UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
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Ref: 8EPR-ER

ACTION MEMORANDUM

SUBJECT: Approval and Funding for a Removal Action at the Left Hand Creek Discharge Site in Boulder County, Colorado

FROM: Craig Myers 12/14/18
Federal On-Scene Coordinator

THRU: Laura Williams, Unit Leader
Emergency Response

Deirdre Rothery, Director 12/14/18
Emergency Response & Preparedness Program

TO: Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Site ID# B803

I. PURPOSE

The purpose of this Action Memorandum is to document the decision to initiate emergency response actions and request and document approval and funding to continue the emergency response actions described herein for the Left Hand Creek Discharge Site (Site) associated with the Captain Jack Mill Superfund Site (NPL Site) in Boulder County, Colorado. This emergency removal action involves the temporary treatment of mine discharge and augmentation of the State of Colorado's (State's) efforts to treat and manage the mine pool in the Big Five adit (a.k.a. tunnel) at the NPL Site. Conditions existing at the Site present a threat to public health or welfare or the environment and meet the criteria for initiating a removal action under 40 CFR § 300.415(b)(2) of the National Contingency Plan (NCP).

This removal action involves no nationally-significant or precedent-setting issues. This emergency removal action will not establish any precedent for how future response actions will be taken and will not commit the U.S. Environmental Protection Agency (EPA) to a course of action that could have a significant impact on future responses or resources.

II. SITE CONDITIONS AND BACKGROUND

Site Name:	Left Hand Creek Discharge
Superfund Site ID (SSID):	B803
NRC Case Number:	N/A
CERCLIS Number:	CON000820950
Site Location:	Boulder County, Colorado
Lat/Long:	40.062478/-105.512820
Potentially Responsible Party (PRP):	No Viable Liable Parties
NPL Status:	Related to an NPL site
Removal Start Date:	10/24/2018

A. Site Description

1. Removal Site Evaluation

The initial emergency response investigation in the Left Hand Creek Discharge Site determined the source of contamination to be from the Big Five tunnel of the NPL Site. Therefore, this emergency response is being conducted at the NPL Site, which has been on the National Priorities List (NPL) since 2003 and is currently State led. A Record of Decision (ROD) was issued in 2008.

In the fall of 2015, the State, in collaboration with the EPA Region 8 Remedial program, began implementation of the selected subsurface remedy for the NPL Site. The remedy includes an innovative in-situ (in-tunnel) treatment system to mitigate the mining impacted water (MIW) discharging from the Big Five tunnel. This system includes impounding water behind a constructed flow-through bulkhead, neutralization and recirculation of the water, and submerging the mineralized region to the extent practical to reduce contact with oxygen. In May 2018, the valves that control the water flow through the bulkhead were closed as planned to allow the MIW to accumulate within the mine workings. Following closure of the bulkhead valves, the elevation of the mine pool rose much more quickly than anticipated and a controlled release was ultimately required to prevent the possibility of an uncontrolled release at other locations along the tunnel alignment. The remedy operation has not been determined to be Operational and Functional and is still in a "shakedown" period where the operation is being optimized. The ROD for the NPL Site contemplated that releases from the in-tunnel treatment system may be necessary.

The controlled release from the NPL Site started on September 8, 2018 as a component of the planned remedy and is continuing in order to control the height of the mine pool. The water was initially directed through a series of settling ponds, which had historically protected the creek by settling out harmful levels of metals contamination present in the mine discharge. This flow path ultimately leads to Left Hand Creek and is being used while the temporary treatment system is being constructed at the portal.

On October 22, 2018, EPA Region 8's Removal program on-duty On-Scene Coordinator (OSC) was notified of a fish kill in Left Hand Creek. The OSC was mobilized along with support from the Superfund Technical Assistance Team (START) contractor. An initial round of sampling and field measurements indicated that the NPL Site could be responsible; however, the sampling also indicated that the Left Hand Water District intake, located approximately 15 miles downstream, was not impacted.

Further investigation showed that when compared to the water quality that had historically drained from this adit, the water quality within the mine pool had significantly degraded as the mine filled with water. This, combined with the seasonal low water flows within the creek, likely contributed to the fish kill.

Aluminum, cadmium, copper, and zinc were all significantly elevated when compared to samples taken before the remedy construction. Sample results are available on the response website and in the administrative record for the Site.

2. **Physical Location**

The Site is located in Boulder County approximately one and one-half miles southeast of Ward, Colorado. The population of Ward was 150 as of the 2010 census. The NPL Site is located along Left Hand Creek, approximately 15 miles upstream on Left Hand Creek, of a drinking water intake structure for the Left Hand Water District.

3. **Site Characteristics**

The Site is located at the headwaters of upper Left Hand Creek, about 1.5 miles south of Ward, in Boulder County, Colorado. The Site is in a narrow valley known as California Gulch. Mining for gold and silver in the region began in 1860 and ended in 1992. Historic mining operations contaminated soil and surface water with metals and other hazardous chemicals.

The Site is located at an elevation of approximately 9,000 feet above sea level. Over the course of the coming winter, sub-zero temperatures are possible, as are substantial snow events. This will make the contemplated removal action more difficult to implement.

4. **Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant**

The ongoing discharge of MIW represents a release to the environment. Aluminum, cadmium, copper, and zinc are all listed hazardous substances in 40 CFR § 302.4 and Section 101(14) of CERCLA.

According to the Agency for Toxic Substances and Disease Registry, cadmium is a cumulative toxin and has a very long half time in the body, exposure to children in even low amounts may have long-term consequences. Studies in animals suggest that children may be more susceptible than adults to cadmium-induced bone damage. In laboratory animals, cadmium causes decreases in fetal or pup body weight, skeletal malformations, and behavioral alterations.

Cadmium and zinc are often found together in the environment and generally in conjunction with lead containing ores. They typically exist in the aquatic environment as a salt of the +2 valence state or as a metal (Me0), with many cadmium and zinc salts being readily soluble in freshwaters with low organic carbon levels. The free divalent ion of these metals is thought to be primarily responsible for their toxicity to aquatic organisms. The mechanism varies slightly by metal but generally occurs by competitive disruption of calcium receptors on the surface of the gill. This inhibits the ability of the organism to maintain ionic balance with the surrounding environment (US EPA, 2016, Smith, 2015). Additional toxicities from chronic cadmium exposures can result in negative alterations to the gill, kidney, liver, increased free radical production and immune suppression (US EPA, 2016).

5. **NPL Status**

This emergency removal action is in response to a release from the NPL Site.

6. **Maps, Pictures, Other Geographic Representations**

A map of the Site is available in Attachment 1. Relevant Site photos are available in Attachment 3 of this document.

B. Other Actions to Date

1. **Previous Actions at the NPL Site**

The NPL Site cleanup has included multiple removal actions to address immediate threats to human health and the environment. EPA removed several drums of chemicals and concentrated mine wastes. In 2004, EPA performed an emergency removal to remove miscellaneous hazardous wastes from the NPL Site, including a large amount of household waste, debris, paint containers and chemical wastes discovered during the initial phase of the remedial investigation. In 2007, an EPA emergency removal rehabilitated the tunnel and removed impounded mine water.

Implementation of the remedial actions began in 2012, when the State constructed the selected surface remedy. Waste rock and mill tailings were excavated and consolidated into two repositories, which were capped and

revegetated. The current remedial action to address the Big Five tunnel discharge started in 2015 and is ongoing.

2. Current Actions at the Site

EPA's Emergency and Rapid Response Services (ERRS) contractor began providing sodium hydroxide (a.k.a. caustic) into the mine pool through the in-tunnel recirculation system. The addition of amendments into the tunnel was contemplated in the remedy design and a port installed as a contingency for operation of the in-tunnel remedy. The addition of caustic was intended to raise the pH of the mine pool to reduce the concentration of dissolved metals in the tunnel and to ultimately mitigate the impacts of the tunnel drainage on Left Hand Creek. This action may continue on a periodic basis until such time as either: (1) the OSC, in consultation with the State Project Manager and EPA RPM, determines that this action is not effective; (2) the mine pool has been treated to a roughly neutral pH of 7; or (3) the water quality and mine pool level stabilizes to a degree that the in-tunnel treatment system can be further optimized by the remedial program as part of the ROD selected remedy.

To manage the mine pool water level, discharge of water from the Big Five adit is required. The ERRS contractor has been providing temporary treatment of water discharging from the Big Five portal using a gravity-fed drip of caustic. This increases the pH and promotes additional settling of metals in the existing settling ponds.

C. State and Local Authorities' Role

1. State and Local Actions to date

The Colorado Department of Public Health and Environment (CDPHE) is providing analysis of samples collected to monitor conditions in Left Hand Creek, and has its contractor monitoring conditions within the tunnel/mine pool through borehole field parameter monitoring and sampling.

2. Potential for Continued State/Local Response

CDPHE is providing all the assistance that its budget and contracting constraints will currently allow. Operation of the temporary treatment system at the portal and augmented in-mine treatment is beyond its capability in the short-term. In the long-term, once the emergency situation is under control and stabilized, per the terms of this Action Memorandum, operation of the NPL Site will return to the EPA and State remedial programs, and the subsurface remedy will be optimized and operated as per the remedy selected in the ROD.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Conditions at the Site present a threat to public health and the environment and meet the criteria for initiating a removal action under 40 CFR § 300.415(b)(2) of the NCP.

EPA has considered all the factors described in 40 CFR § 300.415(b)(2) of the NCP and has determined that the following factors apply at the Site.

> "(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, or pollutants or contaminants;"

The controlled release that triggered this emergency removal action likely contributed to a fish kill in Left Hand Creek. If no action was taken, there is little reason to believe that this situation would remedy itself over time.

> "(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;"

If no action was taken, it is conceivable that the low winter water flows and elevated metals levels in the mine discharge could have eventually impacted the Left Hand Water District water intake downstream of the Site. The Left Hand Water District provides water for an area generally bounded by the City of Longmont to the north, the City of Boulder to the south, Interstate 25 to the east, and the foothills to the west.

> "(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;"

The Site is located in a narrow canyon typical of the Rocky Mountains, where water flows are typically at their lowest during the winter time. This time of year is when creeks are most susceptible to severe impacts from draining mines, as there is less clean water present to mitigate the impacts of metal-laden mine impacted water.

> "(vii) The availability of other appropriate federal or state mechanisms to respond to the release;"

There are no other federal programs capable of responding to this release in the required timeframe to mitigate the effects of the discharge. While the NPL Site is a state-led with a ROD in place, the State's contract mechanism is simply unable to mitigate this situation in the necessary timeframe. Further, additional remedial action funding is currently unavailable to address this immediate threat.

IV. SELECTED REMOVAL ACTION AND ESTIMATED COSTS

A. Planned Actions

1. Planned Action Description

A more robust temporary treatment system, that will be able to operate in winter conditions, is currently under development/construction. This system is an interim measure until CDPHE and EPA remedial programs can resume operation of the site under remedial authorities. It will be installed at the Big Five portal to treat the tunnel discharge required to maintain or decrease the height of the mine pool while options for optimizing the in-situ remedy are explored. System optimization may involve, but is not limited to, any combination of the following: additional/continued chemical amendments to adjust the pH of the mine pool, addition of organic carbon to encourage biological metals stabilization, returning portal water treatment sludges to the mine, augmenting recirculation flows in the in-mine treatment system, and/or making other adjustments to the in-mine treatment system as necessary.

2. Contribution to Remedial Performance

This effort will, to the extent practical, contribute to any future remedial effort at the NPL Site. The EPA RPM and State Project Manager are heavily involved in the planning and execution of this action.

3. Engineering Evaluation/Cost Analysis (EE/CA)

An EE/CA is not required for an time-critical removal action.

4. Applicable or Relevant and Appropriate Requirements (ARARs)

Removal actions conducted under CERCLA are required, to the extent practicable considering the exigencies of the situation, to attain ARARs. In determining whether compliance with an ARAR is practicable, the lead agency may consider appropriate factors including the urgency of the situation and the scope of the removal action to be conducted.

5. Project Schedule

This emergency removal action started on October 24, 2018 and is anticipated to be completed by the summer of 2019. The removal action may conclude earlier based on quality and quantity of water in the mine pool, or if CDPHE and EPA remedial programs are otherwise able to resume operation of the Site without the assistance of the removal program.

B. **Estimated Costs***

	Estimated Costs
ERRS contractor	$1,160,000
START contractor	$250,000
SUBTOTAL	$1,410,000
Contingency costs (20% of subtotal)	$ 282,000
Current Action Removal Project Ceiling	**$1,692,000**
Previous Removal Action Costs at the NPL Site	**$768,260**
Total Removal Project Ceiling, All Removal Actions To Date	**$2,460,260**

*EPA direct and indirect costs, although cost recoverable, do not count toward the Removal Ceiling for this removal action. Liable parties may be held financially responsible for costs incurred by the EPA as set forth in Section 107 of CERCLA.

V. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

A delay in action or no action at this Site would increase the actual or potential threats to the public health and/or the environment.

VI. OUTSTANDING POLICY ISSUES

None

VII. ENFORCEMENT

An investigation to evaluate potential enforcement options will be undertaken. A separate Enforcement Addendum will be prepared if appropriate providing a confidential summary of potential enforcement activities.

VIII. RECOMMENDATION FOR APPROVAL

This decision document represents the selected removal action for the Left Hand Creek Discharge Site in Boulder County, Colorado, developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the NCP section 300.415(b)(2) criteria for a removal action, and I recommend your approval of the proposed removal action. The all-inclusive removal project ceiling of all removal actions to date at the NPL Site, if approved, will be $2,460,260, and the total project ceiling of this action, if approved, will be $1,692,000; this amount will be funded from the Regional removal allowance.

APPROVE

Betsy Smidinger — 12/14/18

Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Date

DISAPPROVE

_____ _____

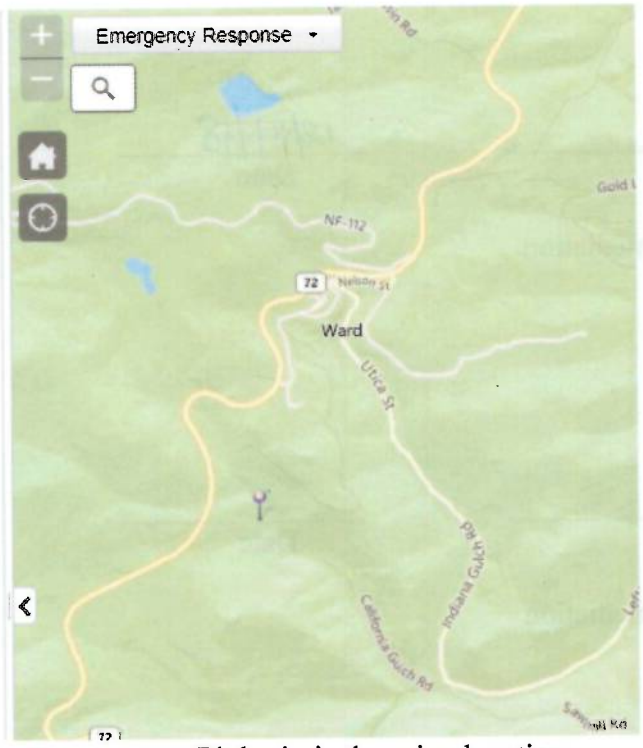
Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Date

Attachments:

Attachment 1: Site Map
Attachment 2: Sampling Results and Hazard Quotients
Attachment 3: Site Photos

Attachment 1 - Maps



Pink pin is the mine location

Arial view of the mine portal and two settling Ponds

A map showing sample locations along Left Hand Creek. CJM-SW-01 is at the Big Five Portal

Attachment 2 – Sample Results and Hazard Quotients

			Background - Left Hand Creek (LHC)		Mine Discharge		Mine Discharge Duplicate		LHC below settling pond discharge		LHC below CJM Site	
Sample ID			CJM-SW-06-20181023		CJM-SW-01-20181023		CJM-SW-01-20181023		CJM-SW-08-20181023		CJM-SW-11-20181023	
Date Collected			10/23/2018		10/23/2018		10/23/2018		10/23/2018		10/23/2018	
Method	Analyte	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
6010B	ALUMINUM	mg/l	0.0375	J	77.3		77.1		32.3		6.2	
6010B	ALUMINUM, DISSOLVED	mg/l	0.0435	B J	76.3		76.6		40.5		6.14	
6010B	CADMIUM	mg/l	<0.00200		0.585		0.587		0.132		0.0261	
6010B	CADMIUM, DISSOLVED	mg/l	<0.00200		0.584		0.583		0.166		0.0263	
6010B	COPPER	mg/l	<0.0100		51.3		51.5		13.2		2.58	
6010B	COPPER, DISSOLVED	mg/l	<0.0100		51.4		51.3		16.5		2.58	
6010B	ZINC	mg/l	0.00993	J	95.8		96.5		21.3		4.58	
6010B	ZINC, DISSOLVED	mg/l	0.0106	J	96.2		93.9		26.7		4.58	
9040C	PH	su	7.57	T8	2.61	T8	2.62	T8	3.05	T8	4.23	T8

			LHC above Beaver Dam Complex	LHC at Lickskillet road	LHC at Rowena		Left Hand and Little James Confluence		LHWD Intake	
Sample ID			BDUS	LHC-LS	ROWENA-20181023		LHC-SW01-20181023		LHWDALDI INTAKE-20181023	
Date Collected			10/24/2018	10/23/2018	10/23/2018		10/23/2018		10/23/2018	
Method	Analyte	Units	Field Measure	Field Measure	Result	Qualifier	Result	Qualifier	Result	Qualifier
6010B	ALUMINUM	mg/l	N/A	N/A	0.684		0.0369	J	0.063	J
6010B	ALUMINUM, DISSOLVED	mg/l	N/A	N/A	0.0369	B J	<0.200		0.0521	B J
6010B	CADMIUM	mg/l	N/A	N/A	0.000843	J	<0.00200		<0.00200	
6010B	CADMIUM, DISSOLVED	mg/l	N/A	N/A	<0.00200		<0.00200		<0.00200	
6010B	COPPER	mg/l	N/A	N/A	0.0169		0.00778	J	<0.0100	
6010B	COPPER, DISSOLVED	mg/l	N/A	N/A	0.0131		0.00534	J	<0.0100	
6010B	ZINC	mg/l	N/A	N/A	0.239		0.101		0.0281	J
6010B	ZINC, DISSOLVED	mg/l	N/A	N/A	0.239		0.0997		0.0293	J
9040C	PH	su	5.09	6.09	7.47	T8	7.63	T8	7.59	T8

Qualifiers

B: The same analyte is found in the associated blank.

J: The identification of the analyte is acceptable; the reported value is an estimate.

J6: The sample matrix interfered with the ability to make any accurate determination; spike value is low

O1: The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.

T8: Sample(s) received past/too close to holding time expiration.

Attachment 2 – Sample Results and Hazard Quotients

Hazard Quotients TVS (acute)

	CJM-SW-06 9/11/2018	CJM-SW-06 10/23/2018	CJM-SW-01 9/11/2018	CJM-SW-01 10/23/2018	CJM-SW-08 9/11/2018	CJM-SW-08 10/23/2018	CJM-SW-11 9/11/2018	CJM-SW-11 10/23/2018
Aluminum (t)	1.99	0.08	12.71	7.66	0.69	3.21	0.89	1.31
Antimony	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Arsenic	#N/A	#N/A	0.55	0.14	#N/A	#N/A	#N/A	#N/A
Barium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Beryllium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Cadmium	#N/A	#N/A	72.93	63.75	#N/A	16.15	2.32	7.81
Copper	0.64	#N/A	1168.93	1033.89	0.71	332.54	21.66	153.66
Iron (t)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Lead	#N/A	0.03	0.18	0.33	0.02	0.40	#N/A	0.17
Manganese	0.00	0.00	24.69	21.11	0.00	8.78	0.26	2.04
Nickel	#N/A	#N/A	0.59	0.50	#N/A	0.17	0.03	0.07
Selenium	#N/A	#N/A	1.03	0.77	#N/A	0.32	#N/A	0.05
Silver	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Thallium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Zinc	#N/A	0.25	217.80	188.33	#N/A	47.30	8.00	23.09

Attachment 2 – Sample Results and Hazard Quotients

Hazard Quotients TVS (chronic)

	CJM-SW-06 9/11/2018	CJM-SW-06 10/23/2018	CJM-SW-01 9/11/2018	CJM-SW-01 10/23/2018	CJM-SW-08 9/11/2018	CJM-SW-08 10/23/2018	CJM-SW-11 9/11/2018	CJM-SW-11 10/23/2018
Aluminum (t)	3.33	0.58	1471.26	686.21	1.00	371.26	4.41	72.26
Antimony	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Arsenic	#N/A	#N/A	1.25	0.31	#N/A	#N/A	#N/A	#N/A
Barium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Beryllium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Cadmium	#N/A	#N/A	557.33	487.14	#N/A	198.71	12.65	52.18
Copper	0.79	#N/A	1980.87	1752.05	0.86	569.52	25.46	235.42
Iron (t)	1.08	0.06	650.00	663.00	0.38	50.40	0.34	6.95
Lead	#N/A	0.65	4.57	8.58	0.60	10.14	#N/A	4.49
Manganese	0.00	0.00	44.70	38.20	0.00	15.89	0.47	3.69
Nickel	#N/A	#N/A	5.34	4.52	#N/A	1.50	0.28	0.65
Selenium	#N/A	#N/A	4.13	3.07	#N/A	1.28	#N/A	0.18
Silver	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Thallium	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Zinc	#N/A	#N/A	287.89	219.63	#N/A	62.45	10.56	30.49

Photo Category: AM Photo

Description: Sampling Location CJM-SW01. This is the Big Five portal, and upper settling pond.

Category: AM Photo

Latitude: 40.06344994

Date Taken: 10/23/2018

Longitude: -105.51215182

Tags: Sampling

Description: View where the mine water discharging into Left Hand Creek at location CJM-SW-08. Left Hand Creek flows right to left in this photo, with the mine discharge entering the creek from the top of the frame.

Category: AM Photo

Latitude: 40.0619055555556

Date Taken: 10/23/2018

Longitude: -105.508941666667

Tags: Sampling

Description: Deceased fish at the LHC-LS sample Location (Lickskillet Road)

Category: AM Photo

Latitude: 40.075157

Date Taken: 10/23/2018

Longitude: -105.414348

Tags: Sampling, Fish

Description: Downstream beaver pond system. The dam in the lower right corner is just above the BDDS sample location.

Category: AM Photo

Latitude: 40.0681277777778

Date Taken: 10/24/2018

Longitude: -105.442183333333

Tags: Assessment