Moab WWTP Relocation
Final Environmental Study

City of Moab, Utah
State of Utah Department of Environmental Quality
Division of Water Quality

www.moabcity.org

October 2016

Moab WWTP
Relocation Project
Final Environmental Study

Prepared by

Bowen Collins & Associates
154 E. 14000 S.
Draper, Utah 84020
801-495-2224

Prepared for:

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Chapter 1 - Purpose and Need for Proposed Action

1.1 Introduction

City of Moab (City), under the direction and funding of the State of Utah Department of Environmental Quality (DEQ), Division of Water Quality, is proposing to relocate the existing wastewater treatment plant to an adjacent parcel. The existing treatment plant is located at 1070 West and 400 North in Moab, Utah. The proposed location is directly to the south of the existing plant, on the southwest corner of 400 North and Stewart Lane, in Moab, Utah. The proposed parcel is currently owned by a private landowner.

The current treatment plant is approximately 3.5 acres in size and services all of Moab City as well the Grand Water & Sewer Service Agency (GWSSA). The City owns and operates the treatment plant and GWSSA contracts to send its collected wastewater for treatment and disposal. The new parcel with be approximately equal in size and will have the ability to treat additional wastewater as the City of Moab and GWSSA continues to grow in population.

Project Purpose and Need: The purpose of relocating the wastewater treatment plant is to replace aging infrastructure and improve water quality discharge to the Colorado River and adjacent wetlands. As population continues to grow within the Moab City boundaries as well as the Grand Water & Sewer Service Agency, the treatment system will need to meet future wastewater treatment demand due to population growth, meet the state and federal environmental regulations, and to protect the facility from a 100-year flood event.

An Environmental Assessment will be prepared in compliance with the National Environmental Policy Act of 1969 (NEPA) to provide a decision-making framework that: 1) analyzes a reasonable range of alternatives to meet the project objectives; 2) evaluates potential issues and impacts to the new treatment plant location resources and values; and 3) identifies mitigation measures to lessen the degree or extent of these impacts.

1.2 Background

The Moab Wastewater Treatment Plant WWTP was initially constructed in the late 1950s to provide primary treatment of domestic wastewater for the Moab area. A secondary treatment process was added in 1967. Additional modifications and expansions have been completed over the life of the plant, including the latest expansion that was completed in 1996. The WWTP treats wastewater from the City of Moab (City) and the Grand Water & Sewer Service Agency (GWSSA).

The City owns and operates the WWTP and GWSSA contracts to send its collected wastewater for treatment and disposal.

The Moab and GWSSA area wastewater treatment and disposal needs have been met by the WWTP for many years. However, population growth and rising tourism visitation have resulted in increased biological loading to the WWTP which have exceeded its capacity to reliably treat influent wastewater to meet State of Utah effluent discharge standards. Upgrades to the biological treatment process are necessary to ensure full compliance with the facility discharge permit. Additionally, portions of the plant are over 55 years old and require renovation or replacement in order to provide continued reliable service.

1.3 Purpose of and Need for Action

The purpose of relocating the wastewater treatment plant is to replace aging infrastructure. The Project is needed to and improve water quality discharge to the Colorado River and adjacent wetlands as well as reduce maintenance of the facility.

As population continues to grow within the Moab City boundaries as well as the Grand Water & Sewer Service Agency, the treatment system will need to meet future wastewater treatment demand due to population growth, meet the state and federal environmental regulations, and protect the facility from a 100-year flood event.

Current annual average daily wastewater flows to the WWTP are 1.1 MGD. The 20-year daily flow projections, based on Utah Governor's Office of Management and Budget annual growth rate for Moab and surrounding areas, are 1.47 MGD annual average, 1.69 MGD peak month and 3.32 MGD peak hourly. This is approximately 1.5 times the current demand. For 20-year planning purposes, the table below shows the projected flow need for an upgraded or new WWTP/WRF.

Table 1
Flows and Seepage Loss
20-Year Wastewater Design Criteria

Parameter	Value
Average Annual Daily Flow	1.5 MGD
Peak Month Flow	1.75 MGD
Peak Hour Flow	3.38 MGD

Note: The flows are calculated in million gallons per day (MGD).

1.4 Scoping

The Proposed Action was presented to the public and cooperating agencies through mailings. Letters were sent to 10 property owners within 1,000 feet of the project site, and 24 municipal, county, State of Utah, and Federal agencies. The letters invited the recipients to provide comments via a written response. A copy of the letter and area map area included in (Appendix D).

Comments were accepted by standard mail and electronic mail. Using the comments from the public and other agencies, the project team identified and considered issues of public concern, which are included in Appendix E Public Comment Summary. A total of one public (local resident) letter was received and one agency letter (Utah Division of Forestry, Fire and State Lands) was received.

1.5 Permits, Licenses, and Authorizations

Implementation of the Proposed Action may require a number of authorizations or permits from municipal, county, state and Federal agencies. The City would be responsible for obtaining all permits, licenses, and authorizations required for the Project. Potential authorizations or permits may include those listed in Table 1-2 and others not listed.

Table 1-2
Permit and Authorization

Agency/Department	Purpose
Utah Division of Water Quality	Utah Pollution Discharge Elimination System (UPDES) Permit for dewatering.
Utah Division of Water Quality	Storm Water Discharge Permit under Section 402 of the Clean Water Act (CWA) if water is to be discharged as a point source into the Colorado River or other natural streams or creeks.
State of Utah Department of Natural Resources, Division of Water Rights (DWRi)	Stream Alteration Permit under Section 404 of the CWA and Utah statutory criteria of stream alteration described in the Utah Code. This would apply for impacts to the Colorado River or other natural streams or creeks during Project construction.
Utah State Historic Preservation Office	Consultation pursuant to Section 106 of the National Historic Preservation Act (NHPA), 16 USC 470.
United States Fish and Wildlife Service	Consultation pursuant to Section 7 of the Endangered Species Act if impacts occur to the Colorado River or a taking of the Yellow-billed Cuckoo.
United States Army Corps of Engineers (USACE)	A USACE permit in compliance with Section 404 of the CWA may be required if waters of the United States are proposed to be filled or dredged as part of the Project.
Grand County	A building permit or other planning documents may need to be obtained prior to construction.
FEMA	New map revision may be necessary to remove the Proposed Action from the 100-year floodplain.

1.6 Related Projects and Documents

1.6.1 Moab Wastewater Treatment Plant Facilities Master Plan

In February 2015 Moab City has contracted with Bowen Collins & Associated (BC&A) to assist in the evaluation and master planning of the Moab WWTP. The objectives of the Wastewater Treatment Facility Plan were:

- Evaluate improvements necessary for the Moab WWTP to meet current and future water quality discharge requirements.

- Develop a plan for the City to reliability and effectively meet the City's current and future wastewater needs due to increase in population and tourism.
- Develop preliminary cost estimates for recommended alternatives.
- Provide an implementation plan.
- Provide documentation necessary to begin the approval and funding process.

1.7 Scope of Analysis

The purpose of this EA is to determine whether or not the State of Utah should authorize, provide funding, and enter into an agreement with the City to relocate the existing Moab City Wastewater Treatment Facility to an adjacent property. That determination includes consideration of whether there would be significant impacts to the human environment. In order to relocate the existing wastewater treatment plant, this environmental study must be completed and a state level Finding of No Significant Impact (FONSI) must be issued. Analysis in this environmental study includes temporary impacts from construction activities and permanent impacts as a result of the facility relocation.

1.8 Document Organization

This study consists of the following chapters:

1. Purpose and Need for Proposed Action
2. Alternatives
3. Affected Environment and Environmental Consequences
4. Environmental Commitments
5. Consultation and Coordination
6. References
7. Preparers
8. List of Acronyms
9. Figures
10. Appendices

Chapter 2 Alternatives

2.1 Introduction

This chapter describes the features of the No Action and Proposed Action Alternatives, and presents a comparative analysis. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative.

The City of Moab is in the process of requesting funding and authorization to relocate the existing wastewater treatment facility. The incoming 24-inch gravity sewer line to the facility and discharge location to the Colorado River would remain the same, the new facility would tie into the existing pipe infrastructure and would only be relocating the wastewater facility. The old facility would be demolished and the site would remain as open space.

The current facility treats an average daily flow of 1.1 MGD and has the maximum capacity of treating a peak flow of 3.1 MGD. It is projected that in 20 years that average daily flow will be 1.5 MGD with a peak flow of 3.38 MGD. The facility also receives and treats septage. Septage is received from homes and other areas that are not connected to the sewer system. They are placed in below surface containments that are periodically pumped out when full, and transported to the treatment facility. These septage areas are typically located at recreational areas and operated by septage vendors. Driller man-camps also deliver septage to the facility. The septage volume received by the Moab WWTP has increased in recent years and is now estimated at approximately 1.2 million gallons per year. This increase is due to more tourism and visitors to the Canyonlands area. The Moab WWTP is the only septage receiving facility in the area.

2.2 No Action Alternative

Under the No Action Alternative, the WWTP would not be relocated. The WWTP would continue to receive and treat wastewater with no change. The City's maintenance and inspection activities would continue, including cleaning, monitoring, and inspection.

This alternative would not provide for nutrient removal, would not create needed additional capacity for future growth and may not allow existing conditions to continue due to effluent discharge exceedances (violations) that have occurred in recent reporting cycles. The aged condition of the existing facilities may also contribute to making continued reliable operation of the plant more difficult over time.

2.3 Proposed Action Alternative (Preferred)

The Proposed Action Alternative consists of relocating the existing WWTP to a privately owned parcel of land located immediately south and across 400 North Street from the existing facility. By relocating to a new parcel, it will provide opportunity to construct a new, updated facility that will have sufficient space for the necessary facility upgrades, help maintain a buffer from surrounding properties, and also provide opportunity to construct the new WRF outside of the 100-year floodplain. The existing WWTP will be demolished and the parcel which it resides upon will be kept as city owned open space.

The new WRF would consists of the following structures:

1. Headworks and Influent Pump Station
2. Sequencing Batch Reactors
3. Equalization Basin
4. UV Disinfection Facility
5. Filters (Future)
6. Solids Holding Basin
7. Solids Dewatering Building
8. Administration, Maintenance, Electrical Building
9. Standby Generator
10. Future Sequencing Batch Reactor

2.3.1 Construction Schedule and WRF Operation During Construction

Facility construction is anticipated to be staged, or phased, to permit construction of currently needed treatment capacity and performance with allowance for projected future growth. Additional growth and/or increased treatment requirements will be accommodated in the future by construction of additional facilities and/or modification of existing ones. Effluent discharge permit requirements, population and visitation trends, development of improved technologies and other factors will influence how and when such changes are accomplished. A staged construction approach will be used for this project.

Additionally, impacts to Yellow-billed Cuckoo habitat should be taken into consideration during the construction phasing of the project. Site clearing of Yellow-billed Cuckoo habitat is not allowed to occur between June 1 and August 31. The site must also be cleared of vegetation prior to January of the upcoming year to minimize impacts to migratory birds as part of the Migratory Bird Treaty Act.

2.3.2 WRF Construction Procedures

2.3.2.1 Construction Sequence

Construction would likely occur in the following sequence:

1. Construct or improve needed access roads
2. Clear and grade parcel
3. Import construction materials
4. Clean up and restore areas disturbed by construction
5. Vegetate site to provide screening to adjacent landowners

2.3.2.2 Clear and Grade Parcel

The new parcel would be excavated and graded to provide a level base for installation of the structures. All excess material would be disposed within the existing parcel. Much of the excavated material could be used for backfill and would be disposed along perimeter of the parcel to protect the site from the 100 year floodplain.

2.3.2.3 Facilities Installation

The materials for the facilities would be transported from the manufacturer to the work site by flatbed trucks and/or specially outfitted loaders. A crane will be used for the construction of the larger structures. Needed backfill material would be imported from available commercial sources. Typically, backfill would be mechanically compacted with a vibratory compactor.

Following construction, the contractor would remove all debris. Spoil in work areas would be spread evenly to blend with contours and maintain local drainage patterns with the exception of a berm that would be constructed along the perimeter to protect the facility from the 100 year floodplain.

2.3.2.4 Quality Control Procedures

After backfilling and all construction work are completed; the contractor would ensure quality control of construction through visual inspection and testing of the facilities. After testing the facility, the WRF can begin operations.

2.3.2.5 Construction Staging Areas

The new WRF parcel would also be used as the construction staging area. The staging areas would be used for equipment staging, construction personnel vehicular parking, and occasional materials stockpiling.

2.3.2.6 Operation and Maintenance

Operation of the WWTP after construction would remain essentially unchanged outside of the newly constructed facility. Wastewater will enter through a 24 inch pipeline and exit through the existing 24 inch pipeline to the Colorado River.

2.3.2.9 Land Disturbance

The new parcel area is approximately 5 acres in size. The construction activity and staging would be confined to the 5 acre parcel or the existing WWTP location. It is anticipated at the end of the construction of the new WRF, the old plant will be demolished and the site will be restored with native grasses and trees and left as open space.

2.3.9.10 Transportation Requirement

Construction transportation route for the project will be 400 north which connects from Main Street or Highway 191 directly to the WWTP. Transportation to the Project would follow this route to and from the project site daily by construction crew. It is anticipated that heavy equipment would remain staged on site unless materials are being transported to the site by a dump truck or concrete truck. When demolition of the existing WWTP occurs, dump trucks will travel along 400 North to an approved disposal site.

2.3.9.11 Standard Operating Procedures

Standard Operating Procedures (SOPs) would be followed (except for unforeseen conditions that would require modifications) during construction and O&M of the Project to avoid or minimize adverse impacts on people and natural resources. The SOPs and features of the Proposed Action have been formulated to avoid or minimize adverse impacts. Chapter 3 presents the impact analysis for resources after SOPs have been successfully implemented.

2.4 Comparison of Alternatives

The suitability of the No Action and Proposed Action Alternatives were compared based on four objectives identified for the project. The objectives are:

1. Meet future WRF demands
2. Comply with state and federal environmental regulations
3. Protect the WRF from the 100-year Flood
4. Upgrade Aging Facilities

As shown in Table 2-4, the No Action Alternative did not meet any of the Project's objectives while the Proposed Action Alternative met all four objectives.

Table 2-4
Comparison of Alternatives

Project Objective	Does the No Action Alternative Meet the Objective	Does the Proposed Action Alternative Meet the Objective
Meet future WRF demands	No	Yes
Comply with state and federal environmental regulations	No	Yes
Protect the WRF from the 100-year Flood	No	Yes
Upgrade Aging Facilities	No	Yes

2.5 Alternative Considered and Eliminated From the Study

The following alternative was evaluated but eliminated because it did not meet the purpose or need for the Project.

2.5.1 Modification and/or Expansion of Existing Treatment Plan

Modifications to and expansion of the existing plant facilities could provide both performance and capacity increases relative to meeting BOD5 and TSS discharge limit requirements, however, it's existing location would remain a threat to a 100-year flood. Additionally, significant changes in removal of phosphorous and nitrogen would not occur as the existing plant is not equipped or suited for these purposes. Removal of nutrients biologically requires other processes and equipment which would yield much the existing plant facilities non-functional.

Additionally, the age and condition of the existing plant facilities remains a concern in regard to future reliable operations. Therefore, modification or expansion of the existing facilities is not considered to be a viable approach to meeting future treatment requirements, whether or not nutrient removal is considered.

Chapter 3 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the environment that could be affected by the Proposed Action. These impacts are discussed under the following resource issues: water resources and water quality; groundwater resources; Utah Department of Environmental Quality (DEQ) Regulated Sites; floodplain; geology and soils; cultural resources; wildlife resources; threatened, endangered and sensitive species; wetlands, riparian and existing vegetation; recreation; visual resources; socioeconomics; health, safety, air quality and noise; public safety, access and transportation. The present condition or characteristics of each resource are discussed first, followed by a discussion of the predicted impacts caused by the Proposed Action. The environmental effects are summarized in Table 3-6.

3.2 Resources Eliminated from Analysis

Table 3-1
Environmental Effects

Resource	Rationale for Elimination from Further Analysis
Wilderness and Wild and Scenic Rivers	There are no designated wilderness areas or Wild and Scenic Rivers affected by the Project area; therefore, there would be no impact to these resources from the Proposed Action. Although the Colorado River is considered a Scenic River, there is no impact proposed to the River this project as the Colorado River is located 0.50 miles from the project site.
Prime and Unique Farmland	There is Prime and Unique Farmland within the Project area, however, there would be no impacts to this resource from the Proposed Action as the proposed relocation site is not currently used for farming or agriculture.
Air Quality and Climate Change	There would be no effects to air quality or climate change as a result of the Proposed Action.
Agricultural Farmlands	There would be no effects to agricultural farmlands as a result of the Proposed Action as the relocation site is not currently used for agriculture.
Water Rights	There would be no impacts to existing water rights from the Proposed Action. Any existing water rights for the existing WWTP would remain the same and no additional water rights would be needed.

3.3 Affected Environment

This chapter describes the affected environment (baseline conditions) of resources of the human environment that could be impacted by construction and operation of the Proposed Action, as described in Chapter 2.

3.3.1 Water Resources and Water Quality

There are no surface water features on the project site that will be affected by the construction or operation of the facility. A site visit conducted on May 4, 2015 concluded that no existing surface water features are within the Project Limits of the existing WWTP and the proposed site.

Surface water quality during construction and final operation is not expected to be adversely impacted. The discharge of treated effluent from the new WRF to the Colorado River will continue once in operation. The quality of the discharge will meet State of Utah water quality standards as identified in Appendix J.

The project is not expected to have adverse impacts to water quality from this Project due to the proposed guidelines for construction outlined in Chapter 2.

3.3.2 Groundwater Resources

The analysis for ground water resources covers water wells and springs near the Moab WWTP relocation site.

Valley fill aquifers underlying Moab Valley are predominately recharged by the springs and subsurface flow from the Glen Canyon aquifer, principally along the northeast side of the valley (Sumsion, 1971), and from direct precipitation and infiltration of water from Pack Creek and Kens Lake (Steiger and Susong, 1997). Groundwater flow is generally southeast to northwest in Moab-Spanish Valley towards the Colorado River.

Unconsolidated alluvium in Moab Valley is approximately 150 to 400 feet in thickness based on well completion reports submitted to the Utah Department of Water Rights.

Ground water quality during construction and final operation will not see a significant impact. Temporary dewatering of the site will be required during construction to install subgrade structures. Local discharge permits for the dewatering of the site are likely required and will be obtained prior to construction. (UDWRi). Adjacent well owners are likely not going to see an impact to their wells during the dewatering process due to the shallow depth of the dewatering wells.

3.3.3 Utah DEQ Regulated Sites

State regulatory websites were utilized to locate potential hazardous waste sites within the Project area. The following websites list the documented and permitted hazardous waste and Comprehensive Environmental Response Compensation and Liability Act (CERCLA), sites:

Division of Environmental Response and Remediation
http://www.enviornmentalresponse.utah.gov

Division of Solid and Hazardous Waste
http://www.hazardouswaste.utah.gov

Table 3-2 presents information regarding underground storage tanks (USTs) and leaking underground storage tanks (LUSTs) in the Project area. Table 3-3 presents information regarding Environmental Incidents in the Project area. Table 3-4 presents information regarding Toxic Release Inventory sites in the Project area. Figure 5 presents the proposed site, as well as identified regulated sites, underground storage tank locations, environmental incidents and Toxic Release Inventory sites within the Project area. Locations that were inventoried in Tables 3-2, 3-3 and 3-4 were located at a distance of 1 mile from the proposed alignment.

Hazardous waste-related incidents and facilities were screened to identify sites with a higher probability for existing soil or groundwater contamination.

High Probability of Environmental Degradation**:** The following sites have a high probability of existing soil or groundwater contamination. Open LUST (leaking underground storage tank) sites (not yet remediated or closed) – There are 0 sites located within 1 mile of the Project area.

Moderate Probability of Environmental Degradation: The following sites have a moderate probability of environmental degradation.

Closed LUST sites – 6 sites are located within 1 mile of the Project area (Tables 3-2 and Figure 5).

Active UST (underground storage tanks) sites – 2 sites are located within 1 mile of the Project area (Table 3-2 and Figure 5).

Low Probability of Environmental Degradation: The following sites have a low probability of environmental degradation.

Environmental Incident sites – 1 site is located within 1 mile of the Project area (Table 3-3 and Figure 5).

Toxic Release Inventory sites – 1 site is located within 1 mile of the Project area (Table 3-4 and Figure 5).

Table 3-2
UST/LUST Locations

Site	DERR ID	Site Type	Site Description
City of Moab	5000100	LUST	Closed Releases
UDOT Sta # 4453	5000211	LUST/UST	Closed Releases / Active
Utah Power and Light Company	5000234	LUST	Closed Releases
Moab Service Center	5000246	UST/LUST	Closed Releases
Jimbos Country Market	5000257	LUST	Closed/Removed
Vacant Building	5000319	UST	Closed/Removed
Black Oil Distributing	5000467	LUST/UST	Closed Releases / Active

Table 3-3
Environmental Incident Locations

Site	DERR ID
Moab Bit and Tool	5154
Leaking Flammable Liquid – RP Trucking	11432
Petroleum Release – Grand County – Black Oil Company	12079

Table 3-4
Toxic Release Inventory

Site	DERR ID
Black Oil Company	84532BLCKL995NH

3.3.4 Floodplain

The Moab WWTP has been constructed within the 100-year floodplain and the Proposed Action is also proposed to be located within the 100-year floodplain as shown in Figure 4. Some minimal berming of the existing site has been constructed along the western edge of the property several years ago, it is estimated this occurred sometime in the 1980's based on aerial photography. Although the Colorado River floodplain is critical habitat for the Colorado pikeminnow (Ptychocheilus lucius) and razorback sucker (Xyrauchen texanus), this berming and gradual uphill slope of the property has created a disconnect for critical fish habitat as explained in Appendix D by an email received from the US Fish and Wildlife on June 24, 2016.

The evaluation of the 100-year floodplain indicates that the flood stage is approximately 3 feet higher than the 1996 WWTP upgraded design accounted for. Additionally, the flood stage is approximately 5-8 feet higher than the wastewater facility at the fence line and the top of wall elevation for all structures lies below the flood plain, with the exception of the trickling filters and the anaerobic digesters.

The Proposed Action will need to raise the footprint of the project to remove the proposed facilities from the floodplain and protect them from future flood events. A FEMA map revision may need to remove the Proposed Action from the 100-year floodplain.

3.3.5 Geology and Soils Resources

The Project is located in the Colorado Plateau Physiographic Province, which is about 14 miles long and 1.25 miles wide. The Project area is in the Moab-Spanish Valley within Grand County in eastern Utah. The elevation is approximately 3970 feet above mean sea level.

The valley fill of Moab-Spanish Valley consists mainly of stream, alluvial-fan, mas-movement and wind-blown deposits (Doelling, 2001). The quaternary alluvial deposits overly sedimentary rocks from a collapsed anticline from a salt diapir with surfacing sedimentary layered formations at the margins of the valley. According to Doelling and Others (2002) geologic formations that are exposed within the Project area include:

- Quaternary Alluvium, Terrace Deposits, Basin Fill Deposits and Floodplain Deposits.
- Paradox Formation (gypsiferous claystone, siltstone, shale, evaporate and salt diapir)
- Honaker Trail Formation (Interbedded sandstone, limestone and siltstone)
- Cutler Formation (arkosic fluvial sandstone and conglomeratic sandstone)
- Moenkopi Formation (Interbedded micaceous sandstone, siltstone, mudstone and shale)

- Chinle Formation (Interbedded sandstone, conglomeratic sandstone, siltstone and mudstone)
- Wingate Sandstone (quartzose to subarkosic eolian sandstone)
- Kayenta Formation (Sandstone with interbedded siltstone)
- Navajo Sandstone (Quartzose eolian sandstone)

In May 2015, a geotechnical soils analysis was performed by Applied Geotechnical Engineering Consultants (AGEC), on the proposed project site. The investigation consisted of a review of the surface, as well as subsurface conditions encountered in 5 exploratory borings drilled between a depth of 30 and 45.5 feet on the proposed project site. The soils encountered on the project site consist of fill, topsoil, clays (CL), silty sands (SM), and poorly graded gravels with silt and sand (GP-GM) (AGEC, 2015). A map of the soils within the Project area is shown in Figure 7. A description of the soils by the Natural Resources Conservation Service of this area can be found in Appendix A.

Structurally, the Project area lies within a collapsed and eroded anticline valley formed by dissolution of a salt dome that occurred during the Tertiary Period. Due to the differences in specific gravity of salt and bedrock, the diapir rose, folding overlying rocks into an anticline (Lowe and Others, 2007). High rates of erosion during the late Tertiary resulted in high rates of erosion allowing surface and groundwater to dissolve the salt layers from the core of the anticline. This allowed the overlying rock to collapse and erode forming the inverted topography of the Moab-Spanish Valley.

The sedimentary rocks at the margins of the Moab-Spanish valley on the north, west and south strike to the northwest and southeast and dip to the southwest and northeast ranging from 2 to 65 degrees. Most all of the steep dip angles are due to the collapse of the salt diapir. Numerous high angle northwest-southeast-aligned normal fault structures developed as a result of the collapse of the salt diaphir and are located along the margins of the valley. The Moab Valley fault has recently been inferred trending down the center of the valley, and is concealed beneath unfaulted Quaternary valley-fill deposits (Doelling and others, 2002). A copy of the Moab 7.5' Quadrangle is located in Appendix G. Surface rupture along the fault is possible, however, the likely location of such a rupture is difficult to predict. According to the U.S. Geological Survey, the faults and folds do not appear to be in an active state.

3.3.6 Cultural Resources

Cultural resources are defined as physical or other expressions of human activity or occupation. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites, as well as isolated artifacts or features, traditional cultural properties, Native American and other sacred places, and artifacts and documents of cultural and historic significance.

Section 106 of the NHPA of 1966, mandates that federal actions take into account the potential effects of their undertakings on historic properties. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object

included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). Potential effects of the described alternatives on historic properties are the primary focus of this analysis.

The affected environment for cultural resources is identified as the APE (area of potential effects), in compliance with the regulations to Section 106 of the NHPA (36 CFR 800.16). The APE is defined as the geographic area within which Federal actions may directly or indirectly cause alterations in the character or use of historic properties. The APE for this Proposed Action consists of the proposed new treatment facility and it is located along W 400 N in Moab, Utah on privately held lands. The parcel for the APE measures 129 by 152 meters and is within a 4.8-acre area.

A Class I records search and a Class III cultural resource inventory and pedestrian survey of the APE were completed by Bighorn Archaeological Consultants, L.L.C. (Bighorn), in May 2015. The APE was inventoried by walking multiple 15 m (50 ft) wide pedestrian transects to provide intensive coverage. Cultural resource encountered during the inventory were recorded as sites or isolates, as defined in the National Register Bulletin No. 16A as the "location of a significant event, a prehistoric occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archaeological value regardless of any existing structure." To clarify, historic, prehistoric, or archaeological features or any archaeological or historic anomaly that contains, at a minimum, greater than ten artifacts in a 10-meter diameter area, multiple features, a single feature for which sufficient information is available to raise the possibility that it may be significant, or a combination of a feature and artifacts were considered a site. All other cultural materials that do not meet the above criteria were considered isolated artifacts, or single artifacts or features of which little is known and possessing no possibility for significance to be determined.

Each site and/or isolated find is recorded using data obtained from a Trimble GeoXT global positioning system (GPS) and based on NAD 83. All GPS data will be submitted to the appropriate agency to incorporate into their databases. All previously and newly recorded sites were evaluated against the criteria set forth by the NRHP.

The results of the Bighorn Archaeology Cultural Resource Inventory report (Appendix C) revealed one isolated find and one historic site (42GR5168) within the inventory area for direct effects. No additional cultural material was observed. The historic site is the existing WWTP built in 1956. The proposed new facility will not have a direct negative impact on the existing facility. However, site 42GR5168 will be demolished and removed upon completion of the new waste water treatment facility. As such, consultation between Utah State Historic Preservation Office and the DEQ occurred to mitigate impacts to the eligible site and continue the permitting process and proposed undertaking. A Memorandum of Agreement between these two agencies and Moab City is located in Appendix H.

3.3.8 Wildlife Resources

Wildlife resources within the general area of the Project include fish, small mammals, raptors, water birds, and upland game birds, with a variety of other birds, reptiles, amphibians, and occasional big game (Figure 9). Additionally, the adjacent Nature Conservancy property, the Matheson Preserve, provides protected habitat to many wildlife species.

3.3.8.1 Fish

The Colorado River is home to a variety of fish but due to its muddy and warm conditions in the Moab area the main species found are channel catfish (*Ictalurus punctatus*) and common carp (*Cyprinus carpio*), followed less abundantly by walleye (*Sander vitrius*), northern pike (*Esox Lucius*), and largemouth bass (*Micropterus salmoides*).

Despite the water conditions, the Colorado River in this area is part of what has been designated as critical habitat for bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), Humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*), all federally endangered species. Additionally, Utah state sensitive species known to occur in the nearby Colorado River include bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), and roundtail chub (*Gila robusta).*

The construction of a berm located along the western edge of the property has created a disconnect to the floodplain of the Colorado River, therefore, it is determined that critical habitat for the bonytail chub and Colorado pikeminnow is restricted by the existence of the berm. This is further explained in an email memorandum from the US Fish and Wildlife dated June 24, 2016 in Appendix D.

3.3.8.2 Small Mammals

Small mammals common within the area include badger (*Tasidea taxus*), chipmunk (*Neotamias sp.*), gopher (*Thomomys sp*), deer mouse (*Peromyscus maniculatus*), porcupine *(Erethizon dorsatum*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*) and Rock squirrels (Spermophilus variegatus).

3.3.8.3 Raptors

A number of birds of prey, or raptors, have been observed near the project area at the Matheson Preserve. One site survey performed by Bowen Collins & Associates in May 2015 observed tall cottonwoods on the property certainly provide potential nesting habitat for raptors such as hawks or owls, however no raptor were observed during the site visit nor were any raptor nests located within the project boundary. Raptor feathers, likely belonging to red-tailed hawk (Buteo jamaicensis) or Cooper's hawk (Accipiter cooperii). A second survey was conducted on July 10, 2016 and determined there may be one probable Cooper's Hawk Nest south of the new WRF site.

3.3.8.4 Water Birds

Water birds do not likely occur in the project area, but the nearby wetlands and ponds in the Matheson Preserve plus the Colorado River provide ideal habitat for a number of water birds such as shorebirds and waterfowl.

3.3.8.5 Upland Game Birds

Several species of upland game birds are likely to be present in the project area which falls within substantial year-long habitat for California quail (*Lophortyx californicus*), with crucial year-long ring-necked pheasant *(Phasianus colchicus*) and high value winter Chukar (*Alectoris chukka*) located nearby. Only ring-necked pheasant were observed during the site visit.

3.3.8.6 Other Birds

Over 200 bird species have been sighted and recorded on the adjacent Nature Preserve property. Many of these same birds likely nest, forage, and travel through the project area, including songbirds and similar species associated with terrestrial habitats. These birds include American robin, (*Turdus migratorius*), starlings (*Sturnus vulgaris*), mourning doves (*Zenaida macroura*), and various species of sparrows and swallows *(Passeridae*), warblers (*Parulidae*), thrushes *(Turdidae),* vireos (*Vireonidae*), blackbirds, and hummingbirds (*Trochilidae*). Another group of birds frequently observed are the corvids, including jays (*Cyanocitta spp*.), black-billed magpie (*Pica pica*), and common raven (*Corvus corax*). Of these various birds, only the black-billed magpie was observed during the site visit, however, several other species were heard.

3.3.8.7 Reptiles and Amphibians

Reptiles are likely in the area although none were observed during the site visit, Amphibian habitat is not present on site. A state species of concern, Northern Leopard Frog (*Rana pipiens*), is known to exist at the nearby Matheson Preserve, but is unlikely to be found on the project property.

3.3.8.8 Big Game

Crucial year-round habitat for Desert Bighorn Sheep (*Ovis canadensis nelsoni*) exists about a half mile west and south of the project area, however the sheep are not likely ever found on the property. Deer scat likely belonging to mule deer (*Odocoileus hemionus*) was found during the site visit, and it likely the only big game to frequent the property.

3.3.9 Threatened, Endangered, and Sensitive Species

Federal agencies are required to ensure that any action federally authorized, funded, or carried out, will not adversely affect a federally listed threatened or endangered species.

Threatened (T), Endangered (E) and Sensitive (S) species in Grand County include the following. The following list is only for species found within a 2-mile radius and not all of Grand County.

