduced up until 1977 contained some level of lead. Regulations enforced by the Consumer Product Safety Commission banned the use of all but small amounts of lead in paints in 1978. However, manufacturers are still allowed to produce paints containing up to 600 parts per million lead.

If the paint which contains lead is in poor or damaged condition, persons working or living in the area can be exposed to small paint chips or lead-containing dust. Exposure can also result from construction, demolition, repair and refinish (sanding) operations or from the torch cutting or burning of painted materials.

Exposure to the lead can also occur as a result of hobbies or sports. Individuals who work with lead while making stained glass or while melting lead to make sinkers or bullets, or individuals that reload ammunition are all exposed to varying levels of lead.

Inspection Procedures

Asbestos Sampling Procedures

The asbestos survey was performed using the applicable portions of the currently recognized standard protocol developed for schools under AHERA, as promulgated in Title 40, Code of Federal Regulations (40 CFR), Part 763 and as amended in the Federal Register and as established in the Administrative Rules of Montana (ARM 17.74.354). Since the primary concern for this investigation was to identify potential asbestos hazards in each of the individual structures, Northern representatives visually inspected existing conditions considering each construction, addition, or renovation date as separate, unique buildings, if applicable.

Laboratory Analysis of Bulk Asbestos Samples

Bulk samples obtained during the inspection were assigned bulk sample numbers and entered on sample summary/chain-of-custody forms. The samples were transported to the laboratory by overnight courier under standard chain-of-custody procedures. The analysis was performed in accordance with EPA Method 600/R-93/116, which employs polarized light microscopic techniques with dispersion staining for identification of mineral forms of asbestos. The quantification of asbestos in the sample is intended to be an estimate only and the limit of detection for this method is approximately 1% by volume.

Lead-Based Paint Sampling Procedures

Lead-Based Paint Inspection Procedures

The painted surfaces in this inspection were analyzed for the presence of lead using a portable X-ray fluorescence instrument (XRF) manufactured for paint analysis. Portable XRF instruments expose the painted surface(s) to X-rays that cause lead to fluoresce with a characteristic frequency. The intensity of this fluorescence is measured by the instrument's detector and is then converted into a number that represents the amount of lead in the paint per unit area (milligrams per square centimeter). The XRF instrument has the capability to analyze the lead content of multiple layers of paint at one time.

The XRF is the preferred method for measuring the lead level in paint. Laboratory analysis of paint-chip samples is recommended for components that cannot be tested using XRF instruments or to confirm inconclusive XRF results. Northern uses the XRF instrument manufactured by NITON Corporation. The instrument is calibrated prior to, following and periodically during each day of field-testing. All field data is stored electronically by the instrument for direct transfer to computer.

The person performing this XRF inspection has received specific training in the use and interpretation of data collected by this instrument, and is familiar with the radiation safety requirements and proper use of the device.

For labeling and definition purposes in this report, the term lead-based paint means paint or other surface coatings that contain lead at a concentration equal to or greater than 1.0 mg/cm^2 as measured using an XRF. This definition is utilized by the Department of Housing and Urban Development (HUD) and does not specifically apply to exposure concerns under the Occupational Safety and Health Administration (OSHA).

Because OSHA does not recognize a threshold of lead content in paint for personnel exposure concerns, the definition of lead-based paint in this report should be used only to discriminate paint with relatively high lead content from paint with relatively low lead content.

Inspection Findings

Asbestos

A total of ten building materials suspected to contain asbestos were identified at each of the rest areas.

All ten materials were sampled from each rest area following sample collection requirements outlined under the EPA, AHERA legislation and State of Montana regulations. Laboratory results revealed that **none** of the sampled materials contain asbestos.

For additional information refer to Tables 1A and 1B and the attached laboratory reports.

Lead-Based Paint

This inspection focused on identifying general painted building components on the interior and exterior of the buildings and performing testing of these components in various locations throughout the facilities.

Eleven painted interior and exterior building components were identified at each of the rest stop areas. Lead paint was detected on one of the identified painted building components tested at each rest stop area. This component is:

L-11 Blue Parking Blocks

Reference Tables 2A, 2B, 3A and 3B for a description of identified painted building components and XRF test results.

Conclusions and Recommendations

Asbestos

Asbestos was not found in any of the suspect materials sampled and analyzed therefore Northern offers no recommendations.

The owner or operator is recommended to keep a copy of this asbestos inspection report on site during any renovation or demolition projects. The report must be made available to the MDEQ upon request.

If the building is scheduled for demolition, the Owner or Operator of the building must prepare and submit a Montana Demolition Notification (form MTACP02-R6) at least 10 days prior to the commencement of the demolition. The form can be obtained from the Asbestos Control Programs web site.

http://deq.mt.gov/Portals/112/Public/Asbestos/Documents/Forms/MTACP02R7.pdf

Lead-Based Paint

Exposure to lead dust or fumes can result from construction, demolition, repair and refinish (sanding) operations or from the torch cutting or burning of painted materials. The one lead-based paint painted component identified at each rest stop area is in poor condition. Northern recommends that the components or the paint be removed by an abatement company whose workers have received proper lead awareness training.

Limitations

This asbestos and lead-based paint inspection survey report was prepared based on information obtained during our on-site observations and interpretation of the XRF data as well as the laboratory results of bulk samples of building materials collected during the survey. The conclusions of this report are professional opinions based solely upon review of previously collected data, our visual site observations and interpretations of laboratory analyses and field data as described in our report.

This report has been prepared to provide information concerning the various types and estimated quantities of asbestos-containing materials and lead-based paint painted building components present at this site. It includes only those materials that were visible and accessible at the time of our inspection. We did not remove any permanent building enclosures or disassemble any equipment.

This inspection and report is intended to identify asbestos-containing materials and lead-based paint building components. It is not intended to be used for the purpose of obtaining bids for its removal by abatement contractors. The scope of services performed by Northern may not be appropriate to satisfy the needs of other users, and any use or re-use of this document, or the findings presented herein, is at the sole risk of the user.

Our opinions are intended exclusively for use by DOWL or the State of Montana. The opinions presented herein apply to the site conditions existing at the time of our investigation. Therefore, our opinions and recommendations may not apply to future conditions that may exist at the site that we have not had the opportunity to evaluate.

We trust this summary report provides sufficient information for planning purposes. We appreciate the opportunity to assist you and look forward to continuing to work with you.

If you have any questions or require additional information, please contact us.

It was a pleasure to assist you with this project. Please call if you have any questions on our report, or if you need any additional assistance.

Respectfully submitted,

NORTHERN INDUSTRIAL HYGIENE, INC.

Todd Schneider
Environmental Scientist

Attachments: Tables 1A-3B
Laboratory Analysis Report
Hazardous Material Location Drawing
Inspector Credentials
Invoice

TABLE 1A
SUMMARY OF MATERIALS SUSPECTED TO CONTAIN ASBESTOS AND LABORATORY RESULTS
Jefferson City Rest Area
North Bound
Jefferson City, Montana

Material Number	Material Description	Material Locations	Laboratory Results
F7.1	Ceramic Floor Tile with Grey Grout and Yellow Adhesive	Men's and Women's Restroom	All Layers ND
M1.1	Asphalt Shingles	Roof of Storage Shed	ND
M1.2	Tar Paper	Roof of Storage Shed	ND
M8.1	Caulking - Brown	Exterior	ND
M8.2	Caulking - White	Men's and Women's Restroom	ND
M13.1	Ceramic Wall Tile with Grey Grout and Yellow Adhesive	Men's and Women's Restroom	All Layers ND
M14.1	Concrete	Building Foundations	ND
M19.1	Fiberglass Insulation	Maintenance Closet	ND
M20.1	Foam Under Metal Roofs	Restroom and Pavilion Roofs	ND
M20.2	Tar Sealant	Sign at Parking Lot	ND

NS = Material Not Sampled

ND = No Asbestos Detected

Confirmed Asbestos-Containing Materials Shown in Bold Type

TABLE 2A
IDENTIFIED PAINTED BUILDING COMPONENTS and XRF SCREENING RESULTS
Jefferson City Rest Area
North Bound
Jefferson City, Montana

Material Number	Building Component	Substrate	Color (at time of survey)	Material Condition	Screening Result*
L1	Wall Exterior	Wood	Brown	Intact	Negative
L2	Vent Casing	Wood	Brown	Intact	Negative
L3	Soffit	Wood	Brown	Intact	Negative
L4	Fascia	Wood	Brown	Intact	Negative
L5	Door Casing	Metal	Brown	Intact	Negative
L6	Door	Metal	White/Green	Intact	Negative
L7	Pavilion Support	Wood	Black	Intact	Negative
L8	Picnic Table	Wood	Green	Intact	Negative
L9	Interior Wall	Wood	Gray	Intact	Negative
L10	Sign	Wood	White	Intact	Negative
L11	**Parking Blocks**	**Concrete**	Yellow/**Blue**	Cracked	Negative/**Positive**

* Pos = Lead-based paint - equal to or greater than 1.0 mg/cm2 measured using XRF screening.

* Neg = Nonlead-based paint - less than 1.0 mg/cm2 measured using XRF screening.

** Reference Table 3A and drawing for locations of confirmed materials.

TABLE 3A
Results of XRF Instrument Paint Testing
Jefferson City Rest Area
North Bound
Jefferson City, Montana

Site	Insp.	Room	Read. No	Mat. No.	Component	Substrate	Color	Cond.	PbC	Result
Jeff City North Rest Stop	TS	N/A	1	calibrate	N/A	N/A	RED	N/A	Negative	0.9
Jeff City North Rest Stop	TS	N/A	2	calibrate	N/A	N/A	RED	N/A	Negative	0.9
Jeff City North Rest Stop	TS	N/A	3	calibrate	N/A	N/A	RED	N/A	Negative	0.9
Jeff City North Rest Stop	TS	N/A	4	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	5	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	6	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	7	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	8	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	9	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	10	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	11	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	12	I3	soffit	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	13	I3	soffit	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	14	I3	soffit	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	15	I4	fascia	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	16	I4	fascia	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	17	I4	fascia	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Maintenance Closet	18	I5	door casing	METAL	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Men's Restroom	19	I5	door casing	METAL	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Women's Restroom	20	I5	door casing	METAL	BROWN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Men's Restroom	21	I6	door	METAL	WHITE	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Maintenance Closet	22	I6	door	METAL	WHITE	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Storage Shed	23	I6	door	METAL	GREEN	INTACT	Negative	< LOD

TABLE 3A
Results of XRF Instrument Paint Testing
Jefferson City Rest Area
North Bound
Jefferson City, Montana

Site	Insp.	Room	Read. No	Mat. No.	Component	Substrate	Color	Cond.	PbC	Result
Jeff City North Rest Stop	TS	N/A	24	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	25	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	26	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	27	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	28	I8	picnic table	WOOD	GREEN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	29	I8	picnic table	WOOD	GREEN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	30	I8	picnic table	WOOD	GREEN	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Women's Restroom	31	I6	door	METAL	WHITE	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Women's Restroom	32	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Women's Restroom	33	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Men's Restroom	34	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	Men's Restroom	35	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	36	I10	sign	WOOD	WHITE	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	37	I10	sign	WOOD	WHITE	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	38	I10	sign	WOOD	WHITE	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	39	I11	parking blocks	CONCRETE	YELLOW	INTACT	Negative	< LOD
Jeff City North Rest Stop	TS	N/A	40	I11	parking blocks	CONCRETE	YELLOW	INTACT	Negative	< LOD
Jeff City North Rest Stop	**TS**	**N/A**	**41**	**I11**	**parking blocks**	**CONCRETE**	**BLUE**	**CRACKED**	**Positive**	**12**
Jeff City North Rest Stop	**TS**	**N/A**	**42**	**I11**	**parking blocks**	**CONCRETE**	**BLUE**	**CRACKED**	**Positive**	**10.5**
Jeff City North Rest Stop	**TS**	**N/A**	**43**	**I11**	**parking blocks**	**CONCRETE**	**BLUE**	**CRACKED**	**Positive**	**13.5**
Jeff City North Rest Stop	TS	N/A	44	calibrate	N/A	N/A	RED	N/A	Negative	0.9
Jeff City North Rest Stop	TS	N/A	45	calibrate	N/A	N/A	RED	N/A	Negative	0.9
Jeff City North Rest Stop	TS	N/A	46	calibrate	N/A	N/A	RED	N/A	Negative	0.9

TABLE 1B
SUMMARY OF MATERIALS SUSPECTED TO CONTAIN ASBESTOS AND LABORATORY RESULTS
Jefferson City Rest Area
South Bound
Jefferson City, Montana

Material Number	Material Description	Material Locations	Laboratory Results
F7.1	Ceramic Floor Tile with Grout	Men's and Women's Restroom	All Layers ND
M1.1	Asphalt Shingles	Roof of Storage Shed	ND
M1.2	Tar Paper	Roof of Storage Shed	ND
M8.1	Caulking - Brown	Exterior	ND
M8.2	Caulking - White	Men's and Women's Restroom	ND
M13.1	Ceramic Wall Tile with Grey Grout and Yellow Adhesive	Men's and Women's Restroom	All Layers ND
M14.1	Concrete	Building Foundations	ND
M19.1	Fiberglass Insulation	Maintenance Closet	ND
M20.1	Foam Under Metal Roofs	Restroom and Pavilion Roofs	ND
M20.2	Tar Sealant	Sign at Parking Lot	ND

NS = Material Not Sampled

ND = No Asbestos Detected

Confirmed Asbestos-Containing Materials Shown in Bold Type

TABLE 2B
IDENTIFIED PAINTED BUILDING COMPONENTS and XRF SCREENING RESULTS
Jefferson City Rest Area
South Bound
Jefferson City, Montana

Material Number	Building Component	Substrate	Color (at time of survey)	Material Condition	Screening Result*
L1	Wall Exterior	Wood	Brown	Intact	Negative
L2	Vent Casing	Wood	Brown	Intact	Negative
L3	Soffit	Wood	Brown	Intact	Negative
L4	Fascia	Wood	Brown	Intact	Negative
L5	Door Casing	Metal	Brown	Intact	Negative
L6	Door	Metal	White/Green	Intact	Negative
L7	Pavilion Support	Wood	Black	Intact	Negative
L8	Picnic Table	Wood	Green	Intact	Negative
L9	Interior Wall	Wood	Gray	Intact	Negative
L10	Sign	Wood	White	Intact	Negative
L11	**Parking Blocks**	**Concrete**	Yellow/**Blue**	Cracked	Negative/**Positive**

* Pos = Lead-based paint - equal to or greater than 1.0 mg/cm2 measured using XRF screening.

* Neg = Nonlead-based paint - less than 1.0 mg/cm2 measured using XRF screening.

** Reference Table 3B and drawing for locations of confirmed materials.

TABLE 3B
Results of XRF Instrument Paint Testing
Jefferson City Rest Area
South Bound
Jefferson City, Montana

Site	Insp.	Room	Read. No	Mat. No.	Component	Substrate	Color	Cond.	PbC	Result
Jeff City South Rest Stop	TS	N/A	1	calibrate	N/A	N/A	RED	N/A	Negative	0.9
Jeff City South Rest Stop	TS	N/A	2	calibrate	N/A	N/A	RED	N/A	Negative	1
Jeff City South Rest Stop	TS	N/A	3	calibrate	N/A	N/A	RED	N/A	Negative	0.9
Jeff City South Rest Stop	TS	N/A	4	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	5	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	6	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	7	I1	exterior wall	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	8	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	9	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	10	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	11	I2	vent casing	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	12	I3	soffit	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	13	I3	soffit	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	14	I3	soffit	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	15	I4	fascia	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	16	I4	fascia	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	17	I4	fascia	WOOD	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Maintenance Closet	18	I5	door casing	METAL	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Men's Restroom	19	I5	door casing	METAL	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Women's Restroom	20	I5	door casing	METAL	BROWN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Men's Restroom	21	I6	door	METAL	WHITE	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Maintenance Closet	22	I6	door	METAL	WHITE	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Storage Shed	23	I6	door	METAL	GREEN	INTACT	Negative	< LOD

TABLE 3B
Results of XRF Instrument Paint Testing
Jefferson City Rest Area
South Bound
Jefferson City, Montana

Site	Insp.	Room	Read. No	Mat. No.	Component	Substrate	Color	Cond.	PbC	Result
Jeff City South Rest Stop	TS	N/A	24	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	25	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	26	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	27	I7	pavilion support	WOOD	BLACK	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	28	I8	picnic table	WOOD	GREEN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	29	I8	picnic table	WOOD	GREEN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	30	I8	picnic table	WOOD	GREEN	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Women's Restroom	31	I6	door	METAL	WHITE	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Women's Restroom	32	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Women's Restroom	33	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Men's Restroom	34	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	Men's Restroom	35	I9	interior wall	WOOD	GRAY	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	36	I10	sign	WOOD	WHITE	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	37	I10	sign	WOOD	WHITE	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	38	I10	sign	WOOD	WHITE	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	39	I11	parking blocks	CONCRETE	YELLOW	INTACT	Negative	< LOD
Jeff City South Rest Stop	TS	N/A	40	I11	parking blocks	CONCRETE	YELLOW	INTACT	Negative	< LOD
Jeff City South Rest Stop	**TS**	**N/A**	**41**	**I11**	**parking blocks**	**CONCRETE**	**BLUE**	**CRACKED**	**Positive**	**13.3**
Jeff City South Rest Stop	**TS**	**N/A**	**42**	**I11**	**parking blocks**	**CONCRETE**	**BLUE**	**CRACKED**	**Positive**	**10**
Jeff City South Rest Stop	**TS**	**N/A**	**43**	**I11**	**parking blocks**	**CONCRETE**	**BLUE**	**CRACKED**	**Positive**	**12.5**
Jeff City South Rest Stop	TS	N/A	44	calibrate	N/A	N/A	RED	N/A	Negative	1
Jeff City South Rest Stop	TS	N/A	45	calibrate	N/A	N/A	RED	N/A	Negative	1
Jeff City South Rest Stop	TS	N/A	46	calibrate	N/A	N/A	RED	N/A	Negative	0.9

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order: 041912837
Customer ID: NIHI62
Customer PO:
Project ID:

Attention: Todd Schneider
Northern Industrial Hygiene, Inc.
201 South 30th Street
Billings, MT 59101

Phone: (406) 245-7766
Fax: (406) 254-1428
Received Date: 05/13/2019 8:55 AM
Analysis Date: 05/14/2019 - 05/20/2019
Collected Date: 05/10/2019

Project: Jeff City Rest Stop / 399-826

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
F7.1A-Floor Tile 041912837-0001	Men's RR - Ceramic Floor Tile - Blue	Blue/Rust Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1A-Grout 041912837-0001A	Men's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1B-Floor Tile 041912837-0002	Men's RR - Ceramic Floor Tile - Blue	Blue/Rust Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1B-Grout 041912837-0002A	Men's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1C-Floor Tile 041912837-0003	Women's RR - Ceramic Floor Tile - Blue	Blue/Rust Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1C-Grout 041912837-0003A	Women's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M1.1A 041912837-0004	Storage Shed Roof - Asphalt Shingle Roof	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
M1.1B 041912837-0005	Storage Shed Roof - Asphalt Shingle Roof	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
M1.1C 041912837-0006	Storage Shed Roof - Asphalt Shingle Roof	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
M1.2A 041912837-0007	Storage Shed Roof - Tar Paper	Black Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
M1.2B 041912837-0008	Storage Shed Roof - Tar Paper	Black Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
M1.2C 041912837-0009	Storage Shed Roof - Tar Paper	Black Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
M8.1A 041912837-0010	Exterior - Caulking - Brown	Brown Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.1B 041912837-0011	Exterior - Caulking - Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.1C 041912837-0012	Exterior - Caulking - Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.2A 041912837-0013	Bathrooms - Caulking - White	White/Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 05/14/2019 11:09:35

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
M8.2B 041912837-0014	Bathrooms - Caulking - White	White/Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.2C 041912837-0015	Bathrooms - Caulking - White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1A-Tile 041912837-0016	Men's RR - Wall Ceramic Tile - Blue and Pink	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1A-Mastic 041912837-0016A	Men's RR - Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1A-Grout 041912837-0016B	Men's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1B-Tile 041912837-0017	Women's RR - Wall Ceramic Tile - Blue and Pink	Blue Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1B-Mastic 041912837-0017A	Women's RR - Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1B-Grout 041912837-0017B	Women's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1C-Tile 041912837-0018	Women's RR - Wall Ceramic Tile - Blue and Pink	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1C-Mastic 041912837-0018A	Women's RR - Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1C-Grout 041912837-0018B	Women's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M14.1A 041912837-0019	Pavillion Foundation - Concrete	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M14.1B 041912837-0020	Restroom Foundation - Concrete	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M14.1C 041912837-0021	Storage Shed Foundation - Concrete	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M19.1A 041912837-0022	Maintenance Closet - Fiberglass Insulation	Black/Yellow Fibrous Homogeneous	25% Cellulose 60% Min. Wool	15% Non-fibrous (Other)	None Detected
M19.1B 041912837-0023	Maintenance Closet - Fiberglass Insulation	Black/Yellow Fibrous Homogeneous	25% Cellulose 60% Min. Wool	15% Non-fibrous (Other)	None Detected
M19.1C 041912837-0024	Maintenance Closet - Fiberglass Insulation	Black/Yellow Fibrous Homogeneous	20% Cellulose 65% Min. Wool	15% Non-fibrous (Other)	None Detected
M20.1A 041912837-0025	Roof - Foam under Metal Roof	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M20.1B 041912837-0026	Roof - Foam under Metal Roof	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 05/14/2019 11:09:35

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	041912837
Customer ID:	NIHI62
Customer PO:	
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
M20.1C *041912837-0027*	Roof - Foam under Metal Roof	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M20.2A *041912837-0028*	Sign at Parking Lot - Tar Sealant	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M20.2B *041912837-0029*	Sign at Parking Lot - Tar Sealant	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M20.2C *041912837-0030*	Sign at Parking Lot - Tar Sealant	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)

Andrew Borsos (26)

John Flanagan (13)

Benjamin Ellis, Laboratory Manager
or Other Approved Signatory

Initial report from: 05/14/2019 11:09:35

OrderID: 041912837

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 041912837

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

EMSL ANALYTICAL, INC.
3356 W. CATALINA DRIVE
PHOENIX AZ 85017
PHONE: 602-276-4344
FAX: 602-276-4053

RECEIVED EMSL CINNAMINSON 2019 MAY 13 AM 10:09

Company : Northern Industrial Hygiene	EMSL-Bill to: ☒ Same ☐ Different — If Bill to is Different note instructions in Comments**
Street: 201 S. 30th Street	*Third Party Billing requires written authorization from third party*
City: Billings — State/Province: MT	Zip/Postal Code: 59101 — Country: USA
Report To (Name): Todd Schneider	Telephone #: 406-245-7766
Email Address: tschneider@northernih.com	Fax #: 406-254-1428 — Purchase Order:
Project Name/Number: Jeff city rest stop South/399-826	Please Provide Results: ☐ Fax ☒ Email
U.S. State Samples Taken: MT	CT Samples: ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour | ☐ 6 Hour | ☐ 24 Hour | ☐ 48 Hour | ☐ 72 Hour | ☐ 96 Hour | ☒ 1 Week | ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PLM - Bulk (reporting limit)	TEM – Bulk
☒ PLM EPA 600/R-93/116 (<1%)	☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
☐ PLM EPA NOB (<1%)	☐ NY ELAP Method 198.4 (TEM)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ Chatfield Protocol (semi-quantitative)
Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
☐ NIOSH 9002 (<1%)	☐ TEM Qualitative via Filtration Prep Technique
☐ NY ELAP Method 198.1 (friable in NY)	☐ TEM Qualitative via Drop Mount Prep Technique
☐ NY ELAP Method 198.6 NOB (non-friable-NY)	**Other**
☐ OSHA ID-191 Modified	☐
☐ Standard Addition Method	

☒ **Check For Positive Stop – Clearly Identify Homogenous Group** — Date Sampled: 5-10-19

Samplers Name: Todd Schneider — Samplers Signature: [signature]

Sample #	HA #	Material Description	Sample Location
F7.1A	F7.1	Ceramic floor tile - Blue	Mens RR
B	|	|	|
C	|	|	Womens RR
M1.1A	m1.1	Asphalt shingle Roof	Storage shed roof
B	|	|	|
C	|	|	|
m1.2A	m1.2	Tar paper	|
B	|	|	|
C	|	|	|

Client Sample # (s): F7.1A → m20.2C — Total # of Samples: 30

Relinquished (Client): [signature] — Date: 5-10-19 — Time: 1700

Received (Lab): [initials] — Date: 5-13-19 — Time: 8:55

Comments/Special Instructions:

30 PLM

Page 1 Of 2

OrderID: 041912837

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 041912837

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

EMSL Analytical, Inc.
3356 W. Catalina Drive
Phoenix, AZ 85017
Phone: 602-276-4344
Fax: 602-276-4053

RECEIVED EMSL CINNAMINSON, NJ
2019 MAY 13 A 10:09

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	HA #	Material Description	Sample Location
m8.1A	m8.1	Caulking Brown	Exterior
B	⊥	⊥ ⊥	⊥
C	⊥	⊥ ⊥	⊥
m8.2A	m8.2	caulking - white	Bathrooms
B	⊥	⊥ ⊥	⊥
C	⊥	⊥ ⊥	⊥
m13.1A	m13.1	wall ceramic tile - ~~Gray~~ Blue+Pink	men's RR
B	⊥	⊥ ⊥	womens RR
C	⊥	⊥ ⊥	womens RR
m14.1A	m14.1	concrete	Pavillion foundation
B	⊥	⊥	Rest Room ⊥
C	⊥	⊥	storage-shed ⊥
m19.1A	m19.1	Fiberglass insulation	maintenance closet
B	⊥	⊥ ⊥	⊥ ⊥
C	⊥	⊥ ⊥	⊥ ⊥
m20.1A	m20.1	foam under metal Roof	Roof
B	⊥	⊥ ⊥	⊥
C	⊥	⊥ ⊥	⊥
m20.2A	m20.2	Tar sealant	Sign at Parking lot
B	⊥	⊥ ⊥	⊥ ⊥ ⊥
C	⊥	⊥ ⊥	⊥ ⊥ ⊥

***Comments/Special Instructions:**

Page 2 of 2 pages

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order: 041912839
Customer ID: NIHI62
Customer PO:
Project ID:

Attention: Todd Schneider
Northern Industrial Hygiene, Inc.
201 South 30th Street
Billings, MT 59101

Phone: (406) 245-7766
Fax: (406) 254-1428
Received Date: 05/13/2019 8:55 AM
Analysis Date: 05/21/2019
Collected Date: 05/10/2019

Project: Jeff City Rest Stop North / 399-826

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
F7.1A-Ceramic Tile *041912839-0001*	Men's RR - Ceramic Floor Tile - Blue	Blue Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1A-Grout *041912839-0001A*	Men's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1A-Adhesive *041912839-0001B*	Men's RR - Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1B-Ceramic Tile *041912839-0002*	Men's RR - Ceramic Floor Tile - Blue	Blue Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1B-Grout *041912839-0002A*	Men's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1B-Adhesive *041912839-0002B*	Men's RR - Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1C-Ceramic Tile *041912839-0003*	Women's RR - Ceramic Floor Tile - Blue	Blue Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1C-Grout *041912839-0003A*	Women's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F7.1C-Adhesive *041912839-0003B*	Women's RR - Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M1.1A *041912839-0004* *Sample is tar paper.*	Storage Shed Roof - Asphalt Shingle Roof	Black Fibrous Homogeneous	70% Cellulose	30% Non-fibrous (Other)	None Detected
M1.1B *041912839-0005* *Sample is tar paper.*	Storage Shed Roof - Asphalt Shingle Roof	Black Fibrous Homogeneous	70% Cellulose	30% Non-fibrous (Other)	None Detected
M1.1C *041912839-0006*	Storage Shed Roof - Asphalt Shingle Roof	Black Fibrous Homogeneous	70% Cellulose	30% Non-fibrous (Other)	None Detected
M1.2A *041912839-0007* *Sample is asphalt shingle.*	Storage Shed Roof - Tar Paper	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
M1.2B *041912839-0008* *Sample is asphalt shingle.*	Storage Shed Roof - Tar Paper	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
M1.2C *041912839-0009*	Storage Shed Roof - Tar Paper	Black Fibrous Homogeneous	20% Glass	80% Non-fibrous (Other)	None Detected

Initial report from: 05/21/2019 11:32:03

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order: 041912839
Customer ID: NIHI62
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
Sample is asphalt shingle.					
M8.1A *041912839-0010*	Exterior - Caulking - Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.1B *041912839-0011*	Exterior - Caulking - Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.1C *041912839-0012*	Exterior - Caulking - Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.2A *041912839-0013*	Bathrooms - Caulking - White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.2B *041912839-0014*	Bathrooms - Caulking - White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M8.2C *041912839-0015*	Bathrooms - Caulking - White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1A-Ceramic Tile *041912839-0016*	Men's RR - Wall Ceramic Tile - Blue and Pink	Blue/Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1A-Grout *041912839-0016A*	Men's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1A-Adhesive *041912839-0016B*	Men's RR - Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1B-Ceramic Tile *041912839-0017*	Women's RR - Wall Ceramic Tile - Blue and Pink	Blue/Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1B-Grout *041912839-0017A*	Women's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1B-Adhesive *041912839-0017B*	Women's RR - Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1C-Ceramic Tile *041912839-0018*	Women's RR - Wall Ceramic Tile - Blue and Pink	Blue/Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1C-Grout *041912839-0018A*	Women's RR - Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M13.1C-Adhesive *041912839-0018B*	Women's RR - Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M14.1A *041912839-0019*	Pavillion Foundation - Concrete	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M14.1B *041912839-0020*	Restroom Foundation - Concrete	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M14.1C *041912839-0021*	Storage Shed Foundation - Concrete	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 05/21/2019 11:32:03

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	041912839
Customer ID:	NIHI62
Customer PO:	
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
M19.1A *041912839-0022*	Maintenance Closet - Fiberglass Insulation	Brown/Black/Yellow Fibrous Homogeneous	40% Cellulose 30% Glass	30% Non-fibrous (Other)	None Detected
M19.1B *041912839-0023*	Maintenance Closet - Fiberglass Insulation	Brown/Black/Yellow Fibrous Homogeneous	40% Cellulose 30% Glass	30% Non-fibrous (Other)	None Detected
M19.1C *041912839-0024*	Maintenance Closet - Fiberglass Insulation	Brown/Black/Yellow Fibrous Homogeneous	40% Cellulose 30% Glass	30% Non-fibrous (Other)	None Detected
M20.1A *041912839-0025*	Roof - Foam under Metal Roof	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M20.1B *041912839-0026*	Roof - Foam under Metal Roof	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M20.1C *041912839-0027*	Roof - Foam under Metal Roof	White/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
M20.2A *041912839-0028*	Sign at Parking Lot - Tar Sealant	Black Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
M20.2B *041912839-0029*	Sign at Parking Lot - Tar Sealant	Black Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
M20.2C *041912839-0030*	Sign at Parking Lot - Tar Sealant	Black Non-Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (Other)	None Detected

Analyst(s)

Alexis Kum (28)

Seri Smith (14)

Benjamin Ellis, Laboratory Manager
or Other Approved Signatory

Initial report from: 05/21/2019 11:32:03

OrderID: 041912839

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 041912839

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

EMSL ANALYTICAL, INC.
3356 W. CATALINA DRIVE
PHOENIX, AZ 85017
PHONE: 602-276-4344
FAX: 602-276-4053

RECEIVED EMSL CINNAMINSON NJ 2019 MAY ... A 10:00

Company : Northern Industrial Hygiene	EMSL-Bill to: ☒ Same ☐ Different. If Bill to is Different note instructions in Comments
Street: 201 S. 30th Street	*Third Party Billing requires written authorization from third party*
City: Billings — State/Province: MT	Zip/Postal Code: 59101 — Country: USA
Report To (Name): Todd Schneider	Telephone #: 406-245-7766
Email Address: tschneider@northernih.com	Fax #: 406-254-1428 — Purchase Order:
Project Name/Number: Jeff city rest stop North/399-826	Please Provide Results: ☐ Fax ☒ Email
U.S. State Samples Taken: MT	CT Samples: ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PLM - Bulk (reporting limit)	TEM – Bulk
☒ PLM EPA 600/R-93/116 (<1%)	☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
☐ PLM EPA NOB (<1%)	☐ NY ELAP Method 198.4 (TEM)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ Chatfield Protocol (semi-quantitative)
Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
☐ NIOSH 9002 (<1%)	☐ TEM Qualitative via Filtration Prep Technique
☐ NY ELAP Method 198.1 (friable in NY)	☐ TEM Qualitative via Drop Mount Prep Technique
☐ NY ELAP Method 198.6 NOB (non-friable-NY)	**Other**
☐ OSHA ID-191 Modified	☐
☐ Standard Addition Method	

☒ Check For Positive Stop – Clearly Identify Homogenous Group — Date Sampled: 5-10-19

Samplers Name: Todd Schneider — Samplers Signature: [signature]

Sample #	HA #	Material Description	Sample Location
F7.1A	F7.1	Ceramic floor tile - Blue	Mens RR
B	⊥	⊥ ⊥ ⊥	⊥
C	⊥	⊥ ⊥ ⊥	Womens RR
M1.1A	m1.1	Asphalt shingle Roof	Storage shed roof
B	⊥	⊥ ⊥ ⊥	
C	⊥	⊥ ⊥ ⊥	
m1.2A	m1.2	Tar paper	
B	⊥		
C	⊥	⊥	⊥ ⊥

Client Sample # (s): F7.1A - m20.2C — Total # of Samples: 30

Relinquished (Client): [signature] Date: 5-10-19 Time: 1700

Received (Lab): [signature] Date: 5-13-19 Time: 8:55

Comments/Special Instructions:

30 pul

Controlled Document – Asbestos COC – R6 – 11/29/2012

OrderID: 041912839

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 041912839

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

EMSL ANALYTICAL, INC.
3356 W. CATALINA DRIVE
PHOENIX, AZ 85017
PHONE: 602-276-4344
FAX: 602-276-4053

RECEIVED
CINNAMINSON, NJ
2019 MAY 13 A 10:00

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

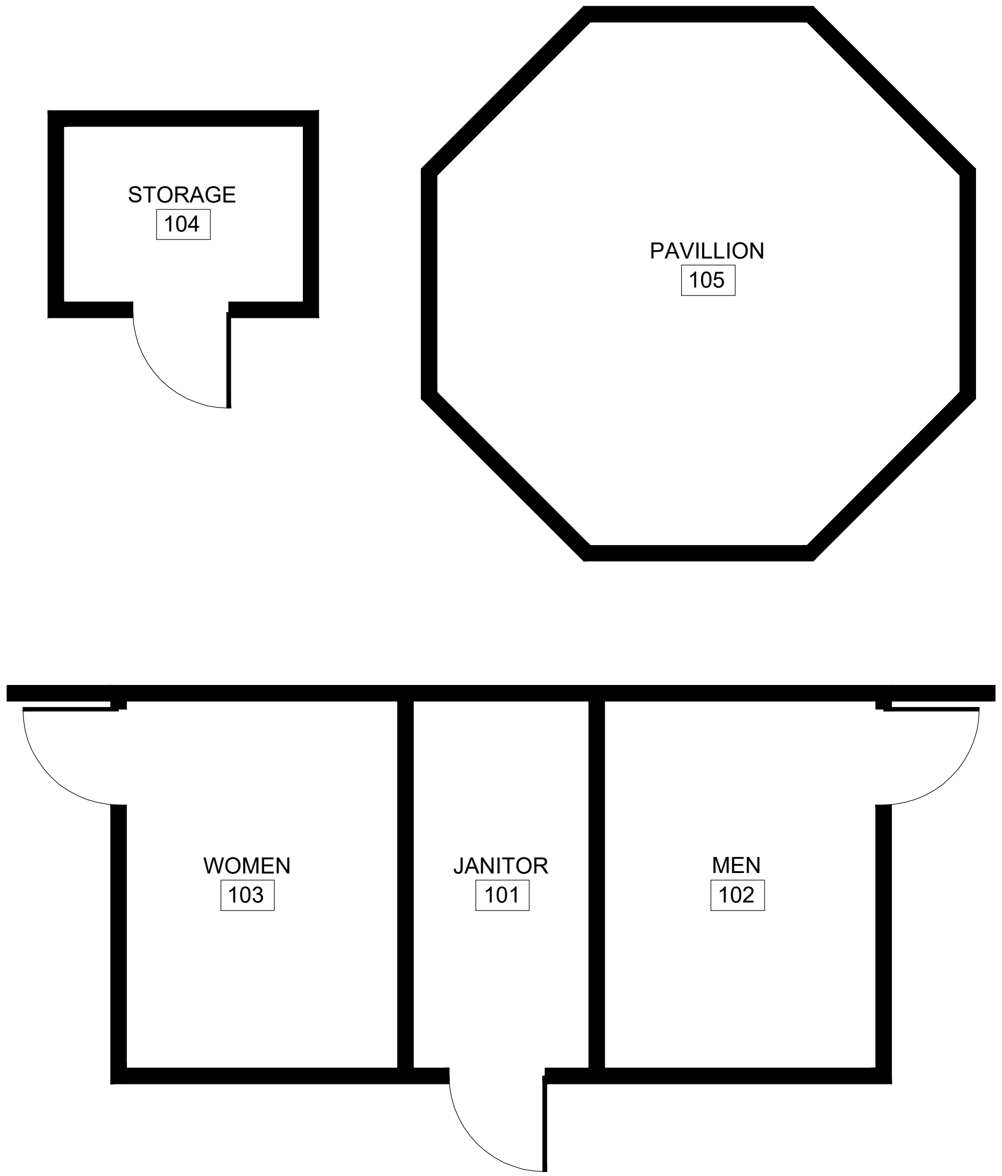
Sample #	HA #	Material Description	Sample Location
m8.1A	m8.1	Caulking Brown	Exterior
B	⊥	⊥ ⊥	⊥
C	⊥	⊥ ⊥	⊥
m8.2A	m8.2	caulking - white	Bathrooms
B	⊥	⊥ ⊥	⊥
C	⊥	⊥ ⊥	⊥
m13.1A	m13.1	wall ceramic tile - ~~Gray~~ Blue+Pink	men's RR
B	⊥	⊥ ⊥	womens RR
C	⊥	⊥ ⊥	womens RR
m14.1A	m14.1	concrete	Pavillion foundation
B	⊥	⊥	Rest Room ⊥
C	⊥	⊥	storage shed ⊥
m19.1A	m19.1	Fiberglass insulation	maintenance closet
B	⊥	⊥ ⊥	⊥ ⊥
C	⊥	⊥ ⊥	⊥ ⊥
m20.1A	m20.1	foam under metal Roof	Roof
B	⊥	⊥ ⊥	⊥
C	⊥	⊥ ⊥	⊥
m20.2A	m20.2	Tar sealant	Sign at Parking lot
B	⊥	⊥ ⊥	⊥ ⊥ ⊥
C	⊥	⊥ ⊥	⊥ ⊥ ⊥

***Comments/Special Instructions:**

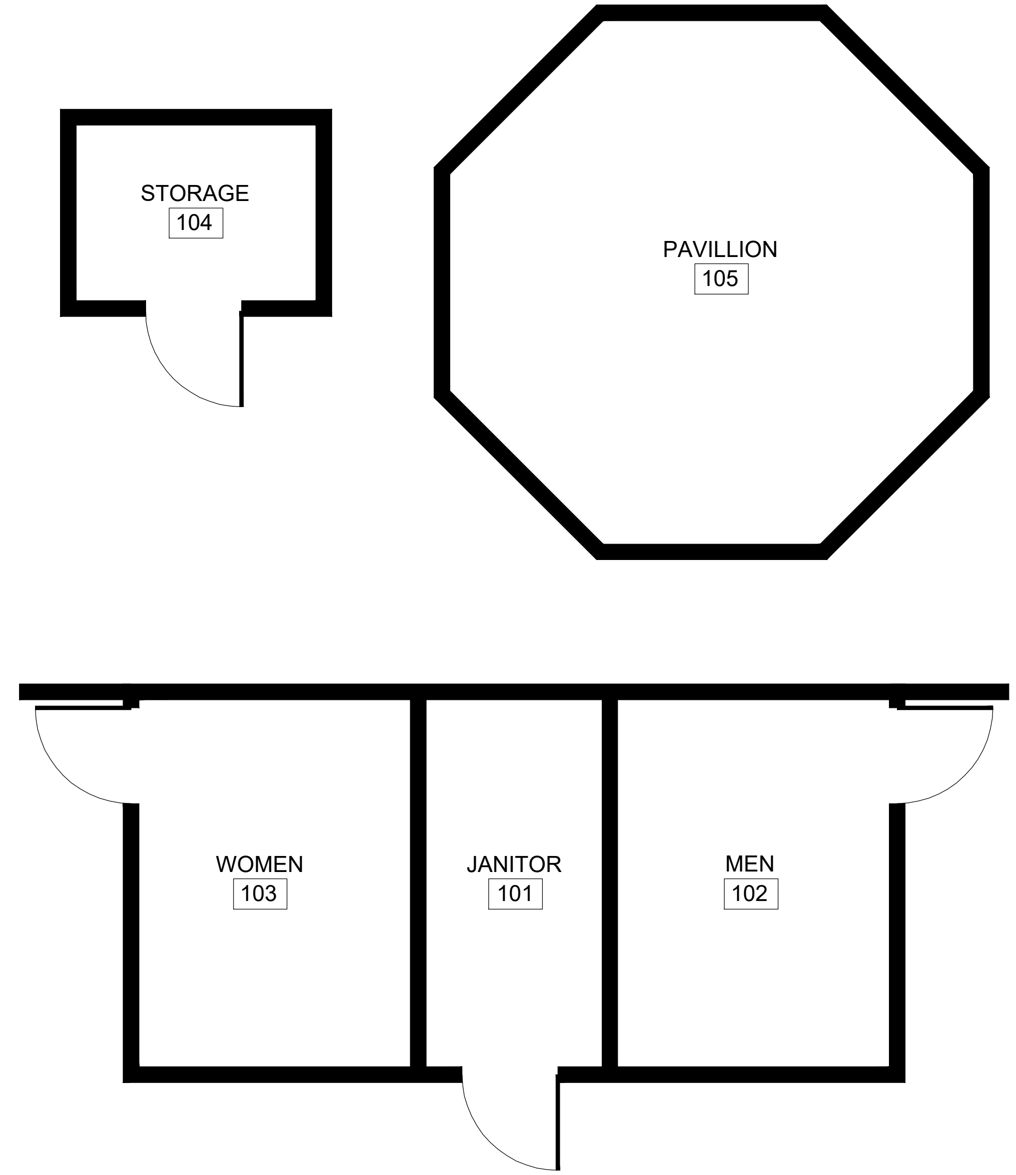
Page 2 of 2 pages

NO ASBESTOS-CONTAINING MATERIALS WERE IDENTIFIED IN THESE BUILDINGS

LEAD BASED PAINT WAS IDENTIFIED ON THE BLUE "HANDICAPPED" PARKING BLOCKS. NO OTHER LEAD BASED PAINT MATERIALS WERE IDENTIFIED AT THIS LOCATION



NORTH BOUND



SOUTH BOUND

JEFFERSON CITY REST AREAS MATERIAL LOCATION PLAN

SCALE: 1/4" = 1'-0"

NORTHERN INDUSTRIAL HYGIENE, INC.	DATE: MAY 2019 DRAWN BY: JMT CHK BY: KBO CAD FILE: 399-826	PROJECT NAME: MONTANA DEPARTMENT OF TRANSPORTATION LOCATION: JEFFERSON CITY REST AREA JEFFERSON CITY, MT NIH PROJECT NUMBER: 399-826		FIG 1.1 JEFFERSON CITY REST AREAS MATERIAL LOCATION PLAN

Appendix L: Noxious Weeds

Jefferson City
Safety Rest Area Study

PREFACE

Jefferson County Officials Weed Board, and Staff Directory

Jefferson County Board of Commissioners:

Bob Mullen, Chairman	*P.O. Box H*
Cory Kirsch	*Boulder, MT*
Leonard Wortman	*(406)225-4025*

Jefferson County Weed District Board:

Cory Fitzgerald, Chairperson	*Whitehall*
Bill Gillespie, Vice Chair	*Whitehall*
Jeff Pallister	*Boulder*
Cory Kirsch	*Commissioner*

Jefferson County Weed Coordinator:

Jill Allen	*P.O. Box H*
	Boulder, MT
	(406) 225-4165

Note: Approximately 1-2 additional staff is needed for seasonal/temporary positions to aid in management of noxious weeds on County right-of-ways, MDOT right-of-ways, Deer Lodge National Forest, Helena National Forest and the BLM weed programs.

Jefferson County Weed District operates under the guidelines set within the Montana/County Weed Control Act & Administrative Rules, and Jefferson County policy.

The Jefferson County Weed Board offices are located at:
111 Odyssey Lane, Boulder Montana & 3 Whitetail Rd., Whitehall Montana

INTRODUCTION:

Jefferson County Weed District Organization:

The Jefferson County Weed District was organized under specification of the Montana Codes Annotated, Sections 7-22-2101 through 7-22-2153. Jefferson County has a three (3) member Weed Board that was created under MCA 7-22-2103. The Jefferson County Board of Commissioners appoints the Weed Board members and the length of their terms. As stated in MCA 7-22-2109 the Weed Board is responsible for the planning, implementing, and administrating the County Weed Management Plan. This is done through a Weed Coordinator that is recommended by the Weed Board and approved by the Board of County Commissioners to organize, direct and supervise the activities needed to carry out the County's weed management program as designated by Montana. All costs of the Weed District is to be paid out of a noxious weed fund authorized by MCA Section 7-22-214.

Jefferson County Weed Management Plan Purpose:

The purpose of the Jefferson County Weed Management Plan, in conjunction with the Montana State Weed Management Plan, is to strengthen, support and coordinate private, county, state and federal weed management efforts in Jefferson County and Montana, to promote implementation of ecologically based integrated weed management programs within Jefferson County.

Noxious weeds are established and spreading in Montana and in Jefferson County. The Jefferson County Weed Board has created this plan for the purpose of managing noxious weeds in Jefferson County, with emphasis on specific weed management areas, as outlined in the attached (EIA), Appendix C. Noxious weeds render land unfit for agricultural production, recreation, wildlife habitat; increase erosion, sedimentation of streams and alter the bio-diversity of the ecological systems. These invasive plants are designated noxious by rule of the Montana Department of Agriculture and local county Weed Boards based on their detrimental impact to the environment and economy of Montana.

The Jefferson County Weed Management Plan will outline objectives that are reasonable for effective and efficient invasive noxious weed management for all landowning entities in Jefferson County. These objectives will provide guidelines for private, county, state and federal land managers to develop plans and goals consistent with state and national strategies; provide a method of prioritizing management strategies, and allocating the limited resources based upon these priorities; and prioritizes ***Noxious Weed Trust Fund Grants*** *based on compatibility and compliance with the Montana State Weed Management Plan. This plan is dynamic and will be revisited every two years as ruled by the Montana Department of Agriculture for qualification of potential funding through the Noxious Weed Trust Fund.*

Overview of Jefferson County:

Jefferson County is located in the southwestern Montana. The county slogan is the "Undiscovered In Between" and provides an accurate description of our magnificent landscape. The County encompasses 1,659 square miles or 1,062,038 acres and is bordered by Broadwater, Silver Bow, Madison, Lewis & Clark, Deer Lodge, Powell and Gallatin Counties.

There are four (4) Federal Highways in Jefferson County including; US 12, US 287, Interstate 90 and Interstate 15. The State Highways in Jefferson County include; MT 2, MT 41, MT 55, and MT 69. There are an estimated 4,254.7 acres or 358 line miles that comprise Montana Department of Transportation Right-of-Way. There is approximately 794 miles of designated county roads.

The main line of Montana Rail link railroad runs through the county with two spur lines extending from Whitehall to Twin Bridges and in the northeastern portion of Madison County from Sappington Junction to Harrison.

There are two incorporated towns in Jefferson County, including; Boulder & Whitehall. There are also several smaller towns including; Basin, Cardwell, Clancy, Jefferson City and Montana City. The County seat is Boulder. Jefferson County's population is estimated at 11,406.

There are two (2) river systems located in Jefferson County: the Boulder River and the Jefferson River. Principal mountain ranges located in Jefferson County consist of the Bull Mountain Range, Elkhorn Mountain Range and the Continental Divide.

Approximately 37% of the total acres in Jefferson County is dedicated to agriculture or 391,248 acres. Jefferson County's primary resource and economic base is production agriculture, wood products and mining. Tourism and recreation continue to be a growing economic base for Jefferson County.

Federal lands in Jefferson County comprise 52% of the total acreage or 556,268 acres; approximately 460,626 acres is under the management of the USDA Forest Service, approximately 92,381 acres are managed by the USDI Bureau of Land Management, approximately 1614 acres is managed by the US Fish & Wildlife Services, approximately 3155 acres is managed by Montana Fish, Wildlife & Parks Services, approximately 1042 acres is managed by Montana Department of Corrections and State lands comprise 3% of the total lands or approximately 31,526.

Jefferson County is plentiful with wildlife management areas, state historical markers as well as numerous Fishing Access Sites and State Parks.

The remaining 466,987 acres are privately owned. This comprises the remaining 44% of total acres in Jefferson County.

Please refer to the Jefferson County EIA, Appendix C, for detailed information regarding topography, soils, water, climate, wildlife, fish, cultural resources, visual resources, and vegetation information. This EIA also includes a list of Threatened and Endangered Species that are located within Jefferson County.

Jefferson County Noxious Weeds

Jefferson County's Noxious Weed list is comprised of species on the statewide list and two additional species listed specifically by the Jefferson County Weed Board. Noxious weeds are estimated to infest 10 to 12 percent of the total acreage in Jefferson County.

Priority 2B: *These weeds comprise 10% of the total acreage within the County. These noxious weeds make up 90% of the infested acreage. The largest infestations include Spotted Knapweed, Leafy Spurge, Houndstongue, Hoary Alyssum and Canada Thistle. Management priorities include maintaining clean roadsides, public grounds and areas, requiring landowners to manage and contain infestations to reduce the infestations, work with landowners to establish management programs, identify and work to eradicate small infestations, and provide cost share assistance.*

Priority 2A: *This group consists of nine weeds. The Priority 2A plants that have been identified in Jefferson County in small rare instances include: Perennial Pepperweed, Orange Hawkweed and Tansy Ragwort. Management priorities will include: Provide cost share assistance, maintain clean roadsides, public grounds and areas, require landowners to manage and contain infestation to reduce infestations, work with landowners to establish management programs, identify and work to eradicate all infestations.*

With aquatic noxious weeds identified in the Missouri Headwaters a complete survey was conducted during the 2011 growing season. Eurasian Watermilfoil was identified infesting waters in the Jefferson River. The source of this infestation is found in the Jefferson Slough in Southern Jefferson County. Because of the infestation of this aquatic weed, an area task force has been formed to set priorities for these sites as well as pool educational resources for the benefit of landowners and recreationists. The newly Missouri Headwaters EWM Task Force spearheaded a week long hand pull effort in a 5 mile stretch of the Jefferson Slough in July 2012. Additional management strategies for the future are being planned by the task force.

Priority 1A: *This category is limited to three weeds: Yellow Starthistle, Dyer's Woad and Common reed. There have been no sightings of this plant to date, but it has been detected in surrounding counties.*

Jefferson County Declared Noxious Weeds: *At this time there is three (3) county declared noxious weed specified in Jefferson County. These noxious weeds are Baby's Breath, Field Scabious and Russian Olive tree. Management of these weeds is the same as Priority 2B Noxious Weeds.*

Jefferson County Watch List: *There is also one (1) additional weed of concern within Jefferson County that is managed if resources permit. Weed of concern is: Common Mullein.*

Jefferson County Weed Program Goals & Priorities

As stated earlier, the Jefferson County Weed Board operates under the guidance of the Montana County Weed Control Act, dated October 2011, Title 7, Chapter 22, Part 21, Sections 2101-2153. The Jefferson County Weed Board is charged with enforcement of the County Weed Control Act and bases the County Weed Program on the requirements of the Noxious Weed Control Act as well as the Montana State Noxious Weed Management Plan.

The Weed Board is directed to provide information, guidance and perform weed management activities within the county. The Jefferson County Weed Board provides assistance to private landowners in forming management plans to promote good stewardship for their land and to effectively and efficiently manage invasive noxious weeds. The Weed Board also provides assistance and develops cooperative agreements with State and Federal agencies to manage noxious weeds on their land within Jefferson County.

Among these cooperative agreements is an agreement to manage noxious weeds on Montana Department of Transportation rights-of-way, and Bureau of Land Management. There are an estimated 4,254.7 acres that are managed each year on these rights-of-way. The average yearly funding for these acres is approximately $37,000.00 for an average price of $8.70 per managed acre.

Helena National Forest contracts with Jefferson County to manage traveled right-of-ways and trails. The project funding is approximately $3,000.00 per fiscal year.

A cooperative agreement to manage noxious weeds is also in place with USDI Bureau of Land Management. Jefferson County manages in excess 1,600 acres per season. Management on these acres concentrate on traveled rights-of-way and rangeland. Preliminary numbers at this time are approximately $16,000.00 for the next five (5) years.

Jefferson County also has cooperative agreements with Jefferson Watershed Council, Department of Natural Resources and Fish, Wildlife & Parks to assist with weed management responsibilities on designated waterway and tributaries to control the aquatic invasive species.

Weed Management Areas

The Weed Board provides assistance to private landowners with formation of noxious weed management plans on their own lands and formation of cooperative weed management areas to address specific, localized noxious weed problems within a group of landowners in a specific area of concern. There is one identified Weed Management Areas in Jefferson County: Travis Creek area and future Aspen Valley weed management area.

The Weed Board provides assistance to these groups via cooperative grants obtained from the Montana Noxious Weed Trust Fund and RAC. Jefferson County actively seeks funding to assist these groups with cost-share for herbicide and/or commercial herbicide application cost-share through these grants. There are also several watershed projects underway, including the Jefferson Slough and Pipestone Creek to assess and treat noxious weeds within the riparian corridor as well as address the sediment issues. These projects have received funding from the Department of Natural Resources.

In addition to seeking grant funding for cost-share, the Weed Board offers a countywide cost-share program to all landowners within Jefferson County. This is a 49% herbicide cost-share up to a maximum of $1500 per landowner in one calendar year and not to exceed $6000 in a four year period. This cost-share assists landowners that are not currently involved in a cooperative management grant project. See attached APPENDIX H for cost-share program specifics.

Noxious Weed Compliance Program

MCA 7-22-2116 Part 1 states: It is unlawful for any person to permit any noxious weed to propagate or go to seed on the person's land. A landowner is considered to be in compliance if they file a Weed Management Plan and the plan is approved by the Jefferson County Weed Board. In the case a landowner is not considered to be in compliance the Weed Board has adopted the following procedures:
When an infestation of noxious weeds have been identified or reported, the Weed Board will attempt to notify the landowner/manager of the problem with a letter outlining the following information:

- ***Legal description where infestation occurs.***
- ***A common location associated with the site.***
- ***Noxious weeds known to be present.***

The landowner/manager will be asked to notify the Weed Board within ten (10) days of their intentions in addressing the noxious weeds. If the landowner/manager does not respond within the ten (10) days, a certified letter will be sent requesting voluntary compliance in the form of a noxious weed management plan. This plan will help to guide the landowner/manager in developing a comprehensive weed management program and help meet requirements set in 7-22-2123 (3) MCA, placing the landowner/manager in compliance. If the landowner/manager does not respond within the ten (10) days, the Weed Board or Weed Board Agent will seek a court order to enter and inspect the land to determine if noxious weeds are present on the property. Under MCA 7-22-2134 the Board may seek a court order to enter the property and institute appropriate noxious weed control measures or seek a civil penalty.
The Jefferson County Weed Board will continue to work with all landowners to develop a Weed Management Plan.

Subdivision Weed Management Plans

As stated in the Jefferson County Weed Management Requirements for Subdivisions: "Upon approval by the Board, this plan must be signed by the Chairman of the Board or appointed Representative in cooperation with the agency responsible for the disturbance of ground and constitutes a binding agreement between the Board and such person or agency."

Jefferson County charges the sub-dividers for time spent on the review, inspections and approval process. The fees are as follows: $150.00 fee for minor subdivisions (5 lots or less), and a $150.00 fee for the first five lots of a major subdivision with an additional $20.00 per lot over five.

Gravel Pit/Opencut Weed Management Plans

The Department of Environmental Quality requires all new gravel pits submit a noxious weed management plan before approval. The Jefferson County Weed Board is charged with the review, inspection, and approval process. A $150.00 fee is charged.

Right of Way Waivers

When a landowner objects to weed control measures along a state or county highway or road that borders or bisects their property they will be asked to complete and submit Noxious Weed Control Permit/Plan (Appendix G) per 7-22-2153MCA. This permit/plan must be approved by the Weed Board. If control measures are not carried out as per permit/plan, the Weed Board will send a letter requesting alternative measurers be carried out within 30 days or the agreement will be revoked and control measures will be undertaken by the Weed Board and may be fined as outlined in MCA 7-22-2153 Part 5 (a) & (b).

Education

Jefferson County Weed Board will continue to develop and participate in numerous educational programs County wide. The Weed Coordinator & the Madison/Jefferson Extension Service will offer Pesticide Applicator Training (PAT) courses throughout the year. In addition to trainings the County will continue to work with many of the Jefferson River Watershed group within the County as well as other organizations like the Elkhorn Working Group and Weed Committee to inform landowners and recreationist to the impacts of invasive noxious weeds. Jefferson County will continue to work with the Southwestern Area Council in continued development of educational displays for the Southwestern Area Education Trailer as well as submitting informational articles to the area newspapers when time allows. Jefferson County also encourages participation in trainings offered by surrounding counties and throughout the state with the Montana Weed Control Association (MWCA).

Jefferson County Weed Board Program Mission

> *The Mission of the Jefferson County Weed District is to promote good land stewardship and to educate landowners/managers as well as agencies within Jefferson County on the importance of implementing an integrated weed management program and to protect and improve the integrity of the natural resources for future use and enjoyment.*

Jefferson County Weed Board
Jefferson County
Integrated Weed Management Plan

Revised by: ____ Date ____________

Jill M. Allen, Weed Coordinator

Reviewed by: ____ Date _____________

Cory Kirsch, Jefferson County Commissioner

Recommended by: ____ Date _____________

Cory Fitzgerald, Jefferson Co. Weed Board Chairman

Montana Noxious Weed List

Effective: February 2017

PRIORITY 1A These weeds are not present or have a very limited presence in Montana. Management criteria will require eradication if detected, education, and prevention:

(a) Yellow starthistle (*Centaurea solstitialis*)
(b) Dyer's woad *(Isatis tinctoria*)
(c) Common reed *(Phragmites australis ssp. australis)*
(d) Medusahead *(Taeniatherum caput-medusae)*

PRIORITY 1B These weeds have limited presence in Montana.
Management criteria will require eradication or containment and education:

(a) Knotweed complex (*Polygonum cuspidatum, P. sachalinense, P. × bohemicum, Fallopia japonica, F. sachalinensis, F. × bohemica, Reynoutria japonica, R. sachalinensis, and R.× bohemica*)
(b) Purple loosestrife (*Lythrum salicaria*)
(c) Rush skeletonweed (*Chondrilla juncea*)
(d) Scotch broom (*Cytisus scoparius*)
(e) Blueweed (*Echium vulgare*)

PRIORITY 2A These weeds are common in isolated areas of Montana. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

(a) Tansy ragwort (*Senecio jacobaea, Jacobaea vulgaris*)
(b) Meadow hawkweed complex (*Hieracium caespitosum, H. praealturm, H. floridundum, and Pilosella caespitosa*)
(c) Orange hawkweed (*Hieracium aurantiacum, Pilosella aurantiaca*)
(d) Tall buttercup (*Ranunculus acris*)
(e) Perennial pepperweed (*Lepidium latifolium*)
(f) Yellowflag iris (*Iris pseudacorus*)
(g) Eurasian watermilfoil (*Myriophyllum spicatum, Myriophyllum spicatum x Myriophyllum sibiricum*)
(h) Flowering rush (*Butomus umbellatus*)
(i) Common buckthorn *(Rhamnus cathartica L.)*

PRIORITY 2B These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

(a) Canada thistle (*Cirsium arvense*)
(b) Field bindweed (*Convolvulus arvensis*)
(c) Leafy spurge (*Euphorbia esula*)
(d) Whitetop (*Cardaria draba, Lepidium draba*)
(e) Russian knapweed (*Acroptilon repens, Rhaponticum repens*)
(f) Spotted knapweed (*Centaurea stoebe, C.maculosa*)
(g) Diffuse knapweed (*Centaurea diffusa*)
(h) Dalmatian toadflax (*Linaria dalmatica*)
(i) St. Johnswort (*Hypericum perforatum*)
(j) Sulfur cinquefoil (*Potentilla recta*)
(k) Common tansy (*Tanacetum vulgare*)
(l) Oxeye daisy (*Leucanthemum vulgare*)
(m) Houndstongue (*Cynoglossum officinale*)
(n) Yellow toadflax (*Linaria vulgaris*)
(o) Saltcedar (*Tamarix spp*.)
(p) Curlyleaf pondweed (*Potamogeton crispus*)
(q) Hoary alyssum (*Berteroa incana*)

PRIORITY 3 Regulated Plants: (NOT MONTANA LISTED NOXIOUS WEEDS)
These regulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. The state recommends research, education and prevention to minimize the spread of the regulated plant.

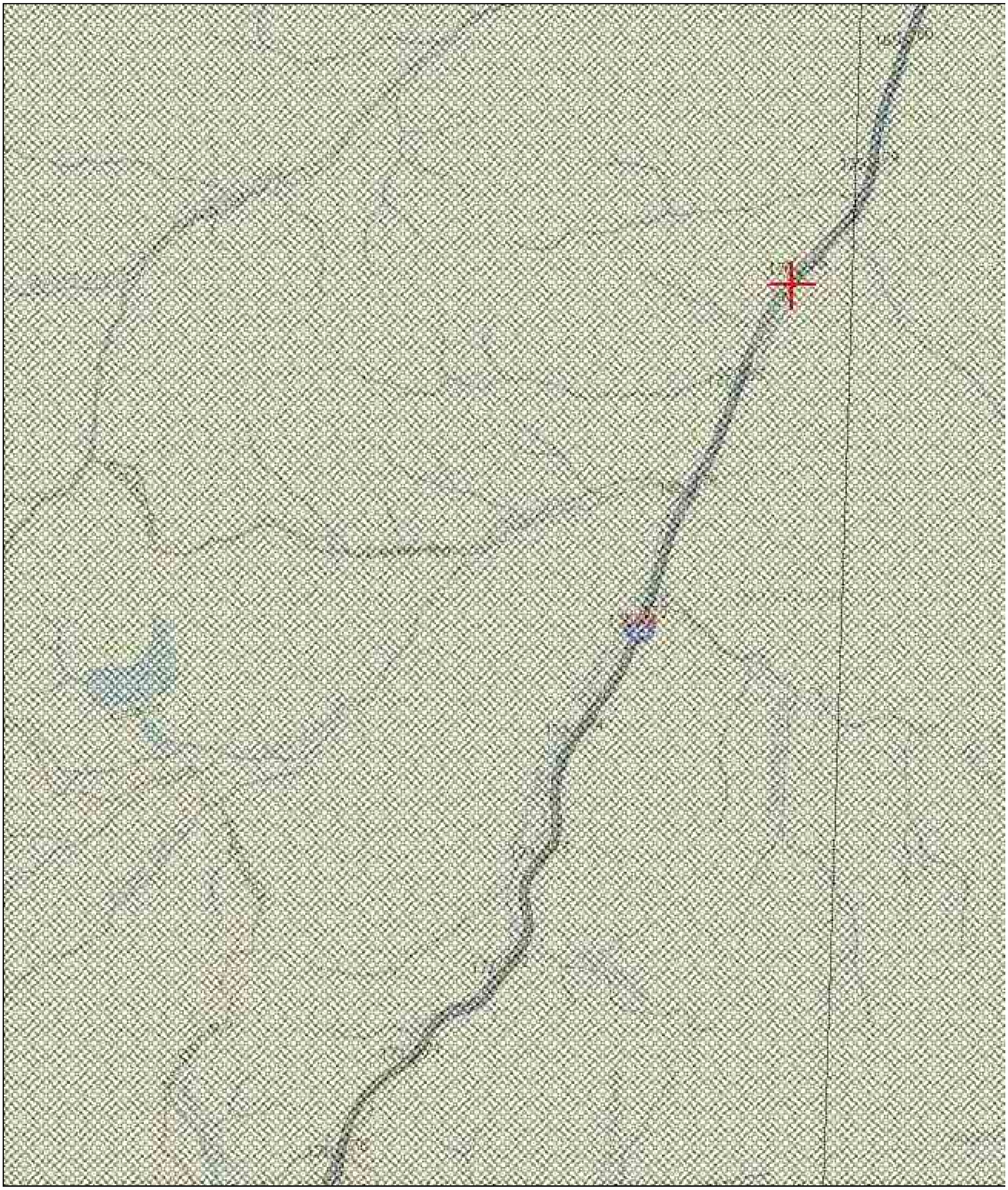
(a) Cheatgrass (*Bromus tectorum*)
(b) Hydrilla (*Hydrilla verticillata*)
(c) Russian olive (*Elaeagnus angustifolia*)
(d) Brazilian waterweed (*Egeria densa*)
(e) Parrot feather watermilfoil (*Myriophyllum aquaticum or M. brasiliense*)

Appendix M:
General Wildlife, SOC, and T&E Species

Jefferson City
Safety Rest Area Study

Montana Generalized Observations Report

Generalized Observations for ((All Mammals) and (All Birds) and (All Reptiles) and (All Amphibians) and (All Fish))



Mammals - Beaver *(Castor canadensis)*	**Obs Count**: 1	**Earliest Obs**: 1998	**Recent Obs**: 1998
Mammals - Big Brown Bat *(Eptesicus fuscus)*	**Obs Count**: 1	**Earliest Obs**: 2015	**Recent Obs**: 2015
Mammals - Black Bear *(Ursus americanus)*	**Obs Count**: 1	**Earliest Obs**: 2018	**Recent Obs**: 2018

Species	Obs Count	Earliest Obs	Recent Obs
Mammals - Bobcat *(Lynx rufus)*	**Obs Count**: 36	**Earliest Obs**:	**Recent Obs**:
Mammals - Canada Lynx *(Lynx canadensis)*	**Obs Count**: 3	**Earliest Obs**: 1994	**Recent Obs**: 1994
Mammals - Coyote *(Canis latrans)*	**Obs Count**: 3	**Earliest Obs**: 2002	**Recent Obs**: 2003
Mammals - Deer Mouse *(Peromyscus maniculatus)*	**Obs Count**: 3	**Earliest Obs**: 1980	**Recent Obs**: 1980
Mammals - Elk *(Cervus canadensis)*	**Obs Count**: 6	**Earliest Obs**: 1970	**Recent Obs**: 2014
Mammals - Golden-mantled Ground Squirrel *(Callospermophilus lateralis)*	**Obs Count**: 1	**Earliest Obs**: 2015	**Recent Obs**: 2015
Mammals - Long-eared Myotis *(Myotis evotis)*	**Obs Count**: 1	**Earliest Obs**: 1991	**Recent Obs**: 1991
Mammals - Marten *(Martes americana)*	**Obs Count**: 1	**Earliest Obs**:	**Recent Obs**:
Mammals - Masked Shrew *(Sorex cinereus)*	**Obs Count**: 3	**Earliest Obs**: 1980	**Recent Obs**: 1980
Mammals - Meadow Vole *(Microtus pennsylvanicus)*	**Obs Count**: 2	**Earliest Obs**: 1980	**Recent Obs**: 1980
Mammals - Montane Vole *(Microtus montanus)*	**Obs Count**: 3	**Earliest Obs**: 1980	**Recent Obs**: 1980
Mammals - Mountain Lion *(Puma concolor)*	**Obs Count**: 15	**Earliest Obs**: 1993	**Recent Obs**: 2000
Mammals - Mule Deer *(Odocoileus hemionus)*	**Obs Count**: 4	**Earliest Obs**: 1971	**Recent Obs**: 1977
Mammals - Northern River Otter *(Lontra canadensis)*	**Obs Count**: 3	**Earliest Obs**:	**Recent Obs**:
Mammals - Porcupine *(Erethizon dorsatum)*	**Obs Count**: 1	**Earliest Obs**: 2009	**Recent Obs**: 2009
Mammals - Red Fox *(Vulpes vulpes)*	**Obs Count**: 1	**Earliest Obs**: 1998	**Recent Obs**: 1998
Mammals - Red Squirrel *(Tamiasciurus hudsonicus)*	**Obs Count**: 19	**Earliest Obs**: 2010	**Recent Obs**: 2014
Mammals - Southern Red-backed Vole *(Myodes gapperi)*	**Obs Count**: 3	**Earliest Obs**: 1980	**Recent Obs**: 1980
Mammals - Vagrant Shrew *(Sorex vagrans)*	**Obs Count**: 3	**Earliest Obs**: 1980	**Recent Obs**: 1980
Birds - American Crow *(Corvus brachyrhynchos)*	**Obs Count**: 3	**Earliest Obs**: 2009	**Recent Obs**: 2014
Birds - American Dipper *(Cinclus mexicanus)*	**Obs Count**: 1	**Earliest Obs**: 2007	**Recent Obs**: 2007
Birds - American Goldfinch *(Spinus tristis)*	**Obs Count**: 12	**Earliest Obs**: 2005	**Recent Obs**: 2015
Birds - American Kestrel *(Falco sparverius)*	**Obs Count**: 2	**Earliest Obs**: 2007	**Recent Obs**: 2010

Birds - American Robin *(Turdus migratorius)*
Obs Count: 68 **Earliest Obs**: 1993 **Recent Obs**: 2013

Birds - American Three-toed Woodpecker *(Picoides dorsalis)*
Obs Count: 1 **Earliest Obs**: 2008 **Recent Obs**: 2008

Birds - American Tree Sparrow *(Spizelloides arborea)*
Obs Count: 2 **Earliest Obs**: 2007 **Recent Obs**: 2010

Birds - Bald Eagle *(Haliaeetus leucocephalus)*
Obs Count: 6 **Earliest Obs**: 2007 **Recent Obs**: 2013

Birds - Bank Swallow *(Riparia riparia)* **Obs Count**: 1 **Earliest Obs**: 2010 **Recent Obs**: 2010

Birds - Barn Swallow *(Hirundo rustica)* **Obs Count**: 2 **Earliest Obs**: 2008 **Recent Obs**: 2011

Birds - Belted Kingfisher *(Megaceryle alcyon)*
Obs Count: 3 **Earliest Obs**: 2007 **Recent Obs**: 2012

Birds - Black-backed Woodpecker *(Picoides arcticus)*
Obs Count: 2 **Earliest Obs**: 1996 **Recent Obs**: 2001

Birds - Black-billed Magpie *(Pica hudsonia)*
Obs Count: 2 **Earliest Obs**: 2007 **Recent Obs**: 2012

Birds - Black-capped Chickadee *(Poecile atricapillus)*
Obs Count: 22 **Earliest Obs**: 2004 **Recent Obs**: 2012

Birds - Black-chinned Hummingbird *(Archilochus alexandri)*
Obs Count: 4 **Earliest Obs**: 2007 **Recent Obs**: 2011

Birds - Black-headed Grosbeak *(Pheucticus melanocephalus)*
Obs Count: 6 **Earliest Obs**: 2002 **Recent Obs**: 2011

Birds - Blue Jay *(Cyanocitta cristata)* **Obs Count**: 5 **Earliest Obs**: 2008 **Recent Obs**: 2012

Birds - Bohemian Waxwing *(Bombycilla garrulus)*
Obs Count: 3 **Earliest Obs**: 2006 **Recent Obs**: 2009

Birds - Boreal Owl *(Aegolius funereus)* **Obs Count**: 1 **Earliest Obs**: 1998 **Recent Obs**: 1998

Birds - Brewer's Blackbird *(Euphagus cyanocephalus)*
Obs Count: 5 **Earliest Obs**: 2007 **Recent Obs**: 2011

Birds - Brown Creeper *(Certhia americana)*
Obs Count: 5 **Earliest Obs**: 1996 **Recent Obs**: 2009

Birds - Brown-headed Cowbird *(Molothrus ater)*
Obs Count: 29 **Earliest Obs**: 1994 **Recent Obs**: 2012

Birds - Bullock's Oriole *(Icterus bullockii)* **Obs Count**: 3 **Earliest Obs**: 2008 **Recent Obs**: 2011

Birds - Calliope Hummingbird *(Selasphorus calliope)*
Obs Count: 6 **Earliest Obs**: 2006 **Recent Obs**: 2011

Birds - Canada Goose *(Branta canadensis)*
Obs Count: 6 **Earliest Obs**: 2007 **Recent Obs**: 2011

Birds - Canada Jay *(Perisoreus canadensis)*
Obs Count: 9 **Earliest Obs**: 1995 **Recent Obs**: 2015

Birds - Cassin's Finch *(Haemorhous cassinii)*
Obs Count: 19 **Earliest Obs**: 2004 **Recent Obs**: 2011

⊞ **Birds - Cassin's Vireo** *(Vireo cassinii)*	**Obs Count**: 7	**Earliest Obs**: 1995	**Recent Obs**: 2013
⊞ **Birds - Cedar Waxwing** *(Bombycilla cedrorum)*	**Obs Count**: 8	**Earliest Obs**: 2007	**Recent Obs**: 2012
⊞ **Birds - Chipping Sparrow** *(Spizella passerina)*	**Obs Count**: 85	**Earliest Obs**: 1994	**Recent Obs**: 2014
⊞ **Birds - Clark's Nutcracker** *(Nucifraga columbiana)*	**Obs Count**: 35	**Earliest Obs**: 1995	**Recent Obs**: 2013
⊞ **Birds - Cliff Swallow** *(Petrochelidon pyrrhonota)*	**Obs Count**: 2	**Earliest Obs**: 2007	**Recent Obs**: 2011
⊞ **Birds - Common Grackle** *(Quiscalus quiscula)*	**Obs Count**: 5	**Earliest Obs**: 2007	**Recent Obs**: 2011
⊞ **Birds - Common Nighthawk** *(Chordeiles minor)*	**Obs Count**: 4	**Earliest Obs**: 2007	**Recent Obs**: 2011
⊞ **Birds - Common Raven** *(Corvus corax)*	**Obs Count**: 46	**Earliest Obs**: 1994	**Recent Obs**: 2014
⊞ **Birds - Common Redpoll** *(Acanthis flammea)*	**Obs Count**: 13	**Earliest Obs**: 2005	**Recent Obs**: 2012
⊞ **Birds - Common Yellowthroat** *(Geothlypis trichas)*	**Obs Count**: 7	**Earliest Obs**: 1994	**Recent Obs**: 2010
⊞ **Birds - Cooper's Hawk** *(Accipiter cooperii)*	**Obs Count**: 1	**Earliest Obs**: 1996	**Recent Obs**: 1996
⊞ **Birds - Cordilleran Flycatcher** *(Empidonax occidentalis)*	**Obs Count**: 3	**Earliest Obs**: 2014	**Recent Obs**: 2014
⊞ **Birds - Dark-eyed Junco** *(Junco hyemalis)*	**Obs Count**: 125	**Earliest Obs**: 1994	**Recent Obs**: 2014
⊞ **Birds - Dark-eyed Junco (Montana)** *(Junco hyemalis montanus)*	**Obs Count**: 2	**Earliest Obs**: 2008	**Recent Obs**: 2010
⊞ **Birds - Downy Woodpecker** *(Dryobates pubescens)*	**Obs Count**: 14	**Earliest Obs**: 2003	**Recent Obs**: 2011
⊞ **Birds - Dusky Flycatcher** *(Empidonax oberholseri)*	**Obs Count**: 73	**Earliest Obs**: 1994	**Recent Obs**: 2014
⊞ **Birds - Eastern Kingbird** *(Tyrannus tyrannus)*	**Obs Count**: 1	**Earliest Obs**: 2010	**Recent Obs**: 2010
⊞ **Birds - Eurasian Collared-Dove** *(Streptopelia decaocto)*	**Obs Count**: 3	**Earliest Obs**: 2007	**Recent Obs**: 2013
⊞ **Birds - European Starling** *(Sturnus vulgaris)*	**Obs Count**: 9	**Earliest Obs**: 1996	**Recent Obs**: 2011
⊞ **Birds - Evening Grosbeak** *(Coccothraustes vespertinus)*	**Obs Count**: 26	**Earliest Obs**: 1993	**Recent Obs**: 2014
⊞ **Birds - Ferruginous Hawk** *(Buteo regalis)*	**Obs Count**: 1	**Earliest Obs**: 2009	**Recent Obs**: 2009
⊞ **Birds - Fox Sparrow** *(Passerella iliaca)*	**Obs Count**: 1	**Earliest Obs**: 2009	**Recent Obs**: 2009
⊞ **Birds - Golden Eagle** *(Aquila chrysaetos)*	**Obs Count**: 2	**Earliest Obs**: 2009	**Recent Obs**: 2011
⊞ **Birds - Golden-crowned Kinglet** *(Regulus satrapa)*			

	Obs Count: 6	**Earliest Obs**: 1994	**Recent Obs**: 1998
Birds - Gray Catbird *(Dumetella carolinensis)*	**Obs Count**: 4	**Earliest Obs**: 2007	**Recent Obs**: 2011
Birds - Gray-crowned Rosy-Finch *(Leucosticte tephrocotis)*	**Obs Count**: 1	**Earliest Obs**: 1999	**Recent Obs**: 1999
Birds - Great Blue Heron *(Ardea herodias)*	**Obs Count**: 4	**Earliest Obs**: 2008	**Recent Obs**: 2011
Birds - Great Gray Owl *(Strix nebulosa)*	**Obs Count**: 4	**Earliest Obs**: 1992	**Recent Obs**: 2005
Birds - Great Horned Owl *(Bubo virginianus)*	**Obs Count**: 1	**Earliest Obs**: 1994	**Recent Obs**: 1994
Birds - Green-tailed Towhee *(Pipilo chlorurus)*	**Obs Count**: 7	**Earliest Obs**: 1992	**Recent Obs**: 2011
Birds - Green-winged Teal *(Anas crecca)*	**Obs Count**: 1	**Earliest Obs**: 1995	**Recent Obs**: 1995
Birds - Hairy Woodpecker *(Dryobates villosus)*	**Obs Count**: 28	**Earliest Obs**: 1993	**Recent Obs**: 2014
Birds - Hammond's Flycatcher *(Empidonax hammondii)*	**Obs Count**: 21	**Earliest Obs**: 1994	**Recent Obs**: 2013
Birds - Hermit Thrush *(Catharus guttatus)*	**Obs Count**: 23	**Earliest Obs**: 1994	**Recent Obs**: 2014
Birds - House Finch *(Haemorhous mexicanus)*	**Obs Count**: 19	**Earliest Obs**: 2004	**Recent Obs**: 2012
Birds - House Sparrow *(Passer domesticus)*	**Obs Count**: 12	**Earliest Obs**: 2005	**Recent Obs**: 2011
Birds - House Wren *(Troglodytes aedon)*	**Obs Count**: 7	**Earliest Obs**: 2007	**Recent Obs**: 2011
Birds - Killdeer *(Charadrius vociferus)*	**Obs Count**: 3	**Earliest Obs**: 2008	**Recent Obs**: 2009
Birds - Lark Sparrow *(Chondestes grammacus)*	**Obs Count**: 6	**Earliest Obs**: 2007	**Recent Obs**: 2011
Birds - Lazuli Bunting *(Passerina amoena)*	**Obs Count**: 5	**Earliest Obs**: 2007	**Recent Obs**: 2011
Birds - Lewis's Woodpecker *(Melanerpes lewis)*	**Obs Count**: 1	**Earliest Obs**: 1994	**Recent Obs**: 1994
Birds - Lincoln's Sparrow *(Melospiza lincolnii)*	**Obs Count**: 31	**Earliest Obs**: 1994	**Recent Obs**: 2012
Birds - MacGillivray's Warbler *(Geothlypis tolmiei)*	**Obs Count**: 12	**Earliest Obs**: 1994	**Recent Obs**: 2014
Birds - Mallard *(Anas platyrhynchos)*	**Obs Count**: 4	**Earliest Obs**: 2008	**Recent Obs**: 2008
Birds - Marsh Wren *(Cistothorus palustris)*	**Obs Count**: 1	**Earliest Obs**: 1991	**Recent Obs**: 1991
Birds - Merlin *(Falco columbarius)*	**Obs Count**: 4	**Earliest Obs**: 2007	**Recent Obs**: 2012
Birds - Mountain Bluebird *(Sialia currucoides)*	**Obs Count**: 17	**Earliest Obs**: 1998	**Recent Obs**: 2014
Birds - Mountain Chickadee *(Poecile gambeli)*	**Obs Count**: 97	**Earliest Obs**: 1994	**Recent Obs**: 2015

⊞ **Birds - Mourning Dove** *(Zenaida macroura)*
Obs Count: 15 **Earliest Obs**: 2007 **Recent Obs**: 2014

⊞ **Birds - Nashville Warbler** *(Oreothlypis ruficapilla)*
Obs Count: 1 **Earliest Obs**: 2010 **Recent Obs**: 2010

⊞ **Birds - Northern Flicker** *(Colaptes auratus)*
Obs Count: 35 **Earliest Obs**: 1994 **Recent Obs**: 2014

⊞ **Birds - Northern Goshawk** *(Accipiter gentilis)*
Obs Count: 12 **Earliest Obs**: 1996 **Recent Obs**: 2017

⊞ **Birds - Northern Harrier** *(Circus hudsonius)*
Obs Count: 1 **Earliest Obs**: 2008 **Recent Obs**: 2008

⊞ **Birds - Northern Pygmy-Owl** *(Glaucidium gnoma)*
Obs Count: 5 **Earliest Obs**: 2004 **Recent Obs**: 2012

⊞ **Birds - Northern Shrike** *(Lanius borealis)* **Obs Count**: 12 **Earliest Obs**: 2006 **Recent Obs**: 2011

⊞ **Birds - Olive-sided Flycatcher** *(Contopus cooperi)*
Obs Count: 18 **Earliest Obs**: 1994 **Recent Obs**: 2013

⊞ **Birds - Orange-crowned Warbler** *(Oreothlypis celata)*
Obs Count: 3 **Earliest Obs**: 1994 **Recent Obs**: 2011

⊞ **Birds - Osprey** *(Pandion haliaetus)* **Obs Count**: 2 **Earliest Obs**: 1995 **Recent Obs**: 2008

⊞ **Birds - Pacific Wren** *(Troglodytes pacificus)*
Obs Count: 3 **Earliest Obs**: 1994 **Recent Obs**: 2010

⊞ **Birds - Pileated Woodpecker** *(Dryocopus pileatus)*
Obs Count: 3 **Earliest Obs**: 2002 **Recent Obs**: 2010

⊞ **Birds - Pine Siskin** *(Spinus pinus)* **Obs Count**: 103 **Earliest Obs**: 1994 **Recent Obs**: 2014

⊞ **Birds - Pygmy Nuthatch** *(Sitta pygmaea)* **Obs Count**: 17 **Earliest Obs**: 2005 **Recent Obs**: 2012

⊞ **Birds - Red Crossbill** *(Loxia curvirostra)* **Obs Count**: 31 **Earliest Obs**: 1994 **Recent Obs**: 2012

⊞ **Birds - Red-breasted Nuthatch** *(Sitta canadensis)*
Obs Count: 86 **Earliest Obs**: 1993 **Recent Obs**: 2014

⊞ **Birds - Red-eyed Vireo** *(Vireo olivaceus)* **Obs Count**: 1 **Earliest Obs**: 2000 **Recent Obs**: 2000

⊞ **Birds - Red-naped Sapsucker** *(Sphyrapicus nuchalis)*
Obs Count: 11 **Earliest Obs**: 1994 **Recent Obs**: 2012

⊞ **Birds - Red-tailed Hawk** *(Buteo jamaicensis)*
Obs Count: 16 **Earliest Obs**: 1994 **Recent Obs**: 2011

⊞ **Birds - Red-winged Blackbird** *(Agelaius phoeniceus)*
Obs Count: 17 **Earliest Obs**: 1996 **Recent Obs**: 2012

⊞ **Birds - Ring-billed Gull** *(Larus delawarensis)*
Obs Count: 1 **Earliest Obs**: 2008 **Recent Obs**: 2008

⊞ **Birds - Rock Pigeon** *(Columba livia)* **Obs Count**: 2 **Earliest Obs**: 2011 **Recent Obs**: 2011

⊞ **Birds - Rock Wren** *(Salpinctes obsoletus)* **Obs Count**: 3 **Earliest Obs**: 2007 **Recent Obs**: 2010

⊞ **Birds - Rough-legged Hawk** *(Buteo lagopus)*
Obs Count: 1 **Earliest Obs**: 2008 **Recent Obs**: 2008

⊞ **Birds - Ruby-crowned Kinglet** *(Regulus calendula)*

	Obs Count: 112	**Earliest Obs**: 1994	**Recent Obs**: 2014
Birds - Ruffed Grouse *(Bonasa umbellus)*	**Obs Count**: 10	**Earliest Obs**: 1996	**Recent Obs**: 2014
Birds - Rufous Hummingbird *(Selasphorus rufus)*	**Obs Count**: 6	**Earliest Obs**: 2006	**Recent Obs**: 2011
Birds - Sandhill Crane *(Antigone canadensis)*	**Obs Count**: 2	**Earliest Obs**: 2009	**Recent Obs**: 2011
Birds - Savannah Sparrow *(Passerculus sandwichensis)*	**Obs Count**: 1	**Earliest Obs**: 2011	**Recent Obs**: 2011
Birds - Sharp-shinned Hawk *(Accipiter striatus)*	**Obs Count**: 8	**Earliest Obs**: 2007	**Recent Obs**: 2012
Birds - Song Sparrow *(Melospiza melodia)*	**Obs Count**: 9	**Earliest Obs**: 1996	**Recent Obs**: 2011
Birds - Spotted Sandpiper *(Actitis macularius)*	**Obs Count**: 5	**Earliest Obs**: 1995	**Recent Obs**: 2008
Birds - Spotted Towhee *(Pipilo maculatus)*	**Obs Count**: 8	**Earliest Obs**: 2004	**Recent Obs**: 2013
Birds - Steller's Jay *(Cyanocitta stelleri)*	**Obs Count**: 6	**Earliest Obs**: 2007	**Recent Obs**: 2011
Birds - Swainson's Thrush *(Catharus ustulatus)*	**Obs Count**: 49	**Earliest Obs**: 1994	**Recent Obs**: 2014
Birds - Townsend's Solitaire *(Myadestes townsendi)*	**Obs Count**: 47	**Earliest Obs**: 1994	**Recent Obs**: 2013
Birds - Townsend's Warbler *(Setophaga townsendi)*	**Obs Count**: 1	**Earliest Obs**: 1994	**Recent Obs**: 1994
Birds - Tree Swallow *(Tachycineta bicolor)*	**Obs Count**: 7	**Earliest Obs**: 1996	**Recent Obs**: 2011
Birds - Turkey Vulture *(Cathartes aura)*	**Obs Count**: 7	**Earliest Obs**: 2002	**Recent Obs**: 2011
Birds - Veery *(Catharus fuscescens)*	**Obs Count**: 3	**Earliest Obs**: 1995	**Recent Obs**: 2011
Birds - Vesper Sparrow *(Pooecetes gramineus)*	**Obs Count**: 6	**Earliest Obs**: 2007	**Recent Obs**: 2011
Birds - Violet-green Swallow *(Tachycineta thalassina)*	**Obs Count**: 5	**Earliest Obs**: 2007	**Recent Obs**: 2011
Birds - Warbling Vireo *(Vireo gilvus)*	**Obs Count**: 78	**Earliest Obs**: 1994	**Recent Obs**: 2014
Birds - Western Meadowlark *(Sturnella neglecta)*	**Obs Count**: 1	**Earliest Obs**: 2008	**Recent Obs**: 2008
Birds - Western Tanager *(Piranga ludoviciana)*	**Obs Count**: 23	**Earliest Obs**: 1994	**Recent Obs**: 2014
Birds - Western Wood-Pewee *(Contopus sordidulus)*	**Obs Count**: 7	**Earliest Obs**: 2007	**Recent Obs**: 2014
Birds - White-breasted Nuthatch *(Sitta carolinensis)*	**Obs Count**: 10	**Earliest Obs**: 2005	**Recent Obs**: 2011
Birds - White-crowned Sparrow *(Zonotrichia leucophrys)*	**Obs Count**: 14	**Earliest Obs**: 1994	**Recent Obs**: 2011

Birds - White-throated Sparrow *(Zonotrichia albicollis)*

Obs Count: 2 **Earliest Obs**: 2008 **Recent Obs**: 2009

Birds - Willow Flycatcher *(Empidonax traillii)*

Obs Count: 7 **Earliest Obs**: 1996 **Recent Obs**: 2011

Birds - Wilson's Snipe *(Gallinago delicata)*

Obs Count: 9 **Earliest Obs**: 1996 **Recent Obs**: 2010

Birds - Wilson's Warbler *(Cardellina pusilla)*

Obs Count: 15 **Earliest Obs**: 1995 **Recent Obs**: 2012

Birds - Yellow Warbler *(Setophaga petechia)*

Obs Count: 5 **Earliest Obs**: 2000 **Recent Obs**: 2015

Birds - Yellow-headed Blackbird *(Xanthocephalus xanthocephalus)*

Obs Count: 1 **Earliest Obs**: 2009 **Recent Obs**: 2009

Birds - Yellow-rumped Warbler *(Setophaga coronata)*

Obs Count: 116 **Earliest Obs**: 1994 **Recent Obs**: 2014

Birds - Yellow-rumped Warbler (Audubon's) *(Setophaga coronata auduboni)*

Obs Count: 6 **Earliest Obs**: 1993 **Recent Obs**: 2013

Birds - Yellow-rumped Warbler (Myrtle) *(Setophaga coronata coronata)*

Obs Count: 1 **Earliest Obs**: 1993 **Recent Obs**: 1993

Reptiles - Common Gartersnake *(Thamnophis sirtalis)*

Obs Count: 1 **Earliest Obs**: 1951 **Recent Obs**: 1951

Reptiles - Gophersnake *(Pituophis catenifer)*

Obs Count: 1 **Earliest Obs**: 1951 **Recent Obs**: 1951

Reptiles - Northern Rubber Boa *(Charina bottae)*

Obs Count: 1 **Earliest Obs**: 2018 **Recent Obs**: 2018

Reptiles - Painted Turtle *(Chrysemys picta)*

Obs Count: 1 **Earliest Obs**: 1995 **Recent Obs**: 1995

Reptiles - Terrestrial Gartersnake *(Thamnophis elegans)*

Obs Count: 4 **Earliest Obs**: 1951 **Recent Obs**: 2010

Amphibians - Columbia Spotted Frog *(Rana luteiventris)*

Obs Count: 33 **Earliest Obs**: 1949 **Recent Obs**: 2018

Amphibians - Long-toed Salamander *(Ambystoma macrodactylum)*

Obs Count: 12 **Earliest Obs**: 1959 **Recent Obs**: 2016

Amphibians - Western Toad *(Anaxyrus boreas)*

Obs Count: 18 **Earliest Obs**: 1996 **Recent Obs**: 2016

Fish - Arctic Grayling *(Thymallus arcticus)* **Obs Count**: 6 **Earliest Obs**: 1999 **Recent Obs**: 2018

Fish - Brook Trout *(Salvelinus fontinalis)* **Obs Count**: 192 **Earliest Obs**: 1993 **Recent Obs**: 2015

Fish - Brown Trout *(Salmo trutta)* **Obs Count**: 5 **Earliest Obs**: 2001 **Recent Obs**: 2015

Fish - Westslope Cutthroat Trout *(Oncorhynchus clarkii lewisi)*

Obs Count: 269 **Earliest Obs**: 1980 **Recent Obs**: 2015

Fish - Yellowstone Cutthroat Trout *(Oncorhynchus clarkii bouvieri)*

Obs Count: 5 **Earliest Obs**: 1999 **Recent Obs**: 2004

MONTANA Natural Heritage Program

port

Latitude	Longitude
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46.45626	-112.17311

ımals) and (All Birds) and (All Reptiles) and (All Amphibians) and (All Fish))

) to (46.45626,-112.17311)

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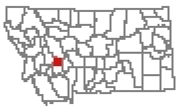
Natural Heritage Map Viewer. Montana Natural Heritage Program. Retrieved on March 29, 2019, from http://mtnhp.org/mapviewer/GenOBSReport.aspx

Report generated 3/29/2019 9:22:46 AM

Environmental Summary

MONTANA
Natural Heritage Program
1515 East 6th Avenue
Helena, MT 59620
(406) 444-0241
mtnhp.org



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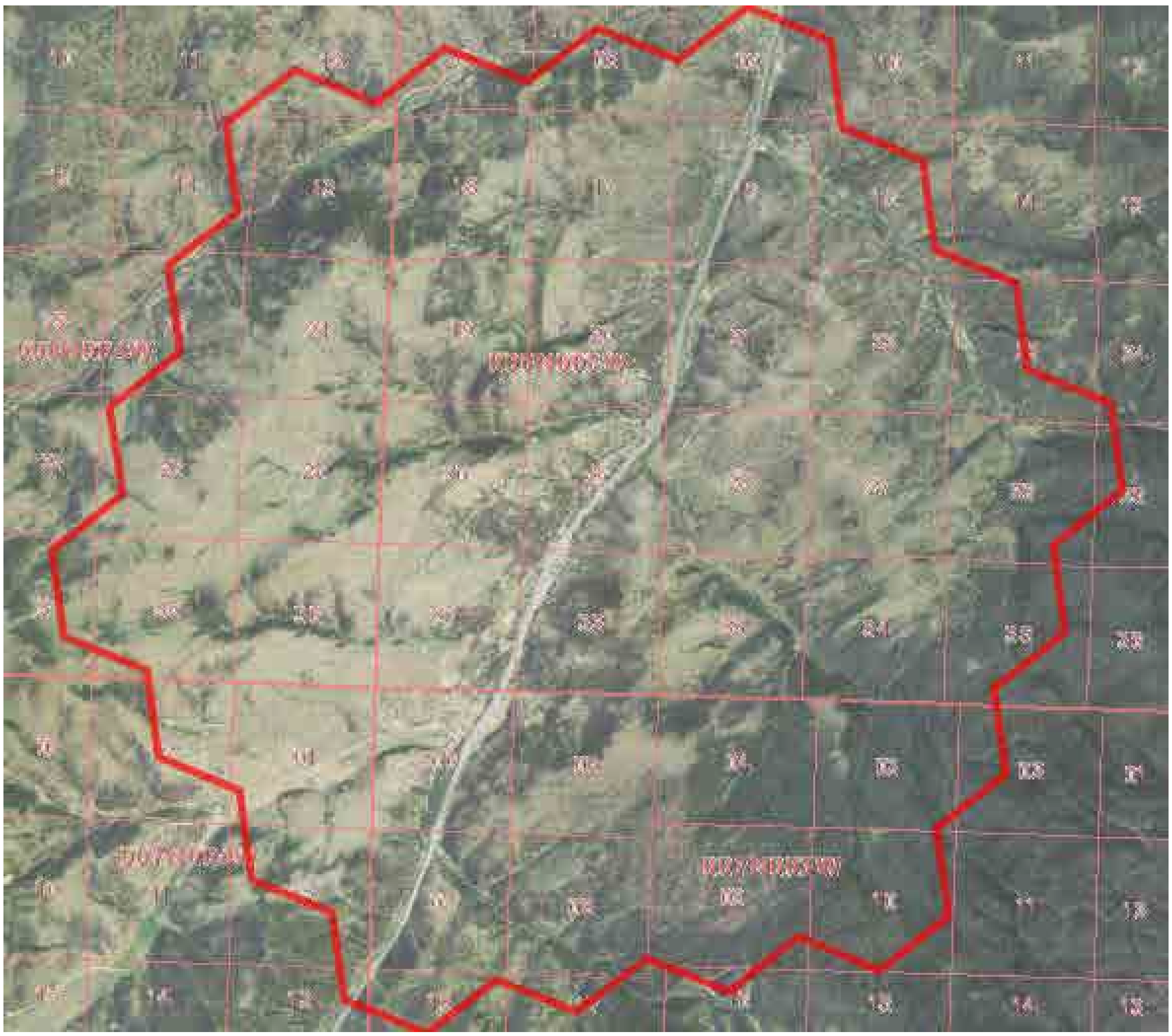
46.46513	-112.08537

Summarized by:
19prvt0137
(Custom Area of Interest)



Suggested Citation
Montana Natural Heritage Program. Environmental Summary Report.
for Latitude 46.35718 to 46.46513 and Longitude -111.93297 to -112.08537. Retrieved on 3/29/2019.

The Montana Natural Heritage Program is a program of the Montana State Library's Natural Resource Information System. It is operated as a special program under the Office of the Vice President for Research and Creative Scholarship at the University of Montana, Missoula.

The Montana Natural Heritage Program is part of NatureServe – a network of over 80 similar programs in states, provinces and nations throughout the Western Hemisphere, working to provide comprehensive status and distribution information for species and ecosystems.

Table of Contents

Introduction to Environmental Summary Report

The Environmental Summary report for your area of interest consists of introductory and related materials in this PDF and an Excel workbook with worksheets summarizing information managed in the Montana Natural Heritage Program's (MTNHP) databases for: (1) species occurrences; (2) other observed species without Species Occurrences; (3) other species potentially present based on their range, presence of associated habitats, or predictive distribution model output if available; (4) structured surveys (organized efforts following a protocol capable of detecting one or more species); (5) land cover mapped as ecological systems; (6) wetland and riparian mapping; (7) land management categories; and (8) biological reports associated with plant and animal observations. In order to do this in a consistent manner across Montana and allow for rapid delivery of summaries, we have intersected this information with a uniform grid of hexagons that have been used for planning efforts across the western United States (e.g. Western Association of Fish and Wildlife Agencies - Crucial Habitat Assessment Tool). Each hexagon is one square mile in area and approximately one kilometer in length on each side. Summary information for each data layer is then stored with each hexagon and those summaries are added up to an overall summary for the report area you have requested. Users should be aware that summaries do not correspond to the exact boundaries of the polygon they have specified, but instead are a summary across all hexagons intersected by the polygon they specified.

In presenting this information, MTNHP is working towards assisting the user with rapidly assessing the known or potential species and biological communities, land management categories, and biological reports associated with the report area. We remind users that this information is likely incomplete and may be inaccurate as surveys to document species are lacking in many areas of the state, species' range polygons often include regions of unsuitable habitat, methods of predicting the presence of species or communities are constantly improving, and information is constantly being added and updated in our databases. **Field verification by professional biologists of the absence or presence of species and biological communities in a report area will always be an important obligation of users of our data. Users are encouraged to only use this environmental summary report as a starting point for more in depth analyses and are encouraged to contact state, federal, and tribal resource management agencies for additional data or management guidelines relevant to your efforts. Please see the Appendix for introductory materials to each section of the report, additional information resources, and a list of relevant agency contacts.**

MONTANA Natural Heritage Program

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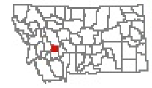
Native Species

Legend

Model Icons	Habitat Icons	Range Icons	Num Obs
N Suitable (native range)	C Common	I Introduced	Count of obs with 'good precision' (<=1000m)
O Optimal Suitability	O Occasional	Y Year-round	+ indicates additional 'poor precision' obs (1001m-10,000m)
M Moderate Suitability		S Summer	
L Low Suitability		W Winter	
I Suitable (introduced range)		M Migratory	
		H Historic	



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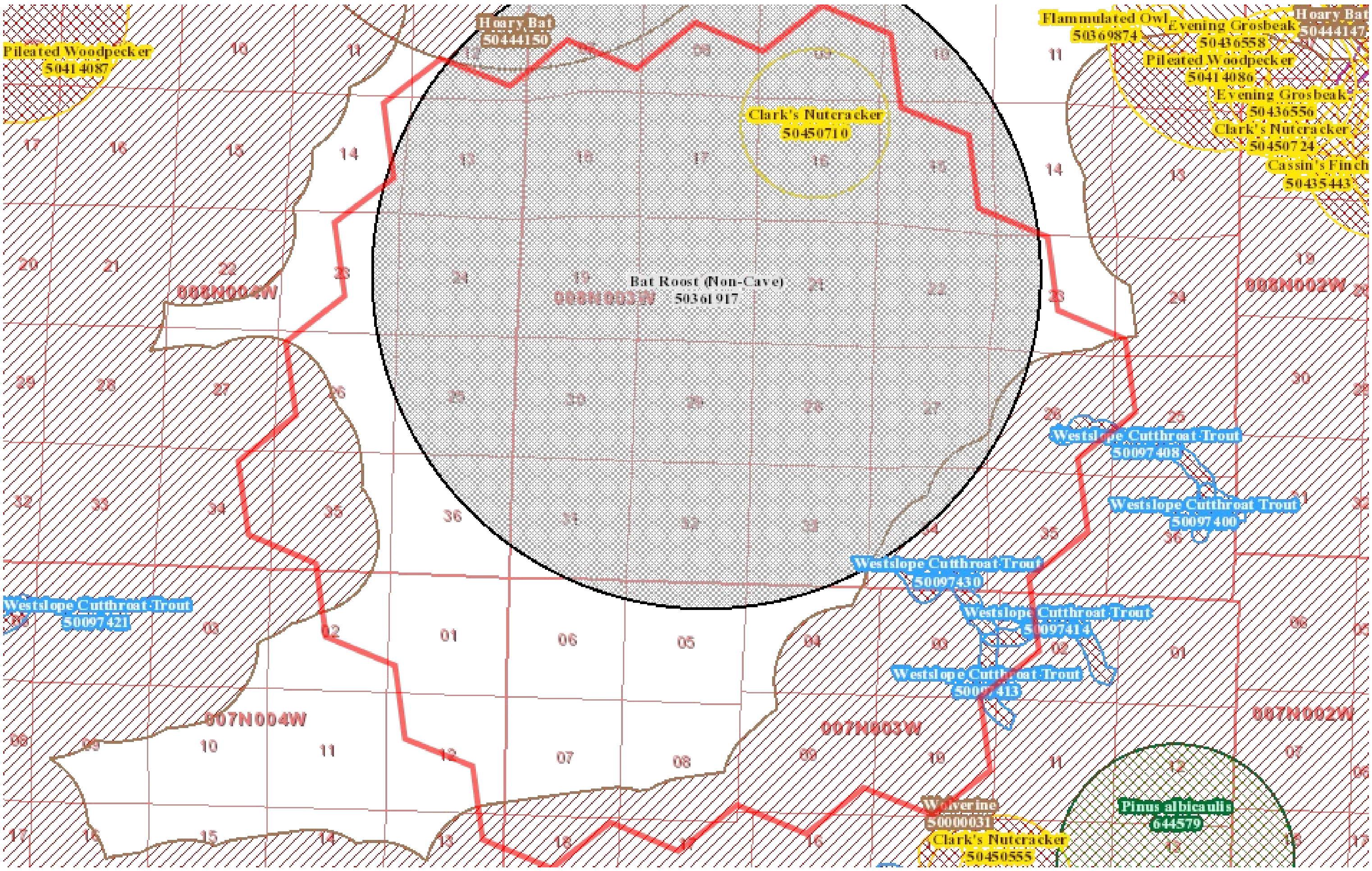
46.46513	-112.08537

Summarized by: **19prvt0137** *(Custom Area of Interest)*

Filtered by:

MT_Status='Species of Concern', 'Special Status', 'Important Animal Habitat', 'Potential SOC'



Species Occurrences

	USFWS Sec7	# SO	# Obs	Predictive Model	Associated Habitat	Range
F - Westslope Cutthroat Trout *(Oncorhynchus clarkii lewisi)* SOC		4	22 +		Not Assigned	Y H

View in Field Guide   **View Predicted Models**   **View Range Maps**

Species of Concern - Native Species   Global: **G4T4**   State: **S2**   USFS: **Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)**
BLM: **SENSITIVE**   FWP SWAP: **SGCN2**

Delineation Criteria Stream reaches and standing water bodies where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters, standing water bodies greater than 1 acre are buffered 50 meters, and standing water bodies less than 1 acre are buffered 30 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards. (Last Updated: Mar 30, 2018)

Predictive Models: N 8% Suitable (native range) (deductive)

	USFWS Sec7	# SO	# Obs	Predictive Model	Associated Habitat	Range
B - Clark's Nutcracker *(Nucifraga columbiana)* SOC		1	18 +			Y

View in Field Guide   **View Predicted Models**   **View Associated Habitat**   **View Range Maps**

Species of Concern - Native Species   Global: **G5**   State: **S3**   USFWS: **MBTA**   USFS: **Species of Conservation Concern on Forests (FLAT)**
FWP SWAP: **SGCN3**   PIF: **3**

Delineation Criteria Observations with direct evidence of breeding activity or indirect evidence of breeding activity between early March and mid-July within forested habitats containing Whitebark Pine (Pinus albicaulis), Limber Pine (Pinus flexilis), or Ponderosa Pine (Pinus ponderosa). Observations are buffered by a minimum distance of 1,000 meters in order to encompass the spring/summer breeding territory size reported for the species or the locational uncertainy of the observation to a maximum distance of 10,000 meters. (Last Updated: Oct 19, 2018)

Predictive Models: M 86% Moderate (inductive), L 14% Low (inductive)   **Associated Habitats:** C 49% Common

M - Hoary Bat *(Lasiurus cinereus)* SOC 1

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**

Species of Concern - Native Species Global: **G3G4** State: **S3** FWP SWAP: **SGCN3**

Delineation Criteria Confirmed area of occupancy based on the documented presence (mistnet captures, definitively identified acoustic recordings, and definitively identified roosting individuals) of adults or juveniles during the active season. Point observation location is buffered by a minimum distance of 3,500 meters in order to be conservative about encompassing the maximum reported foraging distance for the congeneric Lasiurus borealis and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Oct 18, 2018)

Predictive Models: M 27% Moderate (inductive), L 73% Low (inductive) **Associated Habitats:** C 91% Common, O 7% Occasional

M - Wolverine *(Gulo gulo)* SOC 7 1 Y

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**

Species of Concern - Native Species Global: **G4** State: **S3** USFWS: **P** USFS: **Proposed on Forests (BD, BRT, CG, HLC, KOOT, LOLO)** BLM: **SENSITIVE** FWP SWAP: **SGCN3**

Delineation Criteria Confirmed area of occupancy supported by recent (post-1980), nearby (within 10 kilometers) observations of adults or juveniles. Tracking regions were defined by areas of primary habitat and adjacent female dispersal habitat as modeled by Inman et al. (2013). These regions were buffered by 1 kilometer in order to link smaller areas and account for potential inaccuracies in independent variables used in the model. (Last Updated: Sep 03, 2014)

Predictive Models: L 43% Low (inductive) **Associated Habitats:** C 22% Common, O 24% Occasional

O - Bat Roost (Non-Cave) *(Bat Roost (Non-Cave))* IAH 1 Not Available Not Assigned

View in Field Guide

Important Animal Habitat - Native Species Global: **GNR** State: **SNR**

Delineation Criteria Confirmed area of occupancy based on the documented presence of adults or juveniles of any bat species at non-cave natural roost sites (e.g. rock outcrops, trees), below ground human created roost sites (e.g. mines), and above ground human created roost sites (e.g., bridges, buildings). Point observation locations are buffered by a distance of 4,500 meters in order to encompass the 95% confidence interval for nightly foraging distance reported for Townsendâ€™s Big-eared Bat (a resident Montana bat Species of Concern) and otherwise by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Sep 05, 2017)

Montana Natural Heritage Program

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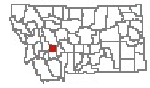
Legend

Model Icons	Habitat Icons	Range Icons	Num Obs
N Suitable (native range)	C Common	I Introduced	Count of obs with 'good precision' (<=1000m)
O Optimal Suitability	O Occasional	Y Year-round	**+** indicates additional 'poor precision' obs (1001m-10,000m)
M Moderate Suitability		S Summer	
L Low Suitability		W Winter	
I Suitable (introduced range)		M Migratory	
		H Historic	



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Native Species

Summarized by: **19prvt0137** *(Custom Area of Interest)*
Filtered by:
MT_Status='Species of Concern', 'Special Status', 'Important Animal Habitat', 'Potential SOC'

Other Observed Species

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Veery *(Catharus fuscescens)* SOC		1			S M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: O 8% Optimal (inductive), M 68% Moderate (inductive), L 24% Low (inductive)
Associated Habitats: C 5% Common, O 14% Occasional

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Northern Goshawk *(Accipiter gentilis)* SOC		2			Y WM

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: O 8% Optimal (inductive), M 24% Moderate (inductive), L 54% Low (inductive)
Associated Habitats: C 40% Common, O 5% Occasional

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
M - Porcupine *(Erethizon dorsatum)* PSOC		1			Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4** FWP SWAP: **SGIN**
Predictive Models: M 95% Moderate (inductive), L 5% Low (inductive) **Associated Habitats:** C 93% Common

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Evening Grosbeak *(Coccothraustes vespertinus)* SOC		16			Y W

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3**
Predictive Models: M 54% Moderate (inductive), L 46% Low (inductive) **Associated Habitats:** C 51% Common, O 1% Occasional

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Cassin's Finch *(Haemorhous cassinii)* SOC		8			Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA; BCC10** FWP SWAP: **SGCN3** PIF: **3**
Predictive Models: M 54% Moderate (inductive), L 46% Low (inductive) **Associated Habitats:** C 45% Common

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Green-tailed Towhee *(Pipilo chlorurus)* SOC		5			S M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**
Predictive Models: M 27% Moderate (inductive), L 73% Low (inductive) **Associated Habitats:** C 65% Common, O 21% Occasional

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Rufous Hummingbird *(Selasphorus rufus)* PSOC		6			S M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4B** USFWS: **MBTA** PIF: **3**
Predictive Models: M 22% Moderate (inductive), L 78% Low (inductive) **Associated Habitats:** C 67% Common, O 22% Occasional

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Bald Eagle *(Haliaeetus leucocephalus)* SSS		5			Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Special Status Species - Native Species Global: **G5** State: **S4** USFWS: **DM; BGEPA; MBTA; BCC10; BCC11; BCC17**
USFS: **Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)** BLM: **SENSITIVE** PIF: **2**
Predictive Models: M 19% Moderate (inductive), L 46% Low (inductive) **Associated Habitats:** C 38% Common, O 21% Occasional

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Brown Creeper *(Certhia americana)* SOC		2			Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **1**
Predictive Models: M 16% Moderate (inductive), L 68% Low (inductive) **Associated Habitats:** C 44% Common, O 1% Occasional

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Great Blue Heron *(Ardea herodias)* SOC		3			YS M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3**
Predictive Models: M 11% Moderate (inductive), L 59% Low (inductive) **Associated Habitats:** C 5% Common

	USFWS Sec7	# Obs	Predictive Model	Associated Habitat	Range
B - Golden Eagle *(Aquila chrysaetos)* SOC		2 +			Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **BGEPA; MBTA; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3**
Predictive Models: L 86% Low (inductive) **Associated Habitats:** C 70% Common

M - Canada Lynx *(Lynx canadensis)* SOC 7 +

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **LT; CH** USFS: **Threatened on Forests (BD, BRT) Threatened, Critical Habitat on Forests (CG, HLC, KOOT, LOLO)** BLM: **THREATENED** FWP SWAP: **SGCN3**
Predictive Models: L 76% Low (inductive) **Associated Habitats:** C 26% Common, O 23% Occasional

B - Ferruginous Hawk *(Buteo regalis)* SOC 1 S M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA; BCC10; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: L 43% Low (inductive) **Associated Habitats:** C 45% Common

B - Pacific Wren *(Troglodytes pacificus)* SOC 2 Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: L 22% Low (inductive) **Associated Habitats:** C 26% Common, O 18% Occasional

B - Short-eared Owl *(Asio flammeus)* PSOC 1 Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4** USFWS: **MBTA; BCC11; BCC17** PIF: **3**
Associated Habitats: C 50% Common, O 21% Occasional

B - American White Pelican *(Pelecanus erythrorhynchos)* SOC + Not Available M

View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**
Associated Habitats: C 1% Common

I - Agapetus montanus *(An Agapetus Caddisfly)* PSOC 1 + Not Available Not Assigned Y

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G3** State: **S3**

Montana Natural Heritage Program

Aprogram of the **Montana State Library's Natural Resource Information System** operated by the **University of Montana**.

Native Species

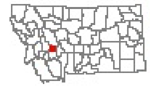
Legend

Model Icons
N Suitable (native range)
O Optimal Suitability
M Moderate Suitability
L Low Suitability
I Suitable (introduced range)

Habitat Icons
C Common
O Occasional

Range Icons
I Introduced
Y Year-round
S Summer
W Winter
M Migratory
H Historic

Num Obs
Count of obs with 'good precision' (<=1000m)
+ indicates additional 'poor precision' obs (1001m-10,000m)



Latitude	Longitude
46.35718	-111.93297
46.46513	-112.08537

Summarized by: **19prvt0137** *(Custom Area of Interest)*
Filtered by:
MT_Status='Species of Concern', 'Special Status', 'Important Animal Habitat', 'Potential SOC'

Other Potential Species

USFWS Sec7 | Predictive Model | Associated Habitat | Range

M - Dwarf Shrew *(Sorex nanus)* SOC — Range: Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S2S3** FWP SWAP: **SGCN2-3**
Predictive Models: O 24% Optimal (inductive), M 73% Moderate (inductive), L 3% Low (inductive)
Associated Habitats: C 23% Common, O 27% Occasional

M - Preble's Shrew *(Sorex preblei)* SOC — Range: Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3** FWP SWAP: **SGCN3**
Predictive Models: M 100% Moderate (inductive) **Associated Habitats:** C 67% Common, O 4% Occasional

M - Silver-haired Bat *(Lasionycteris noctivagans)* PSOC — Range: Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G3G4** State: **S4**
Predictive Models: M 51% Moderate (inductive), L 49% Low (inductive) **Associated Habitats:** C 91% Common, O 4% Occasional

M - Little Brown Myotis *(Myotis lucifugus)* SOC — Range: Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G3** State: **S3** FWP SWAP: **SGCN3**
Predictive Models: M 32% Moderate (inductive), L 68% Low (inductive) **Associated Habitats:** C 95% Common, O 5% Occasional

B - Flammulated Owl *(Psiloscops flammeolus)* SOC — Range: S M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA; BCC10**
USFS: **Sensitive - Known on Forests (BD, BRT, HLC, KOOT, LOLO)**
Sensitive - Suspected on Forests (CG)
Species of Conservation Concern on Forests (FLAT) BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **1**
Predictive Models: M 32% Moderate (inductive), L 68% Low (inductive) **Associated Habitats:** C 39% Common, O 5% Occasional

B - Pileated Woodpecker *(Dryocopus pileatus)* SOC — Range: Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: M 27% Moderate (inductive), L 70% Low (inductive) **Associated Habitats:** C 30% Common, O 15% Occasional

B - Common Poorwill *(Phalaenoptilus nuttallii)* PSOC — Range: S M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4B** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **3**
Predictive Models: M 22% Moderate (inductive), L 43% Low (inductive) **Associated Habitats:** C 61% Common, O 21% Occasional

V - Utricularia intermedia *(Flatleaf Bladderwort)* SOC — Associated Habitat: Not Assigned — Range: Y

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S2** USFS: **Sensitive - Known on Forests (KOOT)** MNPS: **3**
Predictive Models: M 22% Moderate (inductive), L 43% Low (inductive)

M - Townsend's Big-eared Bat *(Corynorhinus townsendii)* SOC — Range: Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3** USFS: **Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)**
BLM: **SENSITIVE** FWP SWAP: **SGCN3**
Predictive Models: M 19% Moderate (inductive), L 81% Low (inductive) **Associated Habitats:** C 89% Common, O 5% Occasional

B - Ovenbird *(Seiurus aurocapilla)* PSOC — Range: S M

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4B** USFWS: **MBTA** PIF: **3**
Predictive Models: M 16% Moderate (inductive), L 54% Low (inductive) **Associated Habitats:** C 8% Common, O 1% Occasional

M - Fringed Myotis *(Myotis thysanodes)* SOC — Range: Y

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S3** BLM: **SENSITIVE** FWP SWAP: **SGCN3**
Predictive Models: M 8% Moderate (inductive), L 92% Low (inductive) **Associated Habitats:** C 89% Common, O 8% Occasional

B - Hooded Merganser *(Lophodytes cucullatus)* PSOC Y M

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Potential Species of Concern - Native Species Global: **G5** State: **S4** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **2**
Predictive Models: M 8% Moderate (inductive), L 22% Low (inductive) **Associated Habitats:** C 5% Common

B - Western Screech-Owl *(Megascops kennicottii)* PSOC Y

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Potential Species of Concern - Native Species Global: **G4G5** State: **S3S4** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **3**
Predictive Models: M 3% Moderate (inductive), L 97% Low (inductive) **Associated Habitats:** C 42% Common, O 1% Occasional

M - Western Spotted Skunk *(Spilogale gracilis)* PSOC Y

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Potential Species of Concern - Native Species Global: **G5** State: **SU** FWP SWAP: **SGIN**
Predictive Models: M 3% Moderate (inductive), L 68% Low (inductive) **Associated Habitats:** C 80% Common, O 4% Occasional

A - Western Toad *(Anaxyrus boreas)* SOC Y

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S2** USFS: **Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)**
BLM: **SENSITIVE** FWP SWAP: **SGCN2**
Predictive Models: L 100% Low (inductive) **Associated Habitats:** C 67% Common, O 23% Occasional

B - Lewis's Woodpecker *(Melanerpes lewis)* SOC S M

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S2B** USFWS: **MBTA; BCC10; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN2** PIF: **2**
Predictive Models: L 100% Low (inductive) **Associated Habitats:** C 27% Common, O 18% Occasional

B - Barrow's Goldeneye *(Bucephala islandica)* PSOC Y WM

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Potential Species of Concern - Native Species Global: **G5** State: **S4** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **2**
Predictive Models: L 97% Low (inductive) **Associated Habitats:** C 5% Common

B - Great Gray Owl *(Strix nebulosa)* SOC Y

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3, SGIN** PIF: **3**
Predictive Models: L 70% Low (inductive) **Associated Habitats:** C 27% Common, O 19% Occasional

B - Brewer's Sparrow *(Spizella breweri)* SOC S M

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC10; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: L 65% Low (inductive) **Associated Habitats:** C 23% Common

V - Adoxa moschatellina *(Musk-root)* SOC Not Assigned Y

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3** USFS: **Sensitive - Known on Forests (BD, CG, LOLO)**
Predictive Models: L 59% Low (inductive)

V - Eleocharis rostellata *(Beaked Spikerush)* SOC Not Assigned Y

View in Field Guide **View Predicted Models** **View Range Maps**
USFS: **Sensitive - Known on Forests (BD, CG, HLC)**
Species of Concern - Native Species Global: **G5** State: **S3** **Species of Conservation Concern on Forests (FLAT)** MNPS: **3**
Predictive Models: L 51% Low (inductive)

B - Bobolink *(Dolichonyx oryzivorus)* SOC S M

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**
Predictive Models: L 43% Low (inductive) **Associated Habitats:** C 23% Common

M - Spotted Bat *(Euderma maculatum)* SOC S M

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S3** USFS: **Sensitive - Known on Forests (BD, CG)** BLM: **SENSITIVE**
FWP SWAP: **SGCN3, SGIN**
Predictive Models: L 35% Low (inductive) **Associated Habitats:** C 51% Common, O 37% Occasional

B - Sage Thrasher *(Oreoscoptes montanus)* SOC S M

View in Field Guide **View Predicted Models** **View Associated Habitat** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA; BCC10; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **3**
Predictive Models: L 35% Low (inductive) **Associated Habitats:** C 23% Common

B - Peregrine Falcon *(Falco peregrinus)* SOC Y

View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3** USFWS: **DM; MBTA; BCC10; BCC11; BCC17**
USFS: **Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: L 24% Low (inductive) **Associated Habitats:** C 42% Common, O 22% Occasional

B - Long-billed Curlew *(Numenius americanus)* SOC S M
View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC10; BCC11; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Predictive Models: L 24% Low (inductive) **Associated Habitats:** C 18% Common, O 24% Occasional

B - Yellow-billed Cuckoo *(Coccyzus americanus)* SOC S M
View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **PS: LT; MBTA; BCC10** USFS: **Threatened on Forests (BRT, LOLO)**
BLM: **SENSITIVE** FWP SWAP: **SGCN3, SGIN** PIF: **2**
Predictive Models: L 22% Low (inductive) **Associated Habitats:** C 5% Common

V - Trichophorum cespitosum *(Tufted Club-rush)* SOC Y
View in Field Guide View Predicted Models View Associated Habitat View Range Maps
USFS: **Sensitive - Known on Forests (BD, HLC, KOOT)**
Species of Concern - Native Species Global: **G5** State: **S2** **Species of Conservation Concern on Forests (FLAT)** MNPS: **3**
Predictive Models: L 19% Low (inductive) **Associated Habitats:** C 1% Common

B - Meesia triquetra *(Meesia Moss)* SOC Not Assigned Y
View in Field Guide View Predicted Models View Range Maps
USFS: **Sensitive - Known on Forests (BRT, CG, KOOT)**
Sensitive - Suspected on Forests (LOLO)
Species of Concern - Native Species Global: **G5** State: **S2** **Species of Conservation Concern on Forests (FLAT)**
Predictive Models: L 14% Low (inductive)

M - Water Vole *(Microtus richardsoni)* PSOC Y
View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4**
Predictive Models: L 11% Low (inductive) **Associated Habitats:** C 18% Common, O 4% Occasional

B - Varied Thrush *(Ixoreus naevius)* SOC S M
View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**
Predictive Models: L 8% Low (inductive) **Associated Habitats:** C 29% Common, O 4% Occasional

B - Black-billed Cuckoo *(Coccyzus erythropthalmus)* SOC S M
View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC11; BCC17** FWP SWAP: **SGCN3, SGIN** PIF: **2**
Predictive Models: L 5% Low (inductive) **Associated Habitats:** C 23% Common

B - Sprague's Pipit *(Anthus spragueii)* SOC 7 S M
View in Field Guide View Predicted Models View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G3G4** State: **S3B** USFWS: **MBTA; BCC11; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **1**
Predictive Models: L 5% Low (inductive) **Associated Habitats:** O 18% Occasional

M - Grizzly Bear *(Ursus arctos)* SOC 7 Not Available Y H
View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S2S3** USFWS: **PS: LT; XN; DM** USFS: **Threatened on Forests (BD, CG, HLC, KOOT, LOLO)**
BLM: **THREATENED** FWP SWAP: **SGCN2-3**
Associated Habitats: C 67% Common, O 23% Occasional

M - Bison *(Bos bison)* SOC Not Available H
View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S2** FWP SWAP: **SGCN2**
Associated Habitats: C 64% Common, O 1% Occasional

B - Sharp-tailed Grouse *(Tympanuchus phasianellus)* SOC Not Available Y
View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **SX,S4** FWP SWAP: **SGCN1** PIF: **2**
Associated Habitats: C 61% Common, O 5% Occasional

B - Loggerhead Shrike *(Lanius ludovicianus)* SOC Not Available S M
View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA; BCC10; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Associated Habitats: C 46% Common, O 1% Occasional

B - Black-backed Woodpecker *(Picoides arcticus)* SOC Not Available Y
View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA**
USFS: **Sensitive - Known on Forests (BD, BRT, CG, HLC, KOOT, LOLO)** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **1**
Associated Habitats: C 44% Common

I - Polygonia progne *(Gray Comma)* SOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G5**   State: **S2**

Associated Habitats: C 29% Common

R - Greater Short-horned Lizard *(Phrynosoma hernandesi)* SOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G5**   State: **S3**   USFS: **Sensitive - Known on Forests (CG) Sensitive - Suspected on Forests (HLC)**   BLM: **SENSITIVE**
FWP SWAP: **SGCN3, SGIN**

Associated Habitats: C 24% Common, O 18% Occasional

B - Pinyon Jay *(Gymnorhinus cyanocephalus)* SOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G5**   State: **S3**   USFWS: **MBTA; BCC17**   FWP SWAP: **SGCN3**

Associated Habitats: C 24% Common, O 4% Occasional

B - Burrowing Owl *(Athene cunicularia)* SOC — Not Available — S M

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G4**   State: **S3B**   USFWS: **MBTA; BCC17**   USFS: **Sensitive - Known on Forests (CG) Sensitive - Suspected on Forests (HLC)**   BLM: **SENSITIVE**
FWP SWAP: **SGCN3**   PIF: **1**

Associated Habitats: C 23% Common, O 21% Occasional

B - Greater Sage-Grouse *(Centrocercus urophasianus)* SOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G3G4**   State: **S2**   USFS: **Sensitive - Known on Forests (BD) Sensitive - Suspected on Forests (CG, HLC)**   BLM: **SENSITIVE**
FWP SWAP: **SGCN2**   PIF: **1**

Associated Habitats: C 23% Common

B - Boreal Owl *(Aegolius funereus)* PSOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Potential Species of Concern - Native Species   Global: **G5**   State: **S3S4**   USFWS: **MBTA**   FWP SWAP: **SGIN**   PIF: **3**

Associated Habitats: C 22% Common, O 5% Occasional

B - McCown's Longspur *(Rhynchophanes mccownii)* SOC — Not Available — S M

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G4**   State: **S3B**   USFWS: **MBTA; BCC10; BCC11; BCC17**   BLM: **SENSITIVE**   FWP SWAP: **SGCN3**   PIF: **2**

Associated Habitats: O 22% Occasional

V - Phlox kelseyi var. missoulensis *(Missoula Phlox)* SOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G3**   State: **S3**   USFS: **Sensitive - Known on Forests (BD, HLC) Sensitive - Suspected on Forests (LOLO)**   MNPS: **2**

Associated Habitats: C 18% Common

B - Northern Hawk Owl *(Surnia ulula)* SOC — Not Available — W M

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G5**   State: **S3**   USFWS: **MBTA**   FWP SWAP: **SGCN3, SGIN**

Associated Habitats: C 12% Common, O 4% Occasional

I - Euphydryas gillettii *(Gillette's Checkerspot)* SOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G3**   State: **S2**

Associated Habitats: C 8% Common, O 22% Occasional

M - Black-tailed Prairie Dog *(Cynomys ludovicianus)* SOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G4**   State: **S3**   USFS: **Sensitive - Known on Forests (CG)**   BLM: **SENSITIVE**   FWP SWAP: **SGCN3**

Associated Habitats: C 5% Common, O 41% Occasional

B - Mountain Plover *(Charadrius montanus)* SOC — Not Available — S M

View in Field Guide | View Associated Habitat | View Range Maps

Species of Concern - Native Species   Global: **G3**   State: **S2B**   USFWS: **MBTA; BCC11; BCC17**   BLM: **SENSITIVE**   FWP SWAP: **SGCN2**   PIF: **1**

Associated Habitats: C 5% Common, O 18% Occasional

I - Argia alberta *(Paiute Dancer)* PSOC — Not Available — Y

View in Field Guide | View Associated Habitat | View Range Maps

Potential Species of Concern - Native Species   Global: **G4**   State: **S2S3**

Associated Habitats: O 5% Occasional

I - Somatochlora minor *(Ocellated Emerald)* PSOC — Not Available — Y

View in Field Guide   View Associated Habitat   View Range Maps
Potential Species of Concern - Native Species   Global: **G5**   State: **S2S4**
Associated Habitats: O 5% Occasional

B - American Bittern *(Botaurus lentiginosus)* SOC   Not Available   S M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G5**   State: **S3B**   USFWS: **MBTA; BCC11; BCC17**   BLM: **SENSITIVE**   FWP SWAP: **SGCN3**   PIF: **3**
Associated Habitats: C 5% Common

B - Common Tern *(Sterna hirundo)* SOC   Not Available   S M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G5**   State: **S3B**   USFWS: **MBTA**   BLM: **SENSITIVE**   FWP SWAP: **SGCN3**   PIF: **2**
Associated Habitats: C 5% Common

B - Harlequin Duck *(Histrionicus histrionicus)* SOC   Not Available   S M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G4**   State: **S2B**   USFWS: **MBTA**   USFS: **Sensitive - Known on Forests (BD, CG, HLC, KOOT, LOLO)**
FWP SWAP: **SGCN2**   PIF: **1**
Associated Habitats: C 5% Common

B - White-faced Ibis *(Plegadis chihi)* SOC   Not Available   S M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G5**   State: **S3B**   USFWS: **MBTA**   BLM: **SENSITIVE**   FWP SWAP: **SGCN3**   PIF: **2**
Associated Habitats: C 5% Common

B - Black-crowned Night-Heron *(Nycticorax nycticorax)* SOC   Not Available   M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G5**   State: **S3B**   USFWS: **MBTA**   FWP SWAP: **SGCN3**   PIF: **3**
Associated Habitats: C 5% Common

B - Caspian Tern *(Hydroprogne caspia)* SOC   Not Available   M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G5**   State: **S2B**   USFWS: **MBTA**   BLM: **SENSITIVE**   FWP SWAP: **SGCN2**   PIF: **2**
Associated Habitats: O 5% Occasional

B - Tennessee Warbler *(Oreothlypis peregrina)* PSOC   Not Available   M

View in Field Guide   View Associated Habitat   View Range Maps
Potential Species of Concern - Native Species   Global: **G5**   State: **S3S4B**   USFWS: **MBTA**
Associated Habitats: C 5% Common

B - Trumpeter Swan *(Cygnus buccinator)* SOC   Not Available   M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G4**   State: **S3**   USFWS: **MBTA**   USFS: **Sensitive - Known on Forests (BD, CG)**   BLM: **SENSITIVE**
FWP SWAP: **SGCN3**   PIF: **1**
Associated Habitats: C 5% Common

M - Black-footed Ferret *(Mustela nigripes)* SOC   Not Available   H

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G1**   State: **S1**   USFWS: **LE; XN**   USFS: **Endangered, Experimental Nonessential on Forests (CG)**
BLM: **ENDANGERED**   FWP SWAP: **SGCN1**
Associated Habitats: C 5% Common

I - Colias gigantea *(Giant Sulphur)* PSOC   Not Available   Y

View in Field Guide   View Associated Habitat   View Range Maps
Potential Species of Concern - Native Species   Global: **G5**   State: **S3**
Associated Habitats: C 3% Common, O 5% Occasional

I - Argia vivida *(Vivid Dancer)* PSOC   Not Available   Y

View in Field Guide   View Associated Habitat   View Range Maps
Potential Species of Concern - Native Species   Global: **G5**   State: **S3S5**
Associated Habitats: C 1% Common, O 5% Occasional

I - Libellula saturata *(Flame Skimmer)* PSOC   Not Available   Y

View in Field Guide   View Associated Habitat   View Range Maps
Potential Species of Concern - Native Species   Global: **G5**   State: **S2S4**
Associated Habitats: C 1% Common, O 5% Occasional

B - Forster's Tern *(Sterna forsteri)* SOC   Not Available   S M

View in Field Guide   View Associated Habitat   View Range Maps
Species of Concern - Native Species   Global: **G5**   State: **S3B**   USFWS: **MBTA**   BLM: **SENSITIVE**   FWP SWAP: **SGCN3**   PIF: **2**
Associated Habitats: C 1% Common, O 5% Occasional

B - Black-necked Stilt *(Himantopus mexicanus)* SOC   Not Available   M

View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**
Associated Habitats: C 1% Common, O 5% Occasional

B - Franklin's Gull *(Leucophaeus pipixcan)* SOC Not Available M

View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Associated Habitats: C 1% Common, O 5% Occasional

I - Aeshna sitchensis *(Zigzag Darner)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S3**
Associated Habitats: C 1% Common, O 1% Occasional

I - Somatochlora hudsonica *(Hudsonian Emerald)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S4**
Associated Habitats: C 1% Common, O 1% Occasional

B - Black Tern *(Chlidonias niger)* SOC Not Available S M

View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G4G5** State: **S3B** USFWS: **MBTA; BCC11** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Associated Habitats: C 1% Common, O 1% Occasional

B - Gray-crowned Rosy-Finch *(Leucosticte tephrocotis)* SOC Not Available Y WM

View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S2B,S5N** USFWS: **MBTA** FWP SWAP: **SGCN2, SGIN**
Associated Habitats: C 1% Common

I - Aeshna constricta *(Lance-tipped Darner)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S1S3**
Associated Habitats: C 1% Common

I - Aeshna eremita *(Lake Darner)* PSOC Not Available YSW

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S4**
Associated Habitats: C 1% Common

I - Aeshna juncea *(Sedge Darner)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**
Associated Habitats: C 1% Common

I - Enallagma clausum *(Alkali Bluet)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S4**
Associated Habitats: C 1% Common

I - Leucorrhinia borealis *(Boreal Whiteface)* SOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Species of Concern - Native Species Global: **G5** State: **S1**
Associated Habitats: C 1% Common

I - Rhionaeschna californica *(California Darner)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**
Associated Habitats: C 1% Common

I - Rhionaeschna multicolor *(Blue-eyed Darner)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S4**
Associated Habitats: C 1% Common

I - Somatochlora semicircularis *(Mountain Emerald)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**
Associated Habitats: C 1% Common

I - Sympetrum madidum *(Red-veined Meadowhawk)* PSOC Not Available Y

View in Field Guide View Associated Habitat View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S3**
Associated Habitats: C 1% Common

V - **Pinus albicaulis** *(Whitebark Pine)* SOC — Not Available — Y

View in Field Guide View Associated Habitat View Range Maps

Species of Concern - Native Species Global: **G3G4** State: **S3** USFWS: **C** USFS: **Candidate on Forests (BD, BRT, CG, HLC, KOOT, LOLO)** BLM: **SENSITIVE**

Associated Habitats: C 1% Common

B - **Black Rosy-Finch** *(Leucosticte atrata)* SOC — Not Available — S M

View in Field Guide View Associated Habitat View Range Maps

Species of Concern - Native Species Global: **G4** State: **S2** USFWS: **MBTA; BCC10** FWP SWAP: **SGCN2, SGIN** PIF: **2**

Associated Habitats: C 1% Common

B - **Clark's Grebe** *(Aechmophorus clarkii)* SOC — Not Available — M

View in Field Guide View Associated Habitat View Range Maps

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**

Associated Habitats: C 1% Common

B - **Common Loon** *(Gavia immer)* SOC — Not Available — M

View in Field Guide View Associated Habitat View Range Maps

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** USFS: **Sensitive - Known on Forests (KOOT, LOLO)** FWP SWAP: **SGCN3** PIF: **1**

Associated Habitats: C 1% Common

B - **Horned Grebe** *(Podiceps auritus)* SOC — Not Available — M

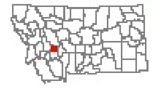
View in Field Guide View Associated Habitat View Range Maps

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC11; BCC17** FWP SWAP: **SGCN3** PIF: **2**

Associated Habitats: C 1% Common

Montana Natural Heritage Program

A program of the **Montana State Library's Natural Resource Information System** operated by the **University of Montana**.



Latitude	Longitude
46.35718	-111.93297
46.46513	-112.08537

Structured Surveys

Summarized by: **19prvt0137** *(Custom Area of Interest)*

The Montana Natural Heritage Program (MTNHP) records information on the locations where more than 80 different types of well-defined repeatable survey protocols capable of detecting an animal species or suite of animal species have been conducted by state, federal, tribal, university, or private consulting biologists. Examples of structured survey protocols tracked by MTNHP include: visual encounter and dip net surveys for pond breeding amphibians, point counts for birds, call playback surveys for selected bird species, visual surveys of migrating raptors, kick net stream reach surveys for macroinvertebrates, visual encounter cover object surveys for terrestrial mollusks, bat acoustic or mist net surveys, pitfall and/or snap trap surveys for small terrestrial mammals, track or camera trap surveys for large mammals, and trap surveys for turtles. Whenever possible, photographs of survey locations are stored in MTNHP databases.

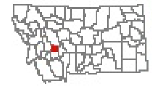
MTNHP does not typically manage information on structured surveys for plants; surveys for invasive species may be a future exception.

Within the report area you have requested, structured surveys are summarized by the number of each type of structured survey protocol that has been conducted, the number of species detections/observations resulting from these surveys, and the most recent year a survey has been conducted.

B-Goshawk Call Playback *(Northern Goshawk Call Playback Survey)*	**Survey Count**: 3	**Obs Count**:	**Recent Survey**: 2004
B-Hummingbird Trapping *(Hummingbird Trapping Survey)*	**Survey Count**: 1	**Obs Count**: 2	**Recent Survey**: 2006
E-Eastern Heath Snail *(Eastern Heath Snail Survey)*	**Survey Count**: 3	**Obs Count**:	**Recent Survey**: 2012
E-Noxious Weed, Road-based *(Noxious Weed Road-based Visual Surveys)*	**Survey Count**: 31	**Obs Count**: 57	**Recent Survey**: 2004
F-Fish Angling *(Fish Angling Survey)*	**Survey Count**: 1	**Obs Count**: 1	**Recent Survey**: 2003
F-Fish Electrofishing *(Fish Electrofishing Surveys)*	**Survey Count**: 28	**Obs Count**: 44	**Recent Survey**: 2015
I-Aquatic Invert Lotic Dipnet *(Invertebrate Lotic Site Dipnet and Visual Encounter Survey)*	**Survey Count**: 1	**Obs Count**: 16	**Recent Survey**: 2008
I-Land Mollusk VES *(Terrestrial Mollusk Visual Encounter Survey)*	**Survey Count**: 1	**Obs Count**: 3	**Recent Survey**: 2005
I-Mussel *(Stream Mussel Survey)*	**Survey Count**: 2	**Obs Count**:	**Recent Survey**: 2008
P-Veg Plot *(Unspecified Vegetation Plot)*	**Survey Count**: 1	**Obs Count**: 21	**Recent Survey**: 1988

MONTANA Natural Heritage Program

A program of the **Montana State Library's Natural Resource Information System** operated by the **University of Montana**.



Latitude	Longitude
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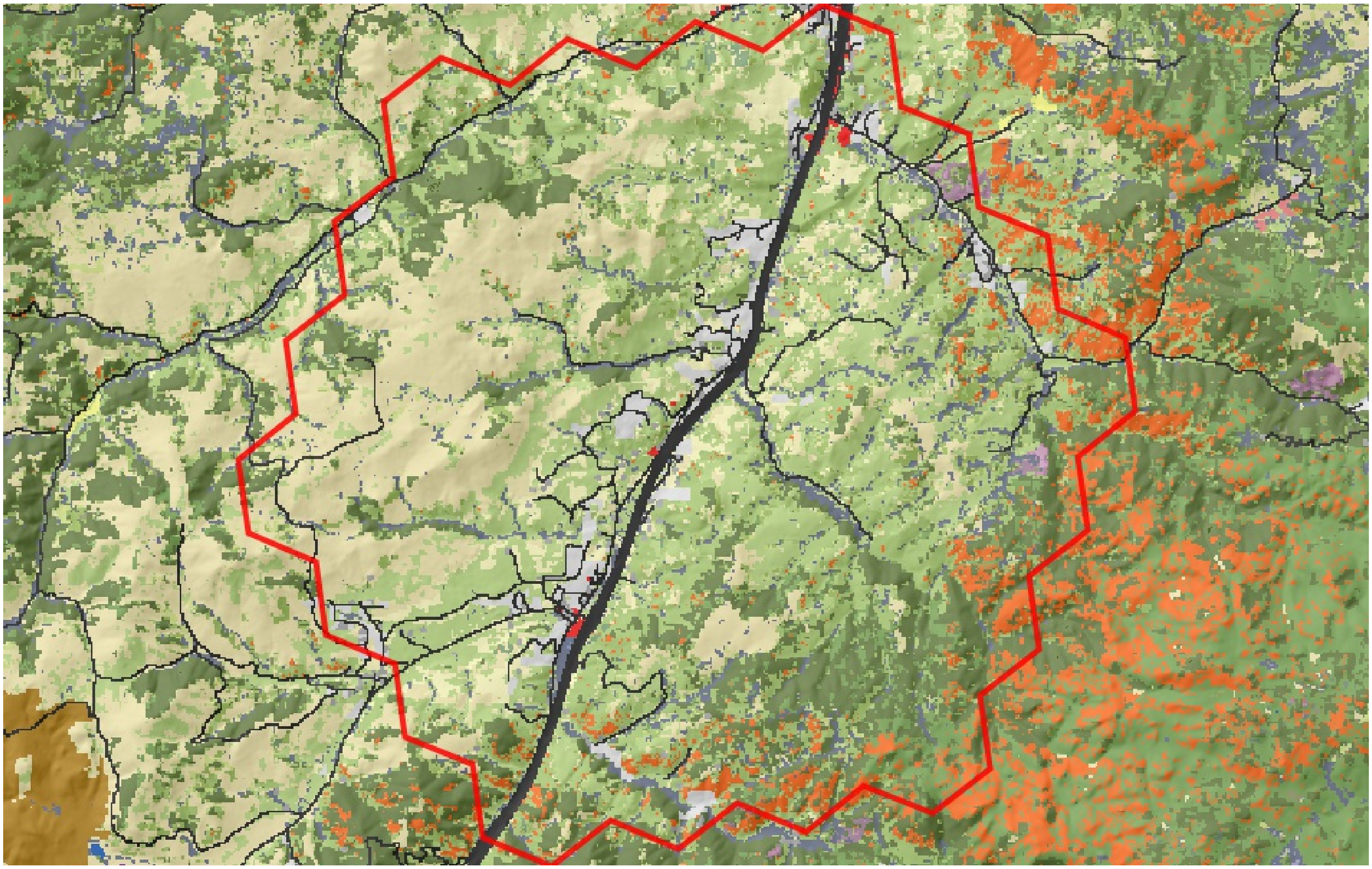
46.46513	-112.08537

Land Cover

Summarized by: **19prvt0137** *(Custom Area of Interest)*



18% (*4,371 Acres*)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Ponderosa Pine Woodland and Savanna

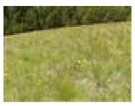
This system occurs on warm, dry, exposed sites in the foothills of the Rocky Mountains in west-central and central Montana, at the ecotone between grasslands or shrublands and more mesic coniferous forests. Elevations range from 1,066 to 1,676 meters (3,500-5,500 feet), with higher elevation examples mostly confined to central Montana. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. True savanna types are infrequent; the system is more characteristically an open forest with a grassy understory. In the western part of the state, this system is seen mostly on dry slopes in the rainshadow of the Bitterroot Mountains. East of the Continental Divide, it is most widespread around Helena and Lewistown, although it occurs throughout mountain ranges as far east as the Little Rocky and Bearpaw Mountains. Ponderosa pine (*Pinus ponderosa*) is the dominant conifer. Douglas-fir (*Pseudotsuga menziesii*) and western larch (*Larix occidentalis*) may be present in the tree canopy in the more western areas, but are usually absent. In central Montana, limber pine (*Pinus flexilis*) and horizontal juniper (*Juniperus horizontalis*) are frequently components. Although the understory of ponderosa pine forests is often shrubby in other states, in Montana, habitats are mostly dominated by graminoids, although bitterbrush (*Purshia tridentata*), white snowberry (*Symphoricarpos albus*), and skunkrush (*Rhus trilobata*) occur in forests on benchlands and rocky slopes in the central portion of the state. Understory vegetation is more typically grasses and forbs that resprout following low to moderate intensity surface fires. Prolonged drought, beetle kill and exotic invasion are rapidly changing the dynamics of this system.

18% (***4,368 Acres***)

Shrubland, Steppe and Savanna Systems
Sagebrush Steppe

Montane Sagebrush Steppe

This system dominates the montane and subalpine landscape of southwestern Montana from valley bottoms to subalpine ridges and is found as far north as Glacier National Park. It can also be seen in the island mountain ranges of the north-central and south-central portions of the state. It primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system occurs in areas of gentle topography, fine soils, subsurface moisture or mesic conditions, within zones of higher precipitation and areas of snow accumulation. It occurs on all slopes and aspects, variable substrates and all soil types. The shrub component of this system is generally dominated by mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*). Other co-dominant shrubs include silver sagebrush (*Artemisia cana ssp. viscidula)*, subalpine big sagebrush (*Artemisia tridentata ssp. spiciformis*), three tip sagebrush (*Artemisia tripartita* ssp. *tripartita*) and antelope bitterbrush (*Purshia tridentata*). Little sagebrush (*Artemisia arbuscula ssp. arbuscula*) shrublands are only found in southwestern Montana on sites with a perched water table. Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) sites may be included within this system if occurrences are at montane elevations, and are associated with montane graminoids such as Idaho fescue (*Festuca idahoensis),* spike fescue (*Leucopoa kingii*), or poverty oatgrass (*Danthonia intermedia)*. In ares where sage has been eliminated by human activities like burning, disking or poisoning, other shrubs may be dominant, especially rubber rabbitbrush (*Ericameria nauseosa*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Because of the mesic site conditions, most occurrences support a diverse herbaceous undergrowth of grasses and forbs. Shrub canopy cover is extremely variable, ranging from 10 percent to as high as 40 or 50 percent.



18% (***4,333 Acres***)

Grassland Systems
Montane Grassland

Rocky Mountain Lower Montane, Foothill, and Valley Grassland

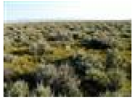
This grassland system of the northern Rocky Mountains is found at lower montane to foothill elevations in mountains and valleys throughout Montana. These grasslands are floristically similar to Big Sagebrush Steppe but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. They are found at elevations from 548 - 1,650 meters (1,800-5,413 feet). In the lower montane zone, they range from small meadows to large open parks surrounded by conifers; below the lower treeline, they occur as extensive foothill and valley grasslands. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline. Microphytic crust may be present in high-quality occurrences. This system is typified by cool-season perennial bunch grasses and forbs (>25%) cover, with a sparse shrub cover (<10%). Rough fescue (*Festuca campestris*) is dominant in the northwestern portion of the state and Idaho fescue (*Festuca idahoensis*) is dominant or co-dominant throughout the range of the system. Bluebunch wheatgrass (*Pseudoroegneria spicata*) occurs as a co-dominant throughout the range as well, especially on xeric sites. Western wheatgrass (*Pascopyrum smithii*) is consistently present, often with appreciable coverage (>10%) in lower elevation occurrences in western Montana and virtually always present, with relatively high coverages (>25%), on the edge of the Northwestern Great Plains region. Species diversity ranges from a high of more than 50 per 400 square meter plot on mesic sites to 15 (or fewer) on xeric and disturbed sites. Most occurrences have at least 25 vascular species present. Farmland conversion, noxious species invasion, fire suppression, heavy grazing and oil and gas development are major threats to this system.

14% (***3,392 Acres***)

Forest and Woodland Systems
Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Montane Douglas-fir Forest and Woodland

In Montana, this ecological system occurs on the east side of the Continental Divide, north to about the McDonald Pass area, and along the Rocky Mountain Front. This system is associated with a dry to submesic continental climate regime with annual precipitation ranging from 51 to 102 centimeters (20-40 inches), with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from valley bottoms to 1,980 meters (6500 feet) in northern Montana and up to 2,286 meters (7500 feet) on warm aspects in southern Montana. It occurs on north-facing aspects in most areas, and south-facing aspects at higher elevations. This is a Douglas-fir (*Pseudotsuga menziesii*) dominated system without any maritime floristic composition. Fire disturbance intervals are as infrequent as 500 years, and as a result, individual trees and forests can attain great age on some sites (500 to 1,500 years). In Montana, this system occurs from lower montane to lower subalpine environments and is prevalent on calcareous substrates. Common understory shrubs include common ninebark (*Physocarpus malvaceus*), common juniper (*Juniperus communis*), Rocky Mountain juniper (*Juniperus scopulorum*), birch-leaf spiraea (*Spiraea betulifolia*), snowberry (*Symphoricarpos* species), creeping Oregon grape (*Mahonia repens*) and Canadian buffaloberry (*Shepherdia canadensis*). The Douglas-fir/pinegrass (C*alamogrostis rubescens*) type is the most ubiquitous association found within this system in Montana.



5% (*1,142* Acres)

Shrubland, Steppe and Savanna Systems
Sagebrush Steppe
Big Sagebrush Steppe

This widespread ecological system occurs throughout much of central Montana, and north and east onto the western fringe of the Great Plains. In central Montana, where this system occurs on both glaciated and non-glaciated landscapes, it differs slightly, with more summer rain than winter precipitation and more precipitation annually. Throughout its distribution, soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs with greater than 25% cover. Overall shrub cover is less than 10 percent. In Montana and Wyoming, stands are more mesic, with more biomass of grass, and have less shrub diversity than stands farther to the west, and 50 to 90% of the occurrences are dominated by Wyoming big sagebrush with western wheatgrass (*Pascopyrum smithii*). Japanese brome (*Bromus japonicus*) and cheatgrass (*Bromus tectorum*) are indicators of disturbance, but cheatgrassis typically not as abundant as in the Intermountain West, possibly due to a colder climate. The natural fire regime of this ecological system maintains a patchy distribution of shrubs, preserving the steppe character. Shrubs may increase following heavy grazing and/or with fire suppression. In central and eastern Montana, complexes of prairie dog towns are common in this ecological system.

5% (*1,130* Acres)

Wetland and Riparian Systems
Floodplain and Riparian
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland

This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions. In Montana, sites occur at elevations of 609-1,219 meters (2,000-4,000 feet) west of the Continental Divide. East of the Continental Divide, this system ranges up to 1,676 meters (5,500 feet). It generally comprises a mosaic of multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime with annual to episodic flooding, so it is usually found within the flood zone of rivers, on islands, sand or cobble bars, and along streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers, or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains, swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) is the key indicator species. Other dominant trees may include boxelder maple (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), eastern cottonwood (*Populus deltoides*), Douglas-fir (*Pseudotsuga menziesii*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), thinleaf alder (*Alnus incana*), river birch (*Betula occidentalis*), redoiser dogwood (*Cornus sericea*), hawthorne (*Crataegus* species), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), willows (*Salix* species), rose (*Rosa* species), silver buffaloberry (*Shepherdia argentea*), or snowberry (*Symphoricarpos* species).

No Image

4% (*904* Acres)

Recently Disturbed or Modified
Insect-Killed Forest
Insect-Killed Forest

No Image

3% (*800* Acres)

Human Land Use
Developed
Other Roads

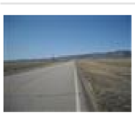
County, city and or rural roads generally open to motor vehicles.

No Image

3% (*672* Acres)

Shrubland, Steppe and Savanna Systems
Deciduous Shrubland
Rocky Mountain Montane-Foothill Deciduous Shrubland

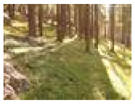
This system is found in the lower montane and foothill regions of western Montana, and north and east into the northern Rocky Mountains. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. They are usually found on steep slopes of canyons, on toeslopes and occasionally on valley bottom lands. These communities can occur on all aspects. In northwestern and west-central Montana, this system forms within Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa)* forests and adjacent to fescue grasslands and big sagebrush (*Artemisia tridentata*) shrublands. In northwestern Montana, these shrublands commonly occur within the upper montane grasslands and forests along the Rocky Mountain Front. Immediately east of the Continental Divide, this system is found within montane grasslands and steep canyon slopes. Most sites have shallow soils that are either loess deposits or volcanic clays. Common ninebark (*Physocarpus malvaceus*), bittercherry (*Prunus emarginata*), common chokecherry (*Prunus virginiana*), rose (*Rosa* spp.), smooth sumac (*Rhus glabra*), Rocky Mountain maple (*Acer glabrum*), serviceberry (*Amelanchier alnifolia*), and oceanspray (*Holodiscus discolor*) are the most common dominant shrubs.



3% (*649* Acres)

Human Land Use
Developed
Developed, Open Space

Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. This category often includes highway and railway rights of way and graveled rural roads.



3% (*635 Acres*)

Forest and Woodland Systems
Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Lodgepole Pine Forest

This forested system is widespread in upper montane to subalpine zones of the Montana Rocky Mountains, and east into island ranges of north-central Montana and the Bighorn and Beartooth ranges of south-central Montana. These are montane to subalpine forests where the dominance of lodgepole pine (*Pinus contorta*) is related to fire history and topoedaphic conditions. In Montana, elevation ranges from 975 to 2,743 meters (3,200-9000 feet). These forests occur on flats to slopes of all degrees and aspect, as well as valley bottoms. Fire is frequent, and stand-replacing fires are common. Following stand-replacing fires, lodgepole pinewill rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests persisting for 50-200 years on warmer, lower elevation forests, and 150-400 years in subalpine forests. They generally occur on dry to intermediate sites with a wide seasonal range of temperatures and long precipitation-free periods in summer. Snowfall is heavy and supplies the major source of soil water used for growth in early summer. Vigorous stands occur where the precipitation exceeds 533 millimeters (21 inches). These lodgepole forests are typically associated with rock types weathering to acidic substrates, such as granite and rhyolite. In west-central Montana ranges such the Big Belts and the Rocky Mountain Front, these forests are found on limestone substrates. These systems are especially well developed on the broad ridges and high valleys near and east of the Continental Divide. Succession proceeds at different rates, moving relatively quickly on low-elevation, mesic sites and particularly slowly in high-elevation forests such as those along the Continental Divide in Montana.

No Image

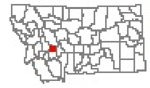
2% (*429 Acres*)

Human Land Use
Developed
Interstate

National Highway System (NHS) limited access highways and their shoulders and rights of way.

Additional Limited Land Cover

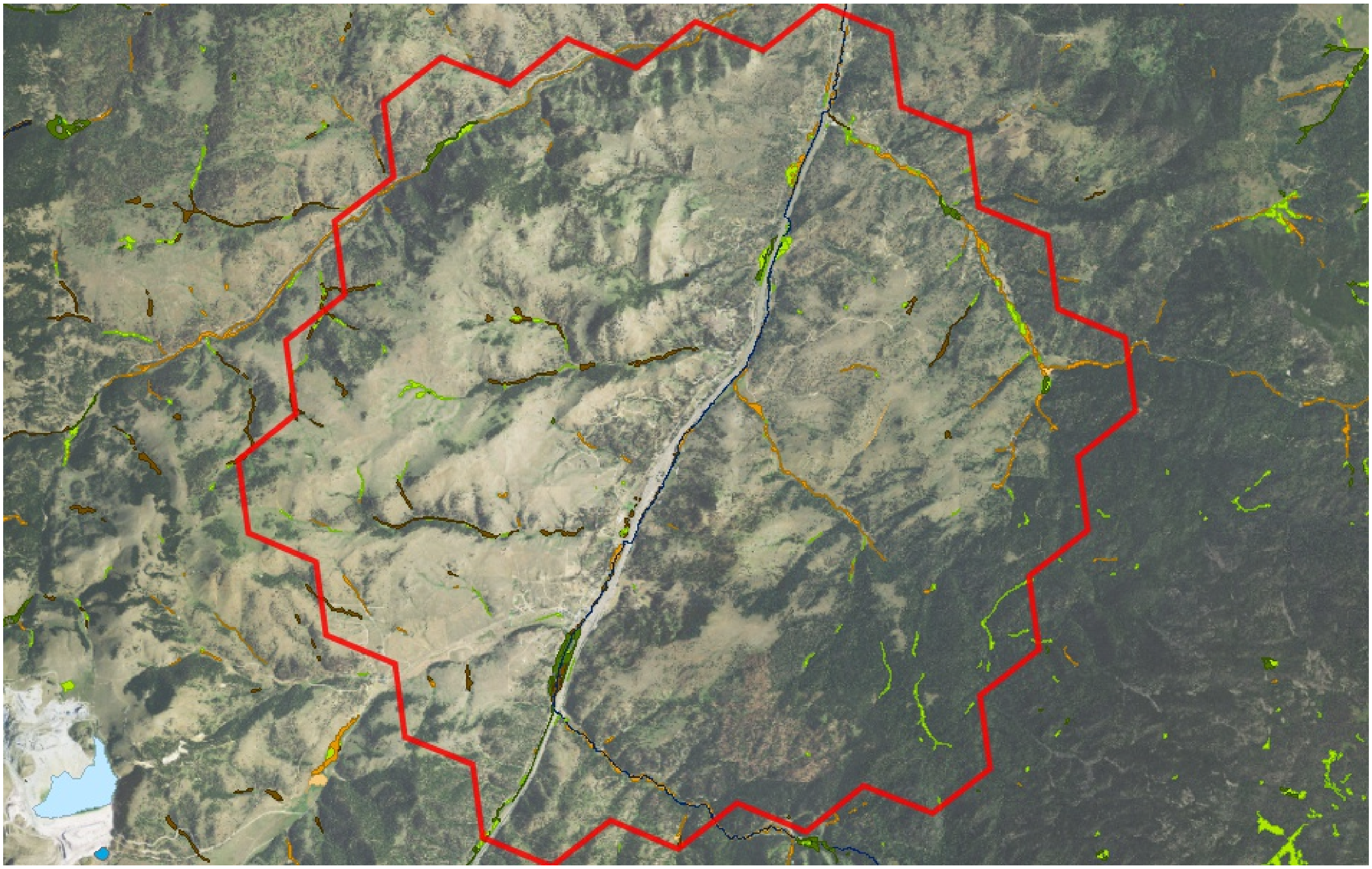
- 1% (*283 Acres*) Low Intensity Residential
- 1% (*247 Acres*) Rocky Mountain Subalpine-Montane Mesic Meadow
- <1% (*115 Acres*) Rocky Mountain Foothill Limber Pine - Juniper Woodland
- <1% (*45 Acres*) Harvested forest-tree regeneration
- <1% (*37 Acres*) Commercial / Industrial
- <1% (*29 Acres*) Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
- <1% (*22 Acres*) Aspen Forest and Woodland
- <1% (*16 Acres*) Major Roads
- <1% (*11 Acres*) Harvested forest-grass regeneration
- <1% (*8 Acres*) Harvested forest-shrub regeneration
- <1% (*7 Acres*) Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
- <1% (*4 Acres*) Alpine-Montane Wet Meadow
- <1% (*2 Acres*) Emergent Marsh
- <1% (*1 Acres*) High Intensity Residential
- <1% (*1 Acres*) Aspen and Mixed Conifer Forest



Latitude	Longitude
46.35718	-111.93297
46.46513	-112.08537

Wetland and Riparian

Summarized by: **19prvt0137** *(Custom Area of Interest)*



Wetland and Riparian Mapping

Explain

P - Palustrine

AB - Aquatic Bed

P - Palustrine, AB - Aquatic Bed
Wetlands with vegetation growing on or below the water surface for most of the growing season.

F - Semipermanently Flooded	3 Acres	
(no modifier)	**1 Acres**	**PABF**
h - Diked/Impounded	**1 Acres**	**PABFh**
x - Excavated	**1 Acres**	**PABFx**

EM - Emergent

P - Palustrine, EM - Emergent
Wetlands with erect, rooted herbaceous vegetation present during most of the growing season.

A - Temporarily Flooded	111 Acres	
(no modifier)	**101 Acres**	**PEMA**
f - Farmed	**4 Acres**	**PEMAf**
h - Diked/Impounded	**1 Acres**	**PEMAh**
x - Excavated	**5 Acres**	**PEMAx**

C - Seasonally Flooded	4 Acres	
(no modifier)	**4 Acres**	**PEMC**
x - Excavated	**<1 Acres**	**PEMCx**

F - Semipermanently Flooded	<1 Acres	
x - Excavated	**<1 Acres**	**PEMFx**

SS - Scrub-Shrub

P - Palustrine, SS - Scrub-Shrub
Wetlands dominated by woody vegetation less than 6 meters (20 feet) tall. Woody vegetation includes tree saplings and trees that are stunted due to environmental conditions.

A - Temporarily Flooded	47 Acres	
(no modifier)	**43 Acres**	**PSSA**

x - Excavated **4 Acres** **PSSAx**

C - Seasonally Flooded 5 Acres

(no modifier) **5 Acres** **PSSC**

R - Riverine (Rivers)

3 - Upper Perennial

UB - Unconsolidated Bottom

G - Intermittently Exposed 14 Acres

(no modifier) **14 Acres** **R3UBG**

R - Riverine (Rivers), 3 - Upper Perennial, UB - Unconsolidated Bottom
Stream channels where the substrate is at least 25% mud, silt or other fine particles.

Rp - Riparian

1 - Lotic

SS - Scrub-Shrub

(no modifier) **158 Acres** **Rp1SS**

Rp - Riparian, 1 - Lotic, SS - Scrub-Shrub
This type of riparian area is dominated by woody vegetation that is less than 6 meters (20 feet) tall. Woody vegetation includes tree saplings and trees that are stunted due to environmental conditions.

FO - Forested

(no modifier) **100 Acres** **Rp1FO**

Rp - Riparian, 1 - Lotic, FO - Forested
This riparian class has woody vegetation that is greater than 6 meters (20 feet) tall.

EM - Emergent

(no modifier) **6 Acres** **Rp1EM**

Rp - Riparian, 1 - Lotic, EM - Emergent
Riparian areas that have erect, rooted herbaceous vegetation during most of the growing season.

MONTANA
Natural Heritage
Program
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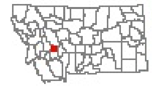
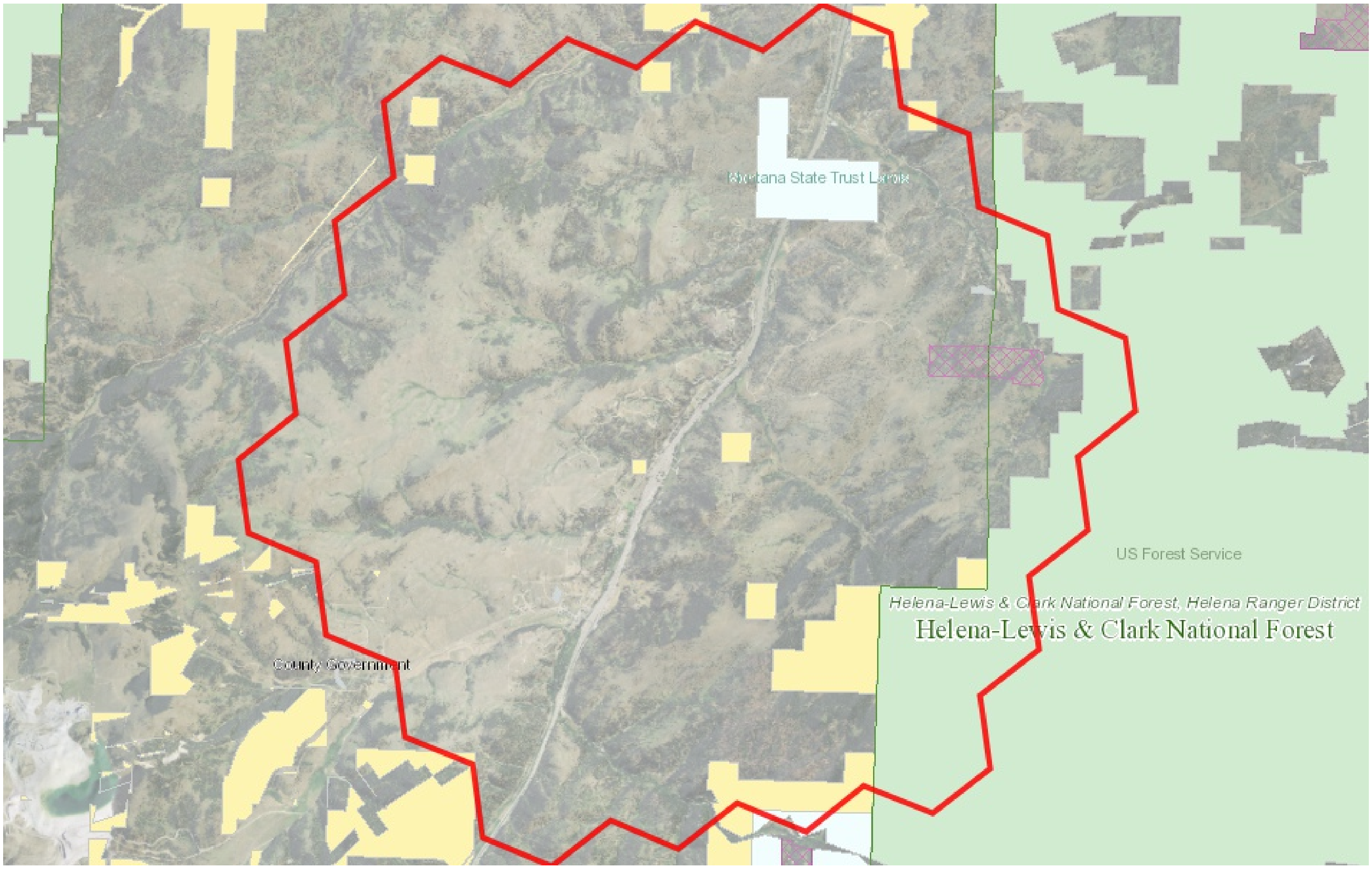


Latitude	Longitude
46.35718	-111.93297
46.46513	-112.08537

Land Management

Summarized by: **19prvt0137** *(Custom Area of Interest)*



Land Management Summary

Explain

	Ownership	Tribal	Easements	Other Boundaries (possible overlap)
Public Lands	**3,467 Acres (15%)**			
Federal	**3,014 Acres (13%)**			
US Forest Service	**2,071 Acres (9%)**			
USFS Owned	**2,071 Acres (9%)**			
USFS Ranger Districts				**2,707 Acres**
Helena-Lewis & Clark National Forest, Helena Ranger District				2,707 Acres
USFS National Forest Boundaries				**2,707 Acres**
Helena-Lewis & Clark National Forest				2,707 Acres
US Bureau of Land Management	**943 Acres (4%)**			
BLM Owned	**943 Acres (4%)**			
State	**441 Acres (2%)**			
Montana State Trust Lands	**441 Acres (2%)**			
MT State Trust Owned	**441 Acres (2%)**			
Local	**12 Acres (<1%)**			
Local Government	**12 Acres (<1%)**			
Local Government Owned	**12 Acres (<1%)**			
Conservation Easements			**159 Acres (1%)**	
Private			**159 Acres (1%)**	

Land Management Summary

Explain

	Ownership	Tribal	Easements	Other Boundaries (possible overlap)
Prickly Pear Land Trust			159 Acres (1%)	
Private Lands or Unknown Ownership	**20,028 Acres (85%)**			

MONTANA Natural Heritage Program

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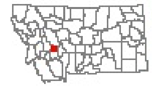

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Biological Reports

Summarized by: **19prvt0137** *(Custom Area of Interest)*

Within the report area you have requested, citations for all reports and publications associated with plant or animal observations in Montana Natural Heritage Program (MTNHP) databases are listed and, where possible, links to the documents are included.

The MTNHP plans to include reports associated with terrestrial and aquatic communities in the future as allowed for by staff resources. If you know of reports or publications associated with species or biological communities within the report area that are not shown in this report, please let us know: mtnhp@mt.gov

No Biological Reports were found in the selected area

Montana Natural Heritage Program

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Invasive and Pest Species

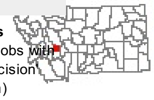
Legend

Model Icons
- N Suitable (native range)
- O Optimal Suitability
- M Moderate Suitability
- L Low Suitability
- I Suitable (introduced range)

Habitat Icons
- C Common
- O Occasional

Range Icons
- T Suspect (invasive / pest)
- D Documented (invasive / pest)
- R Released (biocontrol)
- E Established (biocontrol)

Num Obs
Count of obs with 'good precision' (<=1000m)
+ indicates additional 'poor precision' obs (1001m-10,000m)



Latitude	Longitude
46.35718	-111.93297
46.46513	-112.08537

Summarized by: **19prvt0137** *(Custom Area of Interest)*

Species	# Obs	Predictive Model	Associated Habitat	Range
Noxious Weeds: Priority 1A				
V - Isatis tinctoria *(Dyer's Woad)* N1A	1		Not Assigned	
Noxious Weeds: Priority 2B				
V - Centaurea diffusa *(Diffuse Knapweed)* N2B	7	Not Available	Not Assigned	D
V - Centaurea stoebe *(Spotted Knapweed)* N2B	24	Not Available	Not Assigned	D
V - Cirsium arvense *(Canada Thistle)* N2B	3	Not Available	Not Assigned	D
V - Euphorbia virgata *(Leafy Spurge)* N2B	8	Not Available	Not Assigned	D
V - Lepidium draba *(Whitetop)* N2B	8	Not Available	Not Assigned	D
V - Linaria dalmatica *(Dalmatian Toadflax)* N2B	22	Not Available	Not Assigned	D
V - Linaria vulgaris *(Yellow Toadflax)* N2B	1	Not Available	Not Assigned	D
V - Leucanthemum vulgare *(Oxeye Daisy)* N2B	3	Not Available	Not Assigned	
V - Potentilla recta *(Sulphur Cinquefoil)* N2B	5	Not Available	Not Assigned	
Biocontrol Species				
I - Mecinus janthiniformis *(Dalmatian Toadflax Stem-boring Weevil)* BIOCNTRL			Not Assigned	R
I - Mecinus janthinus *(Yellow Toadflax Stem-boring Weevil)* BIOCNTRL			Not Assigned	R
I - Aphthona lacertosa *(Brown-legged Leafy Spurge Flea Beetle)* BIOCNTRL			Not Assigned	R
I - Cyphocleonus achates *(Knapweed Root Weevil)* BIOCNTRL			Not Assigned	R

Noxious Weeds: Priority 1A

V - Isatis tinctoria *(Dyer's Woad)* N1A — # Obs: 1; Associated Habitat: Not Assigned

View in Field Guide   View Predicted Models
Noxious Weed: Priority 1A - Non-native Species   Global: **GNR**   State: **SNA**
Predictive Models: M 73% Moderate (inductive), L 27% Low (inductive)

Noxious Weeds: Priority 2B

V - Centaurea diffusa *(Diffuse Knapweed)* N2B
View in Field Guide   View Range Maps
Noxious Weed: Priority 2B - Non-native Species   Global: **GNR**   State: **SNA**

V - Centaurea stoebe *(Spotted Knapweed)* N2B
View in Field Guide   View Range Maps
Noxious Weed: Priority 2B - Non-native Species   Global: **GNR**   State: **SNA**

V - Cirsium arvense *(Canada Thistle)* N2B
View in Field Guide   View Range Maps
Noxious Weed: Priority 2B - Non-native Species   Global: **G5**   State: **SNA**

V - Euphorbia virgata *(Leafy Spurge)* N2B
View in Field Guide   View Range Maps
Noxious Weed: Priority 2B - Non-native Species   Global: **GNRTNR**   State: **SNA**

V - Lepidium draba *(Whitetop)* N2B
View in Field Guide   View Range Maps
Noxious Weed: Priority 2B - Non-native Species   Global: **GNR**   State: **SNA**

V - Linaria dalmatica *(Dalmatian Toadflax)* N2B
View in Field Guide   View Range Maps
Noxious Weed: Priority 2B - Non-native Species   Global: **G5**   State: **SNA**

V - Linaria vulgaris *(Yellow Toadflax)* N2B
View in Field Guide   View Range Maps
Noxious Weed: Priority 2B - Non-native Species   Global: **GNR**   State: **SNA**

V - Leucanthemum vulgare *(Oxeye Daisy)* N2B
View in Field Guide
Noxious Weed: Priority 2B - Non-native Species   Global: **GNR**   State: **SNA**

V - Potentilla recta *(Sulphur Cinquefoil)* N2B
View in Field Guide
Noxious Weed: Priority 2B - Non-native Species   Global: **GNR**   State: **SNA**

Biocontrol Species

I - Mecinus janthiniformis *(Dalmatian Toadflax Stem-boring Weevil)* BIOCNTRL
View in Field Guide   View Predicted Models   View Range Maps
Biocontrol Species - Non-native Species   Global: **GNR**   State: **SNA**
Predictive Models: O 54% Optimal (inductive), M 41% Moderate (inductive), L 5% Low (inductive)

I - Mecinus janthinus *(Yellow Toadflax Stem-boring Weevil)* BIOCNTRL
View in Field Guide   View Predicted Models   View Range Maps
Biocontrol Species - Non-native Species   Global: **GNR**   State: **SNA**
Predictive Models: O 30% Optimal (inductive), M 41% Moderate (inductive), L 24% Low (inductive)

I - Aphthona lacertosa *(Brown-legged Leafy Spurge Flea Beetle)* BIOCNTRL
View in Field Guide   View Predicted Models   View Range Maps
Biocontrol Species - Non-native Species   Global: **GNR**   State: **SNA**
Predictive Models: M 76% Moderate (inductive), L 24% Low (inductive)

I - Cyphocleonus achates *(Knapweed Root Weevil)* BIOCNTRL

View in Field Guide **View Predicted Models** **View Range Maps**

Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**

Predictive Models: M 76% Moderate (inductive), L 24% Low (inductive)

I - Aphthona nigriscutis *(Black Dot Leafy Spurge Flea Beetle)* BIOCNTRL Not Assigned R

View in Field Guide **View Predicted Models** **View Range Maps**

Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**

Predictive Models: M 62% Moderate (inductive), L 27% Low (inductive)

I - Oberea erythrocephala *(Red-headed Leafy Spurge Stem Borer)* BIOCNTRL Not Assigned R

View in Field Guide **View Predicted Models** **View Range Maps**

Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**

Predictive Models: M 32% Moderate (inductive), L 54% Low (inductive)

Introduction to Montana Natural Heritage Program

P.O. Box 201800 • 1515 East Sixth Avenue • Helena, MT 59620-1800 • fax 406.444.0266 • tel 406.444.0241 • mtnhp.org

Introduction

The Montana Natural Heritage Program (MTNHP) is Montana's source for reliable and objective information on Montana's native species and habitats, emphasizing those of conservation concern. MTNHP was created by the Montana legislature in 1983 as part of the Natural Resource Information System (NRIS) at the Montana State Library (MSL). MTNHP is "a program of information acquisition, storage, and retrieval for data relating to the flora, fauna, and biological community types of Montana" (MCA 90-15-102). MTNHP's activities are guided by statute (MCA 90-15) as well as through ongoing interaction with, and feedback from, principal data source agencies such as Montana Fish, Wildlife, and Parks, the Montana Department of Environmental Quality, the Montana Department of Natural Resources and Conservation, the Montana University System, the US Forest Service, and the US Bureau of Land Management. The enabling legislation for MTNHP provides the State Library with the option to contract the operation of the Program. Since 2006, MTNHP has been operated as a program under the Office of the Vice President for Research and Creative Scholarship at the University of Montana (UM) through a renewable 2-year contract with the MSL. Since the first staff was hired in 1985, the Program has logged a long record of success, and developed into a highly respected, service-oriented program. MTNHP is widely recognized as one of the most advanced and effective of over 80 natural heritage programs throughout the Western Hemisphere.

Vision

Our vision is that public agencies, the private sector, the education sector, and the general public will trust and rely upon MTNHP as the source for information and expertise on Montana's species and habitats, especially those of conservation concern. We strive to provide easy access to our information in order for users to save time and money, speed environmental reviews, and inform decision making.

Core Values

- We endeavor to be a single statewide source of accurate and up-to-date information on Montana's plants, animals, and aquatic and terrestrial biological communities.
- We actively listen to our data users and work responsively to meet their information and training needs.
- We strive to provide neutral, trusted, timely, and equitable service to all of our information users.
- We make every effort to be transparent to our data users in setting work priorities and providing data products.

Confidentiality

All information requests made to the Montana Natural Heritage Program are considered library records and are protected from disclosure by the Montana Library Records Confidentiality Act (MCA 22-1-11).

Information Managed

Information managed at the Montana Natural Heritage Program includes: (1) lists of, and basic information on, plant and animal species and biological communities; (2) plant and animal surveys, observations, species occurrences, predictive distribution models, range polygons, and conservation status ranks; and (3) land cover and wetland and riparian mapping and the conservation status of these and other biological communities.

Data Use Terms and Conditions

- Montana Natural Heritage Program (MTNHP) products and services are based on biological data and the objective interpretation of those data by professional scientists. MTNHP does not advocate any particular philosophy of natural resource protection, management, development, or public policy.
- MTNHP has no natural resource management or regulatory authority. Products, statements, and services from MTNHP are intended to inform parties as to the state of scientific knowledge about certain natural resources, and to further develop that knowledge. The information is not intended as natural resource management guidelines or prescriptions or a determination of environmental impacts. MTNHP recommends consultation with appropriate state, federal, and tribal resource management agencies and authorities in the area where your project is located.
- Information on the status and spatial distribution of biological resources produced by MTNHP are intended to inform parties of the state-wide status, known occurrence, or the likelihood of the presence of those resources. **These products are not intended to substitute for field-collected data, nor are they intended to be the sole basis for natural resource management decisions.**
- MTNHP does not portray its data as exhaustive or comprehensive inventories of rare species or biological communities. **Field verification of the absence or presence of sensitive species and biological communities will always be an important obligation of users of our data.**
- MTNHP responds equally to all requests for products and services, regardless of the purpose or identity of the requester.
- Because MTNHP constantly updates and revises its databases with new data and information, products will become outdated over time. Interested parties are encouraged to obtain the most current information possible from MTNHP, rather than using older products. We add, review, update, and delete records on a daily basis. Consequently, we strongly advise that you update your MTNHP data sets at a minimum of every three months for most applications of our information.
- MTNHP data require a certain degree of biological expertise for proper analysis, interpretation, and application. Our staff is available to advise you on questions regarding the interpretation or appropriate use of the data that we provide. Contact information for MTNHP staff is posted at: http://mtnhp.org/contact.asp
- The information provided to you by MTNHP may include sensitive data that if publicly released might jeopardize the welfare of threatened, endangered, or sensitive species or biological communities. This information is intended for distribution or use only within your department, agency, or business. Subcontractors may have access to the data during the course of any given project, but should not be given a copy for their use on subsequent, unrelated work.
- MTNHP data are made freely available. Duplication of hard-copy or digital MTNHP products with the intent to sell is prohibited without written consent by MTNHP. Should you be asked by individuals outside your organization for the type of data that we provide, please refer them to MTNHP.
- MTNHP and appropriate staff members should be appropriately acknowledged as an information source in any third-party product involving MTNHP data, reports, papers, publications, or in maps that incorporate MTNHP graphic elements.
- Sources of our data include museum specimens, published and unpublished scientific literature, field surveys by state and federal agencies and private contractors, and reports from knowledgeable individuals. MTNHP actively solicits and encourages additions, corrections and updates, new observations or collections, and comments on any of the data we provide.
- MTNHP staff and contractors do not cross or survey privately-owned lands without express permission from the landowner. However, the program cannot guarantee that information provided to us by others was obtained under adherence to this policy.

Suggested Contacts for Natural Resource Agencies

As required by Montana statute (MCA 90-15), the Montana Natural Heritage Program works with state, federal, tribal, nongovernmental organizations, and private partners to ensure that the latest animal and plant distribution and status information is incorporated into our databases so that it can be used to inform a variety of planning processes and management decisions. In addition to the information you receive from us, we encourage you to contact state, federal, and tribal resource management agencies in the area where your project is located. They may have additional data or management guidelines relevant to your efforts. In particular, we encourage you to contact the Montana Department of Fish, Wildlife, and Parks for the latest data and management information regarding hunted and high-profile management species and to use the U.S. Fish and Wildlife Service's Information Planning and Conservation (IPAC) website http://ecos.fws.gov/ipac/ regarding U.S. Endangered Species Act listed Threatened, Endangered, or Candidate species.

For your convenience, we have compiled a list of relevant agency contacts and links below:

Montana Fish, Wildlife, and Parks

Fish Species	Zachary Shattuck zshattuck@mt.gov (406) 444-1231 or Lee Nelson leenelson@mt.gov (406) 444-2447
American Bison Black-footed Ferret Black-tailed Prairie Dog Bald Eagle Golden Eagle Common Loon Least Tern Piping Plover Whooping Crane	Lauri Hanauska-Brown LHanauska-Brown@mt.gov (406) 444-5209
Grizzly Bear Greater Sage Grouse Trumpeter Swan Big Game Upland Game Birds Furbearers	John Vore jvore@mt.gov (406) 444-5209
Managed Terrestrial Game and Nongame Animal Data	Smith Wells – MFWP Data Analyst smith.wells@mt.gov (406) 444-3759
Fisheries Data	Adam Petersen – MFWP Fish Data Manager apetersen@mt.gov (406) 444-1275
Wildlife and Fisheries Scientific Collector's Permits	http://fwp.mt.gov/doingBusiness/licenses/scientificWildlife/ Karen Speeg for Wildlife kspeeg@mt.gov (406) 444-2612 Kim Wedde for Fisheries kim.wedde@mt.gov (406) 444-5594
Fish and Wildlife Recommendations for Subdivision Development	Renee Lemon RLemon@mt.gov (406) 444-3738 and see http://fwp.mt.gov/fishAndWildlife/livingWithWildlife/buildingWithWildlife/subdivisionRecommendations/
Regional Contacts 	Region 1 (Kalispell) (406) 752-5501 Region 2 (Missoula) (406) 542-5500 Region 3 (Bozeman) (406) 994-4042 Region 4 (Great Falls) (406) 454-5840 Region 5 (Billings) (406) 247-2940 Region 6 (Glasgow) (406) 228-3700 Region 7 (Miles City) (406) 234-0900

United States Fish and Wildlife Service:

Information Planning and Conservation (IPAC) website: http://ecos.fws.gov/ipac/

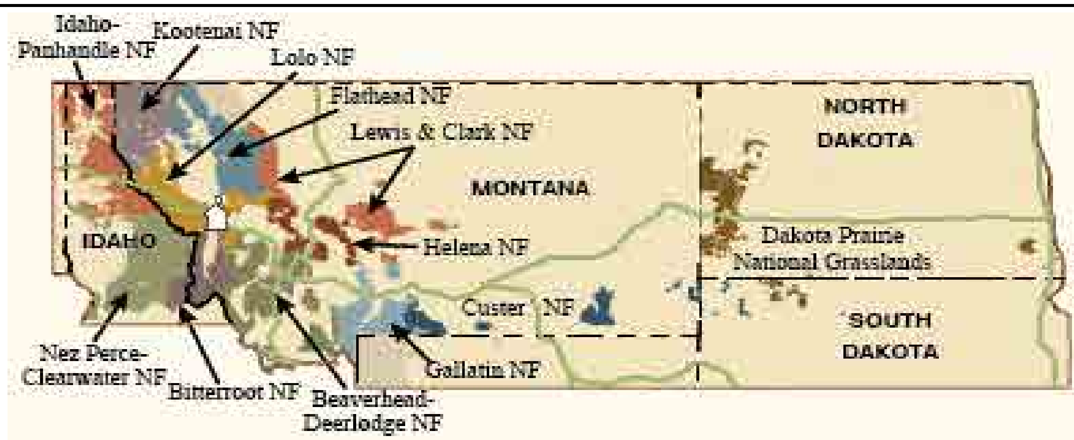
Montana Ecological Services Field Office: http://www.fws.gov/montanafieldoffice/ (406) 449-5225

Bureau of Land Management

Montana Field Office Contacts:

Billings	(406) 896-5013
Butte	(406) 533-7600
Dillon	(406) 683-8000
Glasgow	(406) 228-3750
Havre	(406) 262-2820
Lewistown	(406) 538-1900
Malta	(406) 654-5100
Miles City	(406) 233-2800
Missoula	(406) 329-3914

United States Forest Service



Regional Office – Missoula, Montana Contacts

Wildlife Program Leader	Tammy Fletcher	tammyfletcher@fs.fed.us	(406) 329-3588
Wildlife Ecologist	Cara Staab	cstaab@fs.fed.us	(406) 329-3677
Fish Program Leader	Scott Spaulding	scottspaulding@fs.fed.us	(406) 329-3287
Fish Ecologist	Cameron Thomas	cathomas@fs.fed.us	(406) 329-3087
TES Program	Lydia Allen	lrallen@fs.fed.us	(406) 329-3558
Interagency Grizzly Bear Coordinator	Scott Jackson	sjackson03@fs.fed.us	(406) 329-3664
Regional Botanist	Steve Shelly	sshelly@fs.fed.us	(406) 329-3041

Tribal Nations

Assiniboine & Gros Ventre Tribes – Fort Belknap Reservation

Assiniboine & Sioux Tribes – Fort Peck Reservation

Blackfeet Tribe - Blackfeet Reservation

Chippewa Creek Tribe - Rocky Boy's Reservation

Crow Tribe – Crow Reservation

Little Shell Chippewa Tribe

Northern Cheyenne Tribe – Northern Cheyenne Reservation

Salish & Kootenai Tribes - Flathead Reservation

Introduction to Native Species

Within the report area you have requested, separate summaries are provided for: (1) Species Occurrences (SO) for plant and animal Species of Concern, Special Status Species (SSS), Important Animal Habitat (IAH) and some Potential Plant Species of Concern; (2) other observed non Species of Concern or Species of Concern without suitable documentation to create Species Occurrence polygons; and (3) other non-documented species that are potentially present based on their range, predicted suitable habitat model output, or presence of associated habitats. Each of these summaries provides the following information when present for a species: (1) the number of Species Occurrences and associated delineation criteria for construction of these polygons that have long been used for considerations of documented Species of Concern in environmental reviews; (2) the number of observations of each species; (3) the geographic range polygons for each species that the report area overlaps; (4) predicted relative habitat suitability classes that are present if a predicted suitable habitat model has been created; (5) the percent of the report area that is mapped as commonly associated or occasionally associated habitat as listed for each species in the Montana Field Guide; and (6) a variety of conservation status ranks and links to species accounts in the Montana Field Guide. Details on each of these information categories are included under relevant section headers below or are defined on our Species Status Codes page. In presenting this information, the Montana Natural Heritage Program (MTNHP) is working towards assisting the user with rapidly determining what species have been documented and what species are potentially present in the report area. We remind users that this information is likely incomplete as surveys to document native and introduced species are lacking in many areas of the state, information on introduced species has only been tracked relatively recently, the MTNHP's staff and resources are restricted by declining budgets, and information is constantly being added and updated in our databases. **Thus, field verification by professional biologists of the absence or presence of species and biological communities will always be an important obligation of users of our data.**

If you are aware of observation datasets that the MTNHP is missing, please report them to the Program Botanist apipp@mt.gov or Senior Zoologist dbachen@mt.gov. If you have observations that you would like to contribute, you can submit animal observations using our online data entry system at http://mtnhp.org/AddObs/, plant and animal observations via Excel spreadsheets posted at http://mtnhp.org/observations.asp , or to the Program Botanist or Senior Zoologist.

Observations

The MTNHP manages information on more than 1.8 million animal and plant observations that have been reported by professional biologists and private citizens from across Montana. The majority of these observations are submitted in digital format from standardized databases associated with research or monitoring efforts and spreadsheets of incidental observations submitted by professional biologists and amateur naturalists. At a minimum, accepted observation records must contain a credible species identification (i.e. appropriate geographic range, date, and habitat and, if species are difficult to identify, a photograph and notes on key identifying features), a date or date range, observer name, locational information (ideally with latitude and longitude in decimal degrees), notes on numbers observed, and species behavior or habitat use (e.g., is the observation likely associated with reproduction). Bird records are also required to have information associated with date-appropriate breeding or overwintering status of the species observed. MTNHP reviews observation records to ensure that they are mapped correctly, occur within date ranges when the species is known to be present or detectable, occur within the known seasonal geographic range of the species, and occur in appropriate habitats. MTNHP also assigns each record a locational uncertainty value in meters to indicate the spatial precision associated with the record's mapped coordinates. Only records with locational uncertainty values of 10,000 meters or less are included in environmental summary reports and number summaries are only provided for records with locational uncertainty values of 1,000 meters or less.

Species Occurrences

The MTNHP evaluates plant and animal observation records for species of higher conservation concern to determine whether they are worthy of inclusion in the Species Occurrence (SO) layer for use in environmental reviews; observations not worthy of inclusion in this layer include long distance dispersal events, migrants observed away from key migratory stopover habitats, and winter observations. An SO is a polygon depicting what is known about a species occupancy from direct observation with a defined level of locational uncertainty and any inference that can be made about adjacent habitat use from the latest peer-reviewed science. If an observation can be associated with a map feature that can be tracked (e.g., a wetland boundary for a wetland associated plant) then this polygon feature is used to represent the SO. Areas that can be inferred as probable occupied habitat based on direct observation of a species location and what is known about the foraging area or home range size of the species may be incorporated into the SO. Species Occurrences generally belong to one of the following categories:

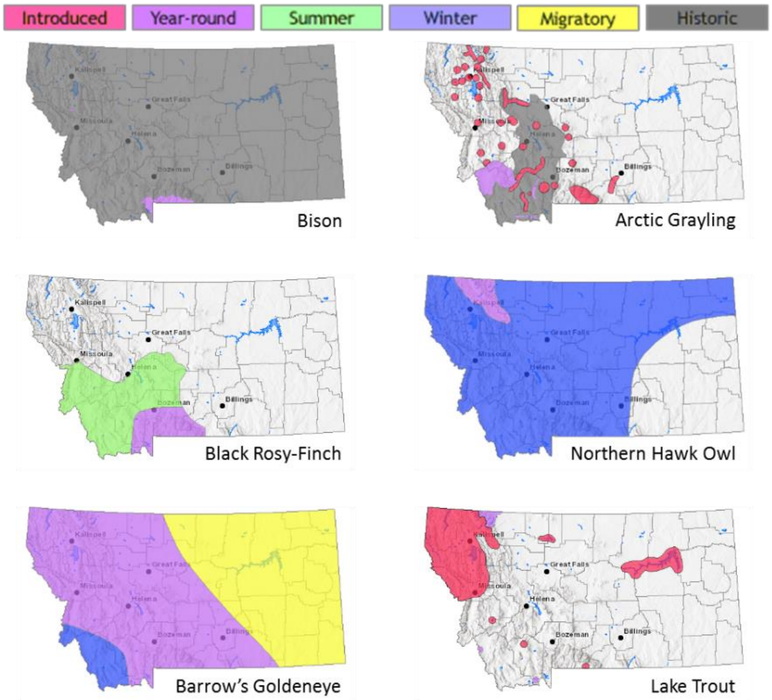
Plant Species Occurrences
A documented location of a specimen collection or observed plant population. In some instances, adjacent, spatially separated clusters are considered subpopulations and are grouped as one occurrence (e.g., the subpopulations occur in ecologically similar habitats, and their spatial proximity likely allows them to interbreed). Tabular information for multiple observations at the same SO location is generally linked to a single polygon. Plant SO's are only created for Species of Concern and Potential Species of Concern.

Animal Species Occurrences
The location of a verified observation or specimen record typically known or assumed to represent a breeding population or a portion of a breeding population. Animal SO’s are generally: (1) buffers of terrestrial point observations based on documented species’ home range sizes; (2) buffers of stream segments to encompass occupied streams and immediate adjacent riparian habitats; (3) polygonal features encompassing known or likely breeding populations (e.g., a wetland for some amphibians or a forested portion of a mountain range for some wide ranging carnivores); or (4) combinations of the above. Tabular information for multiple observations at the same SO location is generally linked to a single polygon. Species Occurrence polygons may encompass some unsuitable habitat in some instances in order to avoid heavy data processing associated with clipping out habitats that are readily assessed as unsuitable by the data user (e.g., a point buffer of a terrestrial species may overlap into a portion of a lake that is obviously inappropriate habitat for the species). Animal SO's are only created for Species of Concern and Special Status Species (e.g., Bald Eagle).

Other Occurrence Polygons
These include significant biological features not included in the above categories, such as Important Animal Habitats like bird rookeries and bat roosts, and peatlands or other wetland and riparian communities that support diverse plant and animal communities.

Geographic Range Polygons

Geographic range polygons have not yet been defined for most plant species. Native year-round, summer, winter, migratory and historic geographic range polygons as well as polygons for introduced populations have been defined for most animal species for which there are enough observations, surveys, and knowledge of appropriate seasonal habitat use to define them (see examples to left). These native or introduced range polygons bound the extent of known or likely occupied habitats for non-migratory and relative sedentary species and the regular extent of known or likely occupied habitats for migratory and long-distance dispersing species; polygons may include unsuitable intervening habitats. For most species, a single polygon can represent the year-round or seasonal range, but breeding ranges of some colonial nesting water birds and some introduced species are represented more patchily when supported by data. Some ranges are mapped more broadly than actual distributions in order to be visible on statewide maps (e.g., fish).



Predicted Suitable Habitat Models

Recent predicted suitable habitat suitability models have not yet been created for most plant species. For animal species for which models have been completed, the environmental summary report includes simple, rule-based, associations with streams for fish and other aquatic species and mathematically complex Maximum Entropy models (Phillips et al. 2006, Ecological Modeling 190:231-259) constructed from a variety of statewide biotic and abiotic layers and presence only data for individual species contributed to Montana Natural Heritage Program databases for most terrestrial species. For the Maximum Entropy models, we reclassified 90 x 90-meter continuous model output into suitability classes (unsuitable, low, moderate, and optimal) then aggregated that into the one square mile hexagons used in the environmental summary report; this is the finest spatial scale we suggest using this information in management decisions and survey planning. Full model write ups for individual species that discuss model goals, inputs, outputs, and evaluation in much greater detail are posted on the MTNHP's Predicted Suitable Habitat Models page. Evaluations of predictive accuracy and specific limitations are included with the metadata for models of individual species. **Model outputs should not be used in place of on-the-ground surveys for species. Instead model outputs should be used in conjunction with habitat evaluations to determine the need for on-the-ground surveys for species.** We suggest that the percentage of predicted optimal and moderate suitable habitat within the report area be used in conjunction with geographic range polygons and the percentage of commonly associated habitats to generate lists of potential species that may occupy broader landscapes for the purposes of landscape-level planning.

Associated Habitats

Within the boundary of the intersected hexagons, we provide the approximate percentage of commonly or occasionally associated habitat for vertebrate animal species that regularly breed, overwinter, or migrate through the state; a detailed list of commonly and occasionally associated habitats is provided in individual species accounts in the Montana Field Guide. We assigned common or occasional use of each of the 82 ecological systems mapped in Montana by: (1) using personal knowledge and reviewing literature that summarizes the breeding, overwintering, or migratory habitat requirements of each species; (2) evaluating structural characteristics and distribution of each ecological system relative to the species' range and habitat requirements; (3) examining the observation records for each species in the state-wide point observation database associated with each ecological system; and (4) calculating the percentage of observations associated with each ecological system relative to the percent of Montana covered by each ecological system to get a measure of numbers of observations versus availability of habitat. Species that breed in Montana were only evaluated for breeding habitat use, species that only overwinter in Montana were only evaluated for overwintering habitat use, and species that only migrate through Montana were only evaluated for migratory habitat use. In general, species were listed as associated with an ecological system if structural characteristics of used habitat documented in the literature were present in the ecological system or large numbers of point observations were associated with the ecological system. However, species were not listed as associated with an ecological system if there was no support in the literature for use of structural characteristics in an ecological system, even if point observations were associated with that system. Common versus occasional association with an ecological system was assigned based on the degree to which the structural characteristics of an ecological system matched the preferred structural habitat characteristics for each species as represented in the scientific literature. The percentage of observations associated with each ecological system relative to the percent of Montana covered by each ecological system was also used to guide assignment of common versus occasional association.

We suggest that the percentage of commonly associated habitat within the report area be used in conjunction with geographic range polygons and the percentage of predicted optimal and moderate suitable habitat from predictive models to generate lists of potential species that may occupy broader landscapes for the purposes of landscape-level planning. Users of this information should be aware that land cover mapping accuracy is particularly problematic when the systems occur as small patches or where the land cover types have been altered over the past decade. Thus, particular caution should be used when using the associations in assessments of smaller areas (e.g., evaluations of public land survey sections).

Introduction to Land Cover

Land Use/Land Cover is one of 15 Montana Spatial Data Infrastructure framework layers considered vital for making statewide maps of Montana and understanding its geography. The layer records all Montana natural vegetation, land cover and land use, classified from satellite and aerial imagery, mapped at a scale of 1:100000, and interpreted with supporting ground-level data. The baseline map is adapted from the Northwest ReGAP (NWGAP) project land cover classification, which used 30m resolution multi-spectral Landsat imagery acquired between 1999 and 2001. Vegetation classes were drawn from the Ecological System Classification developed by NatureServe (Comer et al. 2003). The land cover classes were developed by Anderson et al. (1976). The NWGAP effort encompasses 12 map zones. Montana overlaps seven of these zones. The two NWGAP teams responsible for the initial land cover mapping effort in Montana were Sanborn and NWGAP at the University of Idaho. Both Sanborn and NWGAP employed a similar modeling approach in which Classification and Regression Tree (CART) models were applied to Landsat ETM+ scenes. The Spatial Analysis Lab within the Montana Natural Heritage Program was responsible for developing a seamless Montana land cover map with a consistent statewide legend from these two separate products. Additionally, the Montana land cover layer incorporates several other land cover and land use products (e.g., MSDI Structures and Transportation themes and the Montana Department of Revenue Final Land Unit classification) and reclassifications based on plot-level data and the latest NAIP imagery to improve accuracy and enhance the usability of the theme. Updates are done as partner support and funding allow, or when other MSDI datasets can be incorporated. Recent updates include fire perimeters and agricultural land use (annually), energy developments such as wind, oil and gas installations (2014), roads, structures and other impervious surfaces (various years): and local updates/improvements to specific ecological systems (e.g., central Montana grassland and sagebrush ecosystems). Current and previous versions of the Land Use/Land Cover layer with full metadata are available for download at the Montana State Library's Geographic Information Clearinghouse.

Within the report area you have requested, land cover is summarized by acres of Level 1, Level 2, and Level 3 Ecological Systems.

Literature Cited

Anderson, J.R. E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Geological Survey Professional Paper 964.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological systems of the United States: A working classification of U.S. terrestrial systems. NatureServe, Arlington, VA.

Introduction to Wetland and Riparian

Within the report area you have requested, wetland and riparian mapping is summarized by acres of each classification present. Summaries are only provided for modern MTNHP wetland and riparian mapping and not for outdated (NWI Legacy) or incomplete (NWI Scalable) mapping efforts; described here. MTNHP has made all three of these datasets and associated metadata available for separate download on the Montana Wetland and Riparian Framework MSDI download page.

Wetland and Riparian mapping is one of 15 Montana Spatial Data Infrastructure framework layers considered vital for making statewide maps of Montana and understanding its geography. The wetland and riparian framework layer consists of spatial data representing the extent, type, and approximate location of wetlands, riparian areas, and deepwater habitats in Montana.

Wetland and riparian mapping is completed through photointerpretation of 1-m resolution color infrared aerial imagery acquired from 2005 or later. A coding convention using letters and numbers is assigned to each mapped wetland. These letters and numbers describe the broad landscape context of the wetland, its vegetation type, its water regime, and the kind of alterations that may have occurred. Ancillary data layers such as topographic maps, digital elevation models, soils data, and other aerial imagery sources are also used to improve mapping accuracy. Wetland mapping follows the federal Wetland Mapping Standard and classifies wetlands according to the Cowardin classification system of the National Wetlands Inventory (NWI) (Cowardin et al. 1979, FGDC Wetlands Subcommittee 2013). Federal, State, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands differently than the NWI. Similar coding, based on U.S. Fish and Wildlife Service conventions, is applied to riparian areas (U.S. Fish and Wildlife Service 2009). These are mapped areas where vegetation composition and growth is influenced by nearby water bodies, but where soils, plant communities, and hydrology do not display true wetland characteristics. **These data are intended for use in publications at a scale of 1:12,000 or smaller. Mapped wetland and riparian areas do not represent precise boundaries and digital wetland data cannot substitute for an on-site determination of jurisdictional wetlands.**

A detailed overview, with examples, of both wetland and riparian classification systems and associated codes can be found at: http://mtnhp.org/help/MapViewer/WetRip_Classification.asp

Literature Cited

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, FWS/OBS-79/31. Washington, D.C. 103pp.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, D.C.

U.S. Fish and Wildlife Services. 2009. A system for mapping riparian areas in the western United States. Division of Habitat and Resource Conservation, Branch of Resource and Mapping Support, Arlington, Virginia.

Introduction to Land Management

Within the report area you have requested, land management information is summarized by acres of federal, state, and local government lands, tribal reservation boundaries, private conservation lands, and federal, state, local, and private conservation easements. Acreage for "Owned", "Tribal", or "Easement" categories represents non-overlapping areas that may be totaled. However, "Other Boundaries" represents managed areas such as National Forest boundaries containing private inholdings and other mixed ownership which may cause boundaries to overlap (e.g. a wilderness area within a forest). Therefore, acreages may not total in a straight-forward manner.

Because information on land stewardship is critical to effective land management, the Montana Natural Heritage Program (MTNHP) began compiling ownership and management data in 1997. The goal of the Montana Land Management Database is to manage a single, statewide digital data set that incorporates information from both public and private entities. The database assembles information on public lands, private conservation lands, and conservation easements held by state and federal agencies and land trusts and is updated on a regular basis. Since 2011, the Information Management group in the Montana State Library's Digital Library Division has taken an increasingly active role in managing layers of the Montana Land Management Database in partnership with the MTNHP.

Public and private conservation land polygons are attributed with the name of the entity that owns it. The data are derived from the statewide Montana Cadastral Parcel layer. Conservation easement data shows land parcels on which a public agency or qualified land trust has placed a conservation easement in cooperation with the land owner. The dataset contains no information about ownership or status of the mineral estate. For questions about the dataset or to report errors, please contact the Montana Natural Heritage Program at (406) 444-5354 or mtnhp@mt.gov. You can download various components of the Land Management Database and view associated metadata at the Montana State Library's GIS Data List at the following links:

Public Lands
Conservation Easements
Private Conservation Lands
Managed Areas

Map features in the Montana Land Management Database or summaries provided in this report are not intended as a legal depiction of public or private surface land ownership boundaries and should not be used in place of a survey conducted by a licensed land surveyor. Similarly, map features do not imply public access to any lands. The Montana Natural Heritage Program makes no representations or warranties whatsoever with respect to the accuracy or completeness of this data and assumes no responsibility for the suitability of the data for a particular purpose. The Montana Natural Heritage Program will not be liable for any damages incurred as a result of errors displayed here. Consumers of this information should review or consult the primary data and information sources to ascertain the viability of the information for their purposes.

Introduction to Invasive and Pest Species

Within the report area you have requested, separate summaries are provided for: Aquatic Invasive Species, Noxious Weeds, Agricultural Pests, and Forest Pests that have been documented or potentially occur there based on their known distribution in the state. Definitions for each of these invasive and pest species categories can be found on our Species Status Codes page.

Each of these summaries provides the following information when present for a species: (1) the number of observations of each species; (2) the geographic range polygons for each species, if developed, that the report area overlaps; (3) predicted relative habitat suitability classes that are present if a predicted suitable habitat model has been created; (4) the percent of the report area that is mapped as commonly associated or occasionally associated habitat as listed for each species in the Montana Field Guide; and (5) and links to species accounts in the Montana Field Guide. Details on each of these information categories are included under relevant section headers under the Introduction to Native Species above or are defined on our Species Status Codes page. In presenting this information, the Montana Natural Heritage Program (MTNHP) is working towards assisting the user with rapidly determining what invasive and pest species have been documented and what species are potentially present in the report area. We remind users that this information is likely incomplete as surveys to document introduced species are lacking in many areas of the state, information on introduced species has only been tracked relatively recently, the MTNHP's staff and resources are restricted by declining budgets, and information is constantly being added and updated in our databases. **Thus, field verification by professional biologists of the absence or presence of species will always be an important obligation of users of our data.**

If you are aware of observation or survey datasets for invasive or pest species that the MTNHP is missing, please report them to the Program Coordinator bmaxell@mt.gov Program Botanist apipp@mt.gov or Senior Zoologist dbachen@mt.gov. If you have observations that you would like to contribute, you can submit animal observations using our online data entry system at http://mtnhp.org/AddObs/, plant and animal observations via Excel spreadsheets posted at http://mtnhp.org/observations.asp , or to the Program Botanist or Senior Zoologist.

Additional Information Resources

Home Page for Montana Natural Heritage Program (MTNHP)

MTNHP Staff Contact Information

Montana Field Guide

MTNHP Species of Concern Report - Animals and Plants

MTNHP Species Status Codes - Explanation

MTNHP Predicted Suitable Habitat Models (for select Animals and Plants)

MTNHP Request Information page

Montana Cadastral

Montana Code Annotated

Montana Department of Environmental Quality

Montana Fisheries Information System

Montana Fish, Wildlife, and Parks Subdivision Recommendations

Montana GIS Data Layers

Montana GIS Data Bundler

Montana Greater Sage-Grouse Project Submittal Site

Montana Ground Water Information Center

Montana Legislative Environmental Policy Office Publications
(Including Index of Environmental Permits required in Montana and Guide to the Montana Environmental Policy Act)

Montana Environmental Policy Act (MEPA)

MEPA Analysis Resource List

Laws, Treaties, Regulations, and Permits on Animals and Plants

Montana Spatial Data Infrastructure Layers

Montana State Historic Preservation Office Review and Compliance

Montana Water Information System

Montana Web Map Services

National Environmental Policy Act

U.S. Fish and Wildlife Service Information for Planning and Conservation (Section 7 Consultation)

Web Soil Survey Tool

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

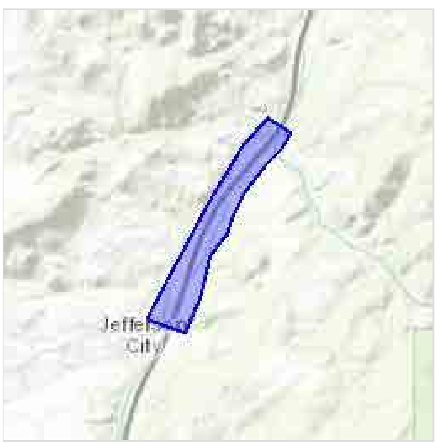
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Jefferson County, Montana



Local office

Montana Ecological Services Field Office

(406) 449-5225
(406) 449-5339

585 Shephard Way, Suite 1
Helena, MT 59601-6287

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx *Lynx canadensis* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
Grizzly Bear *Ursus arctos horribilis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/7642	Threatened
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Cassin's Finch Carpodacus cassinii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

Rufous Hummingbird selasphorus rufus
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Breeds Apr 15 to Jul 15

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

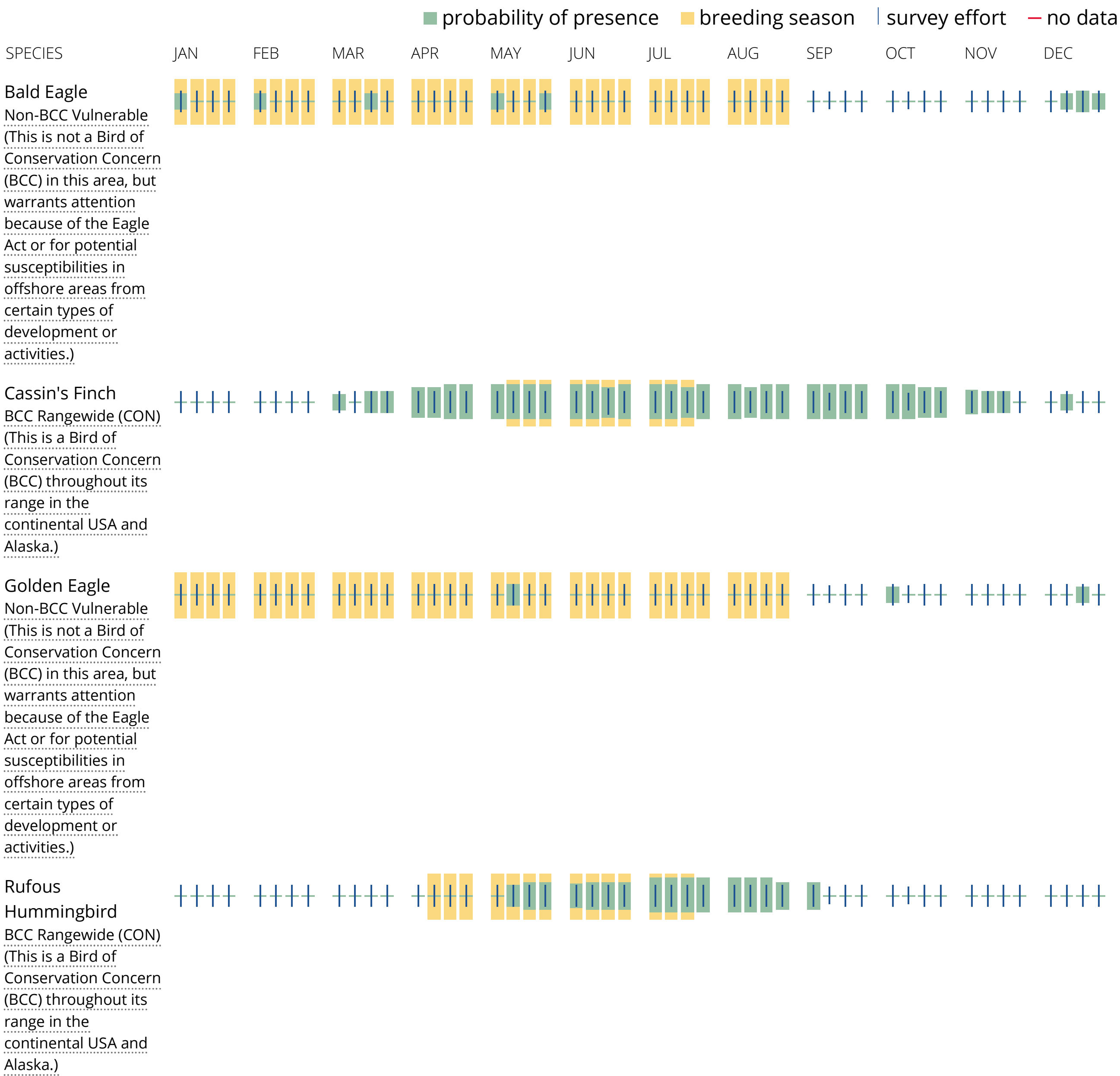
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures] describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures] and/or [permits] may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND
- PEM1C
- PEM1A

FRESHWATER POND
- PABF

RIVERINE
- R3UBG
- R5UBH
- R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix N: Economic Characteristics

Jefferson City
Safety Rest Area Study

DP03

SELECTED ECONOMIC CHARACTERISTICS

2013-2017 American Community Survey 5-Year Estimates

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Technical Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities, and towns and estimates of housing units for states and counties.

Subject	Jefferson County, Montana			
	Estimate	Margin of Error	Percent	Percent Margin of Error
EMPLOYMENT STATUS				
Population 16 years and over	9,587	+/-68	9,587	(X)
In labor force	5,644	+/-240	58.9%	+/-2.5
Civilian labor force	5,624	+/-243	58.7%	+/-2.5
Employed	5,302	+/-259	55.3%	+/-2.7
Unemployed	322	+/-104	3.4%	+/-1.1
Armed Forces	20	+/-20	0.2%	+/-0.2
Not in labor force	3,943	+/-246	41.1%	+/-2.5
Civilian labor force	5,624	+/-243	5,624	(X)
Unemployment Rate	(X)	(X)	5.7%	+/-1.8
Females 16 years and over	4,672	+/-72	4,672	(X)
In labor force	2,537	+/-176	54.3%	+/-3.8
Civilian labor force	2,537	+/-176	54.3%	+/-3.8
Employed	2,372	+/-187	50.8%	+/-4.0
Own children of the householder under 6 years	555	+/-56	555	(X)
All parents in family in labor force	441	+/-66	79.5%	+/-8.9
Own children of the householder 6 to 17 years	1,760	+/-80	1,760	(X)
All parents in family in labor force	1,360	+/-139	77.3%	+/-7.1
COMMUTING TO WORK				
Workers 16 years and over	5,218	+/-254	5,218	(X)
Car, truck, or van -- drove alone	3,942	+/-226	75.5%	+/-3.1
Car, truck, or van -- carpooled	708	+/-147	13.6%	+/-2.6
Public transportation (excluding taxicab)	6	+/-10	0.1%	+/-0.2
Walked	203	+/-84	3.9%	+/-1.6
Other means	72	+/-32	1.4%	+/-0.6
Worked at home	287	+/-74	5.5%	+/-1.4
Mean travel time to work (minutes)	20.3	+/-1.3	(X)	(X)

Subject	Jefferson County, Montana			
	Estimate	Margin of Error	Percent	Percent Margin of Error
OCCUPATION				
Civilian employed population 16 years and over	5,302	+/-259	5,302	(X)
Management, business, science, and arts occupations	2,301	+/-191	43.4%	+/-3.4
Service occupations	900	+/-176	17.0%	+/-3.2
Sales and office occupations	983	+/-152	18.5%	+/-2.5
Natural resources, construction, and maintenance occupations	683	+/-113	12.9%	+/-2.0
Production, transportation, and material moving occupations	435	+/-113	8.2%	+/-2.1
INDUSTRY				
Civilian employed population 16 years and over	5,302	+/-259	5,302	(X)
Agriculture, forestry, fishing and hunting, and mining	367	+/-92	6.9%	+/-1.7
Construction	509	+/-101	9.6%	+/-1.9
Manufacturing	165	+/-56	3.1%	+/-1.1
Wholesale trade	85	+/-64	1.6%	+/-1.2
Retail trade	464	+/-122	8.8%	+/-2.1
Transportation and warehousing, and utilities	242	+/-72	4.6%	+/-1.3
Information	71	+/-32	1.3%	+/-0.6
Finance and insurance, and real estate and rental and leasing	292	+/-80	5.5%	+/-1.5
Professional, scientific, and management, and administrative and waste management services	520	+/-118	9.8%	+/-2.2
Educational services, and health care and social assistance	1,212	+/-147	22.9%	+/-2.8
Arts, entertainment, and recreation, and accommodation and food services	411	+/-101	7.8%	+/-1.9
Other services, except public administration	244	+/-70	4.6%	+/-1.3
Public administration	720	+/-123	13.6%	+/-2.1
CLASS OF WORKER				
Civilian employed population 16 years and over	5,302	+/-259	5,302	(X)
Private wage and salary workers	3,423	+/-230	64.6%	+/-3.1
Government workers	1,357	+/-175	25.6%	+/-2.9
Self-employed in own not incorporated business workers	499	+/-105	9.4%	+/-2.0
Unpaid family workers	23	+/-27	0.4%	+/-0.5
INCOME AND BENEFITS (IN 2017 INFLATION-ADJUSTED DOLLARS)				
Total households	4,512	+/-130	4,512	(X)
Less than $10,000	213	+/-83	4.7%	+/-1.9
$10,000 to $14,999	150	+/-71	3.3%	+/-1.6
$15,000 to $24,999	409	+/-89	9.1%	+/-2.0
$25,000 to $34,999	379	+/-76	8.4%	+/-1.7
$35,000 to $49,999	553	+/-112	12.3%	+/-2.4
$50,000 to $74,999	846	+/-123	18.8%	+/-2.7
$75,000 to $99,999	641	+/-88	14.2%	+/-1.9
$100,000 to $149,999	856	+/-108	19.0%	+/-2.4
$150,000 to $199,999	226	+/-58	5.0%	+/-1.3
$200,000 or more	239	+/-68	5.3%	+/-1.5
Median household income (dollars)	64,911	+/-3,742	(X)	(X)
Mean household income (dollars)	80,622	+/-3,665	(X)	(X)
With earnings	3,405	+/-155	75.5%	+/-2.6
Mean earnings (dollars)	78,491	+/-4,517	(X)	(X)
With Social Security	1,613	+/-116	35.7%	+/-2.5
Mean Social Security income (dollars)	19,234	+/-1,008	(X)	(X)
With retirement income	1,220	+/-143	27.0%	+/-2.9
Mean retirement income (dollars)	26,285	+/-3,065	(X)	(X)
With Supplemental Security Income	125	+/-62	2.8%	+/-1.4

Subject	Jefferson County, Montana			
	Estimate	Margin of Error	Percent	Percent Margin of Error
Mean Supplemental Security Income (dollars)	10,651	+/-2,780	(X)	(X)
With cash public assistance income	57	+/-33	1.3%	+/-0.7
Mean cash public assistance income (dollars)	2,225	+/-1,252	(X)	(X)
With Food Stamp/SNAP benefits in the past 12 months	265	+/-77	5.9%	+/-1.7
Families	3,215	+/-185	3,215	(X)
Less than $10,000	82	+/-48	2.6%	+/-1.5
$10,000 to $14,999	69	+/-55	2.1%	+/-1.7
$15,000 to $24,999	212	+/-58	6.6%	+/-1.7
$25,000 to $34,999	242	+/-65	7.5%	+/-1.9
$35,000 to $49,999	324	+/-85	10.1%	+/-2.5
$50,000 to $74,999	588	+/-92	18.3%	+/-2.9
$75,000 to $99,999	542	+/-80	16.9%	+/-2.4
$100,000 to $149,999	718	+/-103	22.3%	+/-3.0
$150,000 to $199,999	212	+/-56	6.6%	+/-1.7
$200,000 or more	226	+/-67	7.0%	+/-2.1
Median family income (dollars)	78,003	+/-2,973	(X)	(X)
Mean family income (dollars)	92,752	+/-4,991	(X)	(X)
Per capita income (dollars)	32,387	+/-1,561	(X)	(X)
Nonfamily households	1,297	+/-152	1,297	(X)
Median nonfamily income (dollars)	37,264	+/-6,343	(X)	(X)
Mean nonfamily income (dollars)	46,926	+/-4,557	(X)	(X)
Median earnings for workers (dollars)	32,181	+/-1,554	(X)	(X)
Median earnings for male full-time, year-round workers (dollars)	55,486	+/-3,332	(X)	(X)
Median earnings for female full-time, year-round workers (dollars)	42,979	+/-2,415	(X)	(X)
HEALTH INSURANCE COVERAGE				
Civilian noninstitutionalized population	11,458	+/-53	11,458	(X)
With health insurance coverage	10,373	+/-238	90.5%	+/-2.1
With private health insurance	8,360	+/-385	73.0%	+/-3.3
With public coverage	3,929	+/-273	34.3%	+/-2.4
No health insurance coverage	1,085	+/-237	9.5%	+/-2.1
Civilian noninstitutionalized population under 19 years	2,557	+/-69	2,557	(X)
No health insurance coverage	223	+/-107	8.7%	+/-4.2
Civilian noninstitutionalized population 19 to 64 years	6,722	+/-87	6,722	(X)
In labor force:	5,040	+/-211	5,040	(X)
Employed:	4,771	+/-223	4,771	(X)
With health insurance coverage	4,262	+/-230	89.3%	+/-2.6
With private health insurance	3,981	+/-235	83.4%	+/-3.0
With public coverage	524	+/-123	11.0%	+/-2.6
No health insurance coverage	509	+/-126	10.7%	+/-2.6
Unemployed:	269	+/-91	269	(X)
With health insurance coverage	169	+/-60	62.8%	+/-21.6
With private health insurance	108	+/-43	40.1%	+/-17.2
With public coverage	68	+/-41	25.3%	+/-14.8
No health insurance coverage	100	+/-76	37.2%	+/-21.6
Not in labor force:	1,682	+/-203	1,682	(X)
With health insurance coverage	1,429	+/-177	85.0%	+/-4.5
With private health insurance	1,093	+/-183	65.0%	+/-8.6
With public coverage	521	+/-132	31.0%	+/-6.5
No health insurance coverage	253	+/-86	15.0%	+/-4.5

Subject	Jefferson County, Montana			
	Estimate	Margin of Error	Percent	Percent Margin of Error
PERCENTAGE OF FAMILIES AND PEOPLE WHOSE INCOME IN THE PAST 12 MONTHS IS BELOW THE POVERTY LEVEL				
All families	(X)	(X)	6.9%	+/-2.5
With related children of the householder under 18 years	(X)	(X)	11.3%	+/-3.9
With related children of the householder under 5 years only	(X)	(X)	32.7%	+/-20.1
Married couple families	(X)	(X)	4.1%	+/-2.4
With related children of the householder under 18 years	(X)	(X)	3.2%	+/-2.9
With related children of the householder under 5 years only	(X)	(X)	4.5%	+/-7.5
Families with female householder, no husband present	(X)	(X)	32.1%	+/-13.6
With related children of the householder under 18 years	(X)	(X)	37.2%	+/-16.4
With related children of the householder under 5 years only	(X)	(X)	79.0%	+/-25.5
All people	(X)	(X)	9.9%	+/-2.4
Under 18 years	(X)	(X)	11.2%	+/-3.6
Related children of the householder under 18 years	(X)	(X)	10.5%	+/-3.6
Related children of the householder under 5 years	(X)	(X)	23.2%	+/-13.7
Related children of the householder 5 to 17 years	(X)	(X)	7.2%	+/-3.6
18 years and over	(X)	(X)	9.6%	+/-2.7
18 to 64 years	(X)	(X)	10.9%	+/-2.9
65 years and over	(X)	(X)	5.6%	+/-3.9
People in families	(X)	(X)	6.7%	+/-2.2
Unrelated individuals 15 years and over	(X)	(X)	26.1%	+/-7.5

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

Employment and unemployment estimates may vary from the official labor force data released by the Bureau of Labor Statistics because of differences in survey design and data collection. For guidance on differences in employment and unemployment estimates from different sources go to Labor Force Guidance.

Workers include members of the Armed Forces and civilians who were at work last week.

Industry codes are 4-digit codes and are based on the North American Industry Classification System 2012. The Industry categories adhere to the guidelines issued in Clarification Memorandum No. 2, "NAICS Alternate Aggregation Structure for Use By U.S. Statistical Agencies," issued by the Office of Management and Budget.

Occupation codes are 4-digit codes and are based on Standard Occupational Classification 2010.

Logical coverage edits applying a rules-based assignment of Medicaid, Medicare and military health coverage were added as of 2009 -- please see https://www.census.gov/library/working-papers/2010/demo/coverage_edits_final.html for more details. The 2008 data table in American FactFinder does not incorporate these edits. Therefore, the estimates that appear in these tables are not comparable to the estimates in the 2009 and later tables. Select geographies of 2008 data comparable to the 2009 and later tables are available at https://www.census.gov/data/tables/time-series/acs/1-year-re-run-health-insurance.html. The health insurance coverage category names were modified in 2010. See https://www.census.gov/topics/health/health-insurance/about/glossary.html#par_textimage_18 for a list of the insurance type definitions.

Beginning in 2017, selected variable categories were updated, including age-categories, income-to-poverty ratio (IPR) categories, and the age universe for certain employment and education variables. See user note entitled "Health Insurance Table Updates" for further details.

While the 2013-2017 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural populations, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Explanation of Symbols:

1. An '**' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
2. An '-' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
3. An '-' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
4. An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
5. An '***' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.
6. An '*****' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
7. An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
8. An '(X)' means that the estimate is not applicable or not available.

Appendix O: Public and Stakeholder Coordination

Jefferson City
Safety Rest Area Study

Public Involvement Posters

Jefferson City

Safety Rest Area Study

GET INVOLVED

MDT has initiated a study of the Area. We invite you to learn about the study and provide feedback to the team.

The study will consider the following two alternatives:

1. **Reduction in Service**
   Includes maintaining site ramps and parking areas, removing building facilities, and installing vaulted toilets.
2. **Site Closure**
   Includes site reclamation following removal of facilities, parking areas, and ramps.

The team will consider corridor needs, costs, and public and stakeholder input to make a decision about the site.

Southbound Site

Northbound Site

Please provide comments by September 16, 2019.

Go Online
http://www.mdt.mt.gov/mdt/comment_form.shtml

Send by Mail
Chris DeVerniero | DOWL
1300 Cedar Avenue
Helena, MT 59601

Send an Email
Chris DeVerniero | DOWL
cdeverniero@dowl.com

DOWL

MONTANA MDT DEPARTMENT OF TRANSPORTATION

GET INVOLVED

The Montana Department of Transportation has completed the draft
Area Study.
We invite you to learn about the study and provide feedback to the team.

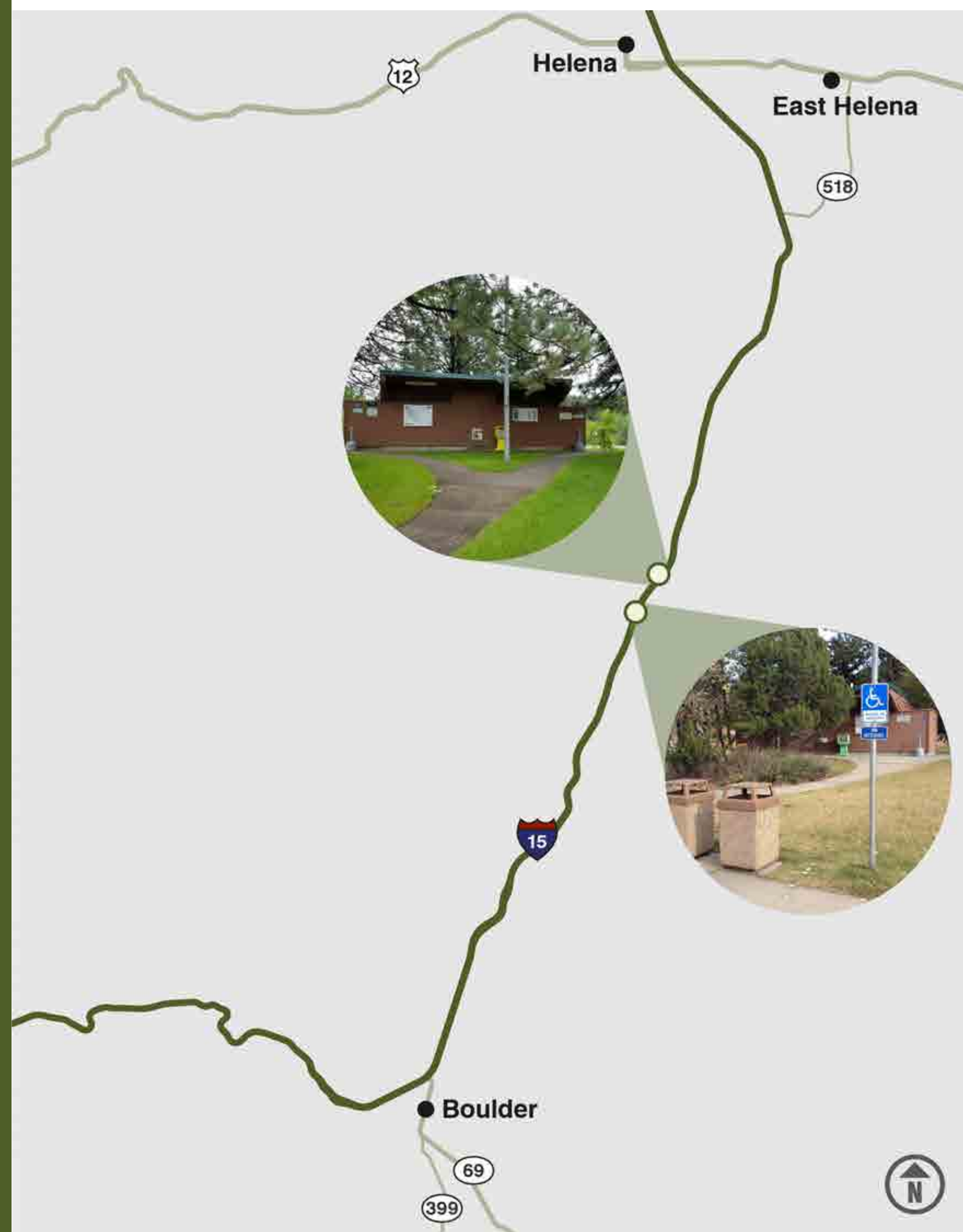
The study will consider the following two alternatives:

1. **Reduction in Service**
Includes maintaining site ramps and parking areas, removing building facilities, and installing vaulted toilets.

2. **Site Closure**
Includes site reclamation following removal of facilities, parking areas, and ramps.

The team will consider corridor needs, costs, and public and stakeholder input to make a decision about the site.

Jefferson City
Safety Rest Area Study



PUBLIC REVIEW PERIOD

You may access the draft report by visiting the project website at

http://www.mdt.mt.gov/pubinvolve/jeffersoncity

Please provide comments by December 31, 2019.

Go Online
http://www.mdt.mt.gov/

Send by Mail
Chris DeVerniero | DOWL
1300 Cedar Avenue
Helena, MT 59601

Send an Email
Chris DeVerniero | DOWL
cdeverniero@dowl.com

DOWL

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Stakeholder Interviews

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/17/2019
PROJECT NUMBER:	4638.12214.01	TIME:	3:38 pm
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Andrea Opitz Executive Director Helena Tourism Alliance Visit Helena Montana/Bike Helena	CALL INFO:	Email

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   The rest area provides benefits to the traveling public, especially since this is the only rest stop located on I-15 between Butte and Helena.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   There is definitely a need for truck parking. Large vehicle parking spaces would add additional parking for shuttle bus groups as well as RV parking.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   A complete closure including removal of the facilities, parking areas, and ramps would be detrimental. Helena markets and promotes our destination as half way between Yellowstone National Park and Glacier National Park. Closing the Jefferson City Rest Area would be removing an asset.

   Tourism is a high revenue-generating source in our city. Removing assets like the Jefferson City Rest Stop would be a barrier for individual visitors and especially group tours.

   Even a slight reduction in service could have unintended consequences with visitation to the Helena area. There are deep concerns on what effect closing this rest stop may have on tourism and travel convenience.

4. *What questions do you have about the study or the alternatives?*
   None.

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/8/2019
PROJECT NUMBER:	4638.12214.01	TIME:	0:00 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Cory Kirsch D2, County Commission Jefferson County	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   Commissioner Kirsch said that he hasn't ever stopped at the Jefferson City Rest Area and that locals aren't using it unless they have an emergency that requires stopping. Because of this, he doesn't think that stakeholders would notice if the rest area were to be closed.

   When driving by, he said that there are usually a few cars and a couple trucks parked there.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   Commissioner Kirsch spoke with the Jefferson County sheriff prior to the interview, who said that there are very few law-enforcement problems at the rest area. He mentioned that the Boulder Town Pump's truck parking is limited and challenging to access, so the truck parking at the rest area is important. If the parking is maintained, the sheriff commented that a restroom facility should be maintained as well to accommodate trash/rest room needs.

   There have been conversations between Jefferson County and the state about building a new rest area at the interchange in Boulder. The County is willing to partner on the initiative.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   Commissioner Kirsch didn't think a complete closure would be problematic at all. Economically, Jefferson County would rather see travelers stop at Boulder, which was the logic behind the Boulder rest area conversations. He mentioned other facilities that have informational kiosks stocked by the Chamber of Commerce that facilitate travelers visiting local businesses and attractions.

4. *What questions do you have about the study or the alternatives?*
   Commissioner Kirsch wondered whether improving the current rest area is an option, or whether paring back services is the state's direction.

He noted that this rest area is seasonal – if it's not missed in the winter, why would it be missed in the summer? He has noticed trucks parked in the on and off ramps during the winter.

DOWL

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/6/2019
PROJECT NUMBER:	4638.12214.01	TIME:	11:30 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Jim McCormick Chair, County Commission Silver Bow County	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   Commissioner McCormick said that he's inclined to trust the "engineering standard" when assessing this rest area. Because of the proximity of both Jefferson City and Clancy, he didn't see any need to keep services available at this location.
   There might be some "heat" from constituents due to change, but he thought the merchants in nearby towns would appreciated travelers being directed to stop in the communities rather than at the rest area.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   Same answer as above.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   Commissioner McCormick thought that a vault toilet would be his preference. He appreciates the newly improved rest areas like the one by Reed Point but doesn't think that level of improvement is necessary at this location because the return on investment would not justify the investment.

4. *What questions do you have about the study or the alternatives?*
   Commissioner McCormick commented that he is impressed and appreciates the level of outreach on this study. He worked for the Highway Department while in college, and really likes the direction things are going. He reiterated that he would like to see travelers use the services in the nearby communities rather than stopping at a rest area.

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	4/24/2019
PROJECT NUMBER:	4638.12214.01	TIME:	5:15 pm
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	John Morgan Chair, County Commission Silver Bow County	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   When traveling between Butte and Helena, it's generally not long enough of a drive to need to stop. John did an informal survey of staff around his office – not many people had stopped at Jefferson City Safety Rest Area. Some didn't even know that it existed. Personally, John had only stopped there once.
   Driving by the rest area, it appears to be adequate. There does always seem to be a car parked there.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   John doesn't think there is a need for the rest area. He said that he always stops at the truck stop in Boulder when he needs a stop or drink.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   John said that from his standpoint, that there would not be much effect. He commented that the gates are frequently closed, as it stands currently.

4. *What questions do you have about the study or the alternatives?*
   John felt that everything seemed "pretty cut and dry." He commented that he hears a lot of positive comments on the functionality of the newer design of rest areas that are being built – he mentioned the rest area by Anaconda/Wise River. In comparison he mentioned personally stopping at the rest area past Missoula often, which "feels like a prison."

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/7/2019
PROJECT NUMBER:	4638.12214.01	TIME:	9:00 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	LaDana Hintz, Planner, Jefferson County	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   LaDana said that she's not sure that the rest area is used much by locals, though there are residents who think that there is a need for a rest area in the area. She doesn't see cars at the rest area often but does see trucks parked there occasionally.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   LaDana said that she's seen trucks parked in the driveway during seasonal closures. She commented that if the facility were closed, that the truckers would find an alternative parking location – either a truck stop or an exit. It would be concerning if there were to park alongside the interstate.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   LaDana doesn't think that complete closure would not impact Jefferson County residents as much as it would probably impact the general public.

4. *What questions do you have about the study or the alternatives?*
   She commented that it would probably be best to have a vault rest room, though a parking area would also be okay. Truckers need a place to pull off to nap.

   Would it be possible to move the rest area? There is a group of Boulder residents who are trying to get a rest area at Boulder, which would encourage travelers to patronize local businesses. MDT has been approached about this idea.

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/6/2019
PROJECT NUMBER:	4638.12214.01	TIME:	10:00 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Leonard Wortman Chair, County Commission Jefferson County	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   Commissioner Wortman said that the Jefferson City Rest Area is unnecessary in that location and would just assume that the land be reclaimed. He said that the Commission is looking at installing a rest area at the Boulder interchange.

   In speaking with the mayor of Lima, Commissioner Wortman learned that business increased 20% when a rest area was installed nearby.

   In speaking with someone who works at the Anaconda rest area, Commissioner Wortman learned that despite being approximately a mile off the highway, it's packed all the time, and travelers frequently come into town as a result of the brochure kiosk.

   He also described having heard that Town Pumps like being near rest areas due to increased business.

   Commissioner Wortman went on to address the Montana Rest Area Plan, saying that he has a problem with the way that the it's written and how it directs travelers to urban areas. To cater to the traveling public, we shouldn't force them to an urban area. He said that he tries to speak to people stopped at rest areas and has gotten the following feedback:
   - They don't like contending with urban traffic and feel that rest areas provide a quicker place to stop.
   - They don't like feeling obligated to purchase something when stopping at a gas station.
   - They like rural rest areas for the space it provides for dogs and the opportunity to rest.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   Commissioner Wortman didn't have any additional thoughts regarding truck traffic. The Jefferson City Rest Area is closed half of the year, anyway.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   Commissioner Wortman said that he'd only stopped there a couple times, so didn't foresee a full closure being impactful to his constituents.

4. *What questions do you have about the study or the alternatives?*
   Commissioner Wortman has been working with Jeff Ebert, MDT District Administrator, looking at the potential rest area site at the Boulder interchange. He said that the County has proposed maintaining, providing utilities and parking area to a new site if the State were to build the rest area building. The vision for the new development would include a hall of fame/museum, possible visitors center, and future plans for a hotel and restaurants. He said that the conversations are ongoing and provided the following rendering.

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/6/2019
PROJECT NUMBER:	4638.12214.01	TIME:	4:30 pm
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Lindsay Morgan, Planner, Lewis and Clark County	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   Lindsay said that she has never stopped at the Jefferson City Rest Area. Having small children though, she frequently stops at rest areas and referenced recently stopping at the Dearborn Rest Area. She likes the availability of rest areas and feels guilty using gas station bathrooms when she doesn't need to purchase anything.

   Safety at the rest areas is a concern for Lindsay – particularly at night. She likes the newer styles of rest areas and appreciates facilities that provide dog walking areas.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   Lindsay said that she has noticed big rigs stopped at the Jefferson City site. If the facility remains, it's nice for the truck parking to be separated from the rest rooms from a safety/visibility perspective.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   Lindsay doesn't think there would be a major impact to Helena residents if the rest area were to be closed.

4. *What questions do you have about the study or the alternatives?*
   Lindsay commented that she has family members with medical issues that require frequent stopping who appreciate having rest area options at more-than-average intervals.

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/18/2019
PROJECT NUMBER:	4638.12214.01	TIME:	11:43 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Maria Pochervina Butte Convention Visitors Bureau	CALL INFO:	Email

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   I feel the stopping opportunities in the area are adequate when looking at the rest stop near Jefferson City. There is a significant amount of traffic between Butte and Helena, both local (Montana residents), and non-resident visitors who pass along this section of the Interstate as they travel north and south or look to jump onto I-90 for east west travel. One group traveling in both directions are our Canadian visitors as they travel south for some warm weather in the winter and the return trip north when spring is on its way.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   I feel the location of the rest stop at Jefferson City allows for large semi's, motorhomes, motorcycles and vehicles towing other units is wonderful. It is out of the way enough to allow for easy on and off access. When semi drivers have reached their limit on hours, the Jefferson City location is a quiet place to stop and pull over.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   Rest stops are nice for people traveling with pets, who need to let the animals relieve themselves as well as the humans. I live in Butte and have on many occasions had to utilize the Jefferson City rest stop either for myself or with other family members. It's nice to know there is an easy and accessible stop along the way.

4. *What questions do you have about the study or the alternatives?*
   I really don't have a question, just a bit of sadness to think a spot in the road, where it is really pretty and place to stretch and "powder" is looking at closing facilities.

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/9/2019
PROJECT NUMBER:	4638.12214.01	TIME:	11:00 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Jan Stoddard, Bureau Chief, Industry Services and Outreach, Tourism and Business Development Gus Byrom, Outreach Specialist, Department of Commerce Galen Steffens, Community Planning Program Manager, Department of Commerce	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*

   Jan provided the following thoughts:
   - The State of Montana has 12.2 million inbound visitors including many seasonal visitors. The heaviest traffic is on I-15 going to Glacier. Many are traveling from Glacier to Yellowstone or from Yellowstone to Glacier through Helena.
   - Markets that this rest area impacts include:
     - Motorcyclists (resident and non-resident), who tend to use rest areas more than auto travelers
     - RV travelers (resident and non-resident). RVers try to avoid "Helena mess". There is heavy RV traffic in spring and fall as snowbirds move north/south.
     - Bicyclists
   - Jan offered to provide ITRR research on routing.

   Galen commented that existing rest stops serve their purpose and are used. She sees some concern in preventing people from visiting local downtowns. Because this is an existing site, it's different in the conversation though.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*

   Jan said that the type of parking provided is important. RVs are getting bigger – campgrounds are having to provide larger spaces to accommodate them.

   Gus added that often they're even towing a boat or other vehicle.

Galen said that communities' goals are to get visitors to travel and spend money, but parking is a constant issue. The vehicle size issue is seasonal and nonseasonal – seasonal closures affect vehicles like those pulling large snowmobile trailers or logging trucks.

Gus said that year-round access would be beneficial as a chain-up area, noting that this is the beginning of a nasty stretch of road.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*

   Jan said that this would be the removal of an asset used by resident and nonresident travelers. It's located close to recreational opportunities like national forests, so closing the site would change how people use this area. Closure would direct people to towns but may cause them to speed by the town too.

   Galen commented that towns often lack public rest rooms.

4. *What questions do you have about the study or the alternatives?*

   Jan referred to energy behind some Boulder projects (Making Boulder Bright Again, Feasibility Study on Boulder).

   Gus added that they are working on funding for various projects in Boulder that are interconnected.

   Galen said that that stretch of road has a lot of communities that are very concerned about getting people to stop in their towns.

   Jan mentioned that bus tour operators use rest areas too. There is a recent trend in Chinese tours who do 12 hours of driving and are looking for places to stop.

**Jan provided this study: Motorcycle Touring in Monana-A Market Analysis.pdf

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/13/2019
PROJECT NUMBER:	4638.12214.01	TIME:	11:27 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Sarah Bannon Southwest Montana	CALL INFO:	Email

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   We are grateful that travelers have a place to stop on this I-15 stretch. There aren't any really easy areas to stop in the Helena area.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   There is a great need for truck parking and RV parking. We have so many truckers that come through this stretch to avoid the mountain passes. They will turn off at Boulder just to avoid the passes. Also, we have so many RVs that come through this stretch and they are increasing. We had a travel show in Calgary and had a much greater interest in the last two years for places for RV's down through I-15.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   It would negatively impact the members and constituents. Anytime we can get travelers to stop and get out of their vehicles, the more they appreciate the area. This increases our chances of getting them to explore the region.

4. *What questions do you have about the study or the alternatives?*
   If this stretch is taken away what would be provided as an easy alternative for the truckers and RV travelers for getting off the road on this stretch?

STAKEHOLDER INTERVIEW RECORD

PROJECT:	Jefferson City Safety Rest Area Study	DATE:	5/9/2019
PROJECT NUMBER:	4638.12214.01	TIME:	10:15 am
ORGANIZER:	Lisa Olmsted, Public Involvement Specialist	SUBJECT:	Jefferson City Safety Rest Area Study Stakeholder Interview
WITH:	Spook Stang Executive Vice President, Montana Motor Carries Association	CALL INFO:	

NOTES:

1. *How do your constituents feel about stopping opportunities in this area? Adequate? Lacking?*
   Spook said that they do not favor closing the site as it us used by many drivers and his organization hears many complaints when it's closed in the winter. He described a former weigh station site that was also used during off-hours as a parking location for trucks - his association received numerous complaints when it was closed completely.

   He brought up the new ELDs (electronic logging devices) that were mandated about a year ago. The devices force truckers to comply to the hours of services requirements, which require ten-hour breaks after 11 hours of driving in a 14-hour day. Because of this, truckers need places to park and rest. If a place isn't available, they would be forced to park on the interstate shoulder. A vault toilet or parking area would be acceptable for these needs.

2. *Please describe your views on the perceived need for truck parking at the Jefferson City site.*
   This site is heavily used by truckers looking for a place to park for their mandatory rest break or 10-hour restart.

3. *How would complete closure of the Jefferson City site impact your members/constituents?*
   Closure would continue to eliminate places for truckers to take mandatory rest, which would adversely affect them. There isn't a plethora of Helena truck stops, and the mall renovation eliminates parking that was formerly used. Truck parking in Boulder is also limited. He referenced Utah as a best-practice example – they have signs directing truckers to available parking, and he has seen 30-40 trucks spots filled in some locations.

4. *What questions do you have about the study or the alternatives?*
   Spook said that he appreciates MDT engaging stakeholders. Looking forward, changing regulations for the trucking industry will require more and more parking options.

Team Meeting Minutes

MEETING SUMMARY

PROJECT:	Jefferson City Rest Area Study	DATE:	3/20/19
PROJECT NUMBER:	4638.12214.01	TIME:	11:00 A.M.
ORGANIZER:	Paul Johnson – MDT	SUBJECT:	Scoping Meeting
LOCATION:	Paul Johnson's Office		

ATTENDEES:	ORGANIZATION:
Paul Johnson	MDT – Rail, Transit and Planning
Andy White	MDT – Rail, Transit and Planning
Chris DeVerniero	DOWL

Meeting Summary

The Montana Department of Transportation (MDT) has retained DOWL to assist with the Jefferson City Rest Area Study. On March 20, 2019, MDT and DOWL met to discuss the scope of the study.

Paul Johnson explained that Andy White will be the MDT Project Manager (PM) and all correspondence, deliverables, and invoicing should be coordinated through him. Chris DeVerniero will serve as the DOWL PM and will be the single point of contact for the duration of the project.

Paul confirmed that the project schedule would extend eight months from March 8, 2019, at which time any incomplete activities would need to be addressed through a project extension. The project is subject to the terms as outlined in Contract # 312036-B Task Order #4 for an approved amount of $61,275.95. Any activities requested out of scope or otherwise beyond the agreed upon activities will need to be addressed through an amendment.

Task 1: Scoping

Paul agreed that there were no changes to the proposed scope of services outlined in the proposal submitted by DOWL on March 1, 2019, with the exception of schedule. An eight (8) month project schedule beginning from March 8, 2019, would be substituted for the proposed six (6) month schedule. Chris agreed that this was amenable and that the intent is to work for the six-month schedule understanding that there is some flexibility in the schedule for deliverables and MDT review times. DOWL will submit the scope of services, budget, and schedule as discussed in addition to meeting minutes.

Paul agreed that the use of 2019 Rest Area Plan Health Index Update data specific to the Jefferson City Rest Area would be sufficient for the purpose of this study and no additional site-specific inventory would need to be conducted. Additionally, Andy will investigate and provide any study area information including as-builts or specific building facility data that has not already been provided to DOWL as soon as possible.

Task 2: Existing Conditions Analysis

Paul confirmed that the activities identified in the proposal are sufficient and can be carried forward to the final scope of services. Andy will request any additional information available from MDT Maintenance including maintenance personnel feedback, annual custodial costs, annual

MDT Maintenance costs, and any other contracted cost occurred at the Jefferson City Rest Area.

Task 3: Alternative Identification

Paul confirmed that the activities identified in the proposal are sufficient and can be carried forward to the final scope of services with the exception that cost estimates for each site (northbound and southbound) are detailed separately.

Task 4: Alternatives Screening

Paul confirmed that the activities identified in the proposal are sufficient and can be carried forward to the final scope of services with the exception that screening evaluations for each site (northbound and southbound) are detailed separately.

Task 5: Report Documentation

Paul confirmed that the activities identified in the proposal are sufficient and can be carried forward to the final scope of services. The final report should mirror the Gold Creek Rest Area Study in format and structure.

Task 6: Public & Stakeholder Involvement

Paul confirmed that the activities identified in the proposal are sufficient and can be carried forward to the final scope of services. Andy will provide the most current biennial survey results to DOWL in electronic format as soon as possible. DOWL will provide a proposed list to stakeholder contacts for MDT review and approval.

Task 7: Team Meetings

Paul confirmed that the team meeting frequency and timing in the proposal are adequate and can be carried forward to the final scope of services.

Task 8: Progress Reporting

Paul confirmed that bulleted monthly progress reporting emailed to Andy and hard copy invoicing are satisfactory and can be carried forward to the final scope of services.

TASK ASSIGNMENTS:	ASSIGNED TO:
◆ Prepare TOC meeting minutes.	DOWL
◆ Prepare Final Scope of Services, Budget, and Schedule.	DOWL
◆ Provide any study area information including as-builts or specific building facility specific data.	MDT
◆ Provide maintenance personnel feedback, annual custodial costs, annual MDT Maintenance costs, and any other contracted cost occurred at the Jefferson City Rest Area.	MDT
◆ Provide the most current biennial survey results.	MDT
◆ Provide a proposed list to stakeholder contacts.	DOWL

MEETING SUMMARY

PROJECT:	Jefferson City Rest Area Study	DATE:	6/19/19
PROJECT NUMBER:	4638.12214.01	TIME:	10:00 A.M.
ORGANIZER:	Andy White – MDT	SUBJECT:	Team Meeting #2
LOCATION:	Paul Johnson's Office		

ATTENDEES:	ORGANIZATION:
Paul Johnson	MDT – Rail, Transit and Planning
Andy White	MDT – Rail, Transit and Planning
Chris DeVerniero	DOWL

A project coordination meeting with MDT and DOWL for the Jefferson City Rest Area Study was held in Paul Johnson's office on Wednesday June 19th, 2019. The intent of the meeting was to review the draft Existing Conditions Analysis, Cost Estimates, and Biennial Survey.

Meeting Summary

Schedule and Budget

Chris provided a high-level overview noting that the project was currently tracking right on schedule and budget. Paul confirmed that he had no concerns for either at the time.

Task 2: Existing Conditions Analysis

Paul and Andy confirmed that they have not had a chance to fully review the draft Existing Conditions Analysis; however, concluded that that the report was in order and would fully review the document for additional suggestions and comments. A further discussion section by section revealed some concern regarding parking demand. Chris explained that parking demand calculations in the report were based on the WTI methodology using traffic volumes due to the absence of door counts at the facilities. The WTI methodology has been observed by MDT's Rest Area Committee to be extremely conservative but is to be used in the absence of door counts for rough facility sizing only. Paul, Andy and Chris agreed to use recent door counts to analyze parking demand for inclusion in the final report.

Paul commented on the lack of a water right at the northbound site noted in the draft analysis. Chris pointed out that DOWL had previously reviewed existing water rights as part of the recent Rest Area Study Update and were not successful in locating the water right through a cursory review of online source and DNRC's database. Paul agreed that he would further investigate locating the existing water right or submit an application to acquire one.

Task 3: Alternative Identification

Paul and Andy confirmed that the cost estimates for the northbound alternatives 1 & 2 appeared to be inline with their expectations. However, Paul felt that the southbound alternative 1 (Reduction in Service) did not include improvements needed to accommodate sufficient truck parking. Paul noted that the existing configuration at the southbound site does not allow for adequate truck movements or parking availability. Paul, Andy, and Chris agreed that DOWL would reevaluate the parking area to include additional truck parking. Chris noted that DOWL would investigate and provide an updated parking area layout and cost estimate that would provide additional truck parking and allow for WB-67 turning movements.

Task 4: Alternatives Screening
Paul and Andy confirmed that the draft Alternative Identification & Screening report was complete, screening criteria was sound, and had no concerns other than the cost estimate as noted for the southbound reduction in service alternative in Task 3. Chris agreed that once an updated cost estimate was recalculated and approved by MDT, that it would be incorporated into the Alternative Identification & Screening report.

Task 6: Public & Stakeholder Involvement
Chris provided and overview of website, biennial survey review, stakeholder interviews and other miscellaneous public involvement activities. Paul and Andy commented that they have not had a chance to fully review the biennial survey review; however, noted that they would do so in the next week and provide comments. Paul commented that the stakeholder interviews appeared to be consistent with other rest area studies and that there was a general consensus for retaining truck parking over abandonment.

TASK ASSIGNMENTS:	ASSIGNED TO:
◆ Prepare TOC meeting minutes.	DOWL
◆ Provide 2019 Door counts as available.	MDT
◆ Investigate water right for the northbound site.	MDT
◆ Update parking demand calculations.	DOWL
◆ Update southbound alternative 1 to include additional truck parking.	DOWL
◆ Update Alternative Identification & Screening report to include SB alternative 1 updates.	DOWL
◆ Review and provide comments for the draft Existing Conditions Analysis, and Biennial Survey Review.	MDT

MEETING SUMMARY

PROJECT:	Jefferson City Rest Area Study	DATE:	8/27/19
PROJECT NUMBER:	4638.12214.01	TIME:	1:00 P.M.
ORGANIZER:	Andy White – MDT	SUBJECT:	Team Meeting #3
LOCATION:	Paul Johnson's Office		

ATTENDEES:	ORGANIZATION:
Paul Johnson	MDT – Rail, Transit and Planning
Andy White	MDT – Rail, Transit and Planning
Chris DeVerniero	DOWL

A draft overview meeting with MDT and DOWL for the Jefferson City Rest Area Study was held in Paul Johnson's office on Tuesday August 27, 2019. The intent of the meeting was to review and comment on the draft Jefferson City Rest Area Study Summary Report.

Meeting Summary

Schedule and Budget

Chris provided a high-level overview noting that the project was currently tracking on schedule and budget. Paul confirmed that he had no concerns for either at the time. It was noted that the contract time may need to be extended to allow sufficient MDT and public review of the summary report.

Draft Report

Paul and Andy noted a few edits on page numbering and general formatting changes to the draft document.

Paul suggested that Lyons Creek be removed from the network spacing analysis and updated in all tables and exhibits.

Paul, Andy, and Chris agreed that the parking demand analysis should consider the existing southbound truck parking as providing no stalls due to its substandard configuration. The group also agreed that existing source water and wastewater are limiting factors for the existing site and would greatly influence future decisions.

Paul and Andy agreed to finalize their comments and email to Chris as soon as possible. Chris agreed to have a revised draft returned to MDT by September 18, 2019. The revised draft will be distributed to the MDT Rest Area Committee and others for final comment.

TASK ASSIGNMENTS:	ASSIGNED TO:
◆ Prepare TOC meeting minutes.	DOWL
◆ Provide formal comments to DOWL on the draft	MDT
◆ Revise draft based on MDT comments and resubmit by 9/18/19	DOWL

MEETING SUMMARY

PROJECT:	Jefferson City Rest Area Study	DATE:	10/16/19
PROJECT NUMBER:	4638.12214.01	TIME:	10:00 A.M.
ORGANIZER:	Andy White – MDT	SUBJECT:	Team Meeting #4
LOCATION:	Paul Johnson's Office		

ATTENDEES:	ORGANIZATION:
Paul Johnson	MDT – Rail, Transit and Planning
Andy White	MDT – Rail, Transit and Planning
Chris DeVerniero	DOWL

A second draft overview meeting with MDT and DOWL for the Jefferson City Rest Area Study was held in Paul Johnson's office on Wednesday October 16, 2019. The intent of the meeting was to review, and address comments submitted by the MDT Rest Area Committee regarding the draft Jefferson City Rest Area Study Summary Report.

Meeting Summary

Schedule

It was noted that the original contract time will expire November 8, 2019 and will need to be extended to allow a 30-day public review period of the draft document. MDT proposed to modify the schedule to extend to December 31, 2019.

Draft Report

The group reviewed each comment and made the following changes to the draft document.

- Remove any reference to the Dearborn and Divide Safety Rest Areas. The adjusted study limit will extend from Helena to Butte, MT.
- Revise *Figure 1 Study Area* to capture the portion of the I-90 corridor extending from Helena to Butte, MT.
- Revise *Section 2.1 Network Spacing and Demand*, *Table 1 Jefferson City Safety Rest Area Spacing Analysis*, and *Figure 2 Jefferson City Safety Rest Area Spacing Analysis* to reflect the portion of the I-90 corridor extending from Helena to Butte, MT.
- Revise the Summary of *Section 2.3 Public Wastewater Systems* to further detail "if the existing Jefferson City sites were to be improved or expanded".
- Reference *Figure 3 Wetlands and Waterways Within the Vicinity of The Study Area* in *Section 2.9 Environmental Conditions*.
- Move the *Section 3.3 Survey Summaries* conclusion after *Section 3.5 Written Comments* to address Section 3.0 in its entirety.
- Address minor grammatical errors and omissions in the document.

Next Steps

DOWL will update the draft document and submit to MDT for final approval prior to making it available for the public review period. Upon approval, DOWL will submit a request to update the project website to include language detailing the public review period and a link to the draft document. DOWL will update project posters to reflect the public review period and distribute them similar to the initial public notice effort.

TASK ASSIGNMENTS:	ASSIGNED TO:
◆ Prepare TOC meeting minutes.	DOWL
◆ Submit a request to extend the contract end date to 12/31/19	MDT
◆ Revise draft based on team meeting discussion.	DOWL
◆ Review and approve final draft for the public review period.	MDT
◆ Submit request for project website update.	DOWL
◆ Post notification of public review period.	DOWL

Public Comment

-----Original Message-----
From: www@mt.gov <www@mt.gov>
Sent: Thursday, September 26, 2019 5:59 PM
To: MDT Comments - Project <mdtcommentproject@mt.gov>
Subject: Comment on a Project or Study Submitted

A question, comment or request has been submitted via the "Contact Us" web page.

Reason for Submission: Comment on a Project or Study
Submitted: 09/26/2019 17:58:36
Project/Study Commenting On:JeffersonCitySafetyRestArea
Name: Cindy Lake
Email Address: beltlassie@hotmail.com

Comment or Question:

I have heard that the State of Montana is thinking about closing this rest area. I have taken many of my breaks in this rest area. I am a professional driver and have seen countless people come and go here. The walking paths and the beautiful lawns and picnic areas are a favorite with many travelers. Many out of state people stop here, as do many snowbirds travelling back and forth from the southern states. I have also noted that the I-15 corridor has many, many people traveling on it, and people stop at this rest area because it is convenient, clean and a nice place to get out and stretch your legs and take care of restroom needs. The public needs to keep this instead of installing a pit outhouse toilet. The pit toilets are usually unsanitary, and only one toilet which is always taken by someone that wants to spend an hour on the pot! The ability to wash your hands and look in a mirror is very nice.

If you want Montana to look like a we don't care about our visitors, just keep installing pit toilets everywhere. Better idea, why don't the people making the decision whether to keep this rest area or turn it into a pit outhouse, quit using their toilets at their work with running water and the ability to wash your hands and start using an outhouse!!!! Thank you for listening to my opinion, which is echoed by many!

Submitter's IP address: 192.230.175.2

Reference Number = prjcomment_427855151313455

From: Johnson, Paul
Sent: Tuesday, October 1, 2019 9:00 AM
To: 'beltlassie@hotmail.com' <beltlassie@hotmail.com>
Subject: Jefferson City Rest Area

Hello Cindy,

MDT greatly appreciates your comments on the Jefferson City Rest Area facilities. These comments will help drive long-term decisions for these Rest Area sites – which are currently being evaluated via the Jefferson City Rest Area Study. While the study hasn't been finalized, we do know that there are major challenges associated with the shallow water table at these locations – thus making it difficult to site drinking water wells and adequately treat wastewater. So, MDT's decision to utilize vaulted toilets (or not) will likely be driven by this constraint – rather than some other consideration.

As for your concerns regarding total closure of the facility, we have seen a good deal of public support for keeping services at this location – so MDT will give this input strong consideration when making a final decision. Should MDT decide to convert this area to a truck parking facility, we would most assuredly have multiple toilet facilities for the NB and SB sites. And, as part of the conversion, MDT would make every effort to maintain some of the existing amenities (historic signs, etc.) and keep the area as natural as possible.

I hope this information is helpful. If you require additional information, please feel free to contact me at any time. Also, if you would like a copy of the Jefferson City Rest Area study, I would be happy to provide that when it is made public.

Thanks ...

Paul Johnson
MDT - Project Analysis

Appendix P: Cost Estimates

Jefferson City
Safety Rest Area Study

JEFFERSON CITY (NB) SAFETY REST AREA

ALTERNATIVE 1 - REDUCTION OF SERVICE (TRUCK PARKING)

Item Description	Unit	NB CALCULATED QUANTITY	NB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
DEMOLITION ITEMS								
REMOVE BITUMINOUS PAVEMENT	SQ YD	1,206.7	1,210.0	$ 13.00	$ 15,730.00	$ -	$ -	Assume 1' saw cut around median islands curb removal for clean pavement edge for repaving. Remove islands to provide improved turning movement, additional parking, and easier snow plowing maintenance activities.
REMOVE PRE-CAST CURB/PIN-DOWN CURB (w/rebar)	LF	1,176.0	1,176.0	$ 3.00	$ 3,528.00	$ -	$ -	Remove raised median islands. Remove and replace deteriorated pin-down curb.
REMOVE CONCRETE SIDEWALK/PATH	SQ YD	610.8	620.0	$ 11.50	$ 7,130.00			Assume removal of sidewalk leading to the facility and "loops" leading to and adjacent to picnic shelters.
REMOVE CONCRETE SHELTER FLOOR SLABS	SQ YD	160.0	160.0	$ 11.50	$ 1,840.00			Assume total removal of picnic shelters served by access routes.
REMOVE LIGHT POLES	EACH	-	-	$ 500.00	$ -	$ -	$ -	No cost; assume light poles remain and power is reconnected after rest area building demolition.
REMOVE ELECTRICAL SYSTEM/CONDUIT	L.SUM	-	-	$ -	$ -	$ -	$ -	No cost.
REMOVE BUILDING STRUCTURE	EACH	1.0	1.0	$ 25,000.00	$ 25,000.00	$ -	$ -	Total removal, including everything inside structure (electrical, plumbing).
LEAD PAINT ABATEMENT	EACH	1.0	1.0	$ -	$ -			Per MDT, no abatement cost for demolition.
REMOVE PICNIC SHELTER STRUCTURE	EACH	2.0	2.0	$ 2,000.00	$ 4,000.00	$ -	$ -	Total removal - Include 4 picnic tables per structure.
REMOVE EXHIBIT CASE (KIOSK)	EACH	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal.
REMOVE HISTORICAL SIGNS	L.SUM	-	-	$ 500.00	$ -	$ -	$ -	No cost, will rehabilitate existing.
REMOVE BENCHES AND WASTE RECEPTACLES	L.SUM	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal - includes all benches and waste receptacles.
REMOVE ROAD SIGNING/REPLACE ROAD SIGNING	L.SUM	1.5	1.5	$ 1,500.00	$ 2,250.00	$ -	$ -	Replace all advanced "Rest Area" interstate signing with new signing to reference "Truck Parking" facility.
REMOVE IRRIGATION SYSTEM	L.SUM	-	-	$ -	$ -	$ -	$ -	Underground irrigation lines to remain in place. Sprinkler heads may be removed as needed for safety concurrent with sidewalk removal or under contingency category. No cost.
REMOVE/ABANDON SEPTIC TANK	EACH	1.0	1.0	$ 4,000.00	$ 4,000.00	$ -	$ -	Pump septic tanks, crush, and fill in place.
REMOVE/ABANDON DRAINFIELD	EACH	1.0	1.0	$ -	$ -	$ -	$ -	Underground drainfield to remain, abandon in place. No cost.
REMOVE SANITARY SEWER PIPING	L.SUM	-	-	$ -	$ -	$ -	$ -	Excavate connection points, cut pipe, and cap. Underground piping to remain, abandon in place. No cost.
REMOVE/ABANDON WELL	EACH	-	-	$ 3,750.00	$ -	$ -	$ -	Well to remain for irrigation.
				SUBTOTAL	**$ 64,478.00**	**$ -**	**$ -**	
IMPROVEMENT ITEMS								
GENERAL ITEMS								
GENERAL GRADING, EARTHWORK, ETC.	ACRE	2.0	2.0	$ 5,000.00	$ 10,000.00	$ -	$ -	Assumes area of overall site reclamation footprint. Additional earthwork is anticipated build in deterrents to reduce public dumping.
SUPPLEMENTAL EARTHWORK - FILL MATERIAL	CY	-	-	$ 25.00	$ -			No Cost
RECLAIM/RESEEDING	ACRE	0.2	1.0	$ 1,100.00	$ 1,100.00	$ -	$ -	Reclaim building area and other site demolition areas.
TREE REMOVAL/TRIMMING	EACH SITE	1.0	1.0	$ 7,500.00	$ 7,500.00	$ -	$ -	Removal or trimming of overly mature/large trees that may be a hazard for patron use (assume 5 trees at $1,500 per tree).
UPGRADE SIDEWALK - CONCRETE 4 INCH	SQ YD	229.0	230.0	$ 76.00	$ 17,480.00	$ -	$ -	Remove existing sidewalk and replace with 62" ADA compliant sidewalk adjacent to car parking area.
CURB AND GUTTER	LF	346.0	346.0	$ 30.00	$ 10,380.00			Remove existing curb and gutter and replace with new sidewalk limits.
BITUMINOUS PAVEMENT	TON	271.5	280.0	$ 120.00	$ 33,600.00	$ -	$ -	New pavement to replace removed area of raised median islands ~ assume 4" asphalt over 10" crushed agg course.
CRUSHED AGGREGATE BASE	CY	308.6	310.0	$ 60.00	$ 18,600.00	$ -	$ -	New pavement to replace removed area of raised median islands ~ assume 4" asphalt over 10" crushed agg course.
PAVEMENT REHABILITATION (CHIP SEAL)	SQ YD	11,816.7	11,900.0	$ 3.00	$ 35,700.00	$ -	$ -	Assume chip seal of all ramp/parking pavement areas for rehab option at $3/SY per MDT information. Ramp limits assumed to stop at painted nose where mainline edge line and ramp edge line converge.

JEFFERSON CITY (NB) SAFETY REST AREA

ALTERNATIVE 1 - REDUCTION OF SERVICE (TRUCK PARKING)

Item Description	Unit	NB CALCULATED QUANTITY	NB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
STRIPING	LF	7,078.0	7,100.0	$ 1.50	$ 10,650.00	$ -	$ -	Restripe all parking stalls and parking and ramp edge lines - 4" stripes.
UPDATE EXTERIOR LIGHTING	EACH	-	-	$ 8,000.00	$ -			Remove and replace existing with LED lamps and new poles.
NEW BENCHES	L.SUM	1.0	1.0	$ 835.00	$ 835.00			Replace bench.
REHABILITATE HISTORICAL SIGNAGE	L.SUM	2.0	2.0	$ 400.00	$ 800.00			Rehabilitate existing historical signage.
NEW WASTE RECEPTACLES	L.SUM	2.0	2.0	$ 200.00	$ 400.00			Replace waste receptacles.
WASTEWATER SYSTEM								
NEW VAULTED TOILET STRUCTURE	EACH	1.0	1.0	$ 50,000.00	$ 50,000.00	$ -	$ -	Assumes single structure with 2 separate toilet stalls per structure. Vaulted Toilets Information: $41,200 for single building with two rooms. $14,500 for single building with one room. Doesn't include crane setting or foundations. Assumes $50,000 each site.
NEW SEPTIC TANK (ASSUME 2,500 GALLONS)	EACH	1.0	1.0	$ 6,000.00	$ 6,000.00	$ -	$ -	Tank for new vaulted toilet.
PERMITTING COST OF NEW SYSTEM (VAULTED TOILETS)	EACH	1.0	1.0	$ 8,000.00	$ 8,000.00	$ -	$ -	
WATER SYSTEM								
PERPETUATE WELL/WATER SYSTEM	EACH	1.0	1.0	$ 4,500.00	$ 4,500.00	$ -	$ -	Improvements/upgrades to perpetuate well/water system.
				SUBTOTAL	**$ 215,545.00**	**$ -**	**$ -**	
		CONTRACTOR MOBILIZATION/DEMOB/INSURANCE/TAXES		**10%**	**$ 21,554.50**			
			DEMOLITION / CAPITAL IMPROVEMENT SUBTOTAL		**$ 280,023.00**	**$ -**	**$ -**	
			CONTINGENCY	**20%**	**$ 56,004.60**	**$ -**	**$ -**	Included to account for unidentified items
				SUBTOTAL	**$ 357,582.10**	**$ -**	**$ -**	
MAINTENANCE ITEMS								
MAINTENANCE ITEMS								
ANNUAL MAINTENANCE COSTS	ANNUAL			$ 10,000.00	$ -	$ 10,000.00	$ 247,833.17	Unit price based on average labor, equipment, materials, and contracted maintenance costs for several Truck Parking Areas from 2016. Assume this cost includes any/all vaulted toilet pumping costs. An additional to contracted services, 25% was included to capture MDT Mainenance services.
Notes: Quantities calculated from review of aerial photography and MDT as-built drawings. Unit pricing derived from MDT bid tabs and information provided by MDT communication.				**SUBTOTAL**	**$ -**	**$ 10,000.00**	**$ 247,833.17**	2039 total assumes 2.0% compound annual increase in maintenance cost.
				TOTAL	**$ 357,582.10**	**$ 10,000.00**	**$ 247,833.17**	

JEFFERSON CITY (NB) SAFETY REST AREA

ALTERNATIVE 2 - CLOSURE

Item Description	Unit	NB CALCULATED QUANTITY	NB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
DEMOLITION ITEMS								
REMOVE BITUMINOUS PAVEMENT	SQ YD	11,608.9	11,700.0	$ 13.00	$ 152,100.00	$ -	$ -	Total removal - sawcut at 10' beyond mainline edge stripe to provide standard paved shoulder width.
REMOVE PRE-CAST CURB/PIN-DOWN CURB (w/rebar)	LF	1,176.0	1,176.0	$ 3.00	$ 3,528.00	$ -	$ -	Total removal.
REMOVE CONCRETE SIDEWALK/PATH	SQ YD	610.8	620.0	$ 11.50	$ 7,130.00			Total removal.
REMOVE CONCRETE SHELTER FLOOR SLABS	SQ YD	160.0	160.0	$ 11.50	$ 1,840.00			Total removal.
REMOVE LIGHT POLES	EACH	7.0	7.0	$ 500.00	$ 3,500.00	$ -	$ -	Total removal.
REMOVE ELECTRICAL SYSTEM/CONDUIT	L.SUM	-	-	$ -	$ -	$ -	$ -	Underground conduit to remain in place. No cost.
REMOVE BUILDING STRUCTURE	EACH	1.0	1.0	$ 25,000.00	$ 25,000.00	$ -	$ -	Total removal, including everything inside structure (electrical, plumbing).
LEAD PAINT ABATEMENT	EACH	1.0	1.0	$ -	$ -	$ -	$ -	Per MDT, no abatement cost for demolition.
REMOVE PICNIC SHELTER STRUCTURE	EACH	2.0	2.0	$ 2,000.00	$ 4,000.00	$ -	$ -	Total removal - Include 4 picnic tables per structure.
REMOVE EXHIBIT CASE (KIOSK)	EACH	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal.
REMOVE HISTORICAL SIGNS	L.SUM	2.0	2.0	$ 500.00	$ 1,000.00	$ -	$ -	Total removal - includes all historical signs.
REMOVE BENCHES AND WASTE RECEPTACLES	L.SUM	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal - includes all benches and waste receptacles.
REMOVE ROAD SIGNING/REPLACE ROAD SIGNING	L.SUM	1.0	1.0	$ 1,500.00	$ 1,500.00	$ -	$ -	Remove all road signing and any advance signing along interstate in reference to "Rest Area."
REMOVE IRRIGATION SYSTEM	L.SUM		-	$ -	$ -	$ -	$ -	Underground irrigation lines to remain in place. Sprinkler heads may be removed as needed for safety concurrent with sidewalk removal or under contingency category. No cost.
REMOVE/ABANDON SEPTIC TANK	EACH	1.0	1.0	$ 4,000.00	$ 4,000.00	$ -	$ -	Pump septic tanks, crush, and fill in place.
REMOVE/ABANDON DRAINFIELD	EACH	1.0	1.0	$ -	$ -	$ -	$ -	Underground drainfield to remain, abandon in place. No cost.
REMOVE SANITARY SEWER PIPING	L.SUM	-	-	$ -	$ -	$ -	$ -	Excavate connection points, cut pipe, and cap. Underground piping to remain, abandon in place. No cost.
REMOVE/ABANDON WELL	EACH	1.0	1.0	$ 3,750.00	$ 3,750.00	$ -	$ -	Cap and abandon well.
				SUBTOTAL	**$ 208,348.00**	**$ -**	**$ -**	
IMPROVEMENT ITEMS								
GENERAL ITEMS								
GENERAL GRADING, EARTHWORK, ETC.	ACRE	4.9	5.0	$ 5,000.00	$ 25,000.00	$ -	$ -	Assumes area of overall site reclamation footprint.
SUPPLEMENTAL EARTHWORK - FILL MATERIAL	CY	-	-	$ 25.00	$ -			No cost.
RECLAIM/RESEEDING	ACRE	4.9	5.0	$ 1,100.00	$ 5,500.00	$ -	$ -	Reclaim entire site footprint and perimeter disturbance.
TREE REMOVAL/TRIMMING	EACH SITE	-	-	$ 7,500.00	$ -	$ -	$ -	No cost.
UPGRADE SIDEWALK - CONCRETE 4 INCH	SQ YD	-	-	$ 76.00	$ -	$ -	$ -	No cost.
CURB AND GUTTER	LF		-	$ 30.00	$ -			
BITUMINOUS PAVEMENT	TON	-	-	$ 120.00	$ -	$ -	$ -	
CRUSHED AGGREGATE BASE	CY	-	-	$ 60.00	$ -	$ -	$ -	
PAVEMENT REHABILITATION (CHIP SEAL)	SQ YD	-	-	$ 3.00	$ -	$ -	$ -	No cost.

JEFFERSON CITY (NB) SAFETY REST AREA

ALTERNATIVE 2 - CLOSURE

Item Description	Unit	NB CALCULATED QUANTITY	NB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
STRIPING	LF	1,385.0	1,400.0	$ 1.50	$ 2,100.00	$ -	$ -	Restripe interstate outside lane line where ramp connection is removed to provide continuous edge line stripe.
UPDATE EXTERIOR LIGHTING	EACH	-	-	$ 8,000.00	$ -			No cost.
NEW BENCHES	L.SUM	-	-	$ 835.00	$ -			No cost.
REHABILITATE HISTORICAL SIGNAGE	L.SUM	-	-	$ 400.00	$ -			No cost.
NEW WASTE RECEPTACLES	L.SUM	-	-	$ 200.00	$ -			No cost.
WASTEWATER SYSTEM								
NEW VAULTED TOILET STRUCTURE	EACH	-	-	$ 50,000.00	$ -	$ -	$ -	No cost.
NEW SEPTIC TANK (ASSUME 2,500 GALLONS)	EACH	-	-	$ 6,000.00	$ -	$ -	$ -	No cost.
PERMITTING COST OF NEW SYSTEM (VAULTED TOILETS)	EACH	-	-	$ 8,000.00	$ -	$ -	$ -	No cost.
WATER SYSTEM								
PERPETUATE WELL/WATER SYSTEM	EACH	0.5	-	$ 4,500.00	$ -	$ -	$ -	No cost if remove/abandon well
				SUBTOTAL	**$ 32,600.00**	**$ -**	**$ -**	
		CONTRACTOR MOBILIZATION/DEMOB/INSURANCE/TAXES		**10%**	**$ 3,260.00**			
		DEMOLITION / CAPITAL IMPROVEMENT SUBTOTAL			**$ 240,948.00**	**$ -**	**$ -**	
			CONTINGENCY	**20%**	**$ 48,189.60**	**$ -**	**$ -**	Included to account for unidentified items
				SUBTOTAL	**$ 292,397.60**	**$ -**	**$ -**	
MAINTENANCE ITEMS								
MAINTENANCE ITEMS								
ANNUAL MAINTENANCE COSTS	ANNUAL	-	-	$ -	$ -	$ -	$ -	No cost.
				SUBTOTAL	**$ -**	**$ -**	**$ -**	
				TOTAL	**$ 292,397.60**	**$ -**	**$ -**	

Notes: Quantities calculated from review of aerial photography and MDT as-built drawings. Unit pricing derived from MDT bid tabs and information provided by MDT communication.

JEFFERSON CITY (SB) SAFETY REST AREA

ALTERNATIVE 1 - REDUCTION OF SERVICE (TRUCK PARKING)

Item Description	Unit	SB CALCULATED QUANTITY	SB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
DEMOLITION ITEMS								
REMOVE BITUMINOUS PAVEMENT	SQ YD	511.1	520.0	$ 13.00	$ 6,760.00	$ -	$ -	Assume 1' saw cut around parking median curb removal for clean pavement edge for repaving. Remove islands in parking area to provide easier snow plowing maintenance activities.
REMOVE PRE-CAST CURB/PIN-DOWN CURB (w/rebar)	LF	385.0	385.0	$ 3.00	$ 1,155.00	$ -	$ -	Remove and replace deteriorated pin-down curb.
REMOVE CONCRETE SIDEWALK/PATH	SQ YD	565.0	570.0	$ 11.50	$ 6,555.00			Assume removal of sidewalk leading to the facility and "loops" leading to and adjacent to picnic shelters.
REMOVE CONCRETE SHELTER FLOOR SLABS	SQ YD	90.0	90.0	$ 11.50	$ 1,035.00			Assume total removal of picnic shelters served by access routes.
REMOVE LIGHT POLES	EACH	8.0	8.0	$ 500.00	$ 4,000.00	$ -	$ -	No cost; assume light poles remain and power is reconnected after rest area building demolition.
REMOVE ELECTRICAL SYSTEM/CONDUIT	L.SUM	-	-	$ -	$ -	$ -	$ -	No cost.
REMOVE BUILDING STRUCTURE	EACH	1.0	1.0	$ 25,000.00	$ 25,000.00	$ -	$ -	Total removal, including everything inside structure (electrical, plumbing).
LEAD PAINT ABATEMENT	EACH	1.0	1.0	$ -	$ -			Per MDT, no abatement cost for demolition.
REMOVE PICNIC SHELTER STRUCTURE	EACH	2.0	2.0	$ 2,000.00	$ 4,000.00	$ -	$ -	Total removal - Include 4 picnic tables per structure.
REMOVE EXHIBIT CASE (KIOSK)	EACH	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal.
REMOVE HISTORICAL SIGNS	L.SUM	-	-	$ 500.00	$ -	$ -	$ -	No cost, will rehabilitate existing.
REMOVE BENCHES AND WASTE RECEPTACLES	L.SUM	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal - includes all benches and waste receptacles.
REMOVE ROAD SIGNING/REPLACE ROAD SIGNING	L.SUM	1.0	1.0	$ 1,500.00	$ 1,500.00	$ -	$ -	Replace all advanced "Rest Area" interstate signing with new signing to reference "Truck Parking" facility.
REMOVE IRRIGATION SYSTEM	L.SUM	-	-	$ -	$ -	$ -	$ -	Underground irrigation lines to remain in place. Sprinkler heads may be removed as needed for safety concurrent with sidewalk removal or under contingency category. No cost.
REMOVE/ABANDON SEPTIC TANK	EACH	1.0	1.0	$ 4,000.00	$ 4,000.00	$ -	$ -	Pump septic tanks, crush, and fill in place.
REMOVE/ABANDON DRAINFIELD	EACH	1.0	1.0	$ -	$ -	$ -	$ -	Underground drainfield to remain, abandon in place. No cost.
REMOVE SANITARY SEWER PIPING	L.SUM	-	-	$ -	$ -	$ -	$ -	Excavate connection points, cut pipe, and cap. Underground piping to remain, abandon in place. No cost.
REMOVE/ABANDON WELL	EACH	-	-	$ 3,750.00	$ -	$ -	$ -	Well to remain for irrigation.
				SUBTOTAL	**$ 55,005.00**	**$ -**	**$ -**	
IMPROVEMENT ITEMS								
GENERAL ITEMS								
GENERAL GRADING, EARTHWORK, ETC.	ACRE	15.0	15.0	$ 5,000.00	$ 75,000.00	$ -	$ -	Assumes area of overall site reclamation footprint. Also includes additional work required to bring the entire site to grade.
SUPPLEMENTAL EARTHWORK - FILL MATERIAL	CY	1,516.7	1,517.0	$ 25.00	$ 37,925.00			Assumes half of the new parking area would need fill to bring to grade.
RECLAIM/RESEEDING	ACRE	0.1	1.0	$ 1,500.00	$ 1,500.00	$ -	$ -	Reclaim building area and other site demolition areas.
TREE REMOVAL/TRIMMING	EACH	10.0	10.0	$ 7,500.00	$ 75,000.00	$ -	$ -	Removal or trimming of overly mature/large trees that may be a hazard for patron use (assume 5 trees at $1,500 per tree).
UPGRADE SIDEWALK - CONCRETE 4 INCH	SQ YD	113.3	120.0	$ 76.00	$ 9,120.00	$ -	$ -	Remove existing sidewalk and replace with 72" ADA compliant sidewalk adjacent to car parking area.
CURB AND GUTTER	LF	170.0	170.0	$ 30.00	$ 5,100.00	$ -	$ -	Remove existing curb and gutter and replace with new sidewalk limits.
BITUMINOUS PAVEMENT	TON	682.5	690.0	$ 120.00	$ 82,800.00	$ -	$ -	New pavement to replace removed area of raised median parking islands ~ assume 4" asphalt over 10" crushed agg course.
CRUSHED AGGREGATE BASE	CY	842.6	850.0	$ 60.00	$ 51,000.00	$ -	$ -	New pavement to replace removed area of raised median parking islands ~ assume 4" asphalt over 10" crushed agg course.

JEFFERSON CITY (SB) SAFETY REST AREA

ALTERNATIVE 1 - REDUCTION OF SERVICE (TRUCK PARKING)

Item Description	Unit	SB CALCULATED QUANTITY	SB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
PAVEMENT REHABILITATION (CHIP SEAL)	SQ YD	6,933.3	7,000.0	$ 3.00	$ 21,000.00	$ -	$ -	Assume chip seal of all ramp/parking pavement areas for rehab option at $3/SY per MDT information. Ramp limits assumed to stop at painted nose where mainline edge line and ramp edge line converge.
STRIPING	LF	5,330.0	5,400.0	$ 1.50	$ 8,100.00	$ -	$ -	Restripe all parking stalls and parking and ramp edge lines - 4" stripes.
UPDATE EXTERIOR LIGHTING	EACH	8.0	8.0	$ 8,000.00	$ 64,000.00			Remove and replace existing with LED lamps and new poles.
NEW BENCHES	L.SUM	1.0	1.0	$ 835.00	$ 835.00			Replace bench.
REHABILITATE HISTORICAL SIGNAGE	L.SUM	2.0	2.0	$ 400.00	$ 800.00			Rehabilitate and relocate existing historical signage.
NEW WASTE RECEPTACLES	L.SUM	2.0	2.0	$ 200.00	$ 400.00			Replace waste receptacles.
WASTEWATER SYSTEM								
NEW VAULTED TOILET STRUCTURE	EACH	1.0	1.0	$ 50,000.00	$ 50,000.00	$ -	$ -	Assumes single structure with 2 separate toilet stalls per structure. Vaulted Toilets Information: $41,200 for single building with two rooms. $14,500 for single building with one room. Doesn't include crane setting or foundations. Assumes $50,000 each site.
NEW SEPTIC TANK (ASSUME 2,500 GALLONS)	EACH	1.0	1.0	$ 6,000.00	$ 6,000.00	$ -	$ -	Tanks for new vaulted toilet.
PERMITTING COST OF NEW SYSTEM (VAULTED TOILETS)	EACH	1.0	1.0	$ 8,000.00	$ 8,000.00	$ -	$ -	
WATER SYSTEM								
PERPETUATE WELL/WATER SYSTEM	EACH	1.0	1.0	$ 4,500.00	$ 4,500.00	$ -	$ -	Improvements/upgrades to perpetuate well/water system.
				SUBTOTAL	**$ 501,080.00**	**$ -**	**$ -**	
CONTRACTOR MOBILIZATION/DEMOB/INSURANCE/TAXES				**10%**	**$ 50,108.00**			
DEMOLITION / CAPITAL IMPROVEMENT SUBTOTAL					**$ 556,085.00**	**$ -**	**$ -**	
CONTINGENCY				**20%**	**$ 111,217.00**	**$ -**	**$ -**	Included to account for unidentified items
				SUBTOTAL	**$ 717,410.00**	**$ -**	**$ -**	
MAINTENANCE ITEMS								
MAINTENANCE ITEMS								
ANNUAL MAINTENANCE COSTS	ANNUAL			$ 10,000.00	$ -	$ 10,000.00	$ 247,833.17	Unit price based on average labor, equipment, materials, and contracted maintenance costs for several Truck Parking Areas from 2016. Assume this cost includes any/all vaulted toilet pumping costs. An additional to contracted services, 25% was included to capture MDT Mainenance services.
Notes: Quantities calculated from review of aerial photography and MDT as-built drawings. Unit pricing derived from MDT bid tabs and information provided by MDT communication.				**SUBTOTAL**	**$ -**	**$ 10,000.00**	**$ 247,833.17**	2039 total assumes 2.0% compound annual increase in maintenance cost.
				TOTAL	**$ 717,410.00**	**$ 10,000.00**	**$ 247,833.17**	

JEFFERSON CITY (SB) SAFETY REST AREA

ALTERNATIVE 2 - CLOSURE

Item Description	Unit	SB CALCULATED QUANTITY	SB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
DEMOLITION ITEMS								
REMOVE BITUMINOUS PAVEMENT	SQ YD	7,956.6	8,000.0	$ 13.00	$ 104,000.00	$ -	$ -	Total removal - sawcut at 10' beyond mainline edge stripe to provide standard paved shoulder width.
REMOVE PRE-CAST CURB/PIN-DOWN CURB (w/rebar)	LF	385.0	385.0	$ 3.00	$ 1,155.00	$ -	$ -	Total removal.
REMOVE CONCRETE SIDEWALK/PATH	SQ YD	565.0	570.0	$ 11.50	$ 6,555.00			Total removal.
REMOVE CONCRETE SHELTER FLOOR SLABS	SQ YD	90.0	90.0	$ 11.50	$ 1,035.00			Total removal.
REMOVE LIGHT POLES	EACH	8.0	8.0	$ 500.00	$ 4,000.00	$ -	$ -	Total removal.
REMOVE ELECTRICAL SYSTEM/CONDUIT	L.SUM	-	-	$ -	$ -	$ -	$ -	Underground conduit to remain in place. No cost.
REMOVE BUILDING STRUCTURE	EACH	1.0	1.0	$ 25,000.00	$ 25,000.00	$ -	$ -	Total removal, including everything inside structure (electrical, plumbing).
LEAD PAINT ABATEMENT	EACH	1.0	1.0	$ -	$ -	$ -	$ -	Per MDT, no abatement cost for demolition.
REMOVE PICNIC SHELTER STRUCTURE	EACH	2.0	2.0	$ 2,000.00	$ 4,000.00	$ -	$ -	Total removal - Include 4 picnic tables per structure.
REMOVE EXHIBIT CASE (KIOSK)	EACH	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal.
REMOVE HISTORICAL SIGNS	L.SUM	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal - includes all historical signs.
REMOVE BENCHES AND WASTE RECEPTACLES	L.SUM	1.0	1.0	$ 500.00	$ 500.00	$ -	$ -	Total removal - includes all benches and waste receptacles.
REMOVE ROAD SIGNING/REPLACE ROAD SIGNING	L.SUM	1.0	1.0	$ 1,500.00	$ 1,500.00	$ -	$ -	Remove all road signing and any advance signing along interstate in reference to "Rest Area."
REMOVE IRRIGATION SYSTEM	L.SUM		-	$ -	$ -	$ -	$ -	Underground irrigation lines to remain in place. Sprinkler heads may be removed as needed for safety concurrent with sidewalk removal or under contingency category. No cost.
REMOVE/ABANDON SEPTIC TANK	EACH	1.0	1.0	$ 4,000.00	$ 4,000.00	$ -	$ -	Pump septic tanks, crush, and fill in place.
REMOVE/ABANDON DRAINFIELD	EACH	1.0	1.0	$ -	$ -	$ -	$ -	Underground drainfield to remain, abandon in place. No cost.
REMOVE SANITARY SEWER PIPING	L.SUM	-	-	$ -	$ -	$ -	$ -	Excavate connection points, cut pipe, and cap. Underground piping to remain, abandon in place. No cost.
REMOVE/ABANDON WELL	EACH	1.0	1.0	$ 3,750.00	$ 3,750.00	$ -	$ -	Cap and abandon well.
				SUBTOTAL	**$ 156,495.00**	**$ -**	**$ -**	
IMPROVEMENT ITEMS								
GENERAL ITEMS								
GENERAL GRADING, EARTHWORK, ETC.	ACRE	3.4	4.0	$ 5,000.00	$ 20,000.00	$ -	$ -	Assumes area of overall site reclamation footprint.
SUPPLEMENTAL EARTHWORK - FILL MATERIAL	CY	-	-	$ 25.00	$ -			No cost.
RECLAIM/RESEEDING	ACRE	3.4	4.0	$ 1,100.00	$ 4,400.00	$ -	$ -	Reclaim entire site footprint and perimeter disturbance.
TREE REMOVAL/TRIMMING	EACH	-	-	$ 7,500.00	$ -	$ -	$ -	No cost.
UPGRADE SIDEWALK - CONCRETE 4 INCH	SQ YD	-	-	$ 76.00	$ -	$ -	$ -	No cost.
CURB AND GUTTER	LF	-	-	$ 30.00	$ -	$ -	$ -	No cost.
BITUMINOUS PAVEMENT	TON		-	$ 120.00	$ -	$ -	$ -	No cost.
CRUSHED AGGREGATE BASE	CY		-	$ 60.00	$ -	$ -	$ -	No cost.

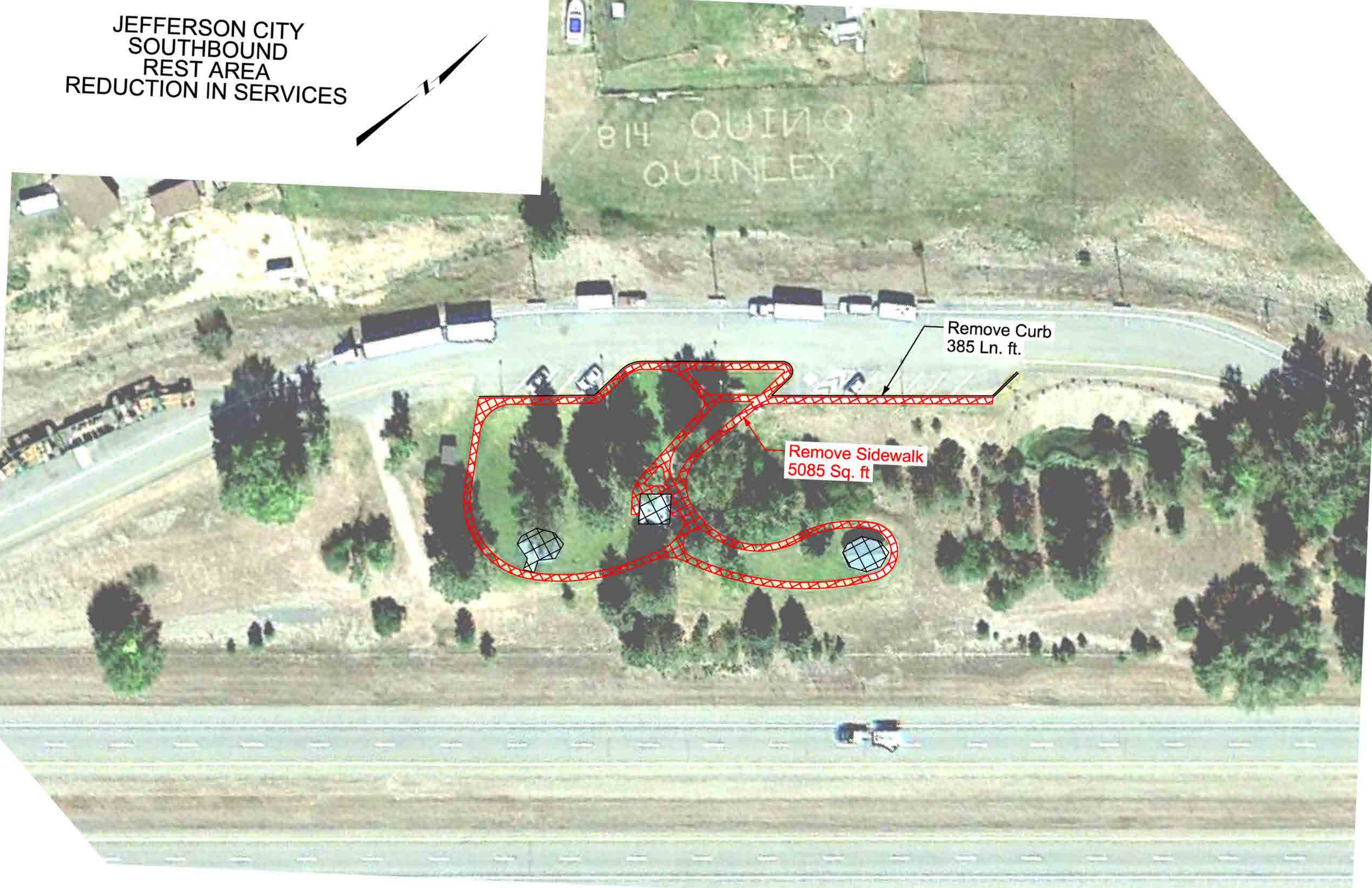
JEFFERSON CITY (SB) SAFETY REST AREA

ALTERNATIVE 2 - CLOSURE

Item Description	Unit	SB CALCULATED QUANTITY	SB QUANTITY	Unit Price	2019 Est. Cost	Annual Maintenance Cost	2039 Cumulative Maintenance Cost	Comments
PAVEMENT REHABILITATION (CHIP SEAL)	SQ YD	-	-	$ 3.00	$ -	$ -	$ -	No cost.
STRIPING	LF	1,400.0	1,400.0	$ 1.50	$ 2,100.00	$ -	$ -	Restripe interstate outside lane line where ramp connection is removed to provide continuous edge line stripe.
UPDATE EXTERIOR LIGHTING	EACH	-	-	$ 8,000.00	$ -			No cost.
NEW BENCHES	L.SUM	-	-	$ 835.00	$ -			No cost.
REHABILITATE HISTORICAL SIGNAGE				$ 400.00				No cost.
NEW WASTE RECEPTACLES	L.SUM	-	-	$ 200.00	$ -			No cost.
WASTEWATER SYSTEM								
NEW VAULTED TOILET STRUCTURE	EACH	-	-	$ 50,000.00	$ -	$ -	$ -	No cost.
NEW SEPTIC TANK (ASSUME 2,500 GALLONS)	EACH	-	-	$ 6,000.00	$ -	$ -	$ -	No cost.
PERMITTING COST OF NEW SYSTEM (VAULTED TOILETS)	EACH	-	-	$ 8,000.00	$ -	$ -	$ -	No cost.
WATER SYSTEM								
PERPETUATE WELL/WATER SYSTEM	EACH	0.5	-	$ 4,500.00	$ -	$ -	$ -	No cost if remove/abandon well
				SUBTOTAL	**$ 26,500.00**	**$ -**	**$ -**	
			CONTRACTOR MOBILIZATION/DEMOB/INSURANCE/TAXES	**10%**	**$ 2,650.00**			
				DEMOLITION / CAPITAL IMPROVEMENT SUBTOTAL	**$ 182,995.00**	**$ -**	**$ -**	
			CONTINGENCY	**20%**	**$ 36,599.00**	**$ -**	**$ -**	Included to account for unidentified items
				SUBTOTAL	**$ 222,244.00**	**$ -**	**$ -**	
MAINTENANCE ITEMS								
MAINTENANCE ITEMS								
ANNUAL MAINTENANCE COSTS	ANNUAL	-	-	$ -	$ -	$ -	$ -	No cost.
				SUBTOTAL	**$ -**	**$ -**	**$ -**	
				TOTAL	**$ 222,244.00**	**$ -**	**$ -**	

Notes: Quantities calculated from review of aerial photography and MDT as-built drawings. Unit pricing derived from MDT bid tabs and information provided by MDT communication.

JEFFERSON CITY SOUTHBOUND REST AREA REDUCTION IN SERVICES



JEFFERSON CITY SOUTHBOUND REST AREA REDUCTION IN SERVICES

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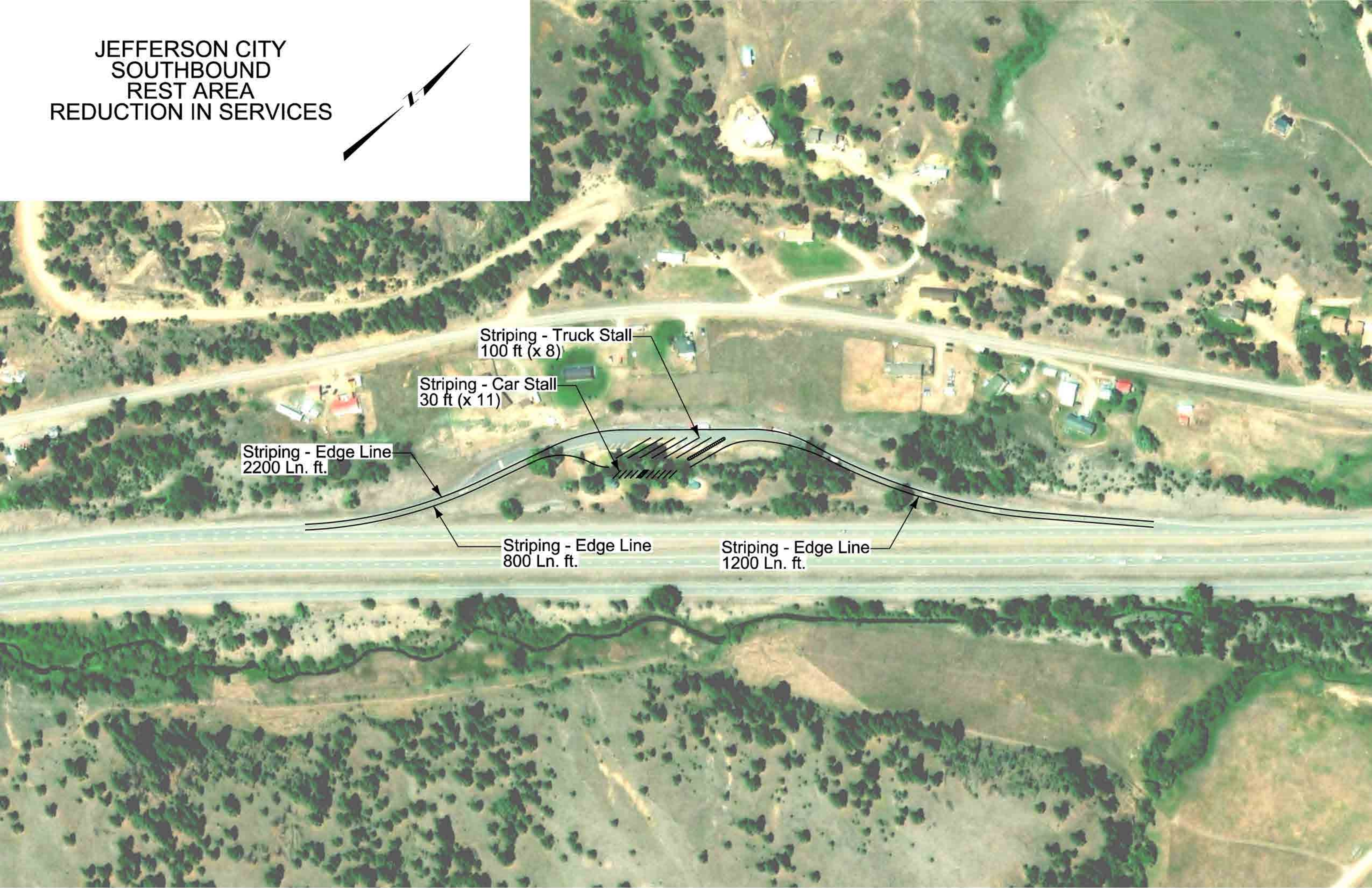
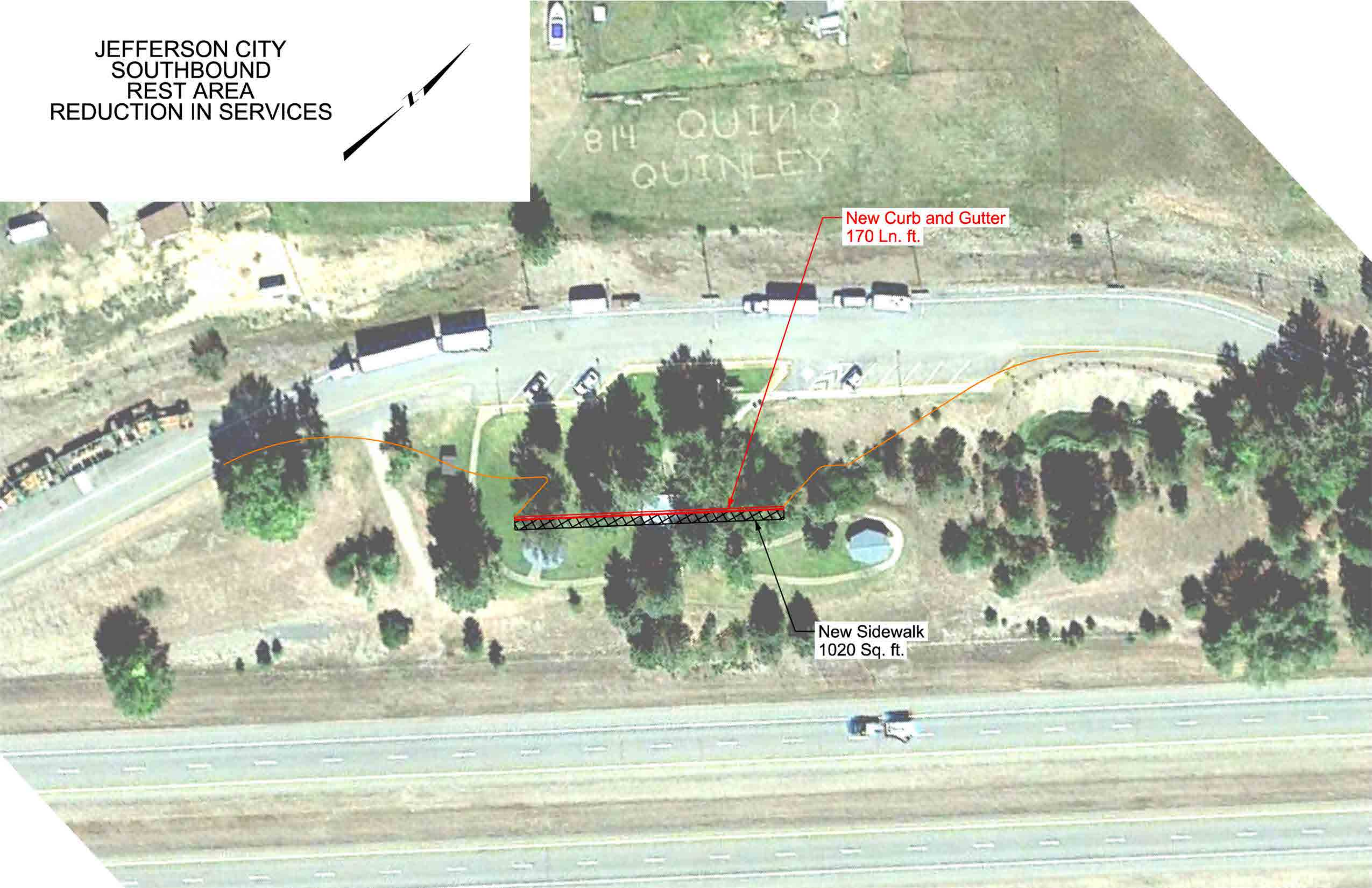
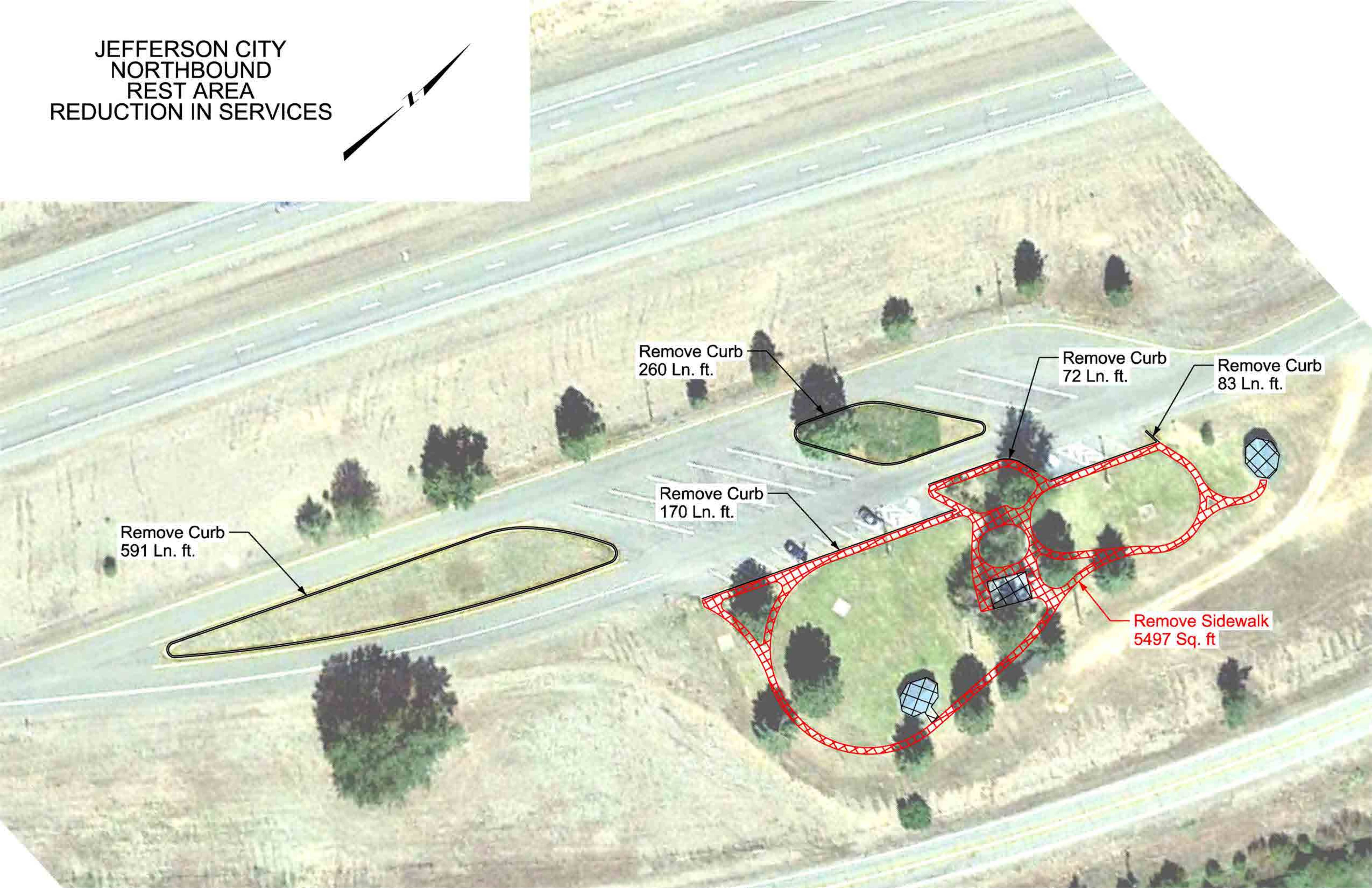


JEFFERSON CITY
SOUTHBOUND
REST AREA
REDUCTION IN SERVICES

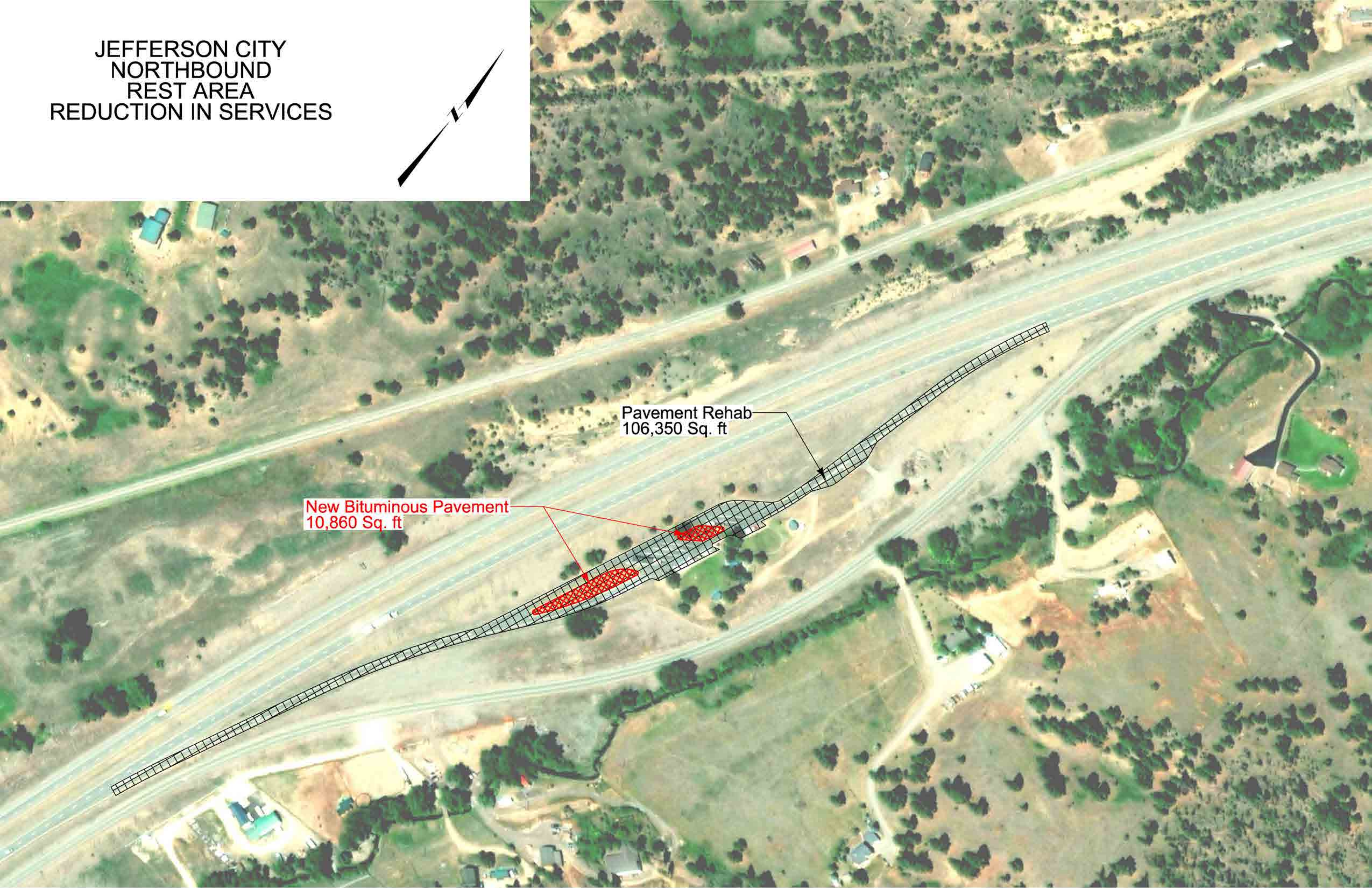


JEFFERSON CITY
SOUTHBOUND
REST AREA
REDUCTION IN SERVICES

JEFFERSON CITY
NORTHBOUND
REST AREA
REDUCTION IN SERVICES



JEFFERSON CITY NORTHBOUND REST AREA REDUCTION IN SERVICES



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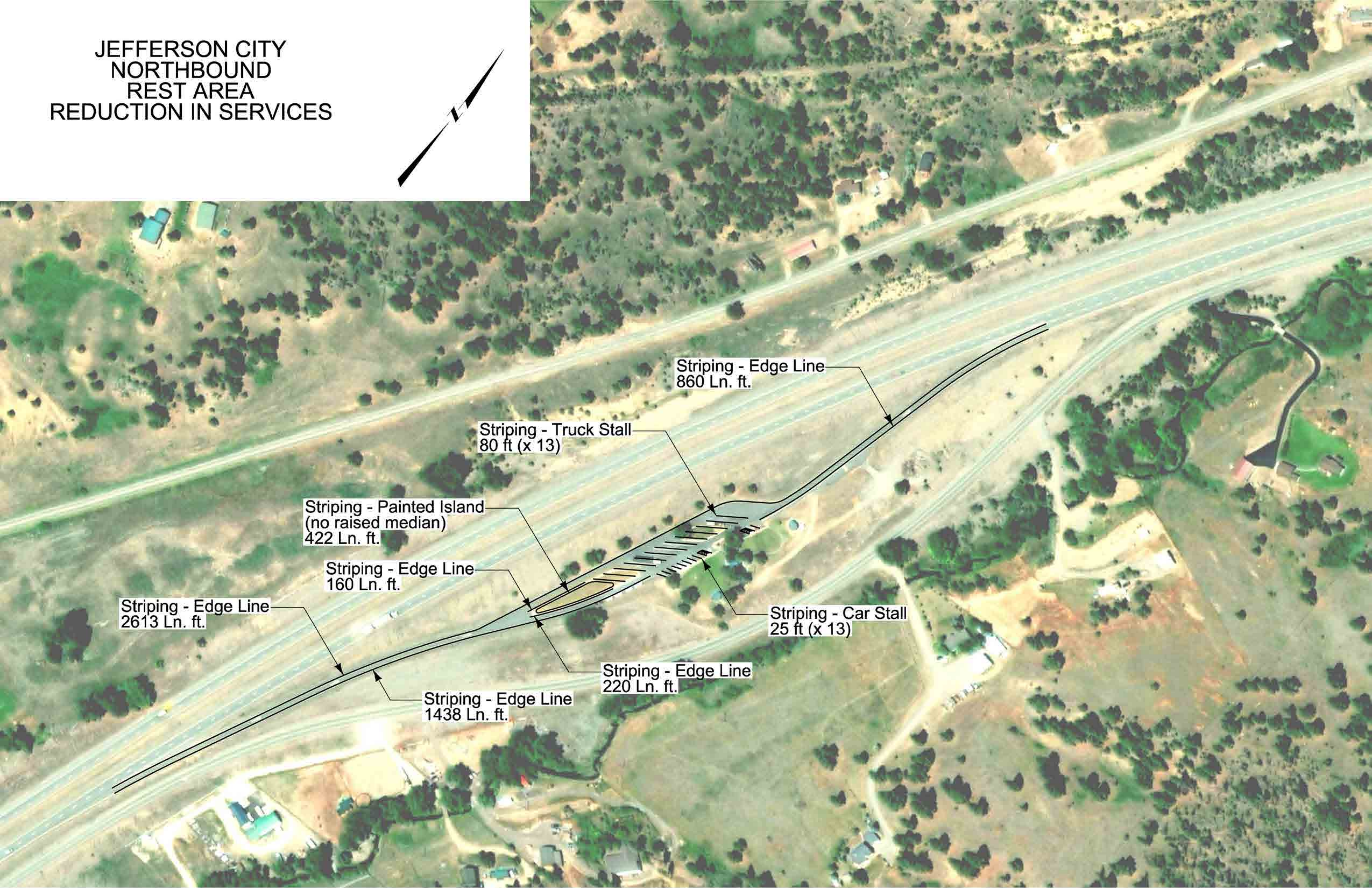
NORTHBOUND
REST AREA
REDUCTION IN SERVICES



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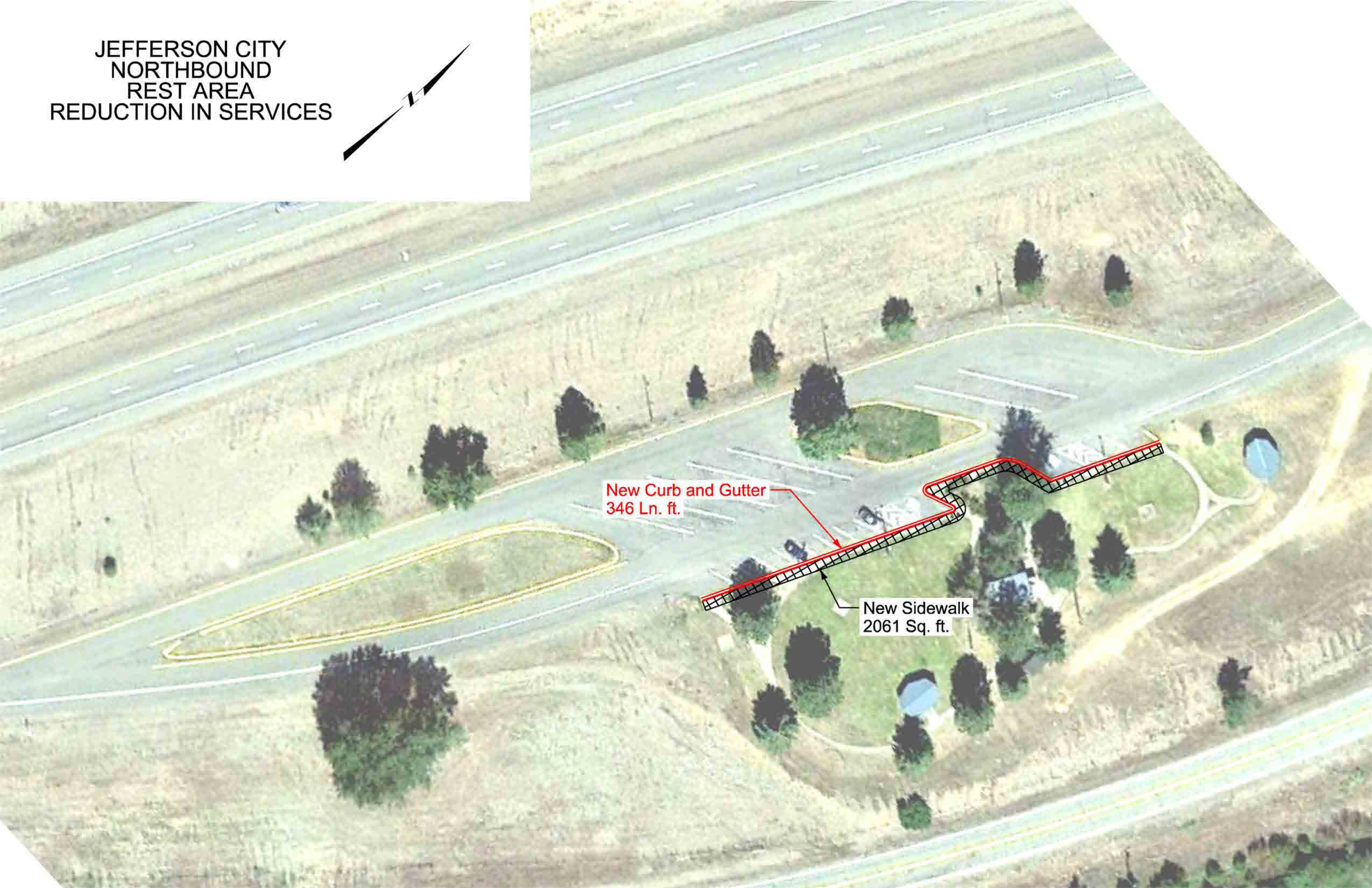
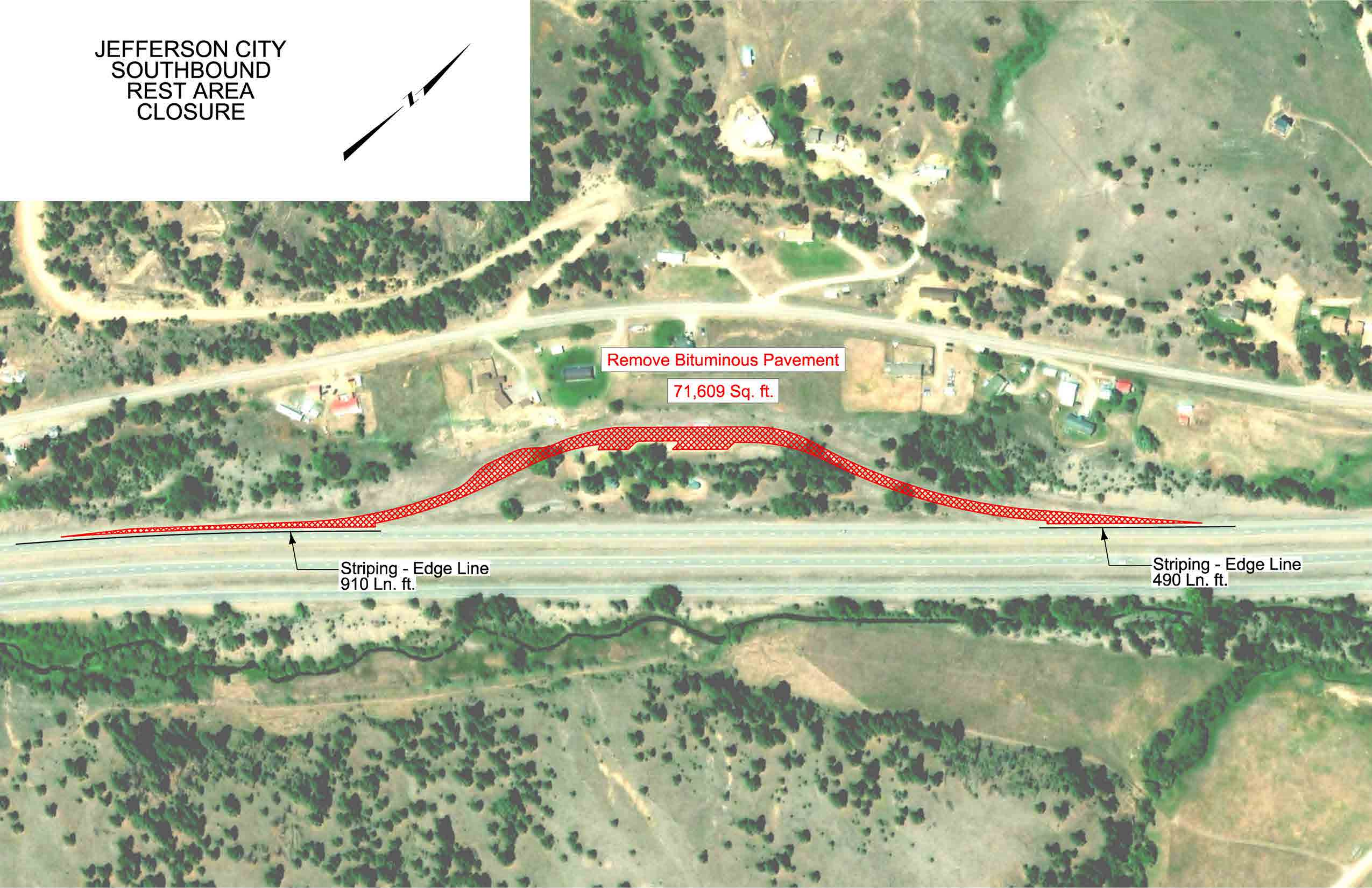


JEFFERSON CITY NORTHBOUND REST AREA REDUCTION IN SERVICES

JEFFERSON CITY
SOUTHBOUND
REST AREA
CLOSURE



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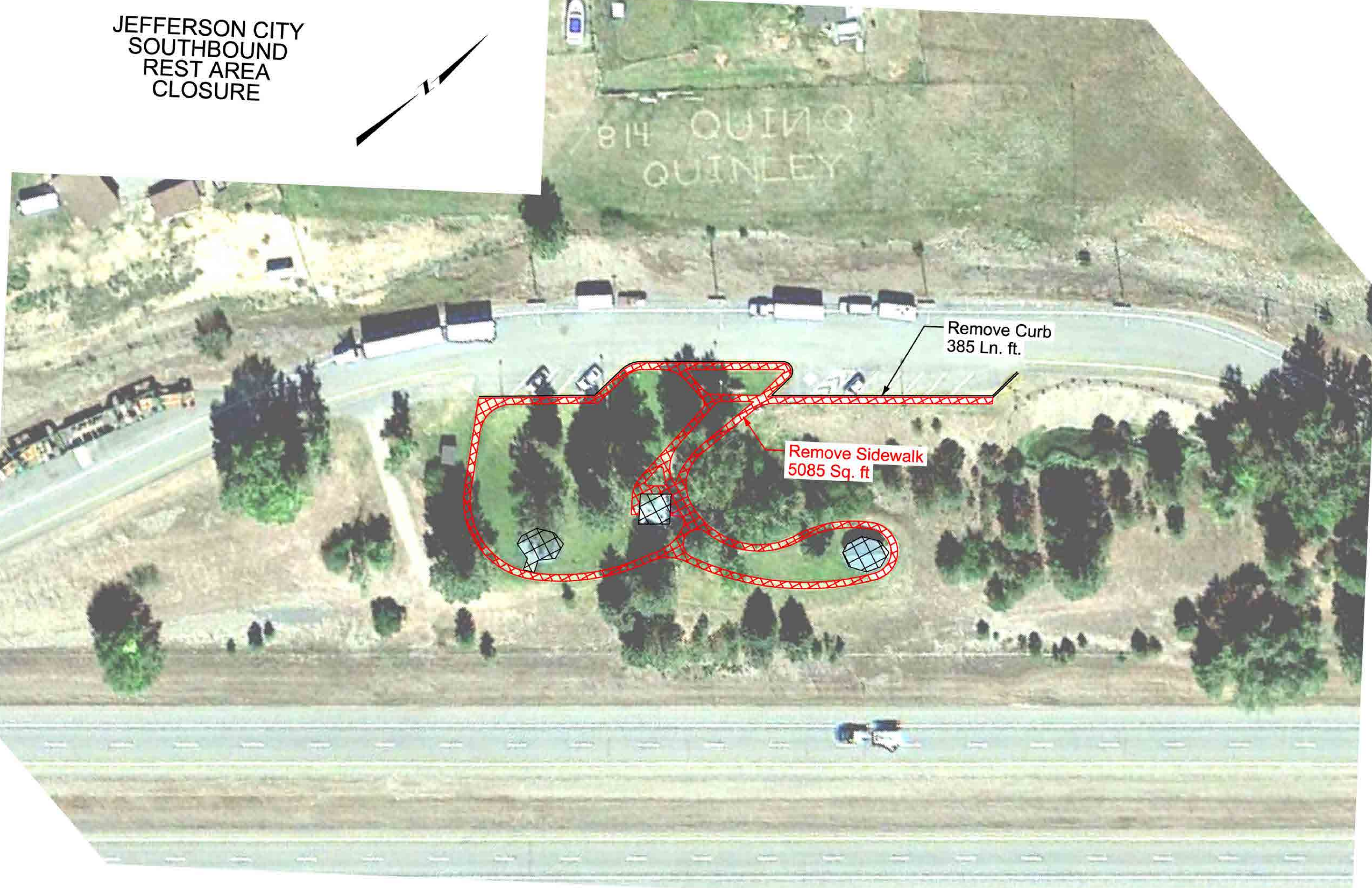
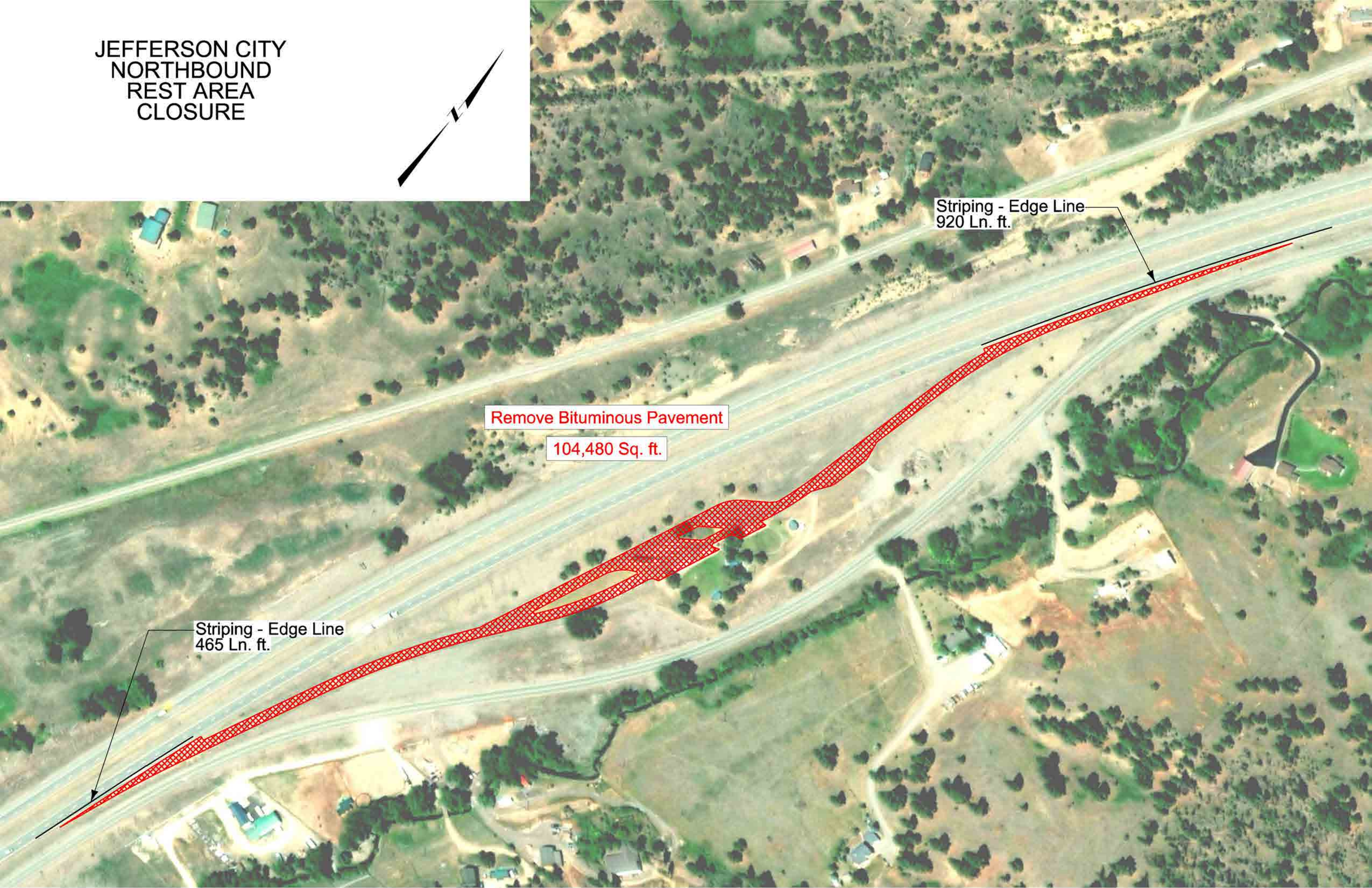


JEFFERSON CITY SOUTHBOUND REST AREA CLOSURE

JEFFERSON CITY NORTHBOUND REST AREA CLOSURE



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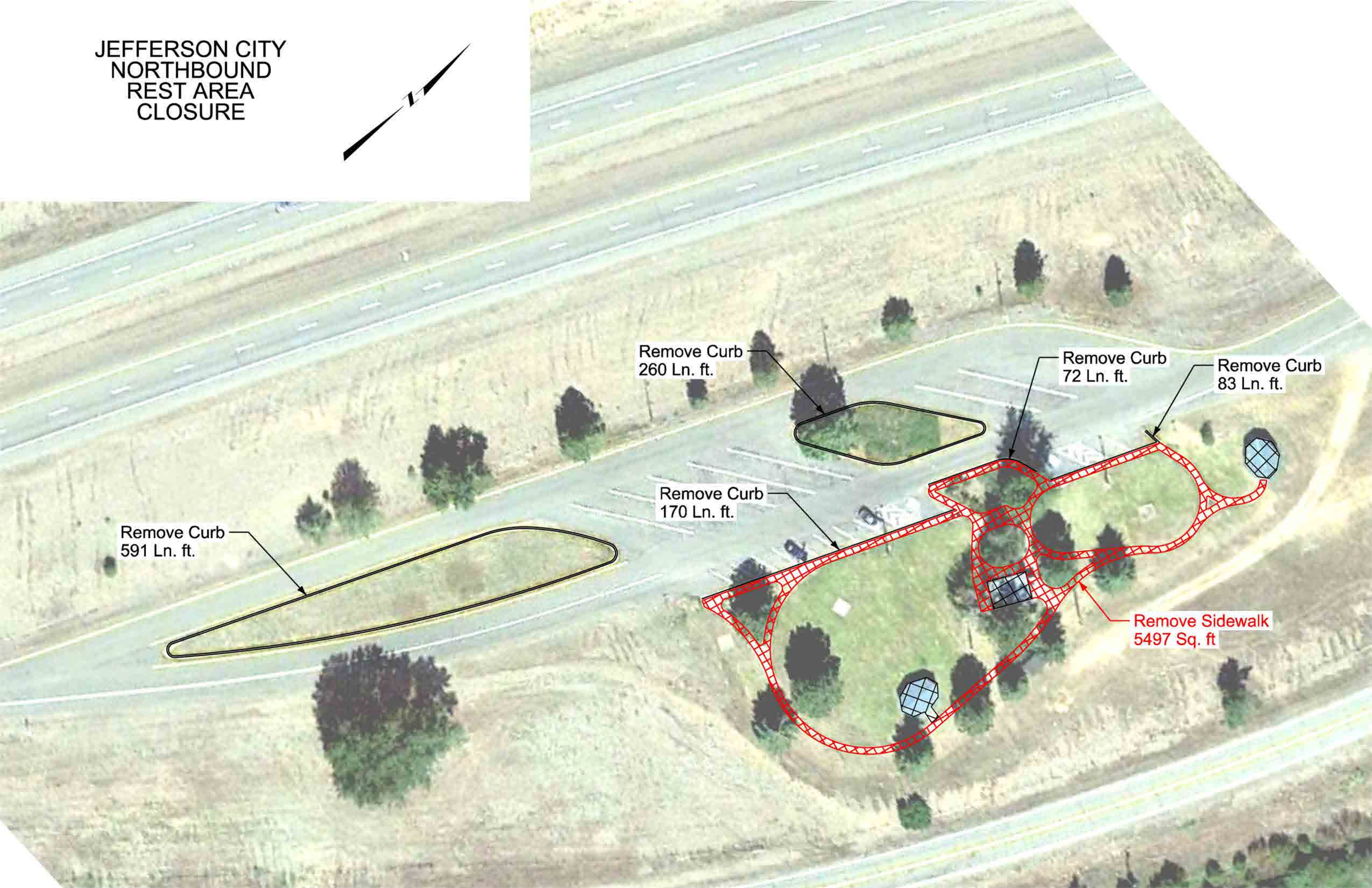
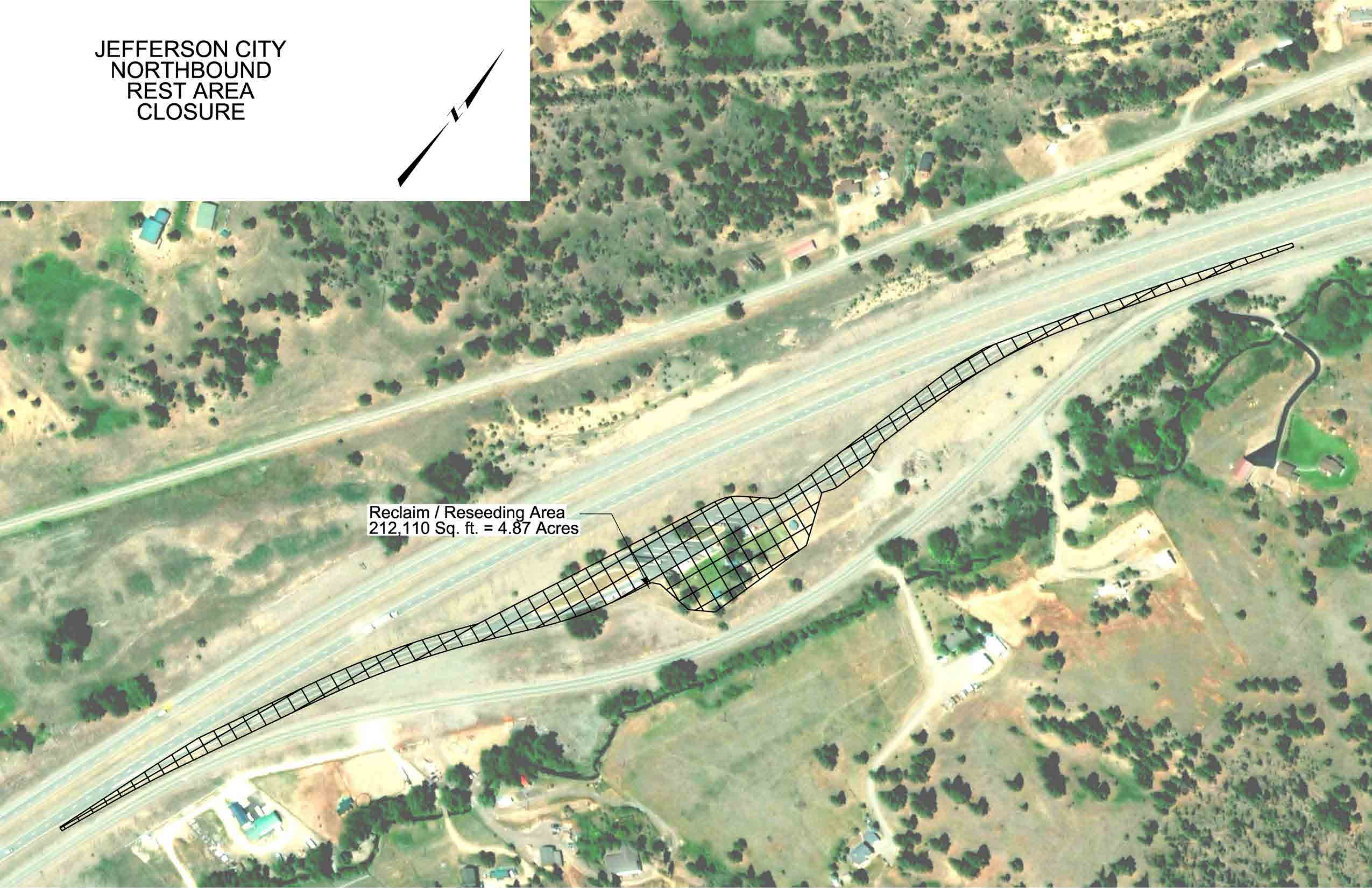


JEFFERSON CITY NORTHBOUND REST AREA CLOSURE



Appendix Q: FHWA Non-Regulatory Supplement

Jefferson City
Safety Rest Area Study

Federal Aid Policy Guide - Non-regulatory Supplement

Transmittal 6: Vending Machines in Interstate Rest Areas and Abandonment of Interstate Rest Areas

FEDERAL-AID POLICY GUIDE
October 5, 1992, Transmittal 6

NS 23 CFR 752

Non-regulatory Supplement

This Supplement Includes Information on Vending Machines In Interstate Rest Areas And Abandonment Of Interstate Rest Areas

1. **VENDING MACHINES IN SAFETY REST AREAS CONSTRUCTED OR LOCATED ON THE INTERSTATE HIGHWAY SYSTEM (23 CFR 752)**. Section 111 of the Surface Transportation Assistance Act (STAA) of 1982 grants the States the authority to permit the placement of vending machines in safety rest areas constructed or located on rights-of-way of the National System of Interstate and Defense Highways.
   a. The State highway agency need not operate the vending machines directly. It may enter into contracts with vendors for the installation, operation, and maintenance of such vending machines. All States, including those which are participating in the 1978 vending machine demonstration project, must give priority to vending machines operated through the State licensing agency designated pursuant to the Randolph-Sheppard Act (RSA). All contracts shall be in writing and shall ensure retention by the State highway agency of full responsibility for and control over all activities within the rest area.
   b. The only application the RSA has to Section 111 is to establish the licensing agency in each State that is to be given priority. With the exception of rest areas on Federal lands, none of the RSA requirements apply to vending machines in Interstate rest areas.
   c. The RSA, however, does apply to vending facilities on Federal property. Although most rest areas are on State owned property, the possibility exists that in certain instances a rest area could be on Federal property. In any instance where the State has acquired less than fee title for a section of Interstate highway located on Federal land, there is a possibility that a rest area located within that section could be considered as being on Federal property. If a State should plan to place vending machines on such property, the FHWA will have to decide whether United States retains sufficient interest in the land for it to be classed as "Federal property." If a State contemplates placing vending machines in such rest areas, the request with appropriate documentation on the land acquisition is to be submitted to Washington Headquarters for determining if the land involved is Federal property for the purposes of RSA application.
   d. Where a rest area is on Federal property both the RSA and Section 111 apply. Further, the more restrictive provisions of both laws must be applied. For example, since Section 111 does not contain any requirements regarding the disposition of

income from vending machines but the RSA does, the RSA applies. Thus, the requirements of 20 U.S.C. 107d-3(c) that such income be applied for the benefit of blind licensees must be met. As another example, the RSA allows a blind person to operate a stand; however, Section 111 expressly limits operations to vending machines. Because Section 111 is more restrictive it controls and only machines are allowed in rest areas.

e. Documentation demonstrating a positive initiative to involve the designated Randolph-Sheppard Act State agency will be required before the State highway agency proposes alternate organizations or corporations to operate the vending machines. However, if the designated Randolph-Sheppard Act agency waives its rights in writing, the State highway agency is free to negotiate agreements described in paragraph 1a of this supplement with any organization or corporation.
f. The ineligibility of Federal assistance for installation, operation, and maintenance of the vending machines includes any modification in existing rest area facilities or the construction of new facilities. This exclusion from Federal-aid participation would also extend to power supplies, water sources and any other ancillary items necessary for the installation, operation, and maintenance of the vending machines.
g. The nondiscrimination provisions of 23 CFR 752.8(c)6 apply to the installation, operation, and maintenance of vending machines.

2. **DEFINITION (23 CFR 752)**. A vending machine is a coin or currency operated machine capable of automatically dispensing an article or product.
   a. By limiting installations to vending machines, it is expressly intended to preclude a vendor from establishing a stand or shop for the purpose of selling the article or product and also to exclude any form of personal salesmanship.
   b. Items which may be dispensed are limited to such food, drink, and other articles as the State highway agency determines to be appropriate and desirable. Title 23 U.S.C. 111 continues to prohibit automotive service stations on the rights-of-way of the Interstate System. Based on this prohibition, the dispensing, by any means, of petroleum products or motor vehicle replacement parts is banned.

3. **ABANDONMENT OF INTERSTATE SAFETY REST AREA FACILITIES (23** CFR 752)
   a. A State may abandon an Interstate rest area or rest areas provided there is a well-documented evaluation demonstrating that the rest areas to remain are adequate in both number and size to satisfy the need of the traveling public. Ability to provide for the needs of the public without any overcrowding along with a showing that the distances between the remaining rest areas are reasonable would be essential in this report. In that regard, a spacing of an hour's driving time or less is considered to be reasonable unless an extenuating circumstance can be established. This spacing is consistent with the recommendation contained in Implementation Package FHWA-IP-81-1 "Safety Rest Area Planning, Location, and Design." A 504 Regulation (49 CFR, Part 27) submission which has been reviewed and approved by Washington Headquarters could constitute the needed documentation provided the submission clearly established those rest areas to be abandoned. If the submission did not include the rest areas to be abandoned a separate evaluation is needed.
   b. The abandonment of a rest area or rest areas near State lines could adversely affect rest areas in adjoining States. Because of the need for coordination at State lines, any proposed abandonment not part of a 504 Regulation approval, should be reviewed by the appropriate regional office or offices.

c. Because the utilization of rest areas for alternative activities is an unusual circumstance which has the potential for creating policy questions, such requests should be forwarded for Headquarter's review and approval.
d. The 504 Regulation is specific regarding the need to make provisions for the handicapped at such locations as rest areas. Recognizing the possibility that in some instances the driver or a rider in a truck may have need for these facilities, exceptions which would permit rest areas for trucks without handicapped provisions should not be granted.
e. The question of whether or not parking areas in rest areas which lack other facilities should continue to be available for use is an operational consideration and thus a State decision. The decision should be made on an individual basis depending on the circumstances. Retention could be a safety benefit. On the other hand if activities in these sites are or become nuisances, closure may be the only acceptable solution.
f. The land of an abandoned rest area need not be made to conform with adjacent areas. However, the area should be dressed up, seeded, and maintained to the extent necessary to be compatible with the adjacent areas. Further, because of the requirements of OMB Circular A-102, Attachment N, Section 3, Real Property, division office and State personnel should jointly review every abandonment on a case-by-case basis. If it is agreed there is a reasonable expectation that the site will be used for highway purposes at some time in the future, no further action is required. If, however, it is determined the site will never be used for such purposes disposal of the excess property to comply with A-102 will be necessary.
g. A State may be permitted to retain the land on which an abandoned rest area is situated. However, any contemplated use other than as a rest area is to be submitted for Washington Headquarter's review and approval. Further, any use of an abandoned rest area should not be of a permanent nature so that it could revert to rest area usage if a future need should develop. Any proposed use other than as a rest area should consider safety and access control.
h. The maintaining or closing of a rest area without facilities is an operational decision to be made by the State with FHWA concurrence. The abandoned, but not disposal of, rest areas should be properly maintained and any activities occurring at the closed rest area, whether lawfully or by trespassers, should not be detrimental to the operation of the Interstate System.
i. The cost of abandonment is not eligible for Federal-aid funding.
j. Federal funding credit is required when the State disposes of any improvement for value. Credit is not required for improvements which are used for other transportation purposes. Credit is also not required when it is more economical to abandon or waste the improvements. Any disposal of the right-of-way should be at fair market value with an appropriate credit to Federal funds. If an abandoned site was to subsequently revert to a rest area, the extent of Federal fund eligibility in restoration costs would have to be considered on a case-by-case basis. Among the factors to be considered would be need, life of facility when abandoned, impact of interim use on restoration costs, and any conditions or agreements associated with abandonment.