Table 3-5
Threatened, Endangered, and Sensitive Species

Endangered			
Fish			
Colorado Pikeminnow	*Ptychocheilus lucius*	Not Present	No Effect
Razorback Sucker	*Xyrauchen texanus*	Not Present	No Effect
Bonytail Chub	*Gila elegans*	Not Present	No Effect
Threatened			
Birds			
Yellow-billed Cuckoo	*Coccysuz americanus*	Not Present	No Effect
Sensitive			
Fish			
Bluehead Sucker	*Catostomus discobolus*	Not Present	No Effect
Flannelmouth Sucker	*Catostomus latipinnis*	Not Present	No Effect
Roundtail Chub	*Gila robusta*	Not Present	No Effect
Birds			
American White Pelican	*Pelecanus erythrorhynchos*	Not Present	No Impact
Lewis's Woodpecker	*Melanerpes lewis*	Marginal Habitat Present	No Impact
Reptiles & Amphibians			
Cornsnake	*Elaphe guttata*	Marginal Habitat Present	No Impact

While not present in the project area, it is possible the endangered fish, Colorado pikeminnow, razorback sucker, and bonytail chub, and sensitive fish, bluehead sucker, flannelmouth sucker, and roundtail chub, exist in the nearby Colorado River. Current plans to relocate the WWTP will not change the existing outlet into the river, therefore, no changes to the location of the discharge pipeline are expected at this time. Water quality discharges are expected to improve with a new, upgraded WRF and also meeting DEQstandards as explained in Appendix J.

3.3.9.1 Yellow-billed Cuckoo Survey

Western yellow-billed cuckoo protocol surveys were conducted on July 10, 23, and August 6, 2016 under the authority of and in compliance with USFWS Permit #TE66521B-0. USFWS protocol tape-callback surveys were conducted between first visible birding light and 12:00 pm within all potentially suitable western yellow-billed cuckoo habitat in the proposed project area. Surveys were conducted by a USFWS-approved, permitted, and qualified surveyor following the Halterman et. al. (Updated 2016) protocol. Habitat evaluation data was simultaneously collected during surveys and consisted of a visual inspection of patch characteristics, including canopy height, open areas, multi-layered canopy, water flow, prey base, and grazing regimes as applicable. In total, forty (40) call stations were located within 0.5 miles of the project area. Each call station was evaluated and ground-truthed prior to establishing the final survey design and route in order to maximize detection visibility, acoustical receptivity, and survey reproducibility. The survey route varied for each independent survey and included as many call stations as possible.

No western yellow-billed cuckoos were detected during any of the three independent surveys. Bird species commonly detected within the project area included the black-chinned hummingbird (*Archilochus alexandri*), black-headed grosbeak (*Pheucticus melanocephalus*), spotted towhee (*Pipilo maculatus*), Eurasian collared dove (*Streptopelia decaocto*), western wood peewee (*Contopus sordidulus*), gray catbird (*Dumetella carolinensis*), house wren (*Troglodytes aedon*), mourning dove (*Zenaida macroura*), Northern flicker (*Colaptes auratus*), song sparrow (*Melospiza melodia*), warbling vireo (*Vireo gilvus*), yellow warbler (*Dendroica petechia)*, and yellow-breasted chat *(Icteria virens).*

Approximately half of the bird species detected are classified as neotropical migrants by Howe (1992) and are also known to utilize multi-layered riparian habitats and associate with western yellow-billed cuckoos (Parrish et al. 1999). Common ravens (*Corvus corax*) and black-billed magpies (*Pica hudsonia*) were observed throughout the project area. A potential active Cooper's hawk nest (*Accipiter cooperi*) was also detected in a large, mature cottonwood gallery south of the proposed parcel. Cooper's hawks are considered predators of western yellow-billed cuckoos. Great-blue herons (*Ardea herodias*) were also commonly observed during surveys.

3.3.9.2 Habitat

According to the USFWS Utah Field Office, the following guidelines characterize suitable breeding and nesting habitat for yellow-billed cuckoos:

- Vegetation that is predominantly multi-layered, with riparian canopy trees and at least one layer of understory shrubby vegetation;
- Patches of multi-layered vegetation (as described above) that are at least 12 acres (5 hectares) or greater in extent and separated from other patches of suitable habitat by at least 300 meters;
- Somewhere within a patch, the multi-layered riparian vegetation (as described above) should be at least 100 meters wide by 100 meters long. This is to avoid patches that may be long enough to meet the minimum area (12 acres) but are so narrow that they are unsuitable--750 m x 75 m (length x width) for example; and,
- Open areas, or gaps of multi-layered vegetation within a patch are less than 300 meters.

Additionally, USFWS Utah Field Office states that breeding and nesting cuckoos will forage in riparian patches that have an overstory canopy only and are within 300 meters (m) of the edge of suitable breeding and nesting habitat. They also state that identification of suitable foraging habitat of nesting cuckoo should include single layer overstory canopy that is within 300 meters of suitable breeding/nesting habitat.

The Proposed Action site contains suitable migratory and/or stopover habitat for the western yellow-billed cuckoo. Based on additional on-site review, the proposed project area also supports potentially suitable breeding or foraging habitat for the

western yellow-billed cuckoo. Of the six habitat patches within 0.5 miles of the proposed project area, the largest of the patches is approximately twenty-three acres and contains approximately 1.5 acres of the Proposed Action site. The patch supports a mature, moderately-stressed cottonwood overstory and riparian dominated herbaceous understory with interspersed patches of mature Russian olive. The nearest perennial water sources are Mill Creek (0.3 miles away) and the Colorado River (0.5 miles away). Standing surface water was not observed in the patch during the 2016 western yellow-billed cuckoo breeding season.

Finally, marginal habitat does exist in the project area for cornsnake, but none were located during the field survey. They are more likely to occur near streams and are therefore not likely to be found in the project area.

3.3.10 Wetlands, Riparian and Existing Vegetation

The Proposed Action parcel is partially forested where it is dominated by tall cottonwoods in the overstory, a mid-story of Russian olives, and an understory of various grasses and forbs. Grasses and forbs also cover most of the area without trees. A levy extends most of the west property border presumably to control water from the adjacent wetlands. According to historical aerials, it is assumed that the berm was constructed sometime in the 1980's.

Dominant plant species located on the parcel included cheatgrass (*Bromus techtorum*), crested wheatgrass, (*Agropyron cristatum*), lamb's quarter (*Chenopodium album*), western wheatgrass (*Pascopyrum smithii*), common spikerush (*Eleocharis palustris*), baltic rush (*Juncus arcticus*), water sedge (*Carex aqualitis*), canary grass (*Phalaris sp.*), tamarisk (Tamarix sp.), Russian olive (*Elaeagnus angustifolia*), and Freemont cottonwood (*Populus fremontii*).

The south end of the parcel has some wetland characteristics with hydrophytic plants but the soils have marginal wetland indicators and hydrology is not present. It is possibly a historic connection from the nearby wetlands but the levy and distance has reduced the hydrology.

A preliminary wetland assessment was completed within the 5-acre Proposed Action Property and a wetland delineation was developed and submitted to the USACE in July 2016 for concurrence. A jurisdictional letter of concurrence was provided by the USACE in September 2016. The wetland delineation performed was in accordance with the 1987 USACE Wetland Delineation Manual. Wetlands must exhibit three parameters to meet the USACE definition of a wetland: hydrophytic vegetation, hydric soils, and hydrology. Test holes were excavated to determine the soil conditions and vegetation was identified. The USFWS National Wetland Inventory (NWI) maps for the area were also used as a screening tool to identify potential wetlands on the property. During the site visit in May 2015 it was determined that no wetlands are present within the Proposed Action property.

3.3.11 Recreation

The closest recreation areas to the Proposed Action are the Colorado River, located 0.50 miles west as well as several trails. The 400 North corridor is also often informally used as a recreational trail access for walking, jogging, and bicycling adjacent to the Colorado River.

3.3.12 Visual Resources

The visual resource of the area would be of a rural and urban setting with irrigated crops, interspersed residential development, commercial development to the east, and dirt access roads/trails.

The impact area of influence for visual resources is the area of the Proposed Action. The Proposed Action property is relatively screened and the property is vegetated with large trees, shrubs and grasses. The site will need to be cleared of the vegetation to accommodate for the new facilities. The removal of the trees, shrubs and grasses will remove the natural vegetative screen that currently exists on the property, thus exposing more open, bare ground.

It is expected that the existing treatment plant will be demolished and kept as open space, which may provide a visual enhancement.

3.3.13 Socioeconomics

The Proposed Action would continue to provide wastewater treatment for the City of Moab and would be relocated to the parcel directly adjacent (south) of the existing parcel. Both the Proposed Action and No Action Alternative would have the same socioeconomics as they are both located adjacent to one another and would both treat wastewater. The No Action Alternative would prohibit growth as it would be limited in the future treatment capacity and the Proposed Action would allow future growth with the ability to be expanded for future capacity.

3.3.14 Health, Safety, Air Quality, and Noise

This section identifies potential public safety hazards and health risks from the construction and operation of the Proposed Action and No Action Alternative. The areas that receive the most noise within the impact area of influence lie adjacent to 400 North and Stewart Lane. Although traffic noise may be heard throughout most of the urbanized areas of impact, most is associated with small volumes of residential traffic. Therefore, they are not considered to be a public safety issue.

Air quality from the new WRF is expected to be better than the existing treatment plant due to newer technologies and treatment processes. The biological process and breakdown of the wastewater will continue to have an odor due to the nature of the WWTP operations, however, it's expected to be less than the current treatment plant.

The new WRF noise level will remain the same or better than the existing WWTP. New proposed equipment is not expected to generate more noise than the current WWTP. The ability to expand and treat more water will result in the use of more vehicles coming and going from the facility and may generate more vehicular noise.

However, the main access to the facility will be on 400 North which will keep the traffic pattern similar as the existing WWTP.

3.3.15 Public Safety, Access, and Transportation

The Project is located within Moab City and can be accessed from several cross streets and major roadways within the City. The impact area of influence for transportation includes 400 North and Stewart Lane that would be used during construction, operation and maintenance of the Proposed Action and the No Action Alternative. The impact area of influence for utilities includes any utilities that would be moved, replaced or experience service interruptions under the Proposed Action or No Action Alternative.

During construction, it is estimated that up to about 15 construction vehicles per day would travel to the site. The majority of the vehicle trips would be for transporting construction materials including concrete, excavation and backfill materials. The contractor would be transporting heavy construction equipment at the beginning and end of the Project. Upon completion of construction, vehicle trips are expected to be reduced to 5-10 vehicles per day for O&M purposes.

3.4 Environmental Consequences

This chapter documents the environmental consequences (impacts as a result of the Proposed Action) on the quality of the human environment. The human environment is defined in this study as all of the environmental resources, including social and economic conditions, occurring in the impact area of influence.

The analysis presented in this chapter includes impacts that would occur from construction of the Proposed Action and continued existing conditions under the No Action Alternative.

3.4.1 Water Resources and Water Quality

3.4.1.1 No Action Alternative

The No Action Alternative would have no effect on water resources and water quality.

3.4.1.2 Proposed Action Alternative

The construction impacts of this Project would not adversely impact water resources and water quality. The amount of water to be treated and released to the Colorado River through the Proposed Action would meet State of Utah water quality discharge standards.

By relocated the WWTP, water quality would improve the discharge to the Colorado River and would allow the WRF to meet the state and federal environmental regulations as explained in Appendix J.

The Proposed Action would require construction activities to take place while the current treatment plan is in operation to have no impact on the existing treatment process. Consequently, water quality of transported water would not be jeopardized since the Proposed Action would be conducted and the discharge pipe would be connected before the existing WWTP is demolished.

Best Management Practices would need to be in place during construction to protect surface water quality from erosion during construction. By implementing these measures, drainage issues would be controlled by containing runoff within the parcel limits. The use of silt fences, straw bales, etc., around the perimeter of the new parcel during construction would minimize runoff to adjacent land. These measures would ensure that in the case of heavy precipitation events, sediment losses from the disturbed areas would be controlled on site.

3.4.2 Groundwater Resources

3.4.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be built. This would have no effect on groundwater resources.

3.4.2.2 Proposed Action Alternative

The Proposed Action Alternative would not significantly impact ground water quality during construction and final operation will not see a significant impact. Temporary dewatering of the site will be required during construction to install subgrade structures. Local discharge permits for the dewatering of the site are likely required and will be obtained prior to construction. (UDWRi). Adjacent well owners are likely not going to see an impact to their wells during the dewatering process due to the shallow depth of the dewatering wells.

3.4.3 Utah Department of Environmental Quality Regulated Sites

3.4.3.1 No Action Alternative

Under the No Action Alternative, the Project would not be built. This would have no effect on regulated sites.

3.4.3.2 Proposed Action Alternative

The construction of the new WWTP would occur directly south of the existing parcel. The excavated soils would be utilized as backfill or berming, it is not anticipated that any soil material would be removed from the Project site. Once the new WRF is constructed, the old plant will be demolished and the remains will be hauled off site to an approved disposal location.

The following regulated site is the closest to the Project area:

Site	DERR ID
Black Oil Company	84532BLCKL995NH

The above site is not within the area of impact for the project and would not be affected by the Proposed Action.

3.4.4 Water Rights

3.4.4.1 No Action Alternative

Under the No Action Alternative, the Project would not be built. This would have no effect on water rights.

3.4.4.2 Proposed Action Alternative

Under the Proposed Action, there would be no changes to water rights. The new WRF would continue to treat wastewater and release it to the Colorado River.

3.4.5 Geology and Soils Resources

3.4.5.1 No Action Alternative

Under the No Action Alternative, the Project would not be built. This would have no effect on geology and soils.

3.4.5.2 Proposed Action Alternative

Temporary surface soil impacts during construction are anticipated. Construction erosion and sediment controls would serve to minimize these impacts.

Construction of the new WRF would include the construction of structures and building foundations. Construction documents and a geotechnical report would address any additional appropriate construction methods or materials.

3.4.6 Cultural Resources

3.4.6.1 No Action Alternative

Under the No Action Alternative, there would be no foreseeable impacts to cultural resources. There would be no need for ground disturbance associated with the construction of the new WRF. The existing conditions would remain intact and would not be affected.

3.4.6.2 Proposed Action Alternative

Under the Proposed Action Alternative, there would be an adverse effect to the existing WWTP (42GR5168) once the site is demolished. Mitigation measures for the adverse effect to both sites are outlined in a Memorandum of Agreement (MOA)

in accordance with 36 CFR 800.6(c) between consultation with the State of Utah, SHPO and the City of Moab. See Appendix H.

3.4.8 Indian Trust Assets

3.4.8.1 No Action Alternative

Under the No Action Alternative, there would be no foreseeable impacts to ITAs. The existing conditions would remain intact and would not be affected.

3.4.8.2 Proposed Action Alternative

Under the Proposed Action Alternative, there would be no foreseeable impacts to ITAs. No ITAs have been identified and implementation of the Proposed Action Alternative would, therefore, likely have no effect.

3.4.9 Wildlife Resources

3.4.9.1 No Action Alternative

The No Action Alternative would have no negative effects on wildlife.

3.4.9.2 Proposed Action Alternative

Under the Proposed Action there would be no long-term detrimental effects to wildlife, however, there will be permanent impacts to suitable Yellow-billed cuckoo habitat removed on the Proposed Action site.

Aside from the permanent impacts due to site clearing, temporary and minor negative impacts would occur to the adjacent properties which may cause stress to some wildlife species from noise, dust, displacement, and temporary loss of habitat, until construction was completed.

Raptors are occasionally present in the Project area and may be temporarily displaced by construction activities (noise and habitat disturbance). Cottonwood trees and dead snags should be avoided wherever possible during construction. Loss of several trees would occur that could displace raptors. These effects would be short term or very limited in extent and would have no long term significant negative effects, since these birds would be able to use abundant similar roost sites or other habitat elements in the immediate vicinity of the Project. A survey was conducted in July and August of 2016 and determined that no raptor nests were located on the Proposed Action site. If site clearing is delayed beyond December 31, 2016, an additional survey of nesting raptors shall be conducted prior to any tree removing activities. This survey would be conducted by a biologist. This would be done in order to avoid any negative impacts to these birds to the extent possible.

Ground nesting birds were also surveyed in the July and August surveys. If site clearing is delayed beyond December 31, 2016, an additional survey of ground nesting birds would be conducted prior to any ground disturbing activities. This

survey would be conducted by a biologist. This would be done in order to avoid any negative impacts to these birds to the extent possible.

Yellow-billed Cuckoo suitable habitat will be negatively impacted by the removal of 1.5 acres of suitable habitat on the Proposed Action site. All vegetation removal, grading and site preparation must be complete by May 31, 2017 to avoid impacts to nesting. If construction continues through the next breeding season, it is assumed that noise and human activity on-site will deter migrating cuckoo from the construction site, as well as any suitable habitat surrounding the construction area. If construction takes a break or does not clear the site prior to May 31, 2017 then Yellow-billed Cuckoo surveys will be required and must be coordinated with the USFWS West Valley, Utah Field Office.

Permanent impacts to the Yellow-billed cuckoo habitat must be replaced at a 2:1 ratio to a site near the existing habitat and approved by the USFWS. Location of the mitigation site and potential impacts shall be determined through informal consultation between the DEQ, USFWS and the City of Moab prior to the removal of the existing habitat.

In effort to avoid take of migratory birds, according to the Migratory Bird Treaty Act, all vegetation removal, grading and site preparation shall be complete by January 2017. If vegetation clearing is to take place past January 2017, then breeding migratory bird nest surveys will be completed within a few days of vegetation removal. If an active nest if found, construction may need to be postponed until the nests have been vacated. Once construction begins, prior to January 2017, it must remain active until completion of the project to avoid breaks in construction, thus, opening a window for nesting and impacts to birds.

3.4.10 Threatened, Endangered, and Sensitive Species

3.4.10.1 No Action Alternative

The No Action Alternative would have on effects on Threatened, Endangered, and Sensitive Species.

3.4.10.2 Proposed Action Alternative

The Proposed Action would have no impacts to threatened and endangered and sensitive species. The site was surveyed by a biologist in May 2015 and again in July and August 2016 and found no T&E and sensitive species within the Proposed Action parcel.

3.4.11 Wetlands, Riparian, and Existing Vegetation

3.4.11.1 No Action Alternative

The No Action Alternative would have no negative effect on wetlands and riparian vegetation.

3.4.11.2 Proposed Action Alternative

The Proposed Action would not have an impact on wetlands. The site was delineated for wetlands in May 2015 and found marginal wetland habitat that exhibited more floodplain characteristics than wetland. All three parameters, hydrology, soils and vegetation, were not present at the time of the delineation which lead to the result of no wetland impacts. A formal wetland delineation was submitted to the USACE in July 2016 in order to obtain a formal Jurisdictional Letter (JD Letter). A JD letter was received in September 2016.

The site has a fair amount of riparian trees. The design should preserve as many of these trees as possible to maintain riparian habitat and also provide a natural screen or buffer to neighboring parcels.

3.4.12 Recreation

3.4.12.1 No Action Alternative

The No Action Alternative would have no effect on recreation.

3.4.12.2 Proposed Action Alternative

The Proposed Action would have no adverse impact on recreation. Local trails will continue to have access during and post construction activities.

3.4.13 Visual Resources

3.4.13.1 No Action Alternative

The No Action Alternative would have no impact on visual resources.

3.4.13.2 Proposed Action Alternative

The Proposed Action would remove trees from the Proposed Action Property to allow for construction of the new WRF. The new structure will be constructed with more modern materials and designed to fit in with Moab City.

The construction of the new structures will be located closer to residential homes along Stewart Lane. The visual impact to these homes may have an adverse effect. Appropriate setbacks and vegetative screening should be implemented to minimize impacts to neighboring properties.

3.4.14 Socioeconomics

3.4.14.1 No Action Alternative

Under the No Action Alternative there would be no adverse effects to socioeconomics.

3.4.14.2 Proposed Action Alternative

Under the Proposed Action Alternative, the wastewater would continue to be treated and would allow for future growth without an interruption to existing operations.

The location of the new WRF would also be located approximately 400 feet to the south east of the existing plant, placing it directly on the corner of 400 North and Stewart Lane. Stewart Lane is primarily residential with a handful of residential property owners located as close as 450 feet south from the new WRF location. These residents currently have septic systems and are not connected to the gravity sewer systems. The City of Moab is evaluating the necessary design requirements that would allow the homes along Stewart Lane to be connected to the gravity sewer system. It is recommended that the new WRF influent pump station be designed to allow sewer flows from the homes along Stewart Lane to flow to the new WRF by gravity, without the need of individual sewer lift stations. This will require that the new influent pump station to be constructed at a lower elevation than the current influent pump station. Constructing an influent pump station at a lower elevation will provide flexibility as the City and the residents along Stewart Lane evaluate the best long term approach for treating sewer flows in this area.

3.4.15 Health, Safety, Air Quality, and Noise

3.4.15.1 No Action Alternative

Under the No Action Alternative there would be no adverse effects to health, safety, air quality, and noise.

3.4.15.2 Proposed Action Alternative

The Proposed Action Alternative would have minor short-term effects during construction, and the long-term effects on health, safety, air quality, and noise is expected to remain the same as is with the current treatment plant.

3.4.16 Public Safety, Access, and Transportation

3.4.16.1 No Action Alternative

The No Action Alternative would have no impact on public safety, access, and transportation.

3.4.16.2 Proposed Action Alternative

The Proposed Action Alternative would have minor short-term effects during construction, but no long-term effects on public safety, access, and transportation as the main access areas to the new WRF will be off of 400 North, which is a dead end street.

3.5 Summary of Environmental Effects

Table 3-5 summarizes environmental effects under the No Action Alternative and the Proposed Action Alternative.

Table 3-5
Summary of Environmental Effects

Project Resource	No Action Alternative	Proposed Action Alternative
Water Resources and Water Quality	No Effect	No Effect
Groundwater Resources	No Effect	No Effect
DEQ Regulated Sites	No Effect	No Effect
Water Rights	No Effect	No Effect
Geology and Soils	No Effect	No Effect
Cultural Resources	No Effect	Adverse Effects to site 42GR5168
Wildlife Resources	No Effect	Adverse Impacts to Suitable YBC Habitat
Threatened and Endangered Species, Sensitive Species	No Effect	No Effect
Wetland, Riparian and Vegetation	No Effect	No Effect
Recreation	No Effect	No Effect
Visual Resources	No Effect	Visual Impact from New WRF
Socioeconomics	No Effect	No Effect
Health, Safety, Air Quality and Noise	No Effect	No Effect
Public Safety, Access and Transportation	No Effect	No Effect

3.6 Cumulative Effects

Cumulative effects are an aggregate of many direct and indirect effects, and include past, present actions, or actions that can reasonably be expected to occur. The potential for direct adverse effects to the environmental resources resulting from the alternatives is discussed in the previous sections.

Cumulative effects for this Project may include operation and maintenance of the new WRF and would be similar in nature as currently occurs with the existing treatment plant.

Chapter 4 Environmental Commitments

4.1 Commitments

The following environmental commitments will be implemented as an integral part of the Proposed Action.

1. **Best Management Practices -** Best Management Practices will be applied during construction activities to minimize environmental effects and will be implemented by construction forces, or included in construction specifications. Such practices or specifications include sections in the present EA on public safety, dust abatement, air pollution, noise abatement, water pollution abatement, waste material disposal, erosion control, archaeological and historical resources, vegetation, wildlife and threatened and endangered species. Excavated material and construction debris may not be wasted in any stream or river channel in flowing waters. This includes material such as grease, oil, joint coating, or any other possible pollutant. Excess materials must be wasted at a State of Utah approved upland site. Construction materials, excavation material, etc. may not be stockpiled in riparian or water channel areas. Silt fencing will be appropriately installed and left in place until after revegetation becomes established, at which time the silt fence can then be carefully removed. Machinery must be fueled and properly cleaned of dirt, weeds, organisms, or any other possibly contaminating substances offsite prior to construction.

2. **Additional Analyses -** If the Proposed Action were to change significantly from that described in this EA because of additional or new information, or if other spoil, or work areas beyond those outlined in this analysis are required outside the defined Project construction area, additional environmental analyses may be necessary.

3. **UPDES Permit -** A UPDES Permit will be required from the State of Utah before any discharges of water, if such water is to be discharged as a point source into a regulated water body. Appropriate measures will be taken to ensure that construction related sediments will not enter the stream either during or after construction. Settlement ponds and intercepting ditches for capturing sediments will be constructed, and the sediment and other contents collected will be hauled off the site for appropriate disposal upon completion of the Project.

4. **Fugitive Dust Control Permit -** The Division of Air Quality regulates fugitive dust from construction sites, requiring compliance with rules

for sites disturbing greater than one-quarter of an acre. Utah Administrative Code R307-205-5, requires steps be taken to minimize fugitive dust from construction activities (Appendix B). Sensitive receptors include those individuals working at the site or motorists that could be affected by changes in air quality due to emissions from the construction activity.

5. **Cultural Resources -** In the case that any cultural resources, either on the surface or subsurface, are discovered during construction, the State of Utah shall be notified and construction in the area of the inadvertent discovery will cease until an assessment of the resource and recommendations for further work can be made by a professional archeologist.

   Any person who knows or has reason to know that he/she has inadvertently discovered possible human remains on Federal or State of Utah land, he/she must provide immediate telephone notification of the discovery to the State of Utah archaeologist. Work will stop until the proper authorities are able to assess the situation onsite. This action will promptly be followed by written confirmation to the responsible State of Utah official. The Utah SHPO and interested Native American Tribal representatives will be promptly notified. Consultation will begin immediately. This requirement is prescribed under the Native American Graves Protection and Repatriation Act (43 CFR Part 10); and the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470).

   A MOA has been executed to mitigate the adverse effects to site 42GR5168 between the State of Utah, SHPO and the City of Moab. Mitigation for the adverse effects, set forth in the stipulations of the MOA, must be completed before the removal of the existing WWTP.

6. **Paleontological Resources -** Should vertebrate fossils be encountered by the proponent during ground disturbing actions, construction must be suspended until a qualified paleontologist can be contacted to assess the find.

7. **Wildlife Resources -**

   Yellow-billed Cuckoo Protection

   a. Maintain a continuous construction window to prohibit Yellow-billed Cuckoo's from nesting or breeding near the project site. Breaks in construction may allow the bird a small window to nest, thus, becoming impacted once construction begins again.

   b. Provide mitigation for permanent habitat loss at a 2:1 ratio at a location and methodology approved by the USFWS.

Migratory Bird Protection

a. Perform any ground-disturbing activities or vegetation treatments before migratory birds begin nesting or after all young have fledged.

b. If activities must be scheduled to start during the migratory bird breeding season, take appropriate steps to prevent migratory birds from establishing nests in the potential impact area. These steps could include covering equipment and structures and use of various excluders (e.g., noise). Prior to nesting, birds can be harassed to prevent them from nesting on the site.

c. If activities must be scheduled during the migratory bird breeding season, a site-specific survey for nesting birds should be performed starting at least two weeks prior to groundbreaking activities or vegetation treatments. Established nests with eggs or young cannot be moved, and the birds cannot be harassed (see b., above), until all young have fledged and are capable of leaving the nest site.

d. If nesting birds are found during the survey, appropriate spatial buffers should be established around nests. Vegetation treatments or ground-disturbing activities within the buffer areas should be postponed until the birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.

Raptor Protection

Raptor protection measures will be implemented to provide full compliance with environmental laws. Raptor surveys will be developed using the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck 2002), to ensure that the proposed project will avoid adverse impacts to raptors, including bald and golden eagles. Locations of existing raptor nests and eagle roosting areas will be identified prior to the initiation of project activities. Appropriate spatial buffer zones of inactivity will be established during breeding, nesting, and roosting periods. Arrival at nesting sites can occur as early as December for certain raptor species. Nesting and fledging can continue through August. Wintering bald eagles may roost from November through March.

8. **Wetland Resources –** The site was cleared of wetlands, however, if impacts are expected to occur outside of the identified Proposed Action area outlined in this EA, additional wetland surveying and delineations will be necessary as well as consultation with the USACE.

9. **Previously Disturbed Areas -** Construction activities will be confined to previously disturbed areas where possible for such activities as work, staging, and storage, waste areas and vehicle and equipment parking areas. Vegetation disturbance will be minimized as much as possible.

10. **Public Access -** Construction sites will be closed to public access. Temporary fencing, along with signs, will be installed to prevent public access. Moab City or the State of Utah will coordinate with landowners or those holding special permits and other authorized parties regarding access to or through the Project area.

11. **Disturbed Areas** - All disturbed areas resulting from the Project will be smoothed, shaped, contoured, and rehabilitated to as near the pre-Project construction condition as practicable. After completion of the construction and restoration activities, disturbed areas will be seeded at appropriate times with weed-free, native seed mixes having a variety of appropriate species (especially woody species where feasible) to help hold the soil around structures, prevent excessive erosion, and to help maintain other riverine and riparian functions. The composition of seed mixes will be coordinated with wildlife habitat specialists, biologists and landscape architects. Weed control on all disturbed areas will be required. Successful revegetation efforts must be monitored and reported to the State of Utah, along with photos of the completed Project.

Chapter 5 Consultation and Coordination

5.1 Introduction

Consultation between State, City, County and Federal Agencies are discussed in this section. The State of Utah will coordinate directly with other agencies for comment and consultation which include SHPO, US Fish and Wildlife, US Army Corps of Engineers, EPA and the Native American Tribes. NEPA requires full disclosure about major actions taken by Federal agencies and accompanying alternatives, impacts, and potential mitigation of impacts.

5.2 Public and Agency Involvement

July 2015, Bowen Collins & Associates mailed 34 scoping letters to property owners within 1000 feet of the new WRF location, as well as state and Federal agencies, notifying them of the Project and inviting them to participate in a 30-day public comment period which ended at the end of August 2015. BC&A received two comment letters, one from a property owner and the other from Forestry, Fire and State Lands. BC&A reviewed the comments and considered relevant comments in the environmental analysis.

5.5 Utah State Historic Preservation Office

A copy of the Class III Cultural Resource Inventory Report and a determination of historic properties affected for the Proposed Action Alternative were submitted to the SHPO. An MOA, located in Appendix H was developed between the State of Utah, SHPO and the City of Moab.

Chapter 6 References

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Division of Environmental Response and Remediation
http://www.enviornmentalresponse.utah.gov

Division of Solid and Hazardous Waste
http://www.hazardouswaste.utah.gov

Chapter 7 Preparers

The following is a list of preparers who participated in the development of the Final EA. They include environmental summary preparers and Federal, State and City members.

Environmental Summary Preparers

Jamie Tsandes, PLA	Project Manager	Bowen Collins & Associates
Merissa Davis	Envir. Scientist/Biologist	Bowen Collins & Associates
Christopher DeKorver, P.G.	Hydrogeologist	Bowen Collins & Associates
Jeff Beckman, P.E.	Senior Engineer	Bowen Collins & Associates
Bob Mayers, P.E.	Engineer	Bowen Collins & Associates
Jon Baxter	Archeologist	Bighorn Archeology
Sheri Murray-Ellis	Archeologist	Certus Environmental Solutions
Adam Petry	Biologist	Western Biology

Federal, State or District Members

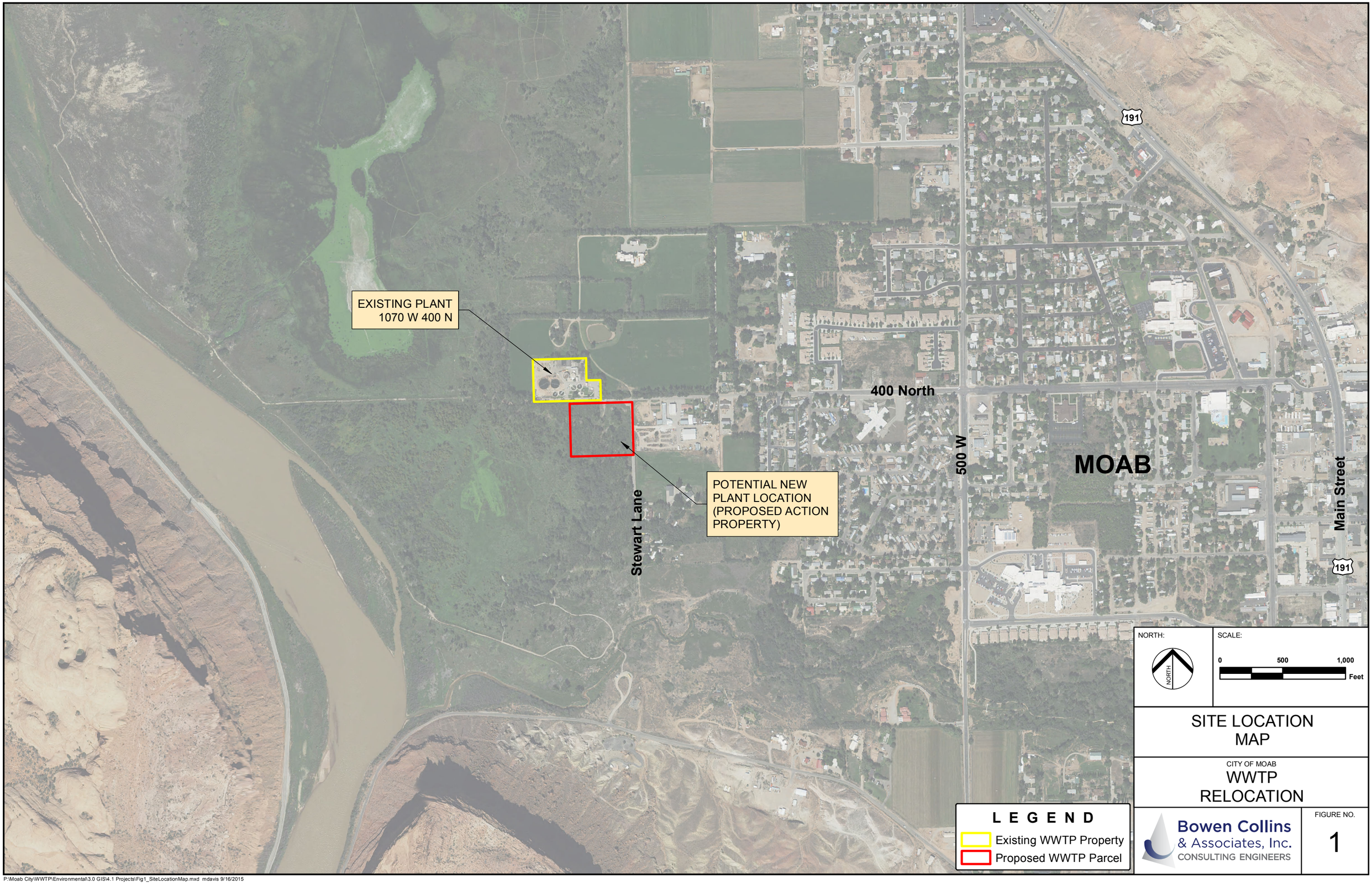
Phillip Bowman, PE	City Engineer	City of Moab
Jeff Foster	Public Works Director	City of Moab
William Damery, P.G.	401 WQ Certification and NEPA	Utah Division of Water Quality
Jonathan Cook, P.E.	Environmental Engineer	Utah Division of Water Quality
John Mackey, P.E.	Engineering Section Manager	Utah Division of Water Quality

Chapter 8 List of Acronyms

APE	Area of Potential Effect
BLM	Bureau of Land Management
BA	Biological Assessment
BOD5	Biochemical Oxygen Demand – 5 Day Technique
BO	Biological Opinion
CITY	City of Moab
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
CONSERVANCY	The Nature Conservancy
COUNTY	Grand County
DEQ	State of Utah Department of Environmental Quality
DWR	State of Utah Division of Wildlife Resources
DWRi	State of Utah Division of Water Rights
EA	Environmental Assessment
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FFSL	Forestry, Fire and State Lands
LUST	Leaking Underground Storage Tank
MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	Operation and Maintenance
SHPO	Utah State Historic Preservation Office
SOP	Standard Operating Procedures
TSS	Total Suspended Solids
UDOT	State of Utah Department of Transportation
UGS	Utah Geological Service
UPDES	Utah Pollution Discharge Elimination System
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tanks
USACE	US Army Corps of Engineers
WRF	Water Reclamation Facility
WWTP	Wastewater Treatment Plant

Chapter 9 Figures

Figure 1 – Site Location Map
Figure 2 – Land Ownership Map
Figure 3 – Geologic Map
Figure 4 – Hydrology Map
Figure 5 – Utah DEQ Regulated Sites
Figure 6 – Vegetation Map
Figure 7 – Soils Map
Figure 8 – Prime Farmlands
Figure 9 – Wildlife Map



SITE LOCATION MAP

CITY OF MOAB
WWTP
RELOCATION

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
1

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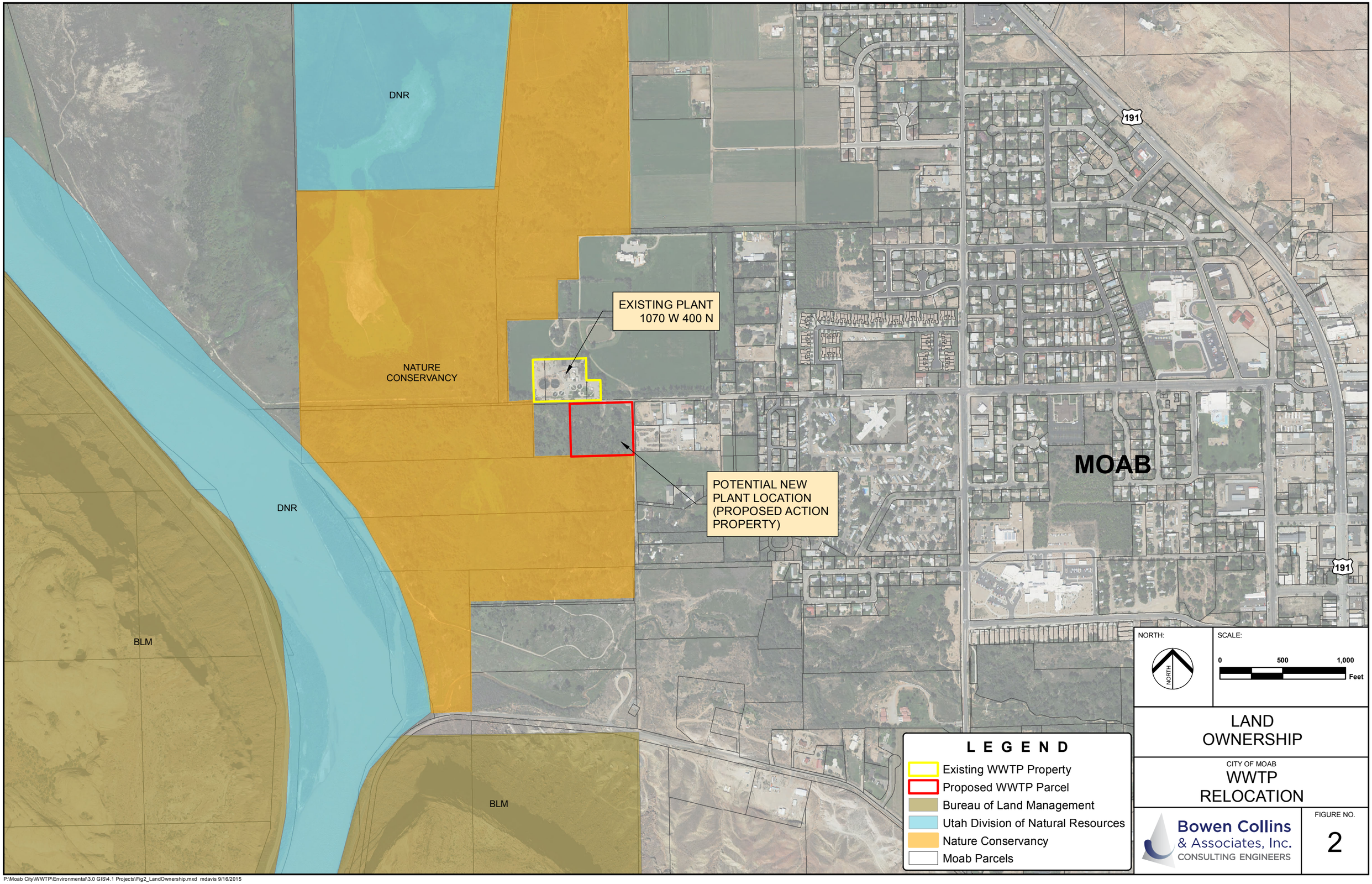

LAND OWNERSHIP

CITY OF MOAB
WWTP RELOCATION

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
2

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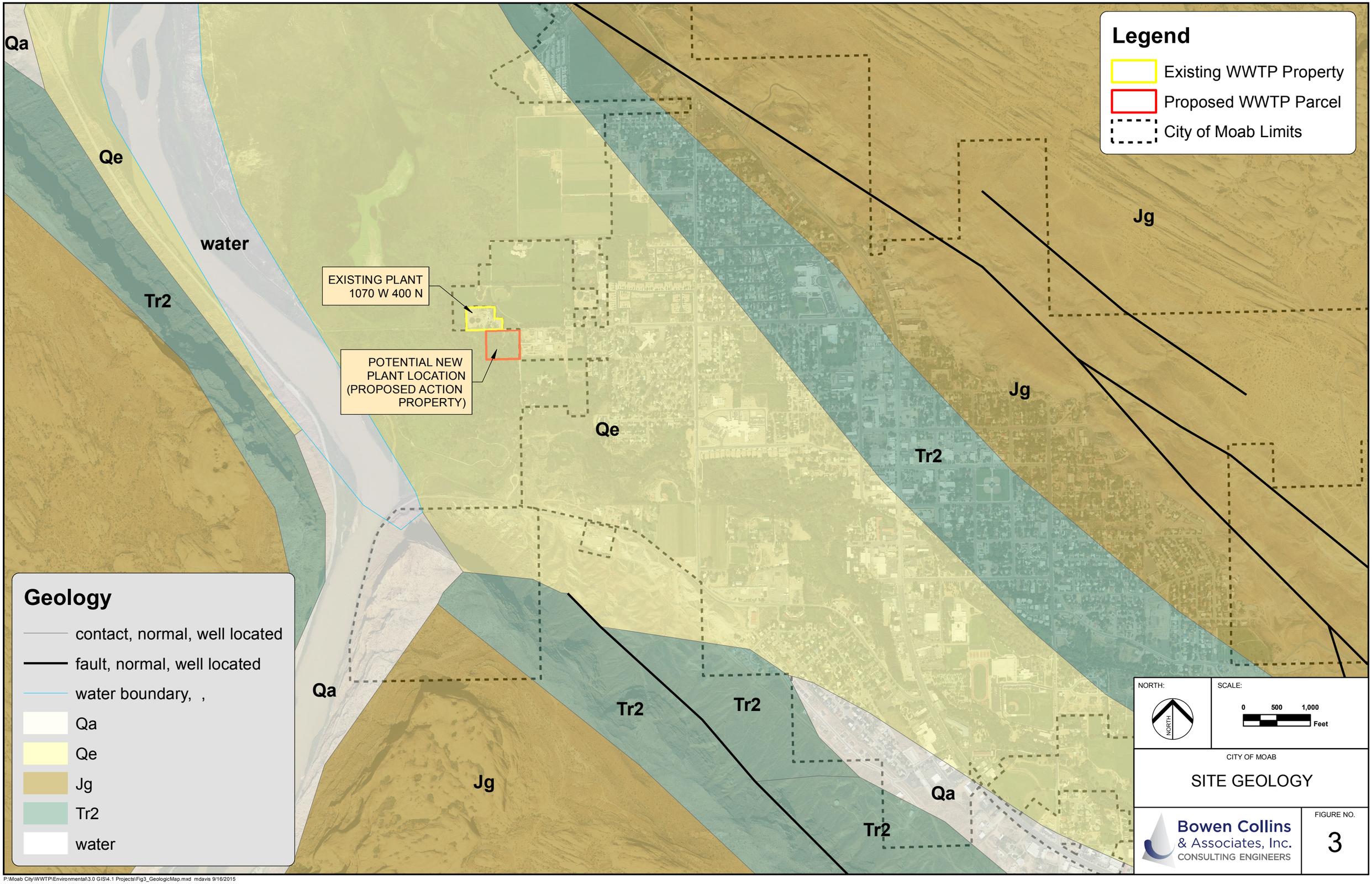

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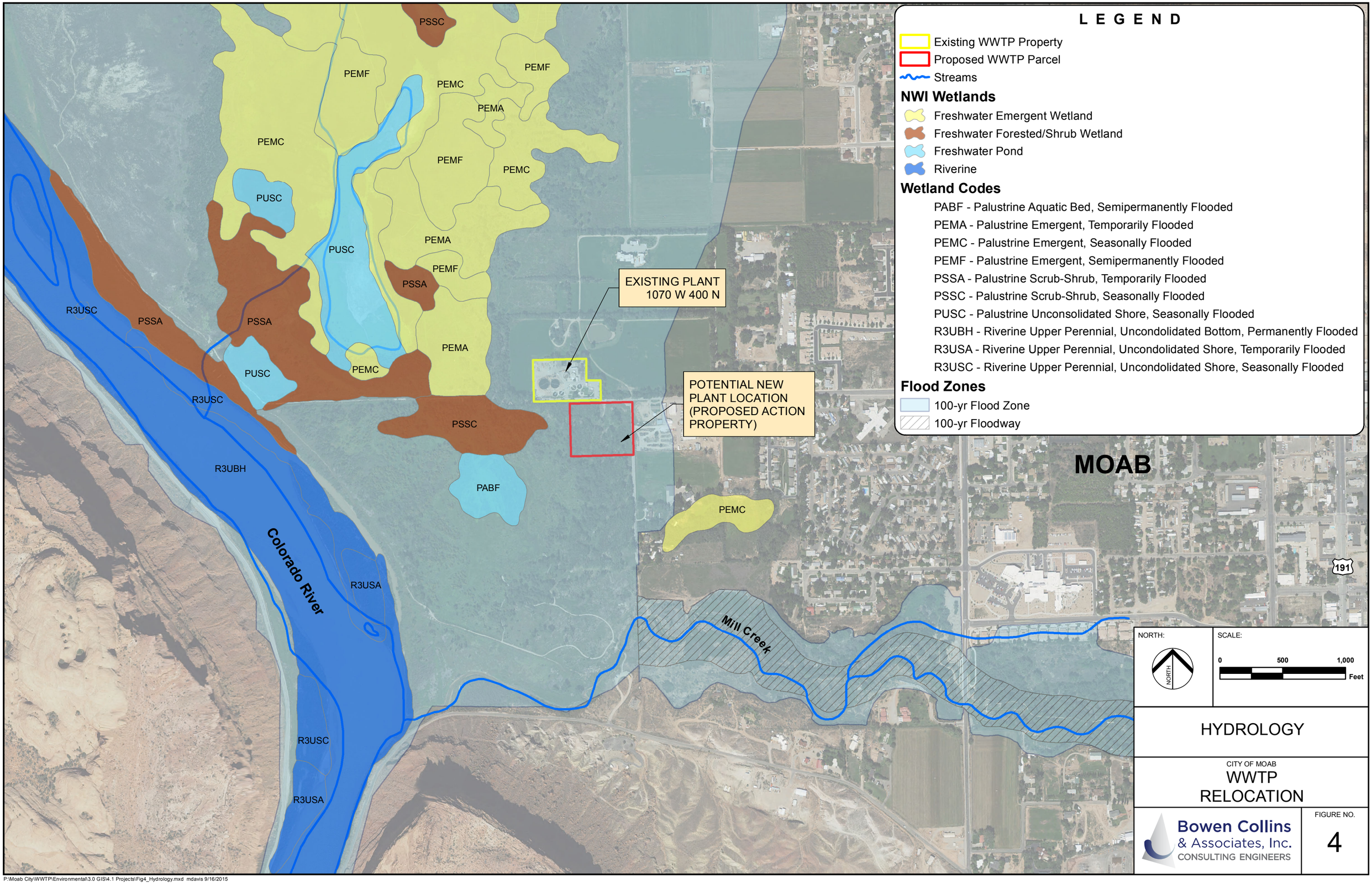

HYDROLOGY

CITY OF MOAB
WWTP
RELOCATION

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
4

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\Fig4_Hydrology.mxd mdavis 9/16/2015

Legend

- Existing WWTP Property
- Proposed WWTP Parcel
- Environmental Incidents
- Underground Storage Tank Facility
- Toxic Release Inventory
- City of Moab Limits

Name: BLACK OIL DISTRIBUTING
5000467

Name: BLACK OIL COMPANY, INC. - MOAB
84532BLCKL995NH

Name: MOAB SERVICE CENTER
5000246

Name: Petroleum Release - Grand County
DERR ID: 12079

Name: Leaking flammable liquid
DERR ID: 11432

Name: VACANT BLDG
5000319

MOAB CITY LIMITS

EXISTING PLANT
1070 W 400 N

POTENTIAL NEW PLANT LOCATION (PROPOSED ACTION PROPERTY)

Name: JIMBOS COUNTRY MKT
5000257

Name: UTAH POWER and LIGHT COMPANY
5000234

Name: Moab Bit and Tool (Null RP Substituted)
DERR ID: 5154

Name: CITY OF MOAB
5000100

Name: UDOT STA # 4453
5000211

NORTH:

SCALE:

0 500 1,000 Feet

CITY OF MOAB

DEQ REGULATED SITES

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
5

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\Fig5_UtahDEQRegulatedSites.mxd mdavis 9/16/2015

EXISTING PLANT
1070 W 400 N

POTENTIAL NEW PLANT LOCATION (PROPOSED ACTION PROPERTY)

191

MOAB

191

L E G E N D

- Existing WWTP Property
- Proposed WWTP Parcel

GAP Land Cover

- Colorado Plateau Blackbrush-Mormon-tea Shrubland
- Colorado Plateau Mixed Bedrock Canyon and Tableland
- Colorado Plateau Pinyon-Juniper Shrubland
- Cultivated Cropland
- Developed, High Intensity
- Developed, Low Intensity
- Inter-Mountain Basins Greasewood Flat
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Inter-Mountain Basins Semi-Desert Grassland
- Inter-Mountain Basins Semi-Desert Shrub Steppe
- Inter-Mountain Basins Shale Badland
- Introduced Riparian and Wetland Vegetation
- Introduced Upland Vegetation - Annual Grassland
- Open Water (Fresh)

NORTH:

NORTH

SCALE:

0 500 1,000 Feet

VEGETATION/ LAND COVER

CITY OF MOAB
WWTP RELOCATION

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
6

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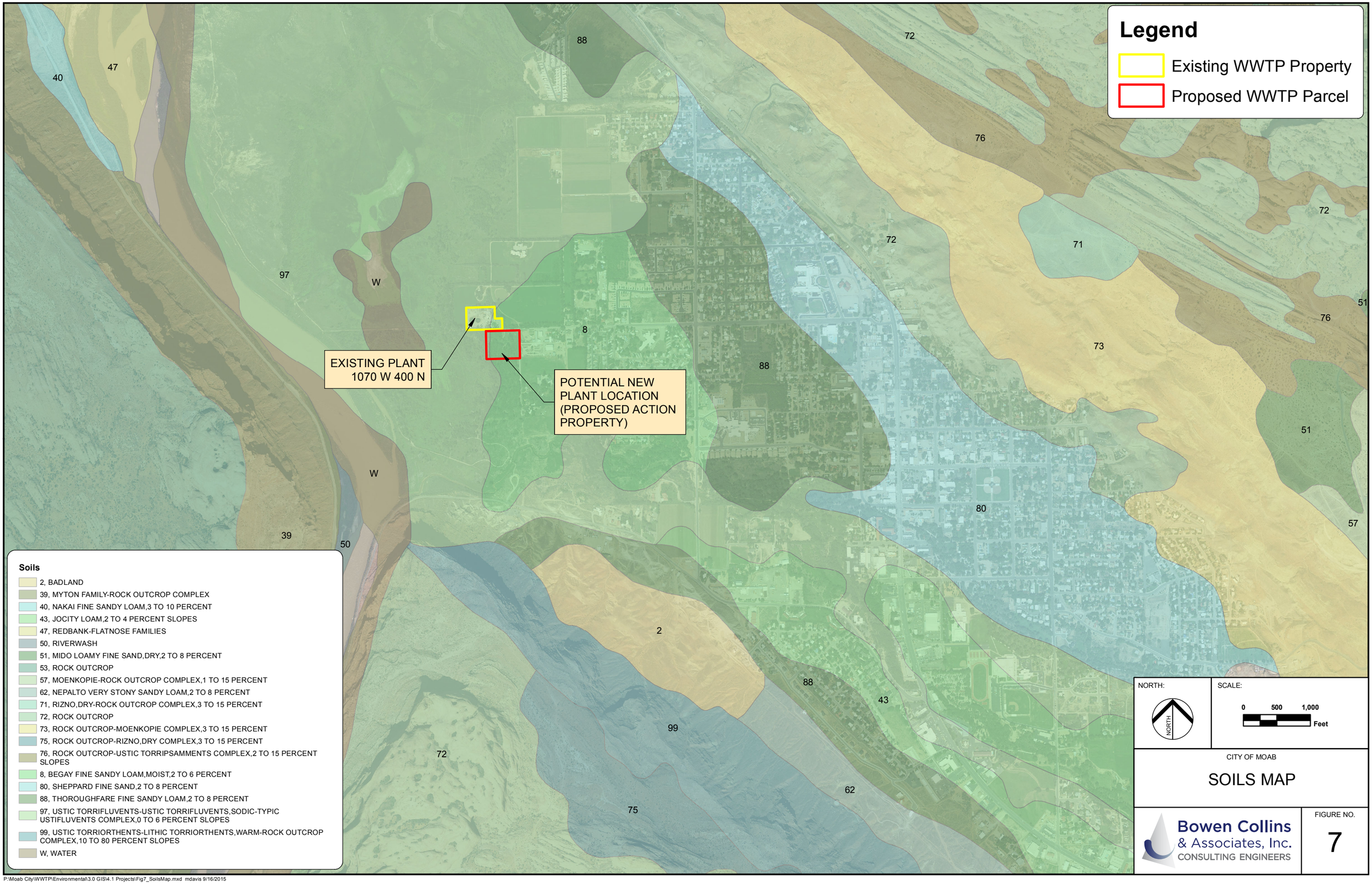

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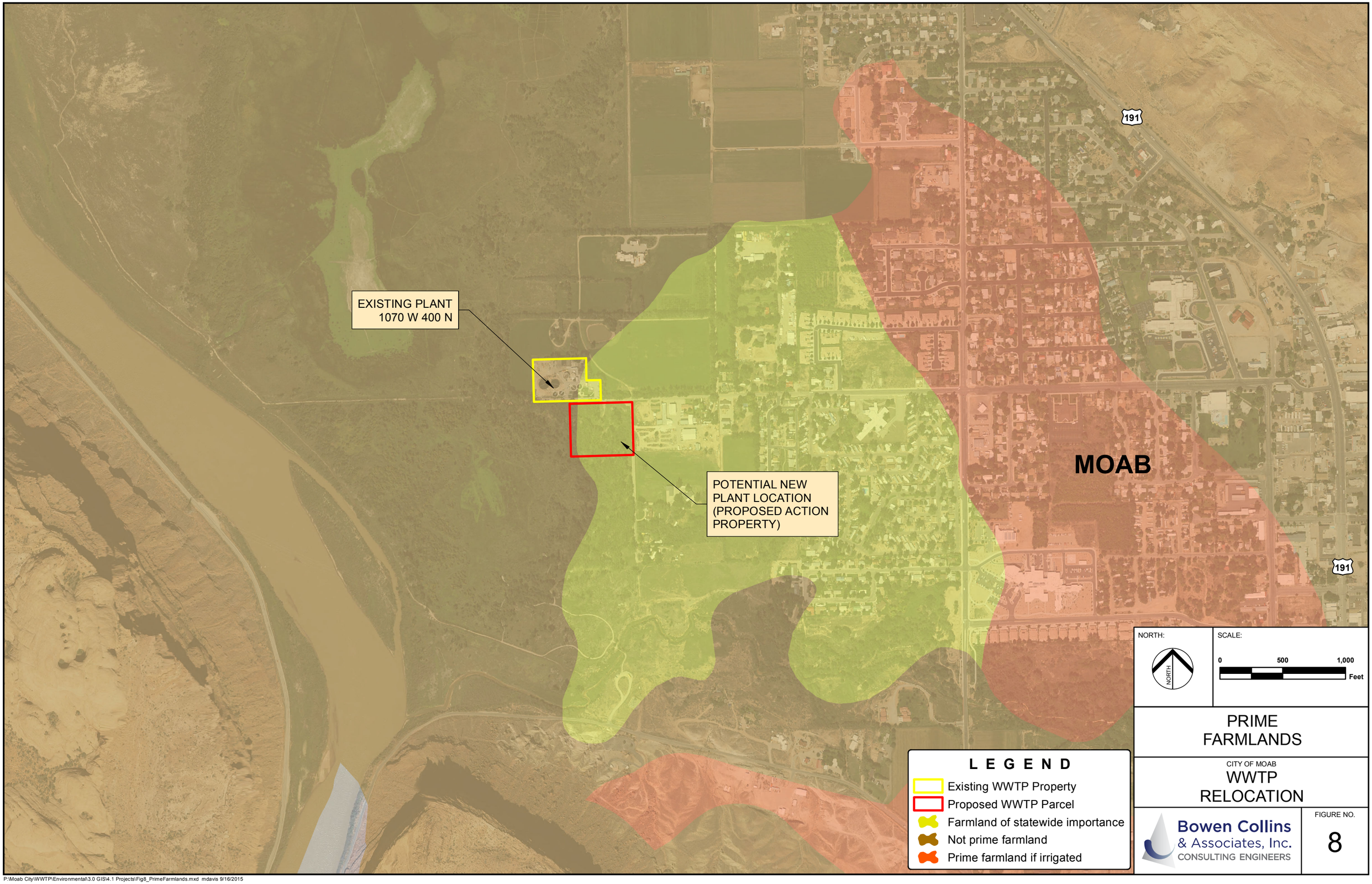

PRIME FARMLANDS

CITY OF MOAB
WWTP
RELOCATION

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
8

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Game Bird Habitat

EXISTING PLANT
1070 W 400 N

POTENTIAL NEW PLANT LOCATION (PROPOSED ACTION PROPERTY)

191

MOAB

Game Bird Legend

- Existing WWTP Property
- Proposed WWTP Parcel
- Crucial Year-Long Ring Necked Pheasant Habitat
- Substantial Year-Long California Quail Habitat
- High Value Winter Chukar Habitat

Big Game Habitat

EXISTING PLANT
1070 W 400 N

POTENTIAL NEW PLANT LOCATION (PROPOSED ACTION PROPERTY)

191

MOAB

Big Game Legend

- Existing WWTP Property
- Proposed WWTP Parcel
- Crucial Year-Long Desert Bighorn Sheep Habitat

NORTH:

NORTH

SCALE:

0 1,000 2,000 Feet

WILDLIFE

CITY OF MOAB
WWTP
RELOCATION

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
9

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APPENDIX A

SOIL UNIT DESCRIPTIONS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Arches National Park, Utah, Canyonlands Area, Utah - Parts of Grand and San Juan Counties, and Grand County, Utah - Central Part

July 22, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

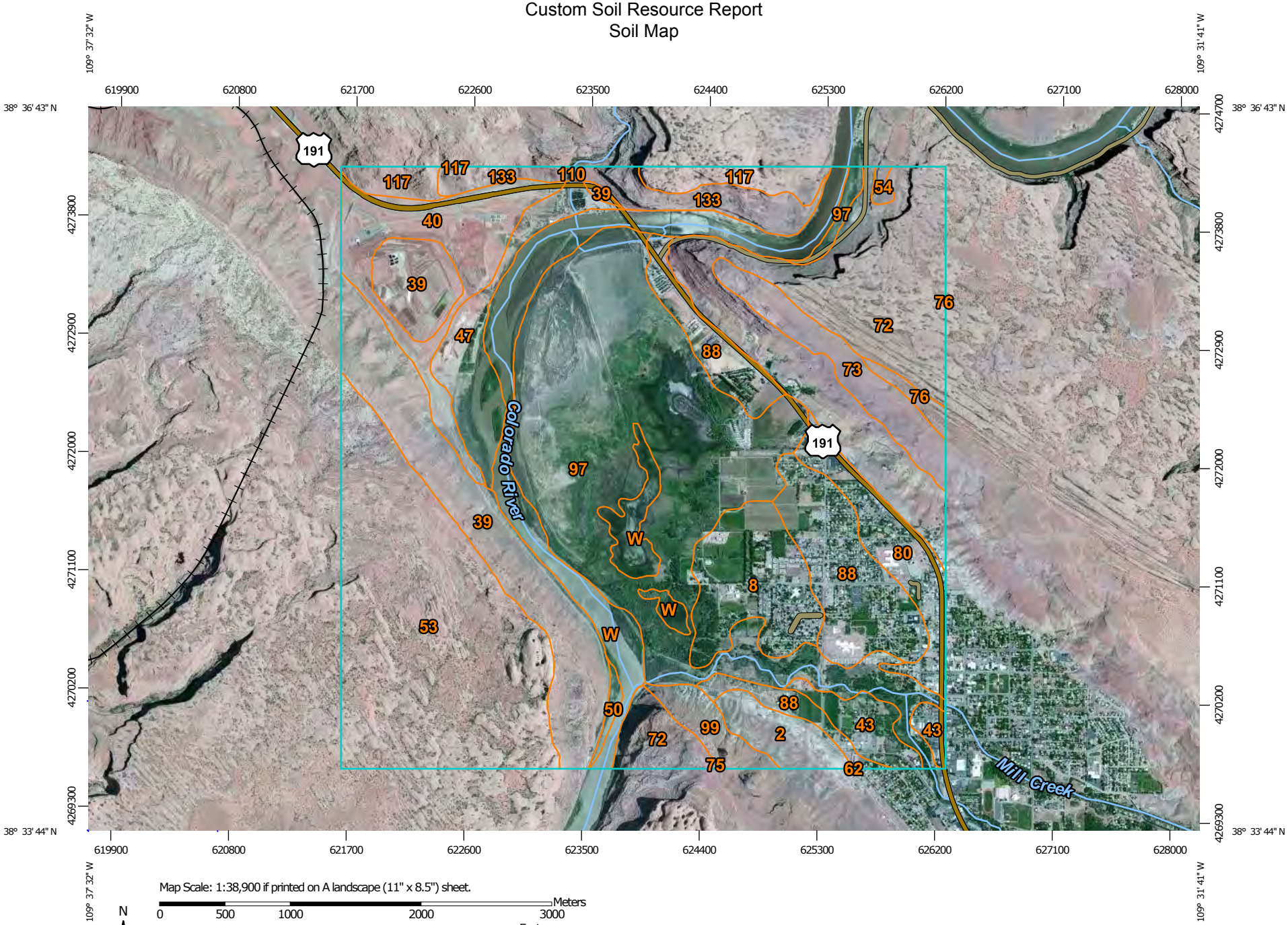
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



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.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Arches National Park, Utah
Survey Area Data: Version 4, Aug 5, 2014

Soil Survey Area: Canyonlands Area, Utah - Parts of Grand and San Juan Counties
Survey Area Data: Version 10, Aug 6, 2014

Soil Survey Area: Grand County, Utah - Central Part
Survey Area Data: Version 10, Aug 8, 2014

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Jun 23, 2010—Jun 24, 2010

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

Arches National Park, Utah (UT687)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
110	Bowington-Radnik-Patterfield complex, 0 to 6 percent slopes	2.8	0.1%
117	Rock outcrop-Arches complex, 2 to 15 percent slopes	104.5	2.0%
133	Chedeski family, 15 to 60 percent slopes	133.1	2.5%
Subtotals for Soil Survey Area		**240.4**	**4.6%**
Totals for Area of Interest		**5,256.5**	**100.0%**

Canyonlands Area, Utah - Parts of Grand and San Juan Counties (UT633)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
2	Badland	80.3	1.5%
8	Begay fine sandy loam, moist, 2 to 6 percent slopes	216.9	4.1%
43	Jocity loam, 2 to 4 percent slopes	90.6	1.7%
54	Moab very cobbly fine sandy loam, 3 to 30 percent slopes	8.9	0.2%
62	Nepalto very stony sandy loam, 2 to 8 percent slopes	0.0	0.0%
72	Rock outcrop	692.8	13.2%
73	Rock outcrop-Moenkopie complex, 3 to 15 percent slopes	137.6	2.6%
75	Rock outcrop-Rizno, dry complex, 3 to 15 percent slopes	1.2	0.0%
76	Rock outcrop-Ustic Torripsamments complex, 2 to 15 percent slopes	21.8	0.4%
80	Sheppard fine sand, 2 to 8 percent slopes	151.8	2.9%
88	Thoroughfare fine sandy loam,2 to 8 percent slopes	372.3	7.1%
97	Ustic Torrifluvents-Ustic Torrifluvents,sodic-Typic Ustifluvents complex, 0 to 6 percent slopes	1,107.8	21.1%
99	Ustic Torriorthents-Lithic Torriorthents, warm-Rock outcrop complex, 10 to 80 percent slopes	61.1	1.2%
W	Water	387.0	7.4%

Canyonlands Area, Utah - Parts of Grand and San Juan Counties (UT633)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Subtotals for Soil Survey Area		**3,330.1**	**63.4%**
Totals for Area of Interest		**5,256.5**	**100.0%**

Grand County, Utah - Central Part (UT624)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
39	Myton family-Rock outcrop complex	480.6	9.1%
40	Nakai fine sandy loam, 3 to 10 percent slopes	246.0	4.7%
47	Redbank-Flatnose families association	157.2	3.0%
50	Riverwash	12.4	0.2%
53	Rock outcrop	789.9	15.0%
Subtotals for Soil Survey Area		**1,686.0**	**32.1%**
Totals for Area of Interest		**5,256.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially

where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Arches National Park, Utah

110—Bowington-Radnik-Patterfield complex, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 20py7
Elevation: 3,960 to 4,820 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 53 to 57 degrees F
Frost-free period: 170 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Bowington and similar soils: 50 percent
Radnik and similar soils: 25 percent
Patterfield and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bowington

Setting

Landform: Flood-plain steps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

C1 - 0 to 1 inches: very fine sand
C2 - 1 to 10 inches: fine sand
C3 - 10 to 25 inches: fine sand
C4 - 25 to 33 inches: very fine sand
C5 - 33 to 38 inches: fine sand
C6 - 38 to 43 inches: coarse sand
C7 - 43 to 48 inches: sand
C8 - 48 to 52 inches: coarse sand
C9 - 52 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.20 to 99.90 in/hr)
Depth to water table: About 20 to 39 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: Semiwet Fresh Streambank (Fremont Cottonwood) (R035XY013UT)

Description of Radnik

Setting

Landform: Flood-plain steps
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

A - 0 to 5 inches: fine sand
Bw1 - 5 to 13 inches: fine sand
Bw2 - 13 to 23 inches: loamy fine sand
C1 - 23 to 37 inches: sand
C2 - 37 to 43 inches: sand
C3 - 43 to 57 inches: sand
C4 - 57 to 83 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R035XY011UT)

Description of Patterfield

Setting

Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

A - 0 to 6 inches: sandy loam
By1 - 6 to 29 inches: sandy clay loam

By2 - 29 to 40 inches: fine sandy loam
By3 - 40 to 65 inches: sandy clay loam
By4 - 65 to 79 inches: sandy clay loam

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Very rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 3 percent
Salinity, maximum in profile: Strongly saline (16.0 to 30.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: Alkali Flat (Greasewood) (R035XY009UT)

117—Rock outcrop-Arches complex, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: 20qnk
Elevation: 3,960 to 5,520 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 53 to 57 degrees F
Frost-free period: 170 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop, navajo formation sandstone: 65 percent
Arches and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop, Navajo Formation Sandstone

Properties and qualities

Slope: 2 to 99 percent
Frequency of ponding: Frequent

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Description of Arches

Setting

Landform: Mesas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone

Typical profile

A - 0 to 1 inches: fine sand
C - 1 to 4 inches: fine sand
2Cr - 4 to 6 inches: bedrock
2R - 6 to 16 inches: bedrock

Properties and qualities

Slope: 2 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 3 to 10 inches to lithic bedrock; 3 to 6 inches to paralithic bedrock
Natural drainage class: Excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Very low (about 0.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon) (R035XY019UT)

133—Chedeski family, 15 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2lhnh
Elevation: 3,960 to 5,250 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 53 to 57 degrees F
Frost-free period: 170 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Chedeski family and similar soils: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chedeski Family

Setting

Landform: Scarp slopes on cuestas, canyon walls
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Colluvium derived from sandstone

Typical profile

A - 0 to 4 inches: gravelly sandy clay loam
Bw1 - 4 to 10 inches: very gravelly sandy clay loam
Bw2 - 10 to 19 inches: gravelly sandy clay loam
2Cr - 19 to 29 inches: bedrock

Properties and qualities

Slope: 15 to 60 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon) (R035XY240UT)

Canyonlands Area, Utah - Parts of Grand and San Juan Counties

2—Badland

Map Unit Composition

Badland: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Badland

Setting

Landform: Hillslopes, escarpments
Down-slope shape: Linear
Across-slope shape: Linear

8—Begay fine sandy loam, moist, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1vn7
Elevation: 5,800 to 6,300 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 100 to 120 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Begay and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Begay

Setting

Landform: Cuestas, structural benches
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Eolian deposits derived from sandstone

Typical profile

A - 0 to 3 inches: fine sandy loam
Bw - 3 to 32 inches: fine sandy loam
Bk - 32 to 60 inches: loamy fine sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Upland Loam (Basin Big Sagebrush) (R035XY306UT)

Minor Components

Mivida

Percent of map unit: 10 percent

Mido

Percent of map unit: 10 percent

Ignacio

Percent of map unit: 5 percent

43—Jocity loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: 1vly
Elevation: 4,400 to 4,800 feet
Mean annual precipitation: 7 to 9 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Jocity and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jocity

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 10 inches: loam
C1 - 10 to 17 inches: sandy loam
C2 - 17 to 49 inches: clay loam
C3 - 49 to 60 inches: stratified loam to clay loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R035XY011UT)
Other vegetative classification: Loamy Bottom (Basin Big Sagebrush) (035XY011UT_2)

Minor Components

Nakai

Percent of map unit: 6 percent

Thoroughfare

Percent of map unit: 6 percent

Barnum

Percent of map unit: 6 percent

Moab

Percent of map unit: 4 percent

Ustic torrifluvents

Percent of map unit: 3 percent

54—Moab very cobbly fine sandy loam, 3 to 30 percent slopes

Map Unit Setting

National map unit symbol: 1vmb
Elevation: 5,200 to 6,000 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 49 to 51 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Moab and similar soils: 95 percent

Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Moab

Setting
Landform: Stream terraces, alluvial fans
Landform position (three-dimensional): Riser
Down-slope shape: Linear, concave
Across-slope shape: Concave, convex
Parent material: Alluvium derived from sandstone and shale and/or alluvium derived from igneous rock

Typical profile
A - 0 to 2 inches: very cobbly fine sandy loam
Bw - 2 to 10 inches: gravelly fine sandy loam
Bk - 10 to 60 inches: very gravelly fine sandy loam

Properties and qualities
Slope: 3 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 60 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Semidesert Stony Loam (Blackbrush) (R035XY243UT)

Minor Components

Redbank
Percent of map unit: 5 percent

62—Nepalto very stony sandy loam, 2 to 8 percent slopes

Map Unit Setting
National map unit symbol: 1vmm
Elevation: 4,000 to 4,600 feet
Mean annual precipitation: 7 to 9 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Nepalto and similar soils: 83 percent
Minor components: 17 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nepalto

Setting

Landform: Canyons, talus cones
Landform position (two-dimensional): Footslope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sandstone

Typical profile

A - 0 to 3 inches: very stony sandy loam
C - 3 to 60 inches: stratified extremely stony fine sand to gravelly fine sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Desert Stony Loam (Blackbrush) (R035XY139UT)

Minor Components

Alluvial soils

Percent of map unit: 10 percent

Thoroughfare

Percent of map unit: 5 percent

Rock outcrop

Percent of map unit: 2 percent

72—Rock outcrop

Map Unit Composition

Rock outcrop: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Landform: Cliffs, escarpments
Down-slope shape: Linear
Across-slope shape: Linear

73—Rock outcrop-Moenkopie complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1vn0
Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 7 to 9 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 60 percent
Moenkopie and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Landform: Cliffs, ledges

Description of Moenkopie

Setting

Landform: Cuestas, structural benches
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: gravelly loamy sand
C - 3 to 8 inches: sandy loam
R - 8 to 12 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 3 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Desert Shallow Sandy Loam (Blackbrush) (R035XY133UT)
Other vegetative classification: Desert Sandy Loam (Blackbrush) (035XY121UT_1)

Minor Components

Trail

Percent of map unit: 5 percent

Thoroughfard

Percent of map unit: 5 percent

Shepherd

Percent of map unit: 5 percent

75—Rock outcrop-Rizno, dry complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1vn2
Elevation: 470 to 6,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 49 to 53 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 65 percent
Rizno and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Landform: Cliffs on cuestas, escarpments on cuestas, ledges on cuestas
Down-slope shape: Linear
Across-slope shape: Convex, linear

Description of Rizno

Setting

Landform: Hogbacks, escarpments on cuestas, structural benches
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Eolian deposits over residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: gravelly fine sandy loam
C - 2 to 8 inches: fine sandy loam
R - 8 to 12 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 4 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Semidesert Shallow Sandy Loam (Utah Juniper, Blackbrush) (R035XY236UT)
Other vegetative classification: Semidesert Shallow Sand (Utah Juniper-Pinyon) (035XY227UT_3)

Minor Components

Arches

Percent of map unit: 10 percent

Mido

Percent of map unit: 5 percent

76—Rock outcrop-Ustic Torripsamments complex, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1vn3
Elevation: 4,700 to 5,500 feet
Mean annual precipitation: 9 to 11 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 45 percent
Ustic torripsamments and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Landform: Cliffs on cuestas, escarpments on cuestas, ledges on cuestas
Down-slope shape: Linear
Across-slope shape: Convex, linear

Description of Ustic Torripsamments

Setting

Landform: Cuestas, structural benches
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Eolian sands derived from sandstone

Typical profile

C1 - 0 to 3 inches: fine sand
C2 - 3 to 34 inches: loamy fine sand
R - 34 to 38 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 20 to 79 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Semidesert Sand (Fourwing Saltbush) (R035XY212UT)
Other vegetative classification: Semidesert Sand (Four-Wing Saltbush) (035XY212UT_3)

Minor Components

Arches

Percent of map unit: 10 percent

Rizno

Percent of map unit: 10 percent

Ignacio

Percent of map unit: 5 percent

80—Sheppard fine sand, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1vn8
Elevation: 4,600 to 5,000 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Sheppard and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sheppard

Setting

Landform: Sand sheets on cuestas, sand sheets on structural benches
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Eolian deposits derived from sandstone

Typical profile

A - 0 to 3 inches: fine sand
C - 3 to 60 inches: fine sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Desert Sand (Sand Sagebrush) (R035XY115UT)

Minor Components

Nakai
Percent of map unit: 10 percent

Trail
Percent of map unit: 10 percent

Arches
Percent of map unit: 10 percent

88—Thoroughfare fine sandy loam,2 to 8 percent slopes

Map Unit Setting
National map unit symbol: 1vnj
Elevation: 4,100 to 5,200 feet
Mean annual precipitation: 7 to 9 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Thoroughfare and similar soils: 83 percent
Minor components: 17 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Thoroughfare

Setting
Landform: Stream terraces, alluvial flats
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

A - 0 to 2 inches: fine sandy loam
C - 2 to 60 inches: stratified gravelly loamy sand to fine sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Desert Sandy Loam (Fourwing Saltbush) (R035XY118UT)

Minor Components

Trail

Percent of map unit: 10 percent

Bluechief

Percent of map unit: 7 percent

97—Ustic Torrifluvents-Ustic Torrifluvents,sodic-Typic Ustifluvents complex, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1vnv
Elevation: 3,900 to 4,400 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Ustic torrifluvents and similar soils: 35 percent
Ustic torrifluvents and similar soils: 30 percent
Typic ustifluvents and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ustic Torrifluvents

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

C1 - 0 to 13 inches: loamy very fine sand
C2 - 13 to 60 inches: stratified gravelly sandy loam to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Slightly saline to strongly saline (4.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R035XY011UT)
Other vegetative classification: Loamy Bottom (Basin Big Sagebrush) (035XY011UT_2)

Description of Ustic Torrifluvents

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

C1 - 0 to 3 inches: loamy very fine sand
C2 - 3 to 60 inches: stratified gravelly sandy loam to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional

Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Slightly saline to strongly saline (4.0 to 32.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Alkali Flat (Greasewood) (R035XY009UT)

Description of Typic Ustifluvents

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

C1 - 0 to 1 inches: loam
C2 - 1 to 60 inches: stratified very gravelly sand to silt loam

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Slightly saline to strongly saline (4.0 to 32.0 mmhos/cm)
Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: B
Ecological site: Semiwet Saline Streambank (Fremont Cottonwood) (R035XY012UT)

Minor Components

Riverwash

Percent of map unit: 7 percent
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave

Rock ourcrop

Percent of map unit: 3 percent

99—Ustic Torriorthents-Lithic Torriorthents, warm-Rock outcrop complex, 10 to 80 percent slopes

Map Unit Setting

National map unit symbol: 1vnx
Elevation: 4,200 to 7,100 feet
Mean annual precipitation: 8 to 15 inches
Mean annual air temperature: 45 to 54 degrees F
Frost-free period: 100 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Ustic torriorthents and similar soils: 35 percent
Lithic torriorthents and similar soils: 25 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ustic Torriorthents

Setting

Landform: Talus cones on escarpments
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Colluvium derived from sandstone and shale

Typical profile

A - 0 to 7 inches: very cobbly loamy fine sand
C - 7 to 60 inches: extremely stony fine sandy loam

Properties and qualities

Slope: 10 to 80 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A

Ecological site: Talus Slope (Blackbrush-Shadscale) (R035XY018UT)

Description of Lithic Torriorthents

Setting

Landform: Escarpments, ledges
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale

Typical profile

A,C - 0 to 17 inches: gravelly fine sandy loam
R - 17 to 21 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 4 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Desert Shallow Sandy Loam (Blackbrush) (R035XY133UT)

Description of Rock Outcrop

Setting

Landform: Cliffs, escarpments, ledges
Down-slope shape: Linear
Across-slope shape: Linear

Minor Components

Nepalto

Percent of map unit: 10 percent

Rubbleland

Percent of map unit: 5 percent

Badland

Percent of map unit: 5 percent

W—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Grand County, Utah - Central Part

39—Myton family-Rock outcrop complex

Map Unit Setting

National map unit symbol: jy08
Elevation: 4,000 to 5,700 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 150 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Myton family and similar soils: 40 percent
Rock outcrop: 25 percent
Minor components: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myton Family

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone

Typical profile

C1 - 0 to 29 inches: extremely stony sandy loam
R - 29 to 33 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 70 percent
Percent of area covered with surface fragments: 21.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Talus Slope (Blackbrush-Shadscale) (R035XY018UT)

Description of Rock Outcrop

Setting

Landform: Escarpments on mountain slopes, ledges on mountain slopes
Landform position (three-dimensional): Free face, free face
Down-slope shape: Linear
Across-slope shape: Convex

Minor Components

Shallow, loamy soils

Percent of map unit: 15 percent

Very deep, loamy soils

Percent of map unit: 10 percent

Soils in dry washes

Percent of map unit: 10 percent

40—Nakai fine sandy loam, 3 to 10 percent slopes

Map Unit Setting

National map unit symbol: jy0b
Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 150 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Nakai and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nakai

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and/or eolian deposits derived from sandstone and/or residuum weathered from sandstone

Typical profile

A1 - 0 to 3 inches: fine sandy loam
B21 - 3 to 9 inches: fine sandy loam
B22,C1ca - 9 to 58 inches: fine sandy loam
R - 58 to 62 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 10 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Desert Shallow Loam (Black Sagebrush) (R034XY118UT)

Minor Components

Shallow, loamy soils

Percent of map unit: 10 percent

Rock outcrop

Percent of map unit: 5 percent

47—Redbank-Flatnose families association

Map Unit Setting

National map unit symbol: jy0k
Elevation: 4,000 to 6,500 feet
Mean annual precipitation: 5 to 12 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 120 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Redbank family and similar soils: 45 percent
Flatnose family and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redbank Family

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear

Across-slope shape: Concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

A1 - 0 to 8 inches: fine sandy loam
C1 - 8 to 13 inches: sandy loam
C2 - 13 to 24 inches: gravelly loamy coarse sand
C3 - 24 to 46 inches: sandy loam
C4 - 46 to 60 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Alkali Flat (Greasewood) (R034XY006UT)
Other vegetative classification: Alkali Flat (Black Greasewood) (034XY006UT_1)

Description of Flatnose Family

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

A1 - 0 to 5 inches: sandy clay loam
C1 - 5 to 11 inches: fine sandy loam
C2 - 11 to 30 inches: fine sandy loam
C3 - 30 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 24 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None

Calcium carbonate, maximum in profile: 3 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: Wet Saline Streambank (Coyote willow) (R034XY026UT)
Other vegetative classification: Wet Saline Streambank (Coyote Willow) (034XY026UT_2)

Minor Components

Very deep loamy soils

Percent of map unit: 5 percent

Unstabilized sandy and gravelly sediment

Percent of map unit: 5 percent

Riverwash

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Semiwet Fresh Streambank (R048AY006UT)

50—Riverwash

Map Unit Composition

Riverwash: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

- 0 to 20 inches: sandy loam

Properties and qualities

Natural drainage class: Somewhat poorly drained
Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 to 20 inches
Frequency of flooding: Frequent
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Ecological site: Semiwet Fresh Streambank (R048AY006UT)

53—Rock outcrop

Map Unit Composition
Rock outcrop: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting
Landform: Ridges on structural benches, ridges on cuestas, escarpments on structural benches, escarpments on cuestas
Landform position (three-dimensional): Free face
Down-slope shape: Linear
Across-slope shape: Convex

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APPENDIX B

FUGITIVE DUST REGULATIONS

R307. Environmental Quality, Air Quality.
R307-205. Emission Standards: Fugitive Emissions and Fugitive Dust.
R307-205-1. Purpose.

R307-205 establishes minimum work practices and emission standards for sources of fugitive emissions and fugitive dust for sources located in all areas in the state except those listed in section IX, Part H of the state implementation plan or located in a PM10 nonattainment or maintenance area.

R307-205-2. Applicability.

R307-205 applies statewide to all sources of fugitive emissions and fugitive dust, except for agricultural or horticultural activities specified in 19-2-114(1)-(3) and any source listed in section IX, Part H of the state implementation plan or located in a PM10 nonattainment or maintenance area.

R307-205-3. Definitions.

The following definition applies throughout R307-205:

"Material" means sand, gravel, soil, minerals or other matter that may create fugitive dust.

R307-205-4. Fugitive Emissions.

Fugitive emissions from sources which were constructed on or before April 25, 1971, shall not exceed 40% opacity. Fugitive emissions from sources constructed or modified after April 25, 1971, shall not exceed 20% opacity.

R307-205-5. Fugitive Dust.

(1) Storage and Handling of Materials. Any person owning, operating or maintaining a new or existing material storage, handling or hauling operation shall minimize fugitive dust from such an operation. Such control may include the use of enclosures, covers, stabilization or other equivalent methods or techniques as approved by the director.

(2) Construction and Demolition Activities.

(a) Any person engaging in clearing or leveling of land greater than one-quarter acre in size, earthmoving, excavation, or movement of trucks or construction equipment over cleared land greater than one-quarter acre in size or access haul roads shall take steps to minimize fugitive dust from such activities. Such control may include watering and chemical stabilization of potential fugitive dust sources or other equivalent methods or techniques approved by the director.

(b) The owner or operator of any land area greater than one-quarter acre in size that has been cleared or excavated shall take measures to prevent fugitive particulate matter from becoming airborne. Such measures may include:

(i) planting vegetative cover,

(ii) providing synthetic cover,

(iii) watering,

(iv) chemical stabilization,

(v) wind breaks, or

(vi) other equivalent methods or techniques approved by the director.

(c) Any person engaging in demolition activities including

razing homes, buildings, or other structures or removing paving material from roads or parking areas shall take steps to minimize fugitive dust from such activities. Such control may include watering and chemical stabilization or other equivalent methods or techniques approved by the director.

R307-205-6. Roads.

(1) The director may require persons owning, operating or maintaining any new or existing road, or having right-of-way easement or possessory right to use the same, to supply traffic count information as determined necessary to ascertain whether or not control techniques are adequate or additional controls are necessary.

(2) Any person who deposits materials that may create fugitive dust on a public or private paved road shall clean the road promptly.

R307-205-7. Mining Activities.

(1) Fugitive dust, construction activities, and roadways associated with mining activities are regulated under the provisions of R307-205-7 and not by R307-205-5 and 6.

(2) Any person who owns or operates a mining operation shall minimize fugitive dust as an integral part of site preparation, mining activities, and reclamation operations.

(3) The fugitive dust control measures to be used may include:

(a) periodic watering of unpaved roads,

(b) chemical stabilization of unpaved roads,

(c) paving of roads,

(d) prompt removal of coal, rock minerals, soil, and other dust-forming debris from roads and frequent scraping and compaction of unpaved roads to stabilize the road surface,

(e) restricting the speed of vehicles in and around the mining operation,

(f) revegetating, mulching, or otherwise stabilizing the surface of all areas adjoining roads that are a source of fugitive dust,

(g) restricting the travel of vehicles on other than established roads,

(h) enclosing, covering, watering, or otherwise treating loaded haul trucks and railroad cars, to minimize loss of material to wind and spillage,

(i) substitution of conveyor systems for haul trucks and covering of conveyor systems when conveyed loads are subject to wind erosion,

(j) minimizing the area of disturbed land,

(k) prompt revegetation of regraded lands,

(l) planting of special windbreak vegetation at critical points in the permit area,

(m) control of dust from drilling, using water sprays, hoods, dust collectors or other controls approved by the director,

(n) restricting the areas to be blasted at any one time,

(o) reducing the period of time between initially disturbing the soil and revegetating or other surface stabilization,

(p) restricting fugitive dust at spoil and coal transfer and loading points,

(q) control of dust from storage piles through use of enclosures, covers, or stabilization and other equivalent methods or techniques as approved by the director, or

(r) other techniques as determined necessary by the director.

R307-205-8. Tailings Piles and Ponds.

(1) Fugitive dust, construction activities, and roadways associated with tailings piles and ponds are regulated under the provisions of R307-205-8 and not by R307-205-5 and 6.

(2) Any person owning or operating an existing tailings operation where fugitive dust results from grading, excavating, depositing, or natural erosion or other causes in association with such operation shall take steps to minimize fugitive dust from such activities. Such controls may include:

(a) watering,

(b) chemical stabilization,

(c) synthetic covers,

(d) vegetative covers,

(e) wind breaks,

(f) minimizing the area of disturbed tailings,

(g) restricting the speed of vehicles in and around the tailings operation, or

(h) other equivalent methods or techniques which may be approvable by the director.

KEY: air pollution, fugitive emissions, mining, tailings
Date of Enactment or Last Substantive Amendment: July 7, 2005
Notice of Continuation: March 4, 2010
Authorizing, and Implemented or Interpreted Law: 19-2-101; 19-2-104; 19-2-109

APPENDIX C

CULTURAL RESOURCE INVENTORY REPORT

Utah Division of State History

COVER PAGE
Must Accompany All Project Reports Submitted to the Utah SHPO

Case No.

U15-HO-0409p

State Project No.

Report Title: A Cultural Resource Inventory for the Proposed New Moab Waste Water Treatment Facility Project in Moab, Grand County, Utah

State Project No.: U15-HO-0409p **Organization Project No.:** 15-32

Report Date: June 2015 **County(ies):** Grand

Report Author(s): Syanna T. Madsen and Jon R. Baxter

Principal Investigator: Jon Baxter **Field Supervisor(s):** Jon Baxter

Records search date(s): 5/11/2015 **Preservation Pro Used?** (•) Yes ( ) No

Acres Surveyed: Intensive *(≤15 m intervals)*: 4.8 **Recon/Intuitive *(>15 m intervals)*:**

USGS 7.5' Series Moab, UT
Map Reference(s):

SITES REPORTED	COUNT	SMITHSONIAN SITE NUMBERS
Revisits (no site form updates)	0	N/A
Updates (updated site forms attached)	0	N/A
New recordings (site forms attached)	1	42GR5168
Total Count of Archaeological Sites in APE	0	N/A
Historic Structures (structure forms attached)	0	N/A
Total National Register Eligible Sites	1	42GR5168

CHECKLIST OF REQUIRED ITEMS FOR SUBMITTAL TO SHPO

1. [X] Copy of the final report
2. [X] Copy of USGS 7.5' Series basemap with investigated area clearly identified
3. [X] Completed site forms
   - [ ] IMACS Encoding Form
   - [ ] Site Sketch Map
   - [ ] Photographs adhering to UDSH standards
   - [ ] Copy of USGS 7.5' Series basemap with site location and Smithsonian site number clearly labeled
4. [ ] CD of digital report and site documents, including shapefiles (optional)
5. [X] Completed "Cover Page" accompanying final report and form

For UDSH office use only

BIGHORN ARCHAEOLOGICAL CONSULTANTS, LLC
1712 NORTH 320 WEST, OREM, UTAH 84057
(801) 368-8091 (801) 437-1736 FAX

Report Number 15-32

A Cultural Resource Inventory for the Proposed New Moab Waste Water Treatment Facility Project in Moab, Grand County, Utah

Prepared by

Syanna T. Madsen
and
Jon R. Baxter
Bighorn Archaeological Consultants, LLC

Prepared for

Bowen Collins & Associates
154 E 14000 S
Draper, Utah 84020

Federal Antiquities Permit Number 11UT81316
Utah State Project Number U15-HO-0409p

June 2015

Abstract

Project Title: A Cultural Resource Inventory for the Proposed New Moab Waste Water Treatment Facility Project in Moab, Grand County, Utah.

Project Description: The project consists of the replacement of the existing Moab Waste Water Treatment Facility by constructing a new, larger facility across the street from the existing one.

Location: The proposed project area is located along W 400 N in Moab, Grand County, Utah within T 26S R 21E, Section 2 (USGS 7.5' Topographic Quad: Moab, Utah).

Number of Surveyed Acres: 4.8 acres

Number of Sites: The proposed facility is located across the street from the existing facility (42GR5168). This facility was built in 1956 and was updated in 1996. No sites were identified within the proposed new treatment facility survey area. Seventeen sites, 57 historic buildings/structures, and 20 previously inventoried projects were identified within the 1.0 Mile Class I buffer.

List of Register Listed Properties: N/A

List of Register Eligible Properties: 42GR5168

List of Ineligible Sites: N/A

List of Unevaluated Sites: N/A

Comments: Examination of the proposed Moab Waste Water Treatment facility revealed one isolated find within the inventory area for the new treatment facility. No additional cultural material was observed in this area. The existing treatment facility was identified as an historic cultural property and recorded as 42GR5168. The existing Moab Waste Water Treatment facility (42GR5168) was built in 1956 and has been recommended eligible for nomination to the National Register of Historic Places (NRHP). The proposed new facility will not have a direct negative impact on the existing facility. However, the existing facility (42GR5168) will be demolished upon completion of the new waste water plant. As such, Bighorn recommends consultation with the Utah State Historic Preservation Office to mitigate impacts to the eligible site and continue the permitting process and proposed undertaking.

Table of Contents

List of Figures

List of Tables

Introduction

Bighorn Archaeological Consultants, LLC, (Bighorn) has completed a cultural resource inventory for the proposed New Moab Waste Water Treatment Facility Project in Moab, Grand County, Utah. The project was undertaken at the request of Bowen Collins & Associates to assist in fulfilling requirements under various federal and state environmental protection laws, including the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA). The proposed new Moab Waste Water Treatment Facility is located along W 400 N in Moab, Grand County, Utah. The proposed project will build and operate a new waste water treatment plant at this location. Bighorn completed the inventory under Utah Project Number U15-HO-0409p. Fieldwork was completed by Jon Baxter on 11 May 2015.

Project Location

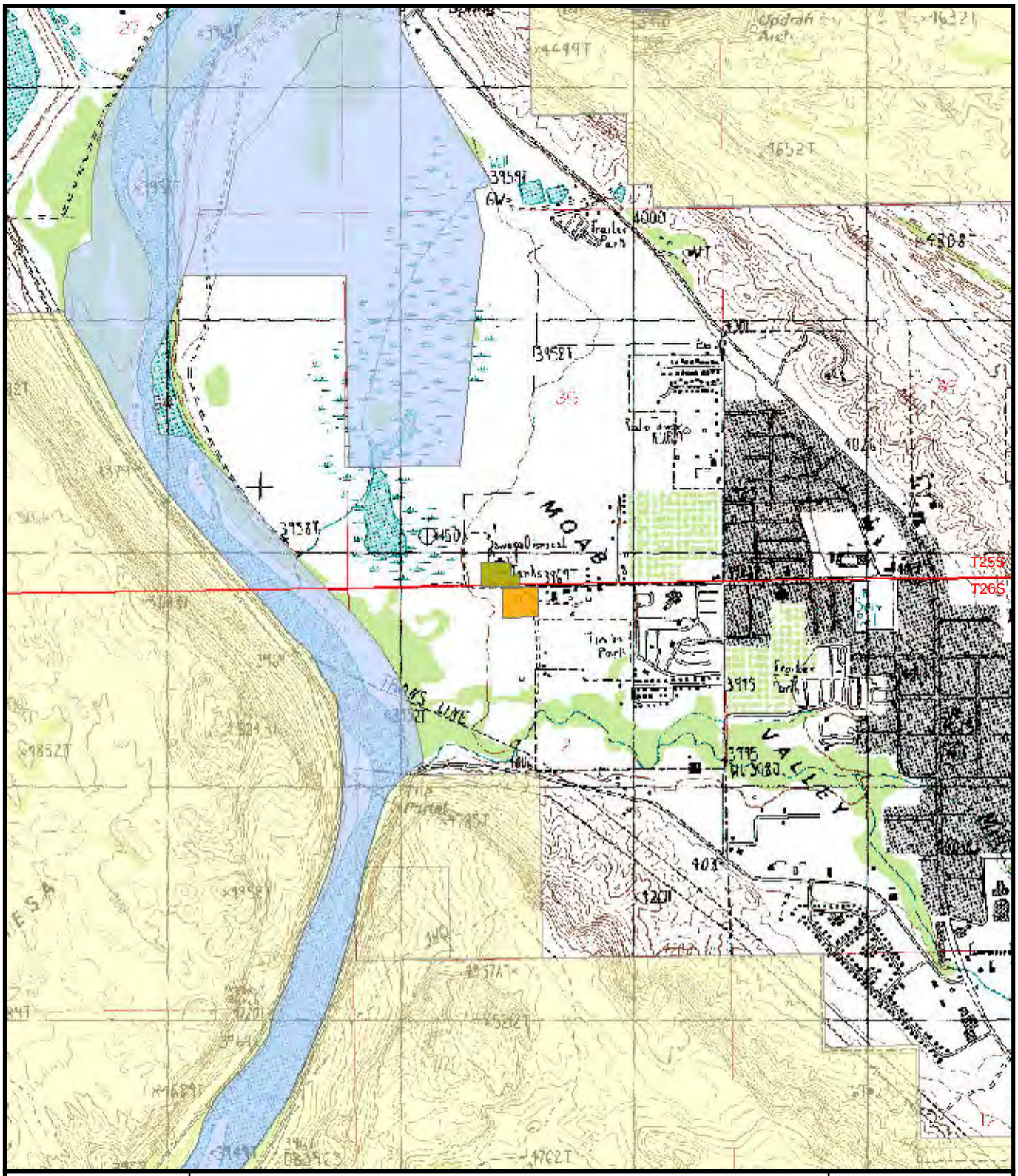
The area of potential effect (APE) is defined as the location for the proposed new treatment facility and it is located along W 400 N in Moab, Utah on privately held lands (Figure 1). Specifically, the APE is within T 26S R 21E (USGS Moab, Utah 7.5' Topographic Quadrangle). The parcel for the APE measures 129 by 152 meters and is within a 4.8-acre area.

Environment

The proposed project is located within the Salt Anticline physiographic subdivision of Utah at 4,000 feet elevation above sea level. The area is characterized by elongate depressions caused by the removal of subterranean salt masses. The valleys typically trend northwesterly and are typically made up of collapsed or depressed anticlines. Shallow salt deposits are still common. The main valleys in this section are Spanish (Moab), Lisbon, Salt, and Castle Valley (Stokes 1987:233-234). Vegetation in the area includes juniper, Russian olive, sagebrush, rabbitbrush, ephedra, snakeweed, Indian ricegrass, cheat grass, and various forbs.

Cultural Context

The prehistory of the Salt Anticline area of the Colorado Plateau region of the Eastern Great Basin can be broken down into a series of developmental stages based on changing technologies, economics, and social systems. Table 1 provides an overview of these phases. For more information refer to general syntheses of the regional prehistory (Jennings 1978; Madsen 1982; Geib 1996; Aikens & Madsen 1986; Madsen 1979; Simms 1986). For more information on the history of the area refer to historic syntheses of the area (Firmage 1996).



Legend

- Proposed Treatment Facility
- Existing Treatment Facility (42GR5168)
- DNR
- BLM
- Private

Figure 1. Moab Waste Water Treatment Facility Project

BIGHORN ARCHAEOLOGICAL CONSULTANTS, LLC

0 1:24,000 1 mi

0 1.5 km

USGS 7.5' Series Quad: Moab, UT

Grand County
T26S, R21E
Sec 2

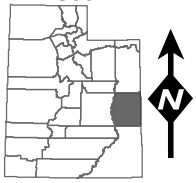


Table 1. Cultural Phases of the Eastern Great Basin

Cultural Phase	Sub-phase	Approximate Time Period
Paleoindian	N/A	20,000 – 6,500 BC
Archaic	Early Archaic	6,500 – 3,500 BC
	Middle Archaic	3,500 – 1,500 BC
	Late Archaic	1,500 BC – AD 400
Formative (Fremont)	N/A	AD 400 - 1350
Late Prehistoric (Southern Paiute / Ute)	Late Prehistoric	AD 1350 – 1700
	Protohistoric	AD 1700 – 1850
	Historic	Post AD 1850
Historic (Euro-American)	Early Exploration	AD 1776-1858
	Mormon Settlement, Farming, Ranching & Mining	AD 1858-1870
		AD 1870-1950s

Figure 2. General project overview facing southwest.

Figure 3. General project overview facing west.

Figure 4. View of existing Waste Water Treatment Facility (42GR5168).

Previous Research

Prior to initiating fieldwork, Bighorn conducted a record search for reported projects and previously recorded cultural sites at the Utah State Historic Preservation Office Database on 11 May 2015. Twenty previous cultural resource inventories (Table 2), 17 previously recorded sites (Table 3), and 57 historic properties were observed within one mile of the proposed project area.

General Land Office (GLO) maps, aerial photographs, Master Title Plats, and the Historic Index of the area were also reviewed for historic features, such as roads, trails, mining claims, or land patents. Four GLOs (1879, 1881, 1914, and 1926) were identified for T 26S R 21E. No historic features within Section 2 were identified on these maps. Additionally, the aerial imagery for the project area does not show any historic features in Section 2 (Appendix A-Aerial Imagery).

Table 2. Previous Cultural Resource Inventories within One Mile of the Proposed Project

Project Name	Project Number	Company
Cultural Resource Management Program MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline	*U80-WG-0299	Woodward-Clyde Consultants
Non-project Investigations near Bluff, Blanding, Eastland, and Moab, Utah	U80-SH-0416s	USDA-Soil Conservation Service
Preliminary Report on a Seismic Corridor Survey near Moab, Utah	U82-AF-0210b,s	Archaeological-Environmental Research Corporation
US-191 Widening Project from Pack Creek Bridge to the Colorado River Bridge	U88-AS-0261p,s	Abajo Archaeology
The Scott M. Matheson Wetlands Preserve Parking Area and Access Road	*U93-BL-0714p	Bureau of Land Management
Cultural Resource Inventories of City and Moab's Mill Creek Flood Control and Parkway Project Grand County, Utah	U95-AS-0494s	Abajo Archaeology
Cultural Resource Inventory of the City of Moab's Maps Project at the Moab Orchard Property in Grand County, Utah	U02-MQ-0718p	Montgomery Archaeological Consultants
Archaeological Inventory of Three Existing Power Lines between Moab and Monticello, San Juan and Grand Counties, Utah	*U03-BC-0061b,p,s	BYU-Office of Public Archaeology
Archaeological Investigations for Moab's Min Street (US-191) Reconstruction Project, Grand County, Utah	U03-MQ-0528s	Montgomery Archaeological Consultants
Proposed Allen-Pipkin Subdivision, Moab, Utah	U05-BT-1048b,p	Bennett Management Services, LLC.
Cultural and Fossil Resource Inventory for Utah Department of Transportation's Colorado River Bridge Replacement Project Grand County, Utah	U05-MQ-1239p,s	Montgomery Archaeological Consultants
A Cultural Resources Inventory of the Department of Energy Crescent Junction Disposal Site Additional Staging and Stockpile Area, Alternate Access Corridor, and Potable Waterline between Thompson Springs and Crescent Junction, Grand County, Utah	U06-ST-0669b,p,w,s	SWCA Environmental Consultants
500 West Reconstruction, 400 North to Kane Creek Blvd, Moab, Utah	*U08-BS-0239s	Baseline Data, Inc.
Cultural Resource Inventory of the Utah Division of Wildlife Resources Slough 2 Fire Rehabilitation	*U08-MQ-1199p,s	Montgomery Archaeological Consultants

Project Name	Project Number	Company
Project (#1332) in the Matheson Wetlands, Grand County, Utah		
Cultural Resource Inventory for the Pipeline Non-Motorized Trail	*U09-BL-0044b	Bureau of Land Management
Moab District Field Office Selected Road Inventory San Juan and Grand Counties, Utah	U09-LI-0075b	Solano Archaeological Services
Cultural Resource Inventory of the Pipe Dream Trail Additions, Grand County, Utah	*U10-BL-0342b	Bureau of Land Management
Cultural Resource Survey of US-191 Shoulder Widening North of Moab Grand County, Utah	U11-BT-1035p	Bennett Management Services, LLC.
A Negative Short Report of the Matheson Preserve Fire Rehabilitation Project #2159 Grand County, Utah	*U11-UQ-0555s	State of Utah - Division of Wildlife Resources
Cultural and Fossil Resource Inventory of Utah Department of Transportation's Proposed 500 West Road Improvements from Mill Creek Bridge to Kane Creek Boulevard Grand County, Utah	U14-MQ-0247p	Montgomery Archaeological Consultants

* Located within 1/2 mile of project

Table 3. Previously Recorded Cultural Sites within One Mile of the Proposed Project

Site Number	Site Type	Cultural Affiliation	Eligibility
42GR170	Prehistoric Site	Unknown Aboriginal	Unevaluated
*42GR210	Prehistoric River Shelter	Fremont	Unevaluated
42GR317	Prehistoric Lithic Scatter	Unknown Aboriginal	Unevaluated
42GR1422	Prehistoric Rock Shelter	Unknown Aboriginal	Eligible
42GR2079	Historic Petroglyph	1935-1935	Eligible
42GR2206	Prehistoric Habitation	Late Archaic	Not Eligible
42GR2813	Historic Moab-Thompson Wagon Road	1883-1930s	Eligible
42GR3292	Prehistoric Artifact Scatter	Unknown Aboriginal	Not Eligible
42GR3293	Prehistoric Artifact Scatter	Unknown Aboriginal	Eligible
42GR3622	Historic Ditch	1950-Unknown	Not Eligible
42GR3623	Historic Ditch	1930-Present	Not Eligible
42GR3624	Historic Foundation Remains	1950-1960	Not Eligible
42GR3625	Historic Ditch	1894-Present	Not Eligible
42GR3626	Prehistoric Lithic Scatter	Late Prehistoric	Determined Eligible
42GR3627	Prehistoric Lithic Scatter	Protohistoric/Contact	Determined Eligible
42GR3628	Prehistoric Lithic Scatter	Unknown Aboriginal	Determined Eligible
*42GR4177	Prehistoric Rock Art	Unknown Aboriginal	Eligible

* Located within 1/2 mile of project

Table 4. Historic Building/Features within One Mile of the Proposed Project

Property Name/Type	Year of Construction	Address	Eligibility
None/ Unknown	1960	94 W 100 N	Unevaluated
None/ Crosswing	1890	61 N 100 W	Not Eligible
None/ Unknown	1950	71 N 100 W	Unevaluated
None/ Unknown	1955	81 N 100 W	Unevaluated
None/ Unknown	1965	91 N 100 W	Unevaluated
None/ Unknown	1950	101 N 100 W	Unevaluated
None/ Foursquare	1950	121 N 100 W	Not Eligible
Hyrum Allen House/ Foursquare	1901	147 N 100 W	Eligible

Property Name/Type	Year of Construction	Address	Eligibility
None/ Unknown	1945	167 N 100 W	Unevaluated
None/ Bungalow	1920	168 N 100 W	Eligible
None/ Unknown	1955	198 N 100 W	Unevaluated
None/ Unknown	1950	211 N 100 W	Unevaluated
None/ Other Residential Type	1940	348 N 100 W	Not Eligible
None/ Other Residential Type	1930	376 N 100 W	Not Eligible
Alfred G. Wilson House/ Crosswing	1887; 1890	84 W 200 N	Eligible
Neals Olson House/ Unknown	1896	90 W 200 N	Eligible
None/ Unknown	1960	340 W 200 S	Unevaluated
None/ Hall-Parlor	1890	291 W 400 N	Not Eligible
None/ Other Residential Type	1940	300 W 400 N	Not Eligible
None/ Bungalow	1915	339 W 400 N	Not Eligible
None/ WWII-Era Cottage	1940	450 W 400 N	Not Eligible
*Allen Memorial House/ Unknown	1957	625 W 400 N	Unevaluated
*None/ Other Residential Type	1930	915 W 400 N	Not Eligible
*None/ Shutgun	1910	991 W 400 N	Not Eligible
*None/ Other Residential Type	1940	993 W 400 N	Not Eligible
*None/ Other Residential Type	1900	1017 W 400 N	Eligible
*None/ Shutgun	1915	405 N 500 W	Not Eligible
*None/ Single Cell	1880	415 N 500 W	Eligible
None/ Other Residential Type	1940	557 N 500 W	Not Eligible
None/ Other Residential Type	1940	567 N 500 W	Not Eligible
None/ 1-Part Block	1940	635 N 500 W	Not Eligible
None/ Hall-Parlor	1900	675 N 500 W	Eligible
None/ Other Residential Type	1940	723 N 500 W	Not Eligible
None/ Other Residential Type	1930	737 N 500 W	Not Eligible
None/ WWII-Era Cottage	1940	1001 N 500 W	Not Eligible
*None/ Rectangle-Gable Entry Granary	1900	655 W Bartlett Circle	Eligible
None/ Bungalow	1935	132 W Center	Not Eligible
None/ Bungalow	1920	171 W Center	Eligible
None/ Unknown	1940	178 W Center	Not Eligible
None/ Other Residential Type	1940	186 W Center	Eligible
None/ Other Residential Type	1940	210 W Center	Not Eligible

Property Name/Type	Year of Construction	Address	Eligibility
Arthur Taylor House/ Crosswing	1894; 1896	1255 N Highway 191	Listed
King World Sandstone Carving/ Unknown	1935	1500 N Highway 191	Eligible
None/ Other-Undefined	1920	480 E Kane Creek Blvd	Eligible
None/ Other Residential Type	1940	592 N Main	Not Eligible
None/ Hall-Parlor	1880	600 N Main	Not Eligible
None/ Other Residential Type	1910	399 N Park Road	Not Eligible
*John F. & Irene Peterson House/ Basement House	1945	436 N River Sands Road	Eligible
Elk Mountain Mission Fort Site/ Unknown	1955	US 160	Listed
None/ Period Cottage	1920	131 W Walnut	Not Eligible
None/ Bungalow	1925	132 W Walnut	Eligible
None/ Single Cell	1905	133 W Walnut	Eligible
None/ Period Cottage	1940	144 W Walnut	Eligible
None/ WWII-Era Cottage	1940	157 W Walnut	Not Eligible
None/ Other Residential Type	1940	178 W Walnut	Eligible
None/ Crosswing	1905	198 W Walnut	Not Eligible
None/ Other Residential Type	1930	268 W Walnut	Not Eligible

All of the previously recorded cultural sites were located outside the proposed project area. Due to the absence of other cultural resource inventories in the immediate area and the relatively undisturbed nature of the project area, Bighorn anticipated cultural material to be present within the project area.

Inventory Methods

The cultural resource inventory for the proposed New Moab Waste Water Treatment Facility Project in Moab, Grand County, Utah involved a pedestrian survey to identify cultural resources within the proposed area of potential effects (APE). The area inventoried consisted of approximately 4.8 acres. This area was inventoried by walking multiple 15 m (50 ft) wide pedestrian transects to provide intensive coverage.

Cultural resource encountered during the inventory were recorded as sites or isolates, as defined in the National Register Bulletin No. 16A as the "location of a significant event, a prehistoric occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archaeological value regardless of any existing structure." To clarify, historic, prehistoric, or archaeological features or any archaeological or historic anomaly that contains, at a minimum, greater than ten artifacts in a 10-meter diameter area, multiple features, a single feature for which sufficient information is available to raise the

possibility that it may be significant, or a combination of a feature and artifacts were considered a site. All other cultural materials that do not meet the above criteria were considered isolated artifacts, or single artifacts or features of which little is known and possessing no possibility for significance to be determined.

Each site and/or isolated find is recorded using data obtained from a Trimble GeoXT global positioning system (GPS) and based on NAD 83. All GPS data will be submitted to the appropriate agency to incorporate into their databases. All previously and newly recorded sites were evaluated against the criteria set forth by the NRHP.

Inventory Results

Examination of the proposed project area resulted in the discovery of one new isolated find (Table 5; Appendix B). Several other trash dumps were noted across the project area, some of which had been burned, however, no diagnostic material was identified in conjunction with these deposits. The existing Moab Waste Water Treatment Facility was documented (Appendix C). No additional features or artifact were observed.

Table 5. Isolated find

IF Number	Description
IF-01	Body and frame for 1938-1939 era Cadillac sedan. The body has rusted out and the windows are removed. The car has back-hinged rear doors which was phased out by Cadillac starting in 1940.

Newly Recorded Site

42GR5168

Site 42GR5168 is the Moab Waste Water Treatment Facility. The facility was updated and upgraded in 1996. The currently facility includes pump stations (intake/outtake), trickling filters, clarifiers, digesters, monitoring wells, and sludge drying beds. This facility was built in 1956 and is presently used. The waste water facility will be phased out as a new facility is built and brought online across the road.

Site 42GR5168 is the Moab Waste Water Treatment Facility. As such, it has been a significant in the growth of the Moab area (A). Proper water treatment and sanitation allows for the growth of metropolitan/urban areas. The Moab Waste Water Treatment Facility is not specifically associated with any person of significant (B). The Moab Waste Water Treatment Facility does not exhibit any unique characteristics of construction or design (C). The Moab Waste Water Treatment Facility is a good example of a treatment facility. The Moab Waste Water Treatment Facility is well documented but additional research potential exists (D). Therefore, Bighorn recommends the site eligible to the NRHP under Criteria A and D.

Project Effects

Site 42GR5168 has been recommended eligible to the NRHP. The existing project will build a new waste water treatment facility across the street from this site. The project will not have any direct impact on the site during construction activities. Over time, this site will be discontinued.

Summary and Recommendations

At the request of Bowen Collins & Associates, Bighorn has completed a cultural resource inventory for the proposed New Moab Waste Water Treatment Facility Project in Moab, Grand County, Utah. Examination of the proposed Moab Waste Water Treatment facility revealed one isolated find and one historic site (42GR5168) within the inventory area for direct effects. No additional cultural material was observed. The historic site is the existing Moab Waste Water Treatment facility built in 1956. The proposed new facility will not have a direct negative impact on the existing facility. However, site 42GR5168 will be demolished and removed upon completion of the new waste water treatment facility. As such, Bighorn recommends consultation with the Utah State Historic Preservation Office to mitigate impacts to the eligible site and continue the permitting process and proposed undertaking.

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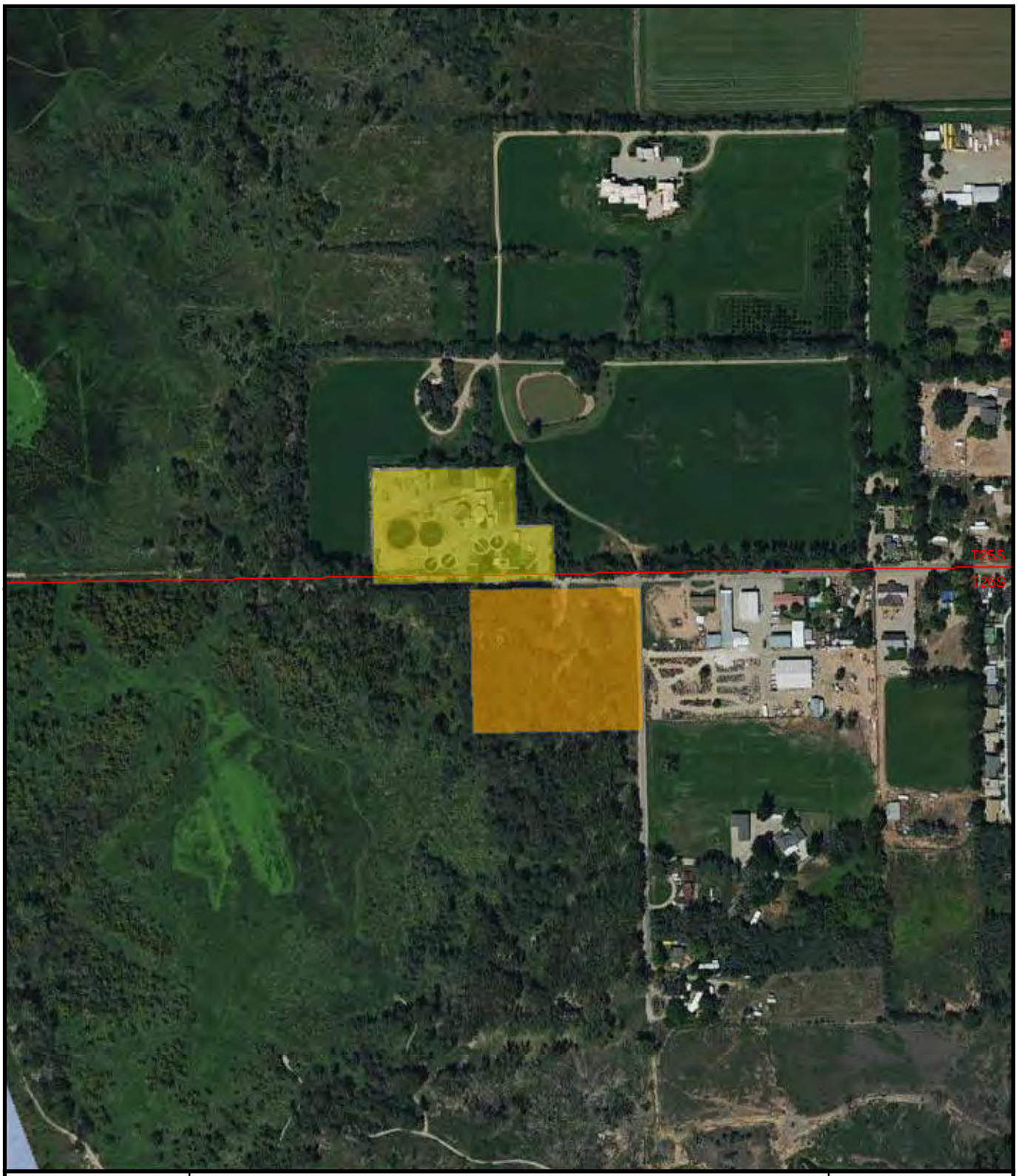
Appendix A
Aerial Map



Legend

- Existing Treatment Facility
- Proposed Treatment Facility
- DNR
- BLM
- Private

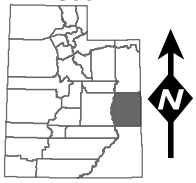
Appendix A. Moab Waste Water Treatment Facility Project Location

BIGHORN ARCHAEOLOGICAL CONSULTANTS, LLC

0 1:5,000 0.2 mi

0 0.325 km

Grand County
T26S, R21E
Sec 2



MOAB CITY WWTP HISTORICAL AERIALS
BC&A May 2015

Photo 1 – 2013

Photo 2 – 1981

Photo 3 – 1979

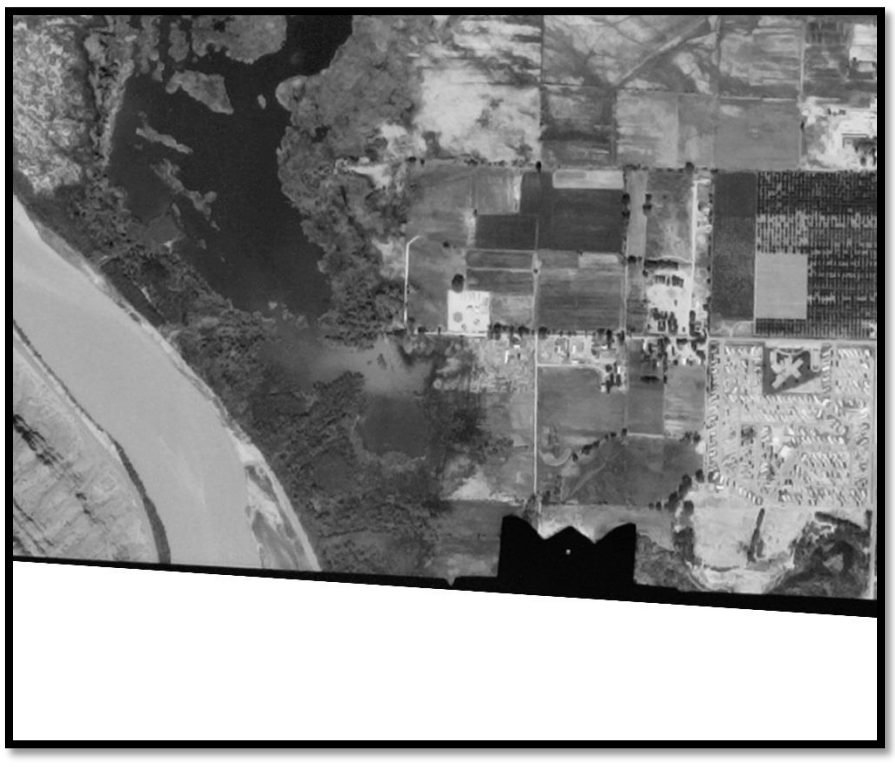


Photo 4 – 1968

Photo 5 - 1952

Appendix B
Isolate Find

Isolate # 01

Class Historic **Type** Car

Description Body and frame for 1938-1939 era Cadillac sedan. The body has rusted out and the windows are removed. The car has back-hinged rear doors which was phased out by Cadillac starting in 1940 (http://www.motorera.com/cadillac/cad1930/cad39s.htm).

UTM Zon 12 **Easting** **Northing** **Photo**

Township 26 **N/S** S **Range** 21 **E/W** E **Section** 2

Map Reference Moab **Quad Series** 7.5 **Quad Date**

Notes Based on NAD 1983

Project U15-HO-0409p. IF-01 1938-1939 Cadillac Sedan. Photo 2755.

Project U15-HO-0409p. IF-01 1938-1939 Cadillac Sedan, logo visible on steering wheel. Photo 2757.

Project U15-HO-0409p. IF-01 1938-1939 Cadillac Sedan, back-hinge rear door visible. Photo 2758.

Project U15-HO-0409p. IF-01 1938-1939 Cadillac Sedan. Photo 2760.

Appendix C
Site Form

IMACS SITE FORM

Part A - Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by
BLM - Utah, Idaho, Wyoming, Nevada
Division of State History - Utah, Wyoming
USFS - Intermountain Region
NPS - Utah, Wyoming

***1. State No:** 42GR5168
***2. Agency No:**
3. Temp. No:

4. State Utah **County:** Grand

5. Project Moab Waste Water Treatment Facility Project

***6. Report No.** U15-HO-0409p

***7. Site Name / Property Name** Moab Waste Water Treatment Facility

8. Class ☐ Prehistoric ☑ Historic ☐ Paleontologic ☐ Ethnographic

9. Site Type Historic Water Treatment Facility

***10. Elevation** 3,958 **ft.**

***11. UTM Grid** 12 624357 **m E** 4271109 **m N**

***12.** SE **of** SE **of** SW **of Section** 35 **T.** 25 S **R.** 21 E
SW **of** SE **of** SW **of Section** 35 **T.** 25 S **R.** 21 E

***13. Meridian** Salt Lake (1)

***14. Map Reference** Moab, UT

15. Aerial Photo

16. Location and Access

From the intersection of Main Street and 400 N in Moab, continue west on 400 N for 1.6 miles. The site is located on the north side of the road.

***17. Land Owner** Private (PR)

***18. Federal Administrative Units** N/A

***19. Location of Curated Materials** N/A

20. Description

Site 42GR5168 is the Moab Waste Water Treatment Facility. The facility was updated and upgraded in 1996 (see attached engineering draft). The current facility includes pump stations (intake/outtake), trickling filters, clarifiers, digesters, monitoring wells, and sludge drying beds. This facility was built in 1956 and is presently used. The waste water facility will be phased out as a new facility is built and brought online across the road.

The site is located just east of the Colorado River within the Moab Valley. The soil consisted of gravelly silt. Vegetation in the general area includes juniper, Russian olive, sagebrush, rabbitbrush, ephedra, snakeweed, Indian ricegrass, cheat grass, and various forbs.

***21. Site Condition** ☑ Excellent (A) ☐ Good (B) ☐ Fair (C) ☐ Poor (D)

***22. Impact Agents** Currently in good, working condition

***23. National Register Status** National Register Quality (C)

Justify Site 42GR5168 is the Moab Waste Water Treatment Facility. As such, it has been significant in the growth of the Moab area (A). Proper water treatment and sanitation allows for the growth of metropolitan area. The Moab Waste Water Treatment Facility is not specifically assocated with any person of significance (B). The Moab Waste Water Treatment Facility does not exhibit any unique characteristics of construction or design (C). The Waste Water Treatment Facilty is a good example of a treatment facility. The Moab Waste Water Treatment Facility is well documented but additional research potential exists (D). Therefore, Bighorn recommends the site eligible to the NRHP under Criteria A and D.

24. Photos 2776, 2790-92, 2795-99

25. Recorded by J. Baxter

***26. Survey Organization** Bighorn Archaeological Consultants, LLC (HO) ***28. Survey Date** 11-May-2015

27. Assisting Crew Members

* Encoded data items

IMACS SITE FORM

Part A - Administrative Data

***1. State No:** 42GR5168

List of Attachments:

- ☐ Part B
- ☑ Part C
- ☐ Part E
- ☑ Topo Map
- ☑ Site Sketch
- ☑ Photos
- ☐ Artifact/Feature Sketch
- ☐ Continuation Sheets
- ☐ Other:_____

Part A - Environmental Data

State No: 42GR5168

Temp. No:

***29. Slope** 1 **(Degrees)** 180 **Aspect (Degrees)**

***30. Distance to Permanent Water** 8 **x 100 Meters**

***Type of Water Source** Stream/River (B)

Name of Water Source Colorado River

***31. Geographic Unit** CAE

***32. Topographic Location** *- See Guide for additional information*

Primary Landform Valley (E)

Secondary Landform Alluvial Fan (A)

Describe The site is located along an alluvial fan just east of the Colorado River within the Moab Valley.

***33. On-site Depositional Context** Fan (A)

Describe Soil consisted of gravelly silt.

***34. Vegetation**

a. Life Zone

☐ Artic-Alpine (A) ☐ Hudsonian (B) ☐ Canadian (C) ☐ Transitional (D) ☑ Upper Sonoran (E) ☐ Lower Sonoran (F)

b. Community

Primary On-Site Pinyon-Juniper Woodland (H)

Secondary On-Site Low Sagebrush (Q)

Surrounding Site Pinyon-Juniper Woodland (H)

Describe Vegetation includes juniper, Russian olive, sagebrush, rabbitbrush, ephedra, snakeweed, Indian ricegrass, cheat grass, and various forbs.

***35. Miscellaneous Text**

36. Comments/Continuation

Part C - Historic Sites

Site No.(s) 42GR5168

1. Site Type Waste Water Treatment Facility

***2. Historic Themes** Waterworks/Reclamation (WW)

	CULTURAL AFFILIATION	DATING METHOD	CULTURAL AFFILIATION	DATING METHOD
***3. Culture**	Euro-American (EA)	Historical Record (I)		

Describe The historical record indicates this was built as part of the Euro-American expansion of Moab.

***4. Oldest Date** 1956 **Recent Date** Present

How Determined? The site was constructed in the mid 1950s, likely in 1956 based on aerial imagery of the area.

5. Site Dimensions 102 **m X** 163 **m** ***Area** 14,829 **sq. m**

***6. Surface Collection/Method**
- [x] None (A)
- [ ] Grab Sample (B)
- [ ] Designed Sample (C)
- [ ] Complete Collection (D)

Sampling Method N/A

***7. Estimated Depth of Cultural Fill**
- [ ] Surface (A)
- [x] 0 - 20 cm (B)
- [ ] 20 - 100 cm (C)
- [ ] 100 cm+ (D)
- [ ] Fill noted but unknown (E)
- [ ] Depth Suspected, but not tested (F)

How Estimated The facility's foundations are partially buried.

(If Tested, show location on site map)

***8. Excavation Status**
- [ ] Excavated (A)
- [ ] Tested (B)
- [x] Unexcavated (C)

Testing Method N/A

***9. Summary of Artifacts and Debris** *(Refer to Guide for additional categories)*

Describe: None observed.

10. Ceramic Artifacts

a. Estimated Number of Ceramic Trademarks 0

Describe None observed.

11. Glass

Describe None observed.

12. Maximum Density - #/sq m (glass and cera

13. Tin Cans

Describe None observed.

***14. Landscape and Constructed Features (locate on site map)** - *See Guide for additional categories*

Describe None observed.

***15. Buildings and Structures (locate on site map)**

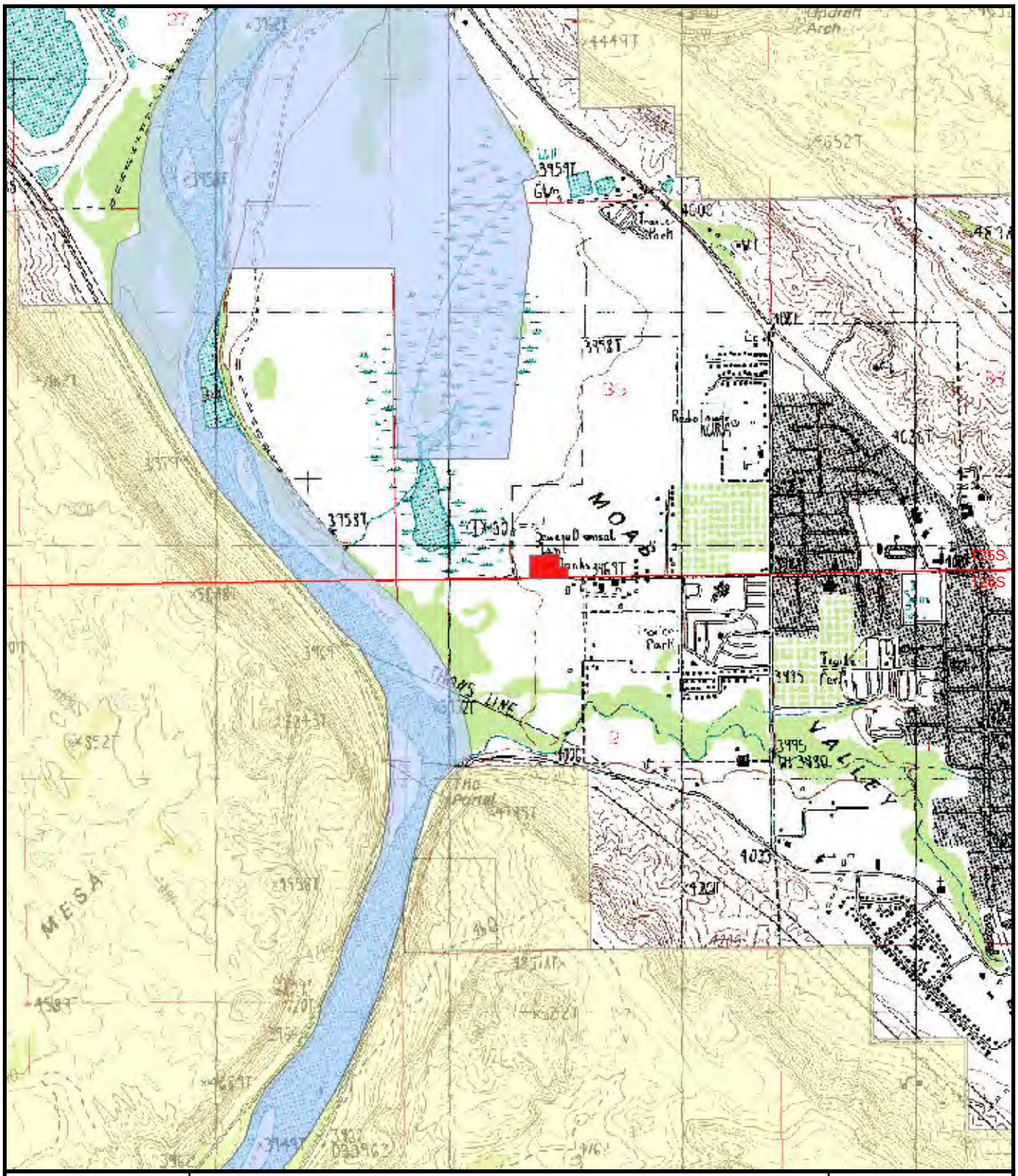
Count	Material	Type
	Combination (W)	Other (AO)

Part C - Historic Sites

Site No.(s) 42GR5168

Describe: Site 42GR5168 is the Moab Waste Water Treatment Facility. After the 1996 update the site includes multiple pump stations (intake/outtake), trickling filters, clarifiers, digesters, monitoring wells, and sludge drying beds.

16. Comments/Continuations - Please make note of any Historic Record searched performe *(County Records, General Land Office, Historic Society, Land Management Agency Records, Oral Histories/Interviews)*



Legend

- 42GR5168
- DNR
- BLM
- Private

Moab Waste Water Treatment Facility Project-Site Locator

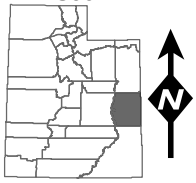
BIGHORN ARCHAEOLOGICAL CONSULTANTS, LLC

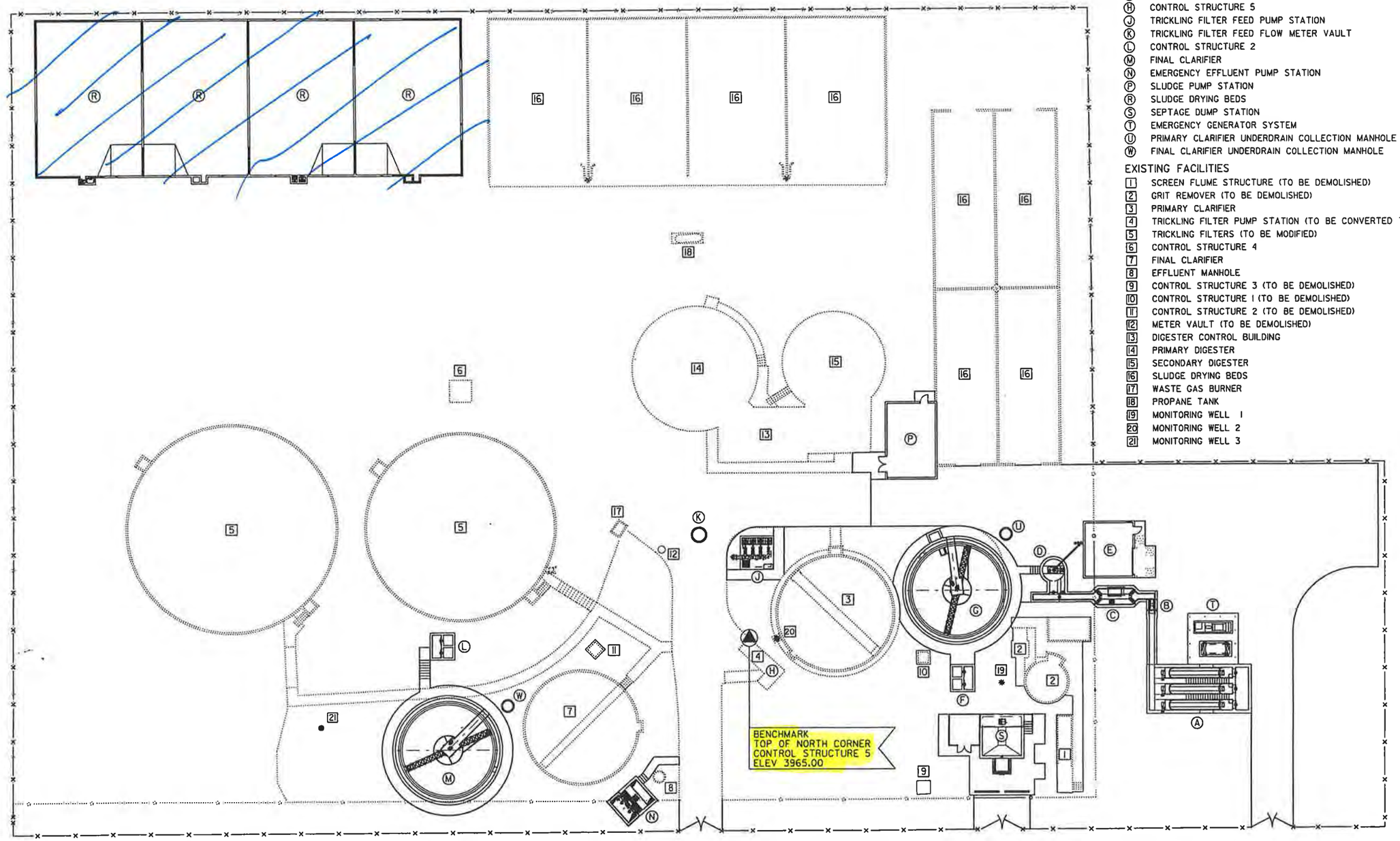
0 1:24,000 1 mi

0 1.5 km

USGS 7.5' Series Quad: Moab, UT

Grand County
T26S, R21E
Sec 2





FACILITIES INDEX

NEW FACILITIES

- (A) HEADWORKS - INFLUENT PUMP STATION
- (B) HEADWORKS - PARSHALL FLUME
- (C) HEADWORKS - BAR SCREEN
- (D) HEADWORKS - GRIT REMOVER
- (E) HEADWORKS BUILDING
- (F) CONTROL STRUCTURE 1
- (G) PRIMARY CLARIFIER
- (H) CONTROL STRUCTURE 5
- (J) TRICKLING FILTER FEED PUMP STATION
- (K) TRICKLING FILTER FEED FLOW METER VAULT
- (L) CONTROL STRUCTURE 2
- (M) FINAL CLARIFIER
- (N) EMERGENCY EFFLUENT PUMP STATION
- (P) SLUDGE PUMP STATION
- (R) SLUDGE DRYING BEDS
- (S) SEPTAGE DUMP STATION
- (T) EMERGENCY GENERATOR SYSTEM
- (U) PRIMARY CLARIFIER UNDERDRAIN COLLECTION MANHOLE
- (W) FINAL CLARIFIER UNDERDRAIN COLLECTION MANHOLE

EXISTING FACILITIES

- [1] SCREEN FLUME STRUCTURE (TO BE DEMOLISHED)
- [2] GRIT REMOVER (TO BE DEMOLISHED)
- [3] PRIMARY CLARIFIER
- [4] TRICKLING FILTER PUMP STATION (TO BE CONVERTED TO CONTROL STRUCTURE 5)
- [5] TRICKLING FILTERS (TO BE MODIFIED)
- [6] CONTROL STRUCTURE 4
- [7] FINAL CLARIFIER
- [8] EFFLUENT MANHOLE
- [9] CONTROL STRUCTURE 3 (TO BE DEMOLISHED)
- [10] CONTROL STRUCTURE 1 (TO BE DEMOLISHED)
- [11] CONTROL STRUCTURE 2 (TO BE DEMOLISHED)
- [12] METER VAULT (TO BE DEMOLISHED)
- [13] DIGESTER CONTROL BUILDING
- [14] PRIMARY DIGESTER
- [15] SECONDARY DIGESTER
- [16] SLUDGE DRYING BEDS
- [17] WASTE GAS BURNER
- [18] PROPANE TANK
- [19] MONITORING WELL 1
- [20] MONITORING WELL 2
- [21] MONITORING WELL 3

REV	DATE	BY	DESCRIPTION

SCALE: 1" = 20'

WARNING 0 ½ 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED J. VERNON
DRAWN C. DUNCAN
CHECKED K. COWAN

SUBMITTED
PROJECT ENGINEER — R. C. E. NO. 138292 — DATE 7-26-96

MONTGOMERY WATSON — R. C. E. NO. 164062 — DATE 7-26-96

MONTGOMERY WATSON
Salt Lake City, Utah

No. 138292 ALVIN R. ANDERSON — STATE OF UTAH

DATE 7-26-96
EXPIRES 5/31/98

CITY OF MOAB, UTAH
WASTEWATER TREATMENT PLANT ADDITIONS
FACILITIES INDEX

SHEET C-1

JOB No. 298.00.c FILE No. e:\moab\civil\moabfcon

17:4 26-JUL-1996

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2776.

42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2790.

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2791.

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2792.

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2795.

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2796.

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2797.

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2798.

Site 42GR5168. Site overview. Project No. U15-HO-0409p. Photo 2799.

MOAB CITY WWTP HISTORICAL AERIALS
BC&A May 2015

Photo 1 – 2013

Photo 2 – 1981

Photo 3 – 1979

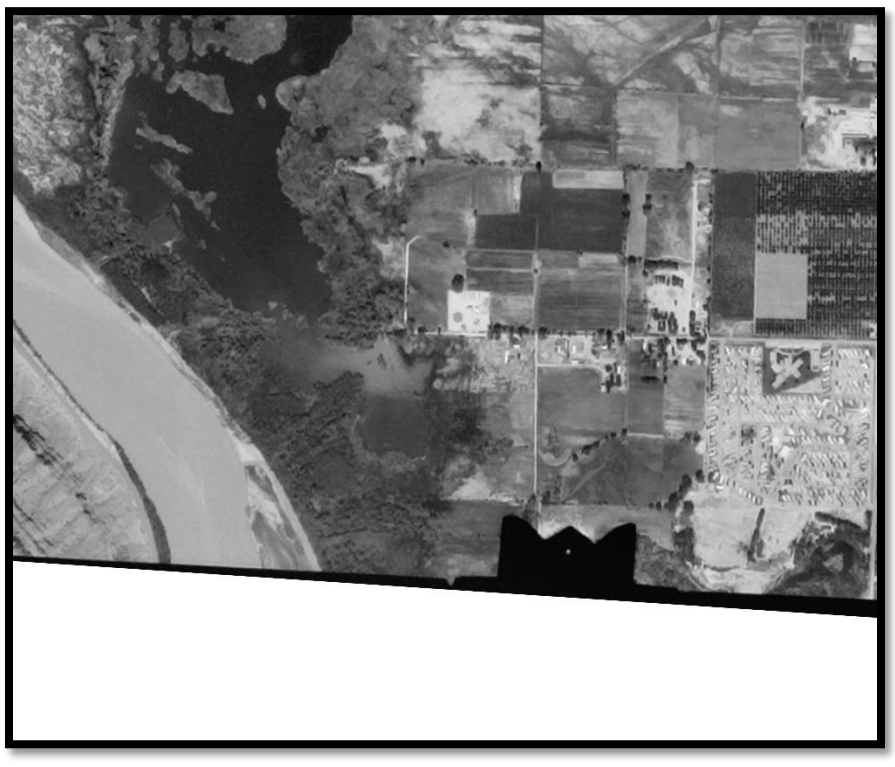


Photo 4 – 1968

Photo 5 - 1952

1990 IMACS ENCODING FORM

Encoder's Name S. Madsen

To be completed for each site form.
For instructions and codes, see IMACS Users Guide.

1 42GR5168 — State Site Number
2 — Agency Site Number
6 U15-HO-0409p — Agency Report Number
10 3,958 — Elevation
11 12 — Zone; 624357 — Easting; 4271109 — Northing

A

12

1/4	1/4	1/4	Sec.	T.		R.	
SE	SE	SW	35	25	S	21	E
SW	SE	SW	35	25	S	21	E
				.	S	.	W
				.	S	.	W

13 1 — Merid.
14 Moab, UT — USGS Map
17 PR — Owner

18 Forest; Dist./Park
19 Loc. Cur. Materials
21 A — Cond.
22 Impacts
23 C — N.R.
26 HO — Organ.
28 05 - 11 - 15 — Survey Date
29 1 — Slope; 180 — Aspect

30 8 B — Water: dstance/type
31 CAE — Geog. Unit
32 E A — Topographic Location: 1st 2st
33 A — Dep.
34 E — Vegetation
35 H Q H — Misc. Text, Site Name: 1 2 3

B

2 Culture/Dating Method
3 Area
4 Collect
5 Depth
6 Excav. Status
7 Prehistoric Artifacts

8 Lithic Tools: # / type
9 # Flaking Stages
11 Ceramics: #/type
13 Features: # / type
14 Architecture: # / material / type

C

2 WW — Historic Themes
3 EA I — Culture/Dating Method
4 1956 2015 — Dates
5 14829 — Area
6 A — Collect
7 B — Depth
8 C — Excav. Status
9 Artifacts

14 Features: # / type
15 W AO — Architecture: # / material / type

Printed on 6/24/2015 2:59:55 P

APPENDIX D

AGENCY AND PUBLIC COORDINATION

Moab City Wastewater Treatment Plan Relocation
Moab, Utah
Environmental Assessment Initial Public Scoping

June 23, 2015

Dear Interested Party,

This letter is to inform you that the City of Moab (City), under the direction and funding of the State of Utah Department of Environmental Quality, Division of Water Quality, is proposing to relocate the existing wastewater treatment plant to an adjacent parcel. The existing treatment plant is located at 1070 West and 400 North in Moab, Utah. The proposed location is directly to the south of the existing plant, on the southwest corner of 400 North and Stewart Lane, in Moab, Utah. The proposed parcel is currently owned by a private landowner.

Included on the back of this letter is an exhibit of the area with the location of the existing and proposed wastewater treatment plant. You are receiving this letter because your property is either located within 1,000 feet of the project or your agency/entity may require notification for this project.

The current treatment plant is approximately 3.5 acres in size and services all of Moab City as well the Grand Water & Sewer Service Agency (GWSSA). The City owns and operates the treatment plant and GWSSA contracts to send its collected wastewater for treatment and disposal. The new parcel with be approximately equal in size and will have the ability to treat additional wastewater as the City of Moab and GWSSA continues to grow in population.

Project Purpose and Need: The purpose of relocating the wastewater treatment plant is to replace aging infrastructure and improve water quality discharge to the Colorado River and adjacent wetlands. As population continues to grow within the Moab City boundaries as well as the Grand Water & Sewer Service Agency, the treatment system will need to meet future wastewater treatment demand due to population growth, meet the state and federal environmental regulations, and protect the facility from a 100-year flood event.

An Environmental Assessment will be prepared in compliance with the National Environmental Policy Act of 1969 (NEPA) to provide a decision-making framework that: 1) analyzes a reasonable range of alternatives to meet the project objectives; 2) evaluates potential issues and impacts to the new treatment plant location resources and values; and 3) identifies mitigation measures to lessen the degree or extent of these impacts.

Comments: The City of Moab encourages public participation throughout the NEPA process. An Environmental Assessment (EA) will be prepared by the City of Moab to evaluate the potential environmental, cultural, and socio-economic consequences of the relocation of the Moab City Wastewater Treatment Plant. The public and agencies have two opportunities to provide a formal comment: once during this initial project scoping and again following the release of the Draft Environmental Assessment.

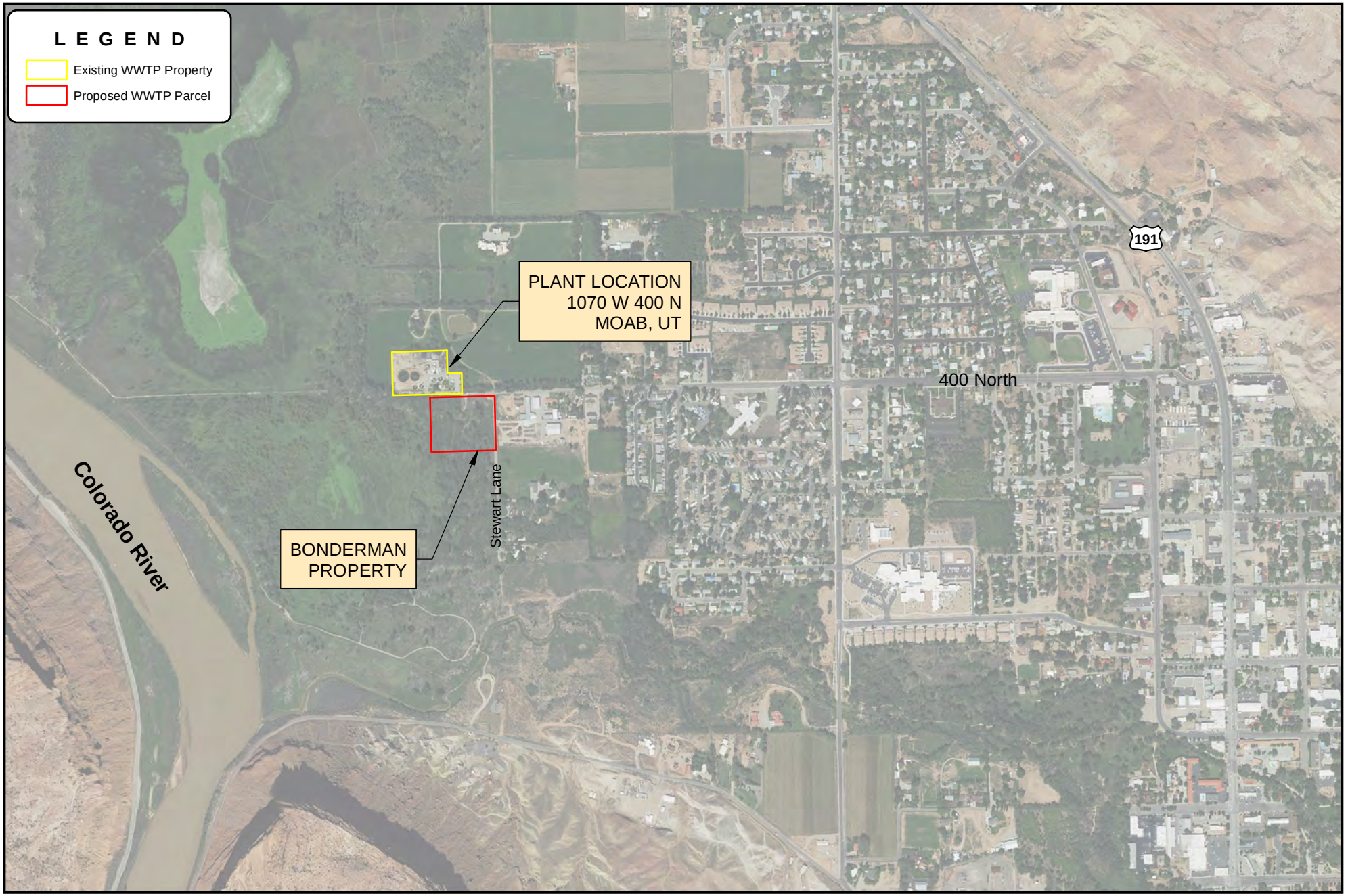
Comments should be received within 30 days from the date of this notification.
Please send comments to:

Moab City WWTP Relocation EA
Bowen Collins & Associates
Attention: Jamie Tsandes
154 East 14000 South
Draper, Utah 84020

We look forward to your participation!

Sincerely,

Jamie Tsandes, ASLA, PLA
Environmental Manager



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

City of Moab

MOAB WWTP RELOCATION PROJECT

SITE LOCATION MAP

Imagery: USDA 2014 NAIP

NORTH:

SCALE: 0 500 1,000 Feet

FIGURE NO. 1

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\Fig2_SiteLocationMap.mxd mdavis 5/25/2015

MOAB WWTP RELOCATION STAKEHOLDERS

Name			Title	Agency	City	State	Zip
FEDERAL							
Mr.	Mike	Pectol	Project Manager	US Army Corps of Engineers	Bountiful	UT	84010
Ms.	Dana	Allen	NEPA Compliance Sector Lead	US EPA	Denver	CO	80202-1129
Mr.	Larry	Crist	Field Supervisor	US Fish & Wildlife Service	West Valley City	UT	84119
STATE AGENCIES							
Mr.	Kenny	Wintch	State Lands Archeologist	School and Institutional Trust Lands Admin.	Salt Lake City	UT	84102
Ms.	LuAnn	Adams	Commissioner	Utah Department of Agriculture	Salt Lake City	UT	84114-6500
Ms.	Lori	Hunsaker	Deputy State Historic Preservation Officer	Utah Department of Community and Culture	Salt Lake City	UT	84101
Ms.	Barbara	Murphy	Deputy State Historic Preservation Officer	Utah Department of Community and Culture	Salt Lake City	UT	84101
Mr.	Walt	Baker	Division Director	Utah Department of Environmental Quality	Salt Lake City	UT	84114-4870
Mr.	Scott T.	Anderson	Director	Utah Department of Environmental Quality	Salt Lake City	UT	84114-4880
Mr.	Bryce	Bird	Division Director	Utah Department of Environmental Quality	Salt Lake City	UT	84114-4820
Mr.	Brad	Johnson	Deputy Director	Utah Department of Environmental Quality	Salt Lake City	UT	84114-4810
Mr.	Brian	Cottam	Director	Utah Department of Natural Resources	Salt Lake City	UT	84114-5703
Ms.	Laura	Ault	Sovereign Lands Program Coordinator	Utah Department of Natural Resources	Salt Lake City	UT	84114-5703
Mr.	Kent L.	Jones	Utah State Engineer	Utah Department of Natural Resources	Salt Lake City	UT	84114-6300
Mr.	Daniel	Eddington	Southeast Region Habitat Managaer	Utah Department of Natural Resources	Price	UT	84501
Mr.	Michael	Styler	Executive Director	Utah Department of Natural Resources	Salt Lake City	UT	84114-5610
Ms.	Judy	Watanabe	Deputy Director	Utah Department of Public Safety	Salt Lake City	UT	84114
Ms.	Sarah	Lindsey	Information Manager	Utah Natural Heritage Program	Salt Lake City	UT	84114-6301
TRIBES							
Ms.	Gari	Lafferty	Tribal Chairwoman		Cedar City	UT	84721
Ms.	Dorena	Martineau	Cultural Resource Representative		Cedar City	UT	84721
Mr.	Gordon	Howell	Chairman		Ft. Duchesne	UT	84026
Mr.	Gordon	Howell	Chairman		Ft. Duchesne	UT	84026
Mr.	Herman G.	Honanie	Chairman		Kykotsmovi	AZ	86039
Mr.	Leigh	Kuwanwisiwma	Director	Hopi Cultural Preservation Office	Kykotsmovi	AZ	86039
GRAND COUNTY							
Ms.	Elizabeth	Tubbs	Council Chair	Grand County Council	Moab	UT	84532
Mr.	Lynn	Jackson		Grand County Council	Moab	UT	84532
Mr.	Zacharia	Levine	Community Development Director	Grand County	Moab	UT	84532
MOAB CITY							
Ms.	Rebecca	Davidson	City Manager	Moab City	Moab	UT	84532
Mr.	Jeff	Foster	Public Works Director	Moab City	Moab	UT	84532
Mr.	Lloyd	Swenson	Water & Sewer Superintendent	Moab City	Moab	UT	84532
PRIVATE							
Ms.	Sandra	Bastian			Moab	UT	84532
	Blue Heron LLC				Jackson	WY	83001
	Dori	Bozung			Sarasota	FL	34236
Mr.	Jerry	Day			Moab	UT	84532
Mr.	Edward	Derderian			Castle Valley	UT	84532
Ms.	Bonnie	Eardley			Moab	UT	84532
Mr.	Stan	Holland			Moab	UT	84532
	Doris Ernestine Kelling Trustee				Moab	UT	84532
Mr.	Gary	McKinnon			Moab	UT	84532
	Moab 21 LLC				Fort Worth	TX	76102
	Moab Bit & Tool Co.				Moab	UT	84532
	Nature Conservancy				Salt Lake City	UT	84102
Ms.	Judy	Powers			Moab	UT	84532
Mr.	William	Randall			Moab	UT	84532
Ms.	Helene	Rohrcooley			Moab	UT	84532
Mr.	Steven	Rouzer			Moab	UT	84532
	Spah Family LTD				Moab	UT	84532
	Stewart Lane LLC				Fort Worth	TX	76102
	James & Mary	Walker			Moab	UT	84532
Mr.	John	Wesson			Kemmerer	WY	83101
	JB & Shannon	Wiggins			Moab	UT	84532
	Mitchell Williams Trustee				Moab	UT	84532
Mr.	William	Stevens			Moab	UT	84532

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

TECHNICAL MEMORANDUM No. 1

TO: Paul Abate and George Weekley
US Fish and Wildlife Service
Utah Ecological Services Field Office
2369 West Orton Circle, Suite 50
West Valley City, UT 84119

COPIES: DEQ - Bill Damery
Moab City – Rebecca Davidson and Phillip Bowman
BC&A - Jeff Beckman, BC&A

FROM: Jamie Tsandes, Environmental Manager
Bowen Collins & Associates
154 East 14000 South
Draper, Utah 84020

DATE: June 23, 2016

SUBJECT: Bonderman Property Existing Conditions

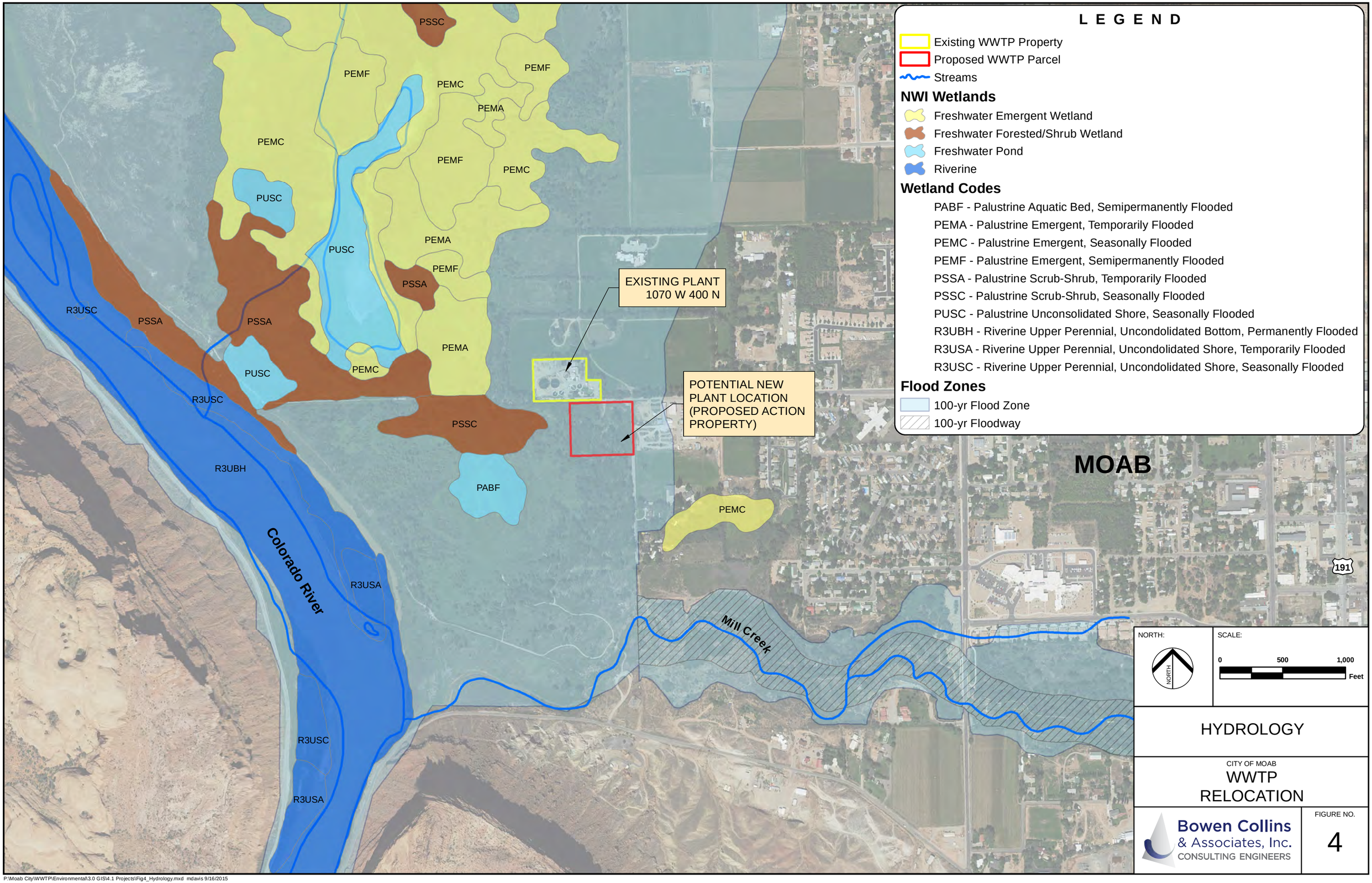
BACKGROUND

On June 22, 2016 a meeting was held between USFWS, Moab City, DEQ Water Quality and Bowen Collins & Associates to discuss the federal nexus and fish habitat impacts related to the proposed wastewater treatment plant in Moab, Utah. The plant is proposed to be located on the Bonderman property on the corner of Stewart Lane and 400 north, directly south of the existing treatment plant. The parcel is approximately 5 acres in size.

This memorandum has been prepared to explain the existing conditions on the Bonderman property and whether threatened and endangered fish could be impacted within this property boundaries. During the meeting, USFWS stated that habitat for fish is within the floodplain of the Colorado River. Although the parcel is inside of the 100 year floodplain, a berm was constructed more than 20 years ago that prevents this parcel from flooding. A survey of the berm is included in this memorandum as well as historical aerials to help illustrate the location of the berm.

It is our professional opinion that this parcel has a disconnect to the floodplain due to the existence of the berm as it relates to fish habitat. Following this page are the following maps:

1. Floodplain Map
2. Property Survey
3. Historical Aerials



HYDROLOGY

CITY OF MOAB
WWTP
RELOCATION

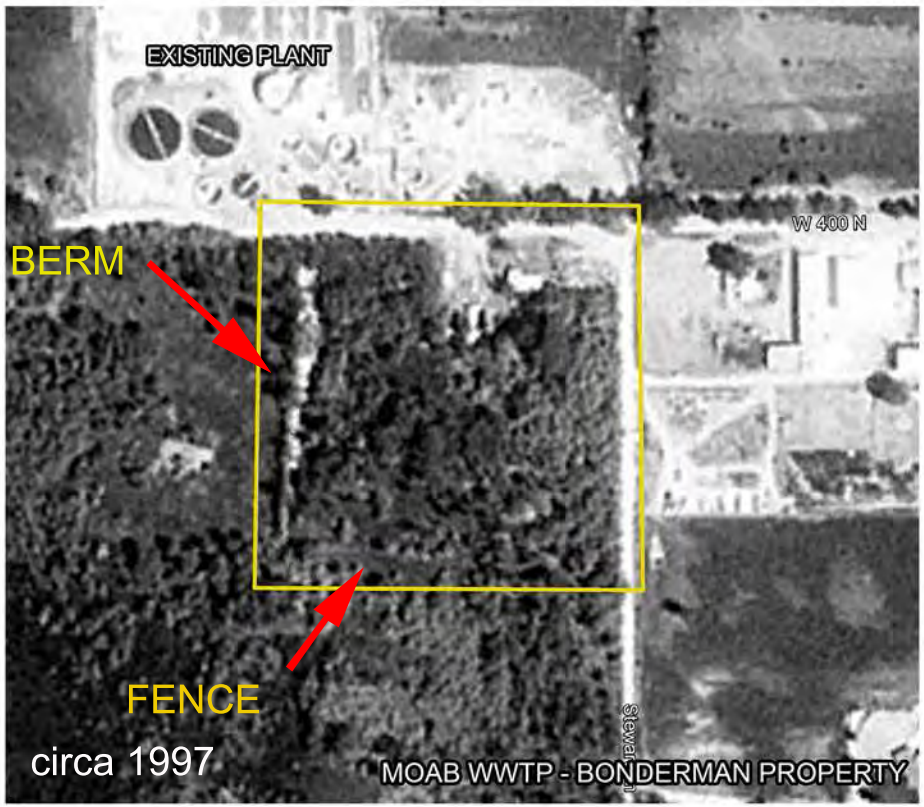
Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

FIGURE NO.
4

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\Fig4_Hydrology.mxd mdavis 9/16/2015


EXISTING PLANT
circa 1968
MOAB WWTP - BONDERMAN PROPERTY


EXISTING PLANT
NORTH
circa 1981
MOAB WWTP - BONDERMAN PROPERTY


EXISTING PLANT
W 400 N
BERM
FENCE
circa 1997
MOAB WWTP - BONDERMAN PROPERTY


EXISTING PLANT
circa 2013
MOAB WWTP - BONDERMAN PROPERTY

N

15 0 30 60
SCALE IN FEET

3' BERM

4' BERM

EXISTING FENCE

EXISTING
MOAB WWTP

BONDERMAN PROPERTY
(FUTURE TREATMENT PLANT SITE)

400 NORTH

STEWART LANE

MARTY S. & MITCHELL WILLIAMS
BK.314 PG.111

THE NATURE CONSERVANCY
BK.472 PG.257

SPAH FAMILY LTD.
BK.509 PG.418

SHARLENE ABBOT
BK.774 PG.946

3964 3965 3966 3967 3968 3969 3970

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING

CITY OF MOAB, UTAH
MOAB WATER RECLAMATION FACILITY
MOAB, UTAH

DESIGN — DESIGN —
REVIEW — CHECKED —
APPROVED —
DRAWN —

CIVIL

EXISTING CONDITIONS
BONDERMAN PROPERTY

DATE: JULY 2016
PROJECT NUMBER 130-15-04

DRAWING NO.
XX
SHEET XX OF X

P:\Moab City\WWTP\Environmental\4.0 Reports\6.0 Technical Memos\1301504_For USFWS.dwg Jun23,2016 - 9:31am

Jamie Tsandes

From: Weekley, George <george_weekley@fws.gov>
Sent: Friday, June 24, 2016 12:38 PM
To: Jamie Tsandes
Cc: Abate, Paul; pbowman@moabcity.org; Jeff Beckman; rdavidson@moabcity.org; Bill Damery (wdamery@utah.gov); Merissa Davis
Subject: Re: Moab Existing Conditions - Bonderman Property

Everyone,
Described below is my assessment of designated critical habitat for Colorado River fishes at the proposed Moab City wastewater treatment plant. Sorry for the long e-mail and please feel free to e-mail or call me if you have any questions.

1 MOAB WASTEWATER TREATMENT PLANT RELOCATION SITE COLORADO RIVER FISHES CRITICAL HABITAT ASSESSMENT

1.1 HABITAT DESCRIPTION

In the project area, the Colorado River and its 100-year floodplain is designated as critical habitat for Colorado pikeminnow (Ptychocheilus lucius), and razorback sucker (Xyrauchen texanus). Critical habitat is defined as specific geographic areas, whether occupied by a listed species or not, that are essential for its conservation and that are formally designated by rule. Concurrently with designating critical habitat, the Service identified physical and biological features (previously known as primary constituent elements) of the habitat. Physical or biological features are those features essential to the conservation of a species for which its designated or proposed critical habitat is based on, such as: space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species historic geographic and ecological distribution.

We identified water, physical habitat, and the biological environment as the physical and biological features of critical habitat for listed Colorado River fish species in the Federal Register (Vol. 59, No. 54, page 13374). Water includes a quantity of water of sufficient quality delivered to a specific location in accordance with a hydrologic regime required for the particular life stage for each species. The physical habitat includes areas of the Colorado River system that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, nursery, feeding, and rearing habitats. Food supply, predation, and competition are important elements of the biological environment.

1.2 HABITAT USAGE

Colorado pikeminnow and razorback sucker are adapted to a hydrologic cycle characterized by large spring peaks of snowmelt runoff and low, relatively stable base flows (U.S. Fish and Wildlife Service 2002a, b). High spring flows maintain channel and habitat diversity, flush sediments from spawning areas, rejuvenate food production, form gravel and cobble deposits used for spawning, and rejuvenate backwater nursery habitats (U.S. Fish and Wildlife Service 2002a, b).

Throughout most of the year, juvenile, subadult, and adult Colorado pikeminnow use relatively deep, low-velocity eddies, pools, and runs that occur in near-shore areas of main river channels (U.S. Fish and Wildlife

Service 2002a). Adults require pools, deep runs, and eddy habitats maintained by high spring flows. In spring, however, adults use floodplain habitats, flooded tributary mouths, flooded side canyons, and eddies that are available only during high flows. Newly hatched larval fish drift downstream to backwaters in sandy, alluvial regions, where they remain through most of their first year of life. Because of their mobility and environmental tolerances, adult Colorado pikeminnow are more widely distributed than other life stages.

Similar to Colorado pikeminnow, razorback sucker use a variety of habitats throughout their life cycle. Outside of the spawning season, adult razorback suckers occupy a variety of shoreline and main channel habitats including slow runs, shallow to deep pools, backwaters, eddies, and other relatively slow velocity areas associated with sand substrates (U.S. Fish and Wildlife Service 2002b). In spring and winter adult razorback sucker require deeper, low-velocity habitat, but are known to occupy shallow sandbars in summer. Reproductive activities are believed to take place in off-channel habitats and tributaries because razorback sucker aggregations were reported in these areas. Off-channel habitats are much warmer than the mainstem river and razorback suckers presumably move to these areas for spawning and other activities, such as, feeding, resting, or sexual maturation.

Off channel and floodplain habitat is also important to young razorback sucker. After hatching, razorback sucker larvae drift downstream to low-velocity floodplain or backwater nursery habitat. The absence of seasonally flooded riverine habitats is believed to be a limiting factor in the successful recruitment of razorback suckers in their native environment. Starvation of larval razorback suckers due to low zooplankton densities in the main channel and loss of floodplain habitats that provide adequate zooplankton densities for larvae food is one of the most important factors limiting recruitment.

1.3 STATUS OF CRITICAL HABITAT IN THE ACTION AREA

The immediate Project area is part of the critical habitat unit for Colorado pikeminnow and razorback sucker identified as essential for the species' recovery (U.S. Fish and Wildlife Service 2002a, 2002b). As discussed in the Federal Register (Vol. 59, No. 54, page 13378) designating critical habitat for Colorado River fishes, the 100-year flood plain is generally included as part of the critical habitat designation for Colorado River fishes; however, only those portions of the flood plain that contain the physical and biological features are considered part of the critical habitat. Specific areas in the flood plain can be evaluated on a case-by-case basis to determine if the area constitute critical habitat.

The discussion below outlines whether the proposed location for a new Moab City Wastewater Treatment Plant (also known as the Bonderman property) offers physical and biological features necessary for the survival and recovery of Colorado River fish:

Water – The proposed wastewater treatment plant relocation site was bermed over 20 years ago to isolate the property from the 100-year floodplain. While the area could potentially flood during high water events, there is no natural connection to the Colorado River in those situations. In addition, the property is of sufficient distance and elevation above the river that it will not alter the quantity and quality of water needed at this location or the hydrologic regime that may be required for Colorado River fishes that may reside in the area. The City proposes to further isolate the area by elevating the site through placement of fill. Therefore, Colorado pikeminnow and razorback sucker will be unable to access the property and use any physical habitat features or the biological environment on the property.

Physical Habitat – The proposed wastewater treatment plant relocation site will not physically alter the Colorado River channel. During a high water event, the property is located within bottom lands along the Colorado River and if inundated, side channels, secondary channels, oxbows or backwaters could form behind the berm and could provide spawning, nursery, feeding, and rearing habitats, or access to these habitats. However, berming of the site prevents any natural connection to the remainder of the

floodplain. Because fish cannot currently access the site, any physical habitat formed during high water events could not contribute to survival and recovery.

Biological Environment – The proposed location is adjacent to a riparian area and is vegetated with cottonwoods and other native and non-native vegetation. Therefore, the area can support a food supply or other elements of the biological environment needed by Colorado River fishes. However, berming has isolated the property from the Colorado River and currently provides no connection for Colorado River fish to access the site for feeding. Because of site isolation during flood events, the proposed location will not increase predation and competition, or allow for the support of introduced non-native fish species.

1.4 CONCLUSION

The proposed wastewater treatment plant relocation site is located within the FEMA 100-year flood plain delineation due to its relevant elevation. The site is isolated from adjacent floodplains through berming and during high water events, the site does not contribute any physical or biological features (water, physical habitat, or biological environment) essential for the conservation of endangered Colorado River fishes because of the lack of connection to the Colorado River and adjacent floodplains. Therefore, we believe the proposed wastewater treatment plant relocation site within the 100-year flood plain does not constitute critical habitat for Colorado pikeminnow and razorback sucker and construction of a wastewater treatment plant in that location will not affect designated critical habitat in the area.

1.5 LITERATURE CITED

U.S. Fish and Wildlife Service. 2002a. Colorado pikeminnow (Ptychocheilus lucius) Recovery Goals: amendment and supplement to the Colorado Squawfish Recovery Plan. Denver, Colorado: US Fish and Wildlife Service, Mountain-Prairie Region. 111 pages.

U.S. Fish and Wildlife Service. 2002b. Razorback Sucker (Xyrauchen texanus) Recovery Goals: amendment and supplement to the Razorback Sucker Recovery Plan. Denver, Colorado: US Fish and Wildlife Service, Mountain-Prairie Region. 113 pages.

George Weekley
Fisheries Biologist

US Fish and Wildlife Service
Utah Ecological Services Field Office
2369 West Orton Circle, Suite 50
West Valley City, UT 84119
(801) 975-3330 x-137

On Thu, Jun 23, 2016 at 11:32 AM, Jamie Tsandes <JTsandes@bowencollins.com> wrote:

> Hi Paul and George,
>
> As promised yesterday, attached is a determination that the Bonderman property has a disconnect to the floodplain of the Colorado River. As you can tell from some of the aerials, this property has been disturbed over the years. There have been cars and what appear to be temporary structures in the past. I only included 4

aerial photos to show the location of the berm, but over the past 15 years the site has been actively disturbed for storage, mobilization, clearing, etc. I can provide more aerials if you need, just let me know.

Also, if you agree with this determination please let us know. The City would like to mobilize and clear once we know we are okay with fish and bird habitat.

Thank you,

Jamie

Jamie Tsandes, PLA, ASLA

Environmental Manager

Landscape Architect

_____

Bowen Collins & Associates

801.495.2224 **Office**

154 E. 14000 South

Draper, Utah 84020

www.bowencollins.com

send me a file

APPENDIX E

PUBLIC AND AGENCY COMMENTS SUMMARY

Jamie Tsandes

From: Bill Stevens <trailgod1947@gmail.com>
Sent: Wednesday, July 29, 2015 6:55 PM
To: Moab WWTP
Subject: Moab City WWTP Relocation EA

Dear Jamie Tsandes:

I would like to comment on the proposed location for the Moab City WWTP Relocation. I am a property owner on Stewart Lane. Currently, one enters my property by using Stewart Lane -- and the sewer plant is not seen upon entry. With the proposed location, anyone (including a potential buyer) will drive right by the new sewer plant. I do believe that the new location is an economic impact upon all the Stewart Lane property owners. Our property values are sure to be lessened.

On the other hand, the relocation greatly benefits one person, Mr. Bonderman, by moving the plant further from his property. This poses an economic justice issue -- the less prosperous landowners on Stewart Lane will bear the cost, and the beneficiary of the action will be one of the wealthiest people in the United States.

I realize the need for a new sewer plant -- but I do question the need to alter the location. I imagine that Mr. Bondermann donated the property in order to get the plant further from his. What is to become of the old sewer plant property? At the very least, it should be put in public ownership -- I certainly hope it is not to be transferred to Mr. Bondermann.

I can propose a mitigation for the economic hardship that moving the plant will impose on Stewart Lane property owners. One idea is to figure out the price of the devaluation of our property, and to compensate us in terms of a cash payment. Another idea is to extend sewer service (at no cost) to the residents of Stewart Lane. We are being asked to bear the cost of the move in terms of devalued property values, and we are the only residents in the city of Moab that do not have sewer service. I realize that a lift may be needed -- but Stewart Lane property owners should be compensated in some way for the devaluation of our properties.

I would like to be notified of the availability of the EA so that I may comment on it. Please be sure to include the issues of property devaluation on Stewart Lane, any mitigations that can be extended to the impacted property owners, the issue of what is to be done with the old sewer site and the issue of Environmental Justice in that the move inordinately affects the less wealthy and benefits the very wealthy.

Thank you,

Katie Kessler Stevens
Moab, Utah

Jamie Tsandes

From: Eli Tome <etome@utah.gov>
Sent: Monday, August 17, 2015 8:51 AM
To: Moab WWTP
Cc: Laura Ault
Subject: Moab Wastewater Treatment Plant EA

Hello,

The State of Utah owns the lands situated below the ordinary high water mark of navigable bodies of water in Utah, including the bed of the Colorado River in Grand County. Such lands, known as state sovereign lands, were passed from the federal government to the state by virtue of the equal footing doctrine at the time of statehood and are held in trust for the use and enjoyment of the public.

The bed of the Colorado River within the identified project area is considered state-owned sovereign land, which is managed by the State of Utah through the Division of Forestry, Fire, and State Lands (FFSL). Any disturbance to or use of the bed and banks of the Colorado River requires prior authorization from FFSL. FFSL strongly recommends that the City of Moab contact FFSL prior to initiating any project activities.

FFSL does look forward to working with the City of Moab and Bowen Collins & Associates to ensure the proper permits and authorizations are in place for the proposed relocation of the Moab City Waste Water Treatment Plant. If you have any questions or need additional information, please contact Eli Tome at 435.210.0362 or etome@utah.gov.

Thanks,

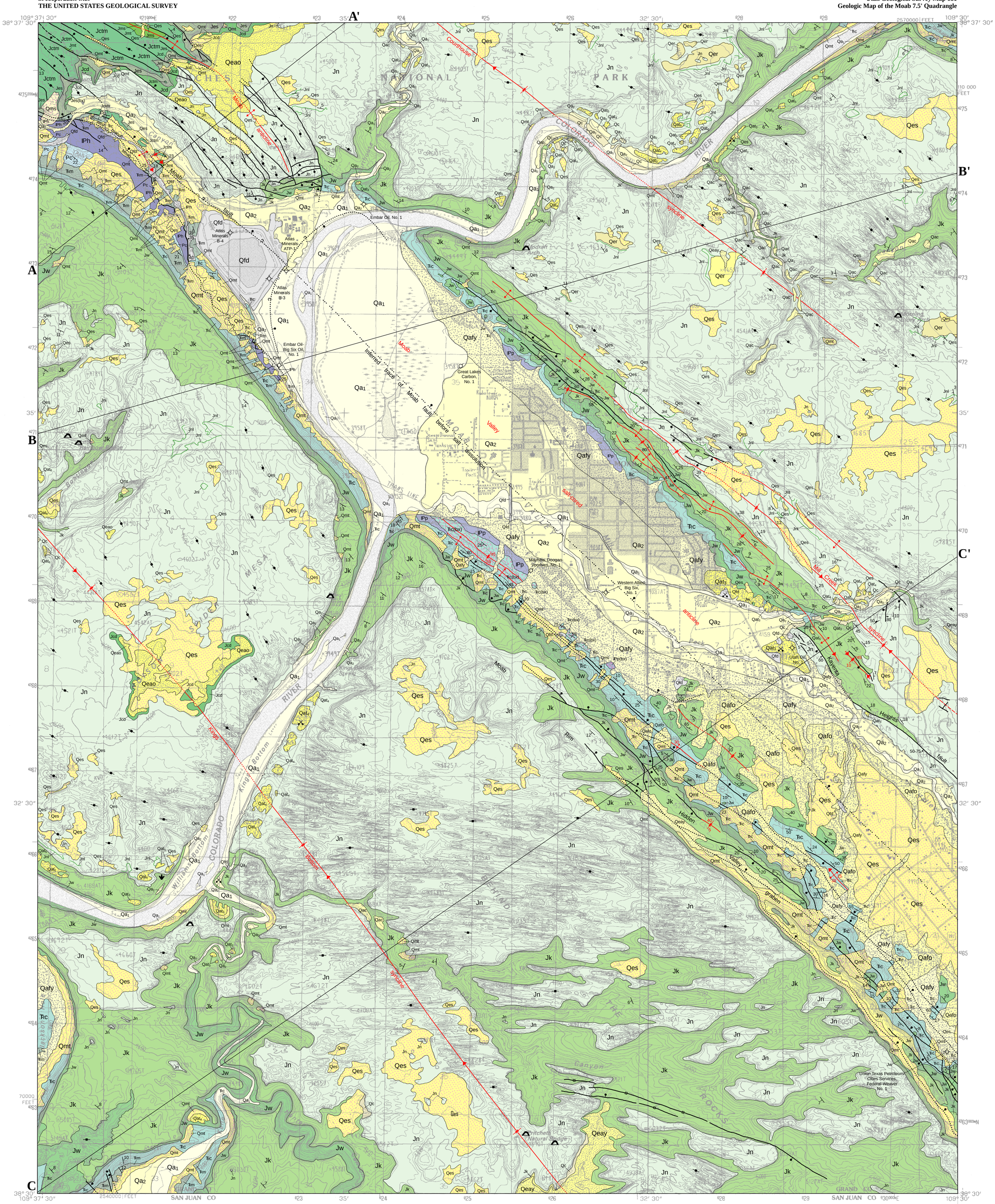
--
Eli Tome
(435) 210-0362
Southeast Sovereign Lands Coordinator
Utah Division of Forestry, Fire and State Lands
1165 South Highway 191, Suite 6
Moab, Utah 84532
etome@utah.gov

APPENDIX F

GEOLOGIC MAP OF MOAB

UTAH GEOLOGICAL SURVEY
UTAH DEPARTMENT OF NATURAL RESOURCES
in cooperation with
THE UNITED STATES GEOLOGICAL SURVEY

Plate 1
Utah Geological Survey Map 181
Geologic Map of the Moab 7.5' Quadrangle



Base from U.S. Geological Survey,
Moab 7.5' provisional quadrangle, 1985

Field work by Doelling north of Mill Creek and Colorado River, 1982, 1994 and 1995;
by Ross south of Mill Creek and Colorado River, 1993-1995;
and by Mulvey in Moab-Spanish Valley, 1993
Project Manager: Grant Willis

SCALE 1:24,000

1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

12°6'
215 mil
2002 MAGNETIC DECLINATION
AT CENTER OF SHEET

GEOLOGIC MAP OF THE MOAB 7.5' QUADRANGLE GRAND COUNTY, UTAH

by
Hellmut H. Doelling, Michael L. Ross, and William E. Mulvey

2002

UTAH GEOLOGICAL SURVEY
UTAH DEPARTMENT OF NATURAL RESOURCES
in cooperation with
THE UNITED STATES GEOLOGICAL SURVEY

Plate 2
Utah Geological Survey Map 181
Geologic Map of the Moab 7.5' Quadrangle

DESCRIPTION OF GEOLOGIC UNITS

Quaternary Deposits

Qa_1 — Modern alluvium (Holocene) - Poorly to well-sorted sand, silt, clay, and lenses of gravel in active channels and modern floodplains; as much as 20 feet (6 m) thick.

Qa_2 — Older alluvium (Holocene to upper Pleistocene) - Sand, silt, minor amounts of clay, and local gravel; contains a variety of locally derived and exotic clasts; forms first surface 10 to 50 feet (3-15 m) above modern floodplains and channels; some deposit surfaces are characterized by weak soil development; as much as 30 feet (9 m) thick.

Qat_3 Qat_4 Qat_5 Qat_6 — Alluvial-terrace deposits (Pleistocene) - Moderately sorted, poorly stratified gravel in a calcareous sandy matrix; contain a variety of locally derived and exotic clasts similar to Qa_2; preserved as isolated remnants along major drainages; Qat_3 gravels are found between 50 and 100 feet (15-30 m) above the present stream channels, some are capped by an eroded Stage II-III pedogenic carbonate soil; Qat_4 gravels are between 100 and 150 feet (30-45 m) above the present stream channels; Qat_5 gravels are between 200 to 240 feet (61-73 m) above the present stream channels; and Qat_6 gravels are between 260 to 280 feet (79-85 m) above the present stream channels; Qat_5 and Qat_6 clasts are distinguishable from those of lower terraces by a well-developed rind of desert varnish; Pleistocene; as much as 60 feet (18 m) thick.

Qabf — Basin-fill deposits (mostly Pleistocene) (cross section B-B' only) - Mostly alluvial deposits that fill Moab Valley; gravel, sand, silt, and minor amounts of clay encountered in drill holes; may exceed 450 feet (137 m) in thickness.

Qafy — Younger alluvial-fan deposits (Holocene to upper Pleistocene) - Poorly sorted, poorly stratified, muddy to sandy cobble gravel; most clasts are locally derived and range from angular to subrounded; in distal parts locally derived subangular clasts are mixed with rounded igneous porphyry clasts; present along northeast and southwest sides of Moab and Spanish Valleys; fans have dendritic drainage patterns; located at the base of cliffs or in gullies incised in older fan deposits (Qafo); as much as 20 feet (6 m) thick.

Qafo — Older alluvial-fan deposits (upper to middle Pleistocene) - Poorly sorted, poorly stratified, muddy to sandy cobble gravel; boulders present near cliffs; clasts are both locally derived and from the La Sal Mountains, and therefore range from angular to rounded; commonly covered by a mantle or veneer of sand (Qes or Qes/Qafo, respectively); fans are dissected and have limited fan morphology; present on divide between Moab and Spanish Valleys; as much as 40 feet (12 m) thick.

Qmt — Talus (Holocene to upper Pleistocene) - Angular boulders, cobbles, and smaller rock fragments commonly in a finer grained matrix; derived from rock falls and forms veneers to mantles on slopes below cliffs; commonly grades downslope into alluvial-fan deposits; as much as 20 feet (6 m) thick.

Qms — Landslide deposits (probably upper or uppermost middle Pleistocene) - Large mass of the Moab Member of the Curtis Formation that slid along a bedding-plane parting at its contact with the underlying Slick Rock Member; located in Moab Canyon north of U.S. Highway 191 near northwest corner of quadrangle; about 60 feet (20 m) thick.

Qc — Colluvium (Holocene) - Poorly sorted gravel, sand, and silt forming thin mantles on slopes; less than 6 feet (2 m) thick.

Qes — Eolian-sand deposits (Holocene) - Well-sorted, fine- to medium-grained, quartzose sand with silt; typically form thin, discontinuous sheets and small dunes, and locally fill hollows; locally as much as 30 feet (9 m) thick.

Qeay — Younger eolian and alluvial deposits (Holocene) - Mainly fine- to medium-grained sand mixed with silt and sparse lenses of granules and pebbles; accumulated and reworked by eolian and alluvial processes; generally thin and restricted to ephemeral washes and hollows on benches capped by Glen Canyon Group sandstone; larger deposits floor small valleys and narrow canyons; as much as 10 feet (3 m) thick.

Qeao — Older eolian and alluvial deposits (middle to lower Pleistocene) - Mainly sand and silt, but contain sparse lenses of rounded granules and pebbles and pedogenic carbonate rubble; sheet-like and locally preserved on mesas and benches; deposit on Poison Spider Mesa is capped by an eroded Stage V pedogenic carbonate; as much as 15 feet (5 m) thick.

Qer — Eolian and residual deposits (Holocene to upper Pleistocene) - Mostly a mix of yellow, tan, and reddish-orange, fine-grained sand and angular limestone rubble derived from carbonate units in the Navajo Sandstone (Jnl) on which they rest; mostly less than 3 feet (1 m) thick.

Qac — Alluvial and colluvial deposits (Holocene to upper Pleistocene) - Mainly sand, but commonly contain a poorly sorted mixture of pebbles, sand, silt, and clay; clasts are subrounded to angular; in ephemeral washes and on adjacent hillslopes where colluvium is reworked and transported by alluvial processes in active channels; as much as 10 feet (3 m) thick.

Qfd — Fill and disturbed deposits (historical) - Clay- to boulder-size material used as railroad and road fill; mostly sand-size mill tailings and fill at the Atlas Minerals mill site; gravel pits, and larger areas disturbed by development; variable thicknesses as much as 70 feet (21 m).

Jurassic Rocks

Jms — Salt Wash Member of Morrison Formation (Upper Jurassic) - Typically blocky ledges of pale-yellow-gray, cross-bedded sandstone interbedded with slope-forming, red and green mudstone and siltstone; only a small remnant is present in the northwest corner of the quadrangle; preserved thickness 30 feet (9 m).

Jmt — Tidwell Member of Morrison Formation and Summerville Formation(?) (Upper and Middle Jurassic) - Red to brown, thin-bedded, silty sandstone, muddy sandstone, siltstone, and shale containing thin to nodular beds of gray limestone; large white siliceous (chert) concretions are associated with the limestone; forms gentle slope littered with limestone and chert fragments; basal 6 to 12 feet (2-4 m) is brown to red, thin-bedded, fine-grained sandstone and siltstone that forms a steep slope that correlates with the Summerville Formation; contact between this steep slope and remainder of unit (Tidwell Member) may be the J-5 unconformity; total thickness about 40 to 50 feet (12-15 m).

Jctm — Curtis Formation, Moab Member (Middle Jurassic) (informal designation - see text) - Pale-gray-orange, pale yellow-brown, and light-gray, fine- to medium-grained, quartzose eolian sandstone; calcareous; forms massive cliff commonly with conspicuous joints; 60 to 100 feet (18-30 m) thick.

Jes — Entrada Sandstone, Slick Rock Member (Middle Jurassic) - Red-orange to brown, thick-bedded, cross-bedded, quartzose eolian sandstone; very fine to fine grained with medium to coarse grains along cross-bed laminae; iron-oxide or calcium-carbonate cemented; forms smooth cliffs and bare rock slopes; estimated thickness 250 feet (76 m).

Jcd — Carmel Formation, Dewey Bridge Member (Middle Jurassic) (formerly member of Entrada Sandstone - see text) - Red-brown, muddy to silty, fine- to medium-grained sandstone; iron-oxide or calcium-carbonate cemented; medium to thick bedded; weathers to distinct irregular and contorted rounded ledges; basal contact is the J-2 unconformity; 90 to 110 feet (27-34 m) thick.

Glen Canyon Group (Jn, Jk, Jw)

Jn / Jnl — Navajo Sandstone (Lower Jurassic) - Pale-orange to light-gray to red-orange, fine-grained, quartzose eolian sandstone; calcareous and silica cemented; medium to massively bedded, commonly with large-scale sweeping cross-beds; locally contains thin, gray, cherty, sandy carbonate beds (Jnl); forms smooth vertical cliffs and rounded knolls; 300 to 700 feet (91-213 m) thick.

Jk — Kayenta Formation (Lower Jurassic) - Moderate-orange-pink and red-purple sandstone, interbedded with dark-red-brown to gray-red siltstone and lesser red intraformational conglomerate and mudstone; sandstones mainly lithic arkose to feldspathic litharenite; mainly of fluvial origin; calcareous cement; pink-orange eolian sandstone beds are conspicuous in upper part; forms thick-bedded, step-like, resistant ledges and steep slopes; 250 to 400 feet (76-122 m) thick.

Jw — Wingate Sandstone (Lower Jurassic) - Gray-orange-pink, gray-orange, and moderate-orange-pink to pale-red-brown, very fine- to fine-grained, quartzose to subarkosic, eolian sandstone; calcareous and siliceous; commonly forms massive cliffs along canyon walls or blocky cliffs where fractured; cliff surfaces commonly streaked with dark-brown desert varnish; 250 to 400 feet (76-122 m) thick.

Triassic Rocks

Trc — Chinle Formation (Upper Triassic) - Red-brown to gray-red, interbedded sandstone, conglomeratic sandstone, siltstone, and mudstone; lenticular and planar sandstone and conglomeratic sandstone are calcareous to quartzose and fine to coarse grained; indistinctly bedded bentonitic and calcareous mudstones form steep slopes separated by ledges and cliffs of sandstone and conglomeratic sandstone; two informal, unmapped members -- a discontinuous lower member of quartzose sandstone and mottled siltstone and mudstone, and an upper member that consists of a lower slope former, middle ledge former, upper slope former, and upper ledge former made up of planar flat beds of possible eolian origin; 100 to 700 feet (30-213 m) thick.

Trm — Moenkopi Formation (Lower Triassic) - Light- to dark-brown ("chocolate"brown), interbedded, largely fine-grained, micaceous sandstone, siltstone, mudstone, and shale; sandstone is commonly ripple marked; forms slopes separated by medium to thin continuous ledges; locally contains distinct pebble conglomerate near base; 0 to 750 feet (0-229 m) thick.

Permian Rocks

Pc — Cutler Formation (Lower Permian) - Red-purple, arkosic fluvial sandstone and conglomeratic sandstone interbedded with red to red-orange, eolian sandstone; medium to thick bedded; thin beds of red-purple siltstone and light-gray, fossiliferous limestone in lower part; forms steep slopes, ledges, and cliffs; 0 to 600 feet (0-183 m) thick at the surface; may be as thick as 5,000 feet (1,524 m) in subsurface due to salt movement.

Pennsylvanian Rocks

lPh — Honaker Trail Formation (Upper Pennsylvanian - Missourian-Virgilian) - Light-gray, gray-pink, gray-purple, and gray-brown interbedded sandstone, limestone, and siltstone; sandstone is fine grained and quartzose, limestone is argillaceous and fossiliferous, siltstone is commonly micaceous; thin to thick bedded; forms ledges; exposed thickness may be as much as 700 feet (213 m); subsurface thickness variable due to salt movement, but may be as much as 2,700 feet (823 m) thick.

lPp — Paradox Formation (Middle Pennsylvanian - Desmoinesian) - Gray, sucrosic gypsum, gypsiferous claystone, gray to black shale, with subordinate fragments of gray, silty sandstone and carbonates as cap rock; contains cyclically bedded evaporite, dolomite, shale, and clastic beds in the subsurface; thickness highly variable due to salt movement, estimated cap rock thickness as much as 700 feet (213 m), estimated height of Moab salt diapir at least 9,000 feet (2,743 m) reaching a maximum width of 2 miles (3.2 km).

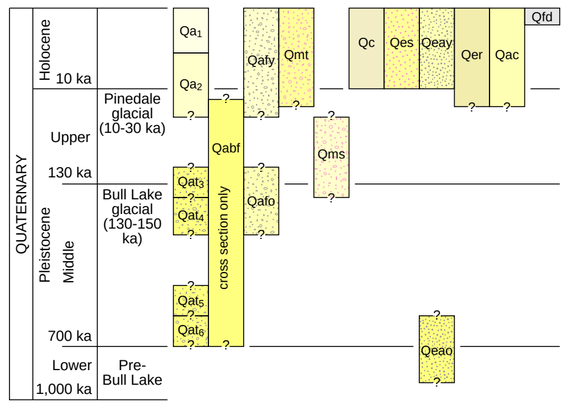
Subsurface Rocks

lPpt — Pinkerton Trail Formation (Middle Pennsylvanian) - (shown on cross sections)

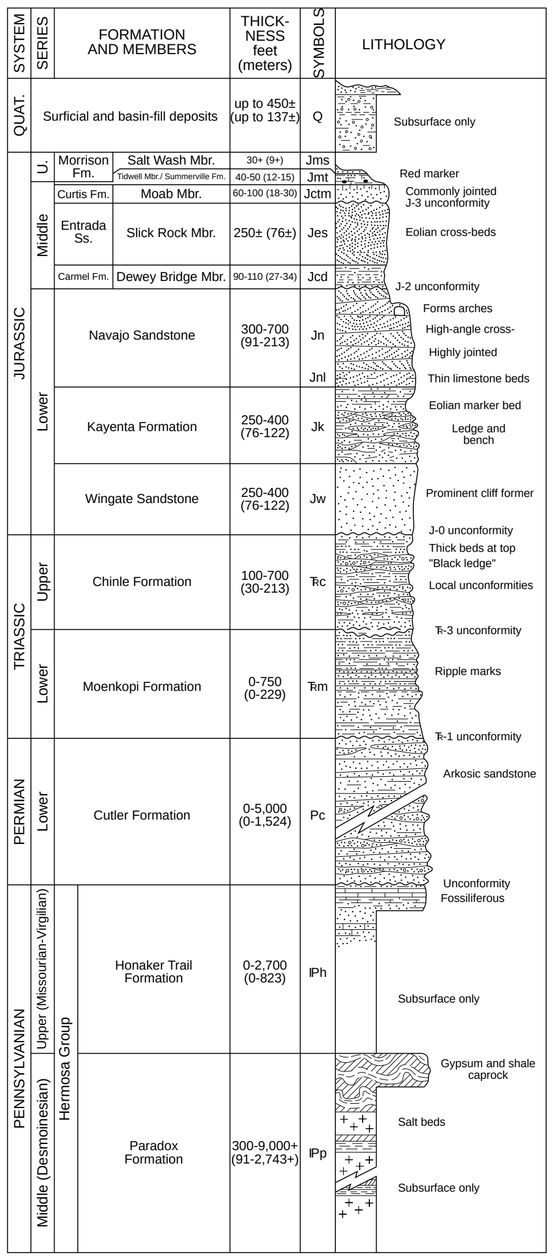
lPm — Molas Formation (Middle Pennsylvanian) - (shown on cross sections)

M — Mississippian rocks (shown on cross sections)

CORRELATION OF GEOLOGIC UNITS

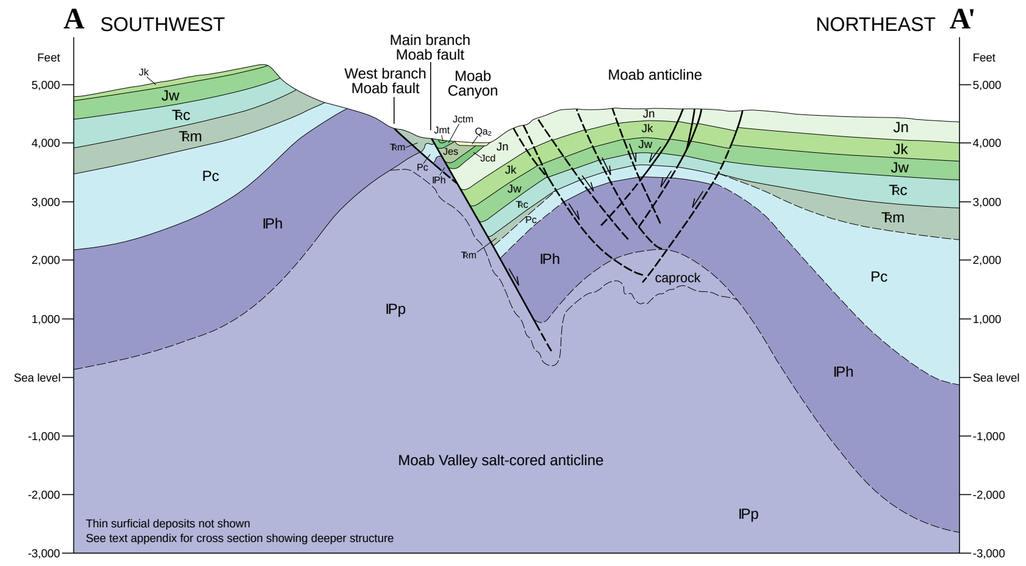


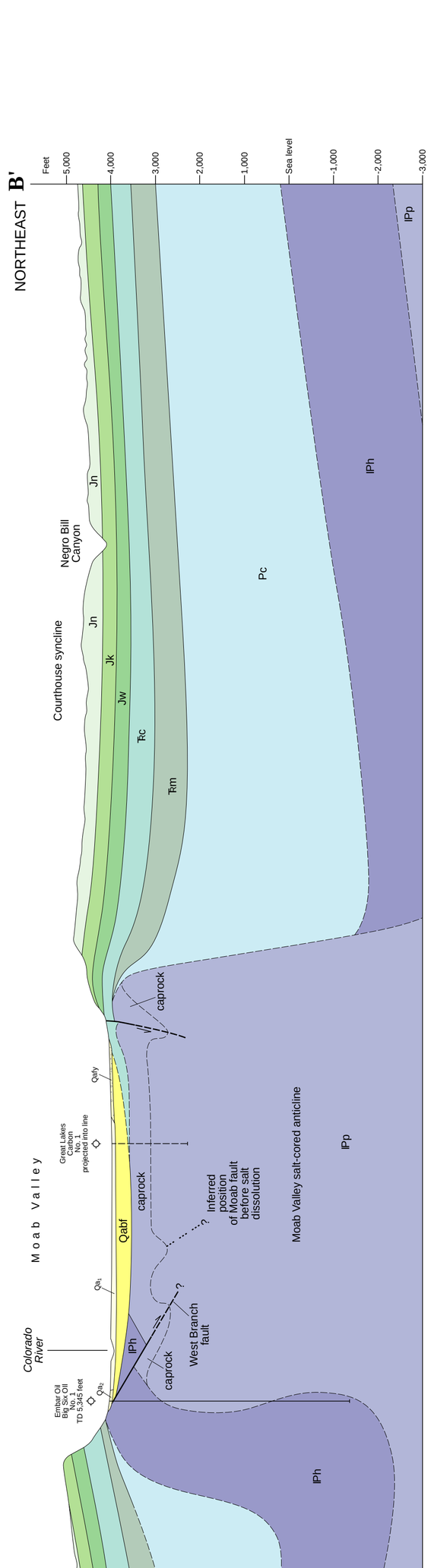
LITHOLOGIC COLUMN

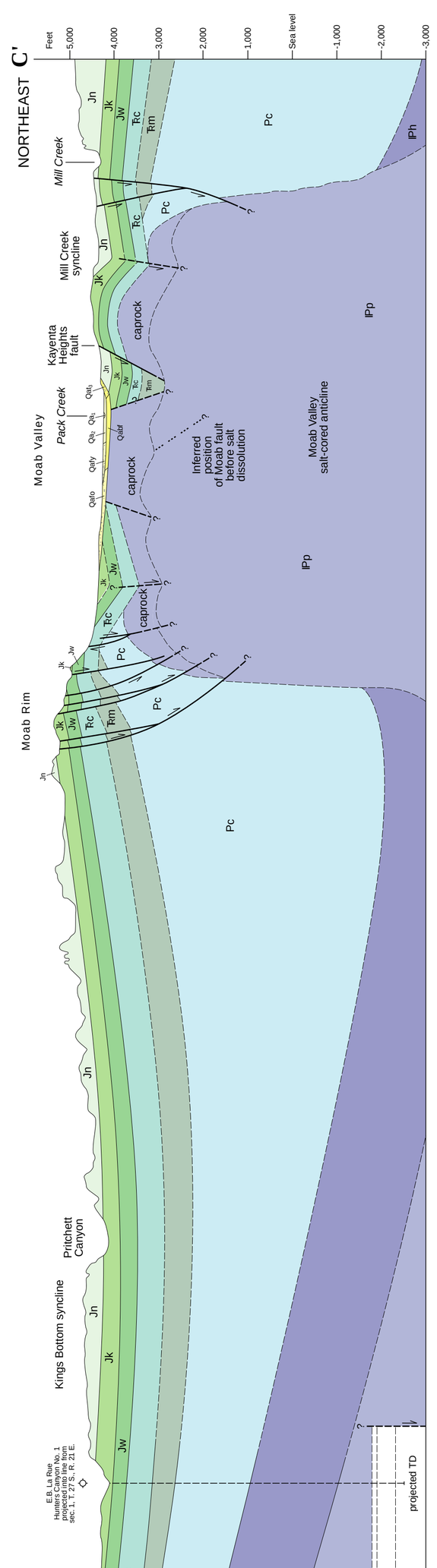


SYMBOLS

- Contact - Dashed where inferred
- Fault - Dashed where inferred, dotted where covered, bar and ball on downthrown block where known, arrow and number indicate dip and dip direction of fault, arrows on cross section show offset, queried where existence uncertain
- Inferred trace of Moab fault prior to salt dissolution
- Axial trace of anticline - Dotted where covered, large arrow shows plunge and numbers are dips of bedding on limbs
- Axial trace of syncline - Dashed where inferred, dotted where covered, large arrow shows plunge and numbers are dips of bedding on limbs
- Axial trace of monocline - Dotted where covered, small arrows show dip of beds
- Near-vertical fracture with minor brecciation
- Strike and dip of beds, inclined
- Strike of near-vertical joints
- Adit
- Dry hole, abandoned (see table 2)
- Gas injection, disposal, or brine well (see table 2)
- Shallow borehole (only holes referred to in text figure 7 shown)
- Gravel pit
- Natural stone arch or bridge
- Dinosaur trackway
- Trc(bx) — Brecciated rock (bx) - Pattern over affected unit added to map unit label







APPENDIX G

MOAB 7.5’ QUADRANGLE

USGS
science for a changing world

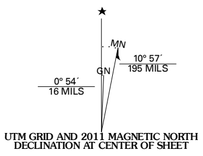
U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

The National Map
US Topo

MOAB QUADRANGLE
UTAH
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 12S
10 000-foot ticks: Utah Coordinate System of 1983
(central zone)

Imagery.....NAIP, July 2009
Roads.....©2006-2010 Tele Atlas
Names.....GNIS, 2009
Hydrography.....National Hydrography Dataset, 2009
Contours.....National Elevation Dataset, 2000



UTM GRID AND 2011 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
XH
Grid Zone Designation
12S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 40 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with version 0.5.10 of the
draft USGS Standards for 7.5-Minute Quadrangle Maps.
A metadata file associated with this product is draft version 0.5.11

QUADRANGLE LOCATION

Merrimac Butte	The Windows Section	Big Bend
Gold Bar Canyon	Moab	Rill Creek
Shafer Basin	Trough Springs Canyon	Kane Springs

ADJOINING 7.5' QUADRANGLES

ROAD CLASSIFICATION

Interstate Route
US Route
Ramp
State Route
Local Road
4WD

Interstate Route US Route State Route

MOAB, UT
2011

APPENDIX H

STATE OF UTAH HISTORIC PRESERVATION OFFICE MEMORANDUM OF AGREEMENT

MEMORANDUM OF AGREEMENT
BETWEEN
THE UTAH DIVISION OF WATER QUALITY, THE CITY OF MOAB, AND THE UTAH STATE HISTORIC PRESERVATION OFFICER
REGARDING THE WASTEWATER TREATMENT PLANT PROJECT
IN MOAB, UTAH

WHEREAS, the Sate Revolving Fund Program (SRF) in the Utah Division of Water Quality (the DWQ) , utilizing funding from the Environmental Protection Agency (EPA), plans to demolish existing buildings and structures at the historic Waste Water Treatment Plant (WWTP) in Moab Utah as part of developing a new WWTP to serve the community; and

WHEREAS, the use of EPA funding makes the Project an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, and its implementing regulations, 36 CFR Part 800; and

WHEREAS, EPA has designated the DWQ as the Responsible Entity for carrying out the Section 106 review; and

WHEREAS, the DWQ has determined that the undertaking would have an adverse effect on the historic WWTP (42GR5168), which is eligible for listing on the National Register of Historic Places, and has consulted with the Utah State Historic Preservation Officer (SHPO) and other consulting parties pursuant to 36 CFR Part 800; and

WHEREAS, the City of Moab (the City) will receive the federal funding through the DWQ and is assigned the responsibility for implementing the mitigation stipulations outlined herein; and

WHEREAS, the DWQ, in accordance with 36 CFR § 800.6(a)(1), has notified the Advisory Council on Historic Preservation (ACHP) of its adverse effect determination, and the ACHP has chosen not to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii);

NOW, THEREFORE, the DWQ, SHPO, and City agree that the undertaking shall be implemented in accordance with the following stipulations to take into account the effect of the undertaking on historic properties.

STIPULATIONS

The DWQ, in consultation with the signatories to this MOA, and other consulting parties as appropriate shall ensure the following measures to resolve the adverse effects identified herein.

I. **RESOURCE DOCUMENTATION:** The DWQ shall ensure the following documentation of affected resources is carried out prior to any physical disturbance of the historic WWTP (42GR5168). The DWQ delegates the responsibility for obtaining

the documentation to the City but retains ultimate authority and responsibility as the distributor of federal funds to ensuring the measures below are implemented.

A. Resource Description and Historical Narrative: An Intensive Level Survey (ILS) packet shall be prepared for the historic WWTP. The packet shall include: brief architectural and engineering descriptions of the affected buildings and structures; a narrative history of the plant; and a discussion of the operational nature of the plant—i.e., how it functioned.

B. Photo-documentation: Photographs shall be obtained of all historical above-ground buildings and features of the historic WWTP. Overview images as well as pictures of architectural and engineering details shall be provided. Photographs may be obtained using digital cameras provided the resolution of all photographs is consistent with current Utah SHPO Preservation Department standards. Photos shall be produced in lab-printed hard copies (1 set) for submittal with the final documentation packet to the SHPO. Digital images will be burned onto an archival CD and submitted as well.

C. Mapping: A minimum of two maps will be prepared for the documentation packet. One map will provide an overview locating the historic WWTP relative to the city of Moab. The second will provide a plan view of the plant, illustrating the location of historic buildings and features to each other. Additional maps, as needed, are encouraged to help illustrate the functional nature of the plant.

D. Repositories: One (1) hard copy of the final documentation packet shall be submitted to each of the repositories listed below. For repositories other than the SHPO, a copy of the documentation packet shall be offered to the repository but the DWQ and City of Moab shall still be considered in compliance with this MOA if a repository declines to accept the submittal.

i. Utah SHPO, Salt Lake City—must include lab-printed photographs and archival CD(s) with digital photographs (if obtained)

ii. University of Utah Marriott Library Special Collections Department, Salt Lake City

iii. Grand County Public Library, Moab

II. AUTHORIZATION TO PROCEED WITH DEMOLITION: Upon completion of the on-site component of the documentation—i.e., photographs and mapping—and confirmation that all relevant data obtained on-site is of appropriate quality and represents a complete documentation of the affected resource, the DWQ may authorize demolition of the historic WWTP to proceed. The DWQ or City will provide a courtesy notification to the SHPO that said demolition is proceeding.

III. APPLICABILITY

The provisions of this MOA shall be applicable to the DWQ and any third parties contracted by the DWQ or with funding or approval from the DWQ to engage in any physical alteration or disturbance of the historical WWTP, as defined by the current limits of all related historical buildings and structures. The provisions apply, by extension, to any third party contractors hired by the City to implement the WWTP improvements.

IV. DURATION

This MOA will expire if its stipulations are not carried out within 2 years from the date of its execution. At such time, and prior to any demolition or physical alteration continuing at the historic WWTP, the DWQ shall either (a) execute a new MOA pursuant to 36 CFR § 800.6 or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. Prior to such time, the DWQ may consult with the other signatories to reconsider the terms of the MOA and amend it in accordance with Stipulation VII, below. Amendments may include extension of the MOA's duration. The DWQ shall notify the other signatories as to the course of action it will pursue.

V. POST-REVIEW DISCOVERIES

If potential historic properties (i.e., eligible prehistoric or historic resources) are discovered during actions not addressed in Stipulation I, or if unanticipated effects to historic properties are identified after execution of this MOA, the DWQ and City shall ensure the following actions are taken.

A. All construction operations within the vicinity (minimum 100-foot buffer) of the discovery or unanticipated effect shall cease immediately, unless doing so would result in unsafe work conditions. If unsafe conditions are present, they shall immediately be made safe with the least amount of disturbance to the discovery, and then construction operations in the vicinity shall cease.

B. The discovery shall be protected from damage, theft, or other harm while the remaining procedures of this stipulation are carried out.

C. The DWQ's or City's designated representative shall notify the SHPO of the discovery in a timely manner.

D. The DWQ's or City's designated representative shall consult with a qualified historian or archaeologist, as appropriate to the discovery in question, to advise the DWQ and the SHPO regarding the significance and recommended disposition of the discovery.

E. The DWQ shall consult with the SHPO in accordance with 36 CFR § 800.13(b)(3) toward developing and implementing an appropriate treatment of the discovery prior to resuming construction operations in the vicinity of the

discovery. The SHPO shall respond to notification of the discovery and request for consultation regarding its treatment within five (5) calendar days; however, the time necessary for the SHPO consultation shall depend on the nature and condition of the discovery and the completeness of information about the discovery provided by the DWQ. Construction activity in the vicinity of the discovery shall not resume until such time as mitigation of historic properties is agreed upon by the DWQ and the SHPO.

i. If the discovery is an isolated artifact, an isolated set of fewer than 10 artifacts, or a collection of artifacts that appear to be removed from their original context, the qualified historian or archaeologist shall document the discovery appropriately, and construction shall be allowed to proceed without further consultation and no treatment plan shall be required.

ii. Should human remains be discovered during construction on non-federal lands, the relevant sections of the Utah Code shall apply; including but not limited to 9-8-309 and 9-9-403.

1. All project-related ground disturbing activity within 300 feet of the discovery shall cease immediately. The DWQ or City shall notify the Moab City Police or coroner as soon as practicable for instructions regarding disposition of the discovery.

2. The DWQ and City shall ensure the discovery is protected against additional disturbance or damage, looting, or other inappropriate activity until relieved of said responsibility by law enforcement or the coroner.

3. Upon authorization from law enforcement, the DWQ or City shall notify the SHPO and the Utah State Forensic Anthropologist.

VI. DISPUTE RESOLUTION

Should any signatory to this MOA object at any time to any actions proposed or the manner in which the terms of this MOA are implemented, the signatory shall notify the DWQ in writing of its objection. The DWQ shall notify all other signatories of the objection and consult with the objecting party to resolve the dispute. If the objection is resolved through this consultation, the DWQ shall notify all other signatories of the nature of the resolution. If the DWQ determines the objection cannot be resolved through consultation with the objecting party, the DWQ shall:

A. Forward all documentation relevant to the dispute, including the DWQ's proposed resolution, to the ACHP. The ACHP shall provide the DWQ with its advice on the resolution of the objection within thirty (30) calendar days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the DWQ shall prepare a written response that takes into account any advice or comments

regarding the dispute received from the ACHP in response to consultation with said agency. The written response shall also take into account comments received from the signatories to the MOA and other consulting parties who may have been engaged to address the objection. The DWQ shall provide all such signatories and parties with a copy of the written response prior to proceeding according to its final decision.

B. If the ACHP does not provide its advice regarding the dispute within thirty (30) calendar days of receiving adequate documentation, the DWQ may make its final decision on the dispute and proceed accordingly. Prior to reaching the final decision, the DWQ shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories to the MOA and other consulting parties, as appropriate, and provide them with a copy of said response.

C. The DWQ's responsibility to carry out all other actions subject to the terms of this MOA that are not the subject of the dispute shall remain unchanged.

VII. AMENDMENTS

This MOA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

VIII. TERMINATION

If any signatory to this MOA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment pursuant to Stipulation VII, above. If an amendment cannot be reached within thirty (30) calendar days (or another time period agreed to by all signatories), any signatory may terminate the MOA upon written notification to the other signatories.

Once the MOA is terminated, and prior to any work continuing on the undertaking, the DWQ must either (a) execute a new MOA pursuant to 36 CFR § 800.6, or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. The DWQ shall notify the signatories as to the course of action it will pursue regarding resolution of the termination.

SIGNATORIES

Execution of this MOA by the signatories and implementation of its terms shall constitute evidence that the DWQ has taken into account the effects of the Project on historic properties and has afforded to Utah SHPO and ACHP an opportunity to comment.

UTAH DIVISION OF WATER QUALITY

Date 16 July 2016

Walt L. Baker, P.E., Director of the Utah Division of Water Quality

CITY OF MOAB

Date June 20, 2016

Rebecca Davidson, Moab City Manager

UTAH STATE HISTORIC PRESERVATION OFFICE

Date 7.21.16

Roger Roper, Deputy State Historic Preservation Officer

APPENDIX I

YELLOW-BILLED CUCKOO SURVEY RESULTS

State of Utah
GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

☐ Concur No Effect
Species:

☒ Concur Not Likely to Adversely Affect
Species: YBCU ; Razorback

☐ No Comment Bicker ; pike-minnow

U.S. FWS Utah Field Supervisor

Date 10/14/2016

RECEIVED
OCT 2016

Amy Defreese
George Weekly
U.S. Fish & Wildlife Service
Utah Ecological Services Field Office
2369 W Orton Circle
West Valley City, UT
84119

Dear Ms. Defreese and Mr. Weekley,

The Division of Water Quality (Division) and the City of Moab is proposing a new wastewater reclamation facility (WRF) to be located on the Moab City owned property located on the southwest corner of Stewart Lane and 400 North, directly south of the existing treatment plant. The property is approximately 5 acres in size. In accordance with the Endangered Species Act (ESA) of 1973, the City of Moab contracted with Bowen Collins & Associates to conduct a suitable habitat evaluation and species surveys from July to August 2016 for the Yellow-billed Cuckoo (*Coccyzus americanus*) within ½ miles radius of the property in order to determine whether the bird is using the site. Additionally, the Division provided the US Fish and Wildlife Service (USFWS) water quality data regarding the State of Utah Water Quality Standards in a letter dated July 28, 2016, attached, concerning the discharge of the new water reclamation facility into the Colorado River with regards to critical fish habitat for the Colorado pikeminnow (*Ptychocheilus lucius*), and razorback sucker (*Xyrauchen texanus*).

The project area and a ½ mile buffer was evaluated for yellow-billed cuckoo suitable habitat using aerial photography and ground-truthing by referencing the USFWS Yellow-billed Cuckoo 2015 guidelines. Approximately 3 acres of suitable nesting habitat was identified in the 5-acre project site. Additional suitable nesting and suitable migratory habitat exists in areas outside the project site, but within the ½ mile buffer (see Figure 3 of attached Technical Memorandum. Species surveys were conducted within suitable nesting and migratory habitat within the project site and ½ mile buffer. The results of the Yellow-billed Cuckoo survey were negative for nesting birds, but a possibility exists that migrating birds could use habitat at the project site and in adjacent areas.

The City of Moab proposes to clear and develop approximately 1.5 acres of suitable cuckoo habitat within the 5-acre project site. To mitigate for impacts to western yellow-billed cuckoo, the City of Moab will implement the following Conservation Measures:

1. All vegetation removal, grading and site preparation will be complete by May 31, 2017.
2. Construction and human activity at the project site will continue without interruption up until, and through, the western yellow-billed cuckoo nesting season (June 1 – August 31).
3. Compensatory mitigation for lost cuckoo suitable habitat will be implemented at a 2:1 ratio. Three acres of suitable cuckoo habitat will be created on the existing treatment plant site once

construction of the new WRF is complete and operational and demolition of the existing treatment plant is complete. The mitigation site will be re-vegetated with cottonwood and willow species, and seeded with native grasses and/or herbaceous vegetation. Attached is a technical memorandum that further explains the compensatory mitigation proposal.

Water quality standards for the new WRF will comply with the Stater of Utah applicable public and ecological health discharge requirements, this is a statewide requirement for all wastewater treatment facilities. Information regarding Moab's existing treatment plant wasteload analysis, draft anti-degradation review and the Environmental Protection Agency's guidelines (adopted by Utah) for protecting aquatic life for toxic pollutants under Section 304(a) of the Clean Water Act can be found attached to this letter. The effluent of the new WRF is expected to have higher quality than the existing, therefore, adverse impacts to the Colorado pikeminnow or the razorback sucker are not expected.

Migratory bird habitat exists at the project site, and in the adjacent areas. To avoid and minimize take of migratory birds under the Migratory Bird Treaty Act, the City of Moab will implement the following conservation measures:

1. All vegetation removal, grading and site preparation at the project site will be complete before January 2017.
2. If vegetation removal, grading and site preparation must continue beyond January 2017, work will cease until site-specific surveys for nesting birds can be performed by a qualified biologist. Established nests with eggs or young cannot be moved, and the birds cannot be harassed (see b., above), until young have fledged and are capable of leaving the nest site.
3. If nesting birds are found during the survey, appropriate spatial buffers will be established around nests. Vegetation treatments or ground-disturbing activities within the buffer areas should be postponed until the birds have left the nest. Confirmation that young have fledged should be made by a qualified biologist.

We have determined that based on the implementation of the afore-mentioned conservation measures for western yellow-billed cuckoo, the proposed project "may affect, but is not likely to adversely affect" the species. Additionally, based on the State of Utah water quality standards and anticipated improvement of the effluent from the new WRF, it has been determined that the proposed project "may affect, but not likely to adversely affect" the Colorado pikeminnow or the razorback sucker.

In accordance with the ESA, we request your concurrence with our determination. If you have any questions please feel free to contact me at (801) 536-4354.

Sincerely,

Bill Damery

Bill Damery, P.G.

cc: Phillip Bowman, Moab City
Jamie Tsandes, Bowen Collins & Associates
Jeff Beckman, Bowen Collins & Associates

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

TECHNICAL MEMORANDUM No. 2

TO: Bill Damery, PG, NEPA Manager
State of Utah DEQ
195 N 1950 W
Salt Lake City, UT 84116

Amy Defreese, Ecologist
U.S. Fish and Wildlife Service
Utah Field Office
2369 W. Orton Circle, Suite 50
West Valley City, Utah 84119

COPIES: Moab City –Phillip Bowman
BC&A - Jeff Beckman, BC&A

FROM: Jamie Tsandes, PLA, Environmental Manager
Merissa Davis, Biologist
Bowen Collins & Associates
154 East 14000 South
Draper, Utah 84020

DATE: October 3, 2016

SUBJECT: City Owned Property Yellow-billed Cuckoo Surveys, Moab, Utah

BACKGROUND

A new water reclamation facility (WRF) is proposed to be located on the Moab City owned property located on the southwest corner of Stewart Lane and 400 North, directly south of the existing treatment plant. The parcel is approximately 5 acres in size and is partially forested by tall cottonwoods in the over-story, a mid-story of Russian olives, and an understory of various grasses and forbs. Approximately three-quarters of the property is dominated by trees while the remaining one-quarter is predominantly grasses and bare ground. The construction of the new WRF is anticipated to begin in September 2016 and will take approximately 18 consecutive months to construct. The project is expected to clear 4 of the 5 acres for the new facilities. Of those 4 acres, 3 acres is considered suitable Yellow-billed Cuckoo habitat, a federally listed species. The remaining 1 acre, located along the south and west portions of the property, will remain as is and the native trees and vegetation will not be removed during the construction of the new WRF.

HABITAT ASSESSMENT

During the summer of 2015, updated guidelines were published by USFWS for identifying WYBCU habitat in Utah. According to these guidelines which give more detail about the vegetation patch sites and requirements, BC&A prepared an assessment for the WWTP property as follows.

Based on site visits and aerial photography, a map was created outlining the potential riparian western Yellow-billed Cuckoo habitat within a half-mile of the project that meets the criteria of predominantly multi-layered vegetation (see Figure 3 - Habitat with Proper WYBCU Structure). Additionally, patches meeting the size requirement of at least 12 acres, with an area of at least 100 meters wide by 100 meters long within the patch, were also delineated. Habitat suitable only for foraging (single overstory canopy) was not found in great significance within a half-mile of the project and is not shown on Figure 3. Areas delineated as suitable habitat were identified as having a combination of both cottonwood trees and a mid-story such as Russian olive trees. If areas had only one layer of vegetation they were not delineated as suitable nesting and breeding habitat.

SURVEYS

Due to the construction phase, duration of the new WRF, and presence of suitable habitat on and adjacent to the project site, the US Fish and Wildlife recommended that it would be best to conduct formal Yellow-billed Cuckoo surveys to determine presence, breeding and nesting of the species. This process would also determine whether to proceed with formal or informal consultation. Yellow-billed Cuckoo surveys were conducted by a third party biologist, Adam Petry, Western Biology, LLC in the summer of 2016 within a 0.50 mile radius of the city property.

The surveyed concluded that no Yellow-billed Cuckoos were present, however, since a June survey was not conducted due to timing, we are concluding that the birds aren't nesting on-site, but may use the area for migration. If construction continues through next season, it is assumed that noise and human activity on-site will deter migrating cuckoo from the construction site, as well as any suitable habitat surrounding the construction area. A final survey and findings are also attached to this memorandum.

REQUEST FOR CONSULTATION

We are requesting informal consultation between the State of Utah DEQ and US Fish and Wildlife Service based on no-presence surveys and a determination that the project is Not Likely to Adversely Affect the Yellow-billed Cuckoo.

As part of the informal consultation conservation measures, all vegetation removal, grading and site preparation must be complete by **May 31, 2017**.

In effort to avoid take of migratory birds, according to the Migratory Bird Treaty Act, all vegetation removal, grading and site preparation shall be complete by **January 2017**. The intent of this project is to have the vegetation of the impacted area removed and preliminary grading of the site prior to January 2017. If vegetation clearing is to take place past January 2017, then breeding migratory bird nest surveys will be completed within a few days of vegetation removal. If an active nest if found, construction may need to be postponed until the nests have been vacated.

COMPENSATORY MITIGATION

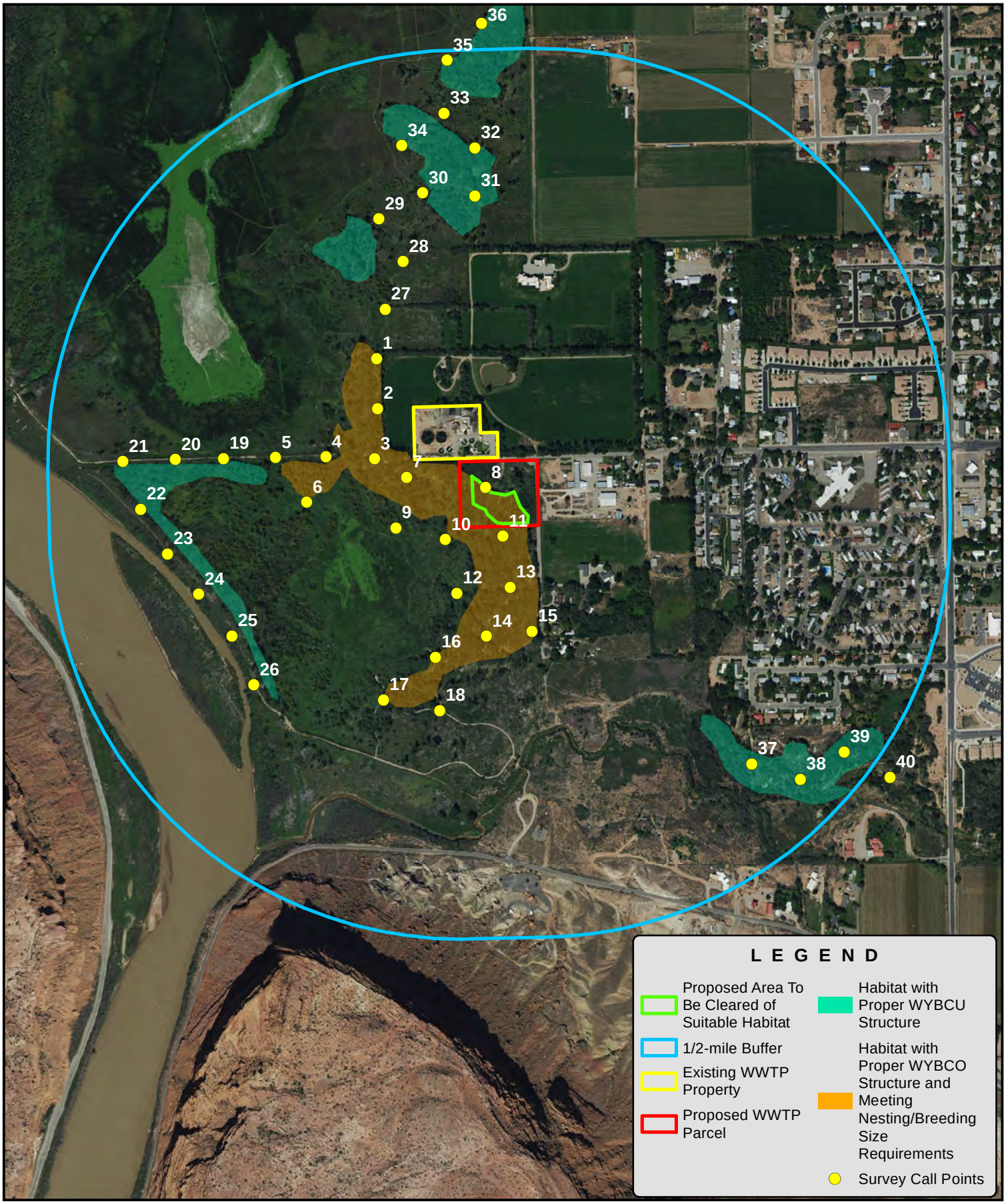
The US Fish and Wildlife Service has requested that the suitable habitat removed from Moab City's property be mitigated at a 2:1 ratio. Therefore, Figure 3 of this document shows the suitable Yellow-billed Cuckoo habitat within 0.50 miles of the project site as well as the anticipated removal of the suitable habitat.

Mitigation: 1.5 acres of habitat is expected to be removed as part of the project and 3.0 acres is to be replaced on the old treatment plant site.

Success Criteria for Trees: For a period of 5 consecutive years, the city will monitor and replace species that are diseased or have not thrived with an equal replacement of species type and size at the end of each growing season. At the end of the 5th growing season it is expected that 90% of the planted trees will be thriving.

Success Criteria for Grasses and Groundcover: The site will be seeded with native or desirable grass or grass like species. The site will also be monitored for a period of 5 growing seasons. The success criteria for the grasses shall be 30% cover the 1st year, 50% the 3rd year and 80% the 5th year.

The compensatory mitigation is proposed to be located on the existing treatment plant site which will be demolished once the new WRF is operational (approximately 18-months from the time construction of the new WRF begins). The site will be seeded with native vegetation and planted with cottonwood trees and willow. The site will also receive supplemental temporary irrigation (spray irrigation) to help establish the understory and tree canopy.



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

Western Yellow-billed Cuckoo Habitat with Proper YBC Structure Survey

Moab City

WWTP Relocation Project

NORTH:

NORTH

SCALE:
0 500 1,000
Ft

FIGURE NO.
3

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\WYBCU_Habitat.mxd mdavis 8/9/2016

Yellow-Billed Cuckoo Survey Site Description Form for Electronic submission

This form is intended to provide a general descrition of the habitat surveyed at a site. More detailed vegetation analysis requires precise measurements, and is outside the scope of this survey protocol. Please check your permit for additional requirements.

Fill in the following information completely	Date Report completed: **8.6.2016**	
Site Name: **Moab Waste Water Treatment Plant**	State: **Utah**	County: **Grand**
Name of Reporting Individual **Adam Petry**	Affiliation: **Western Biology, LLC for Bowen Collins and Associates**	
Phone # **970.462.8702**	Email: **petry@westernbiology.com**	
USFWS Permit #**TE66521B-0**	State Permit #N/A	

Site Coordinates:	Start: **E**	**N**	UTM Zone: 12
	Stop: **E**	**N**	NAD: 83
USGS Quad Name(s):	Length of area surveyed (in kilometers) ~8 kilometers		Elevation: 4,000 feet

Name of nearest Creek, River, Wetland, or Lake: **Colorado River; Moab Slough; Matheson Preserve**

Ownership: BLM Reclamation NPS USFWS USFS Tribal State Private Other (Municipal/Co **TNC/Utah DNR**

Was site surveyed in previous year? Yes **No** Unknown	If yes, what site name was used?	
Did you survey the same general area during each visit this year?	**Yes** / No	If no, summarize in comments below
If "Yes", was the same general area surveyed this year?	Yes / No	If no, summarize in comments below

Native/Exotic: The species in tree/shrub layer at this site are comprised predominantly of (check one):			
Native broadleaf plants (>75% native)		Mixed native and exotic plants (mostly native 51%-75%)	
Exotic/introduced plants (>75% exotic)		**Mixed native and exotic plants (mostly exotic 51%-75%)**	

List up to 5 species of overstory vegetation and percent canopy cover of each species. Use scientific names. For percent cover, please use <1%; 10%, 25%, 50%, 75%, 90%, 100%.

1. *Populus deltoides*	**% cover: 40**	**2. *Elaeagnus angustifolia***	**% cover: 10**	**3.**	**% cover:**
4.	**% cover:**	**5.**	**% cover:**		
Average height of overstory (m)(do not include a range) = 8 meters		Estimated Overall Canopy Cover (percent) = 50% 5.			

List up to 5 species of understory/shrub vegetation (not all sites will have a separate understory) and estimate percent understory cover of each species. Use scientific names. For percent cover, please use <1%; 10%, 25%, 50%, 75%, 90%, 100%.

1. *Elaeagnus angustifolia*	**% cover: 20**	**2. *Salix* sp.**	**% cover: 10**	**3.**	**% cover:**
4.	**% cover:**	**5.**	**% cover:**		
Average height of understory (m)(do not include a range) = ~4 meters		Estimated Overall Cover (percent) = 30%			

Describe adjacent habitat (e.g. upland vegetation; desert scrub; urban/residential; agriculture/orchard; oak woodland): Adjacent habitat consists of undisturbed sloughs and wetlands dominated by reed canarygrass (*Phalaris arundinacea*) charged by unknown water regimes.

List up to five categories of adjacent habitat, and estimate percent cover. Use <1%; 10%, 25%, 50%, 75%, 90%, 100%.

1.	**% cover:**	**2.**	**% cover:**	**3.**	**% cover:**
4.	**% cover:**	**5.**	**% cover:**		

Was surface water or saturated soil present at or adjacent to site within 300 meters?	**Yes**	No (circle one)
Was surface water or saturated soil present at or adjacent to all patches surveyed?	**Yes**	No (circle one)

Comments. Please provide comments regarding differences between the survey patches within the site. For example, if the average canopy for this site is 30% cover, but within one patch it is 60% cover - please note. Also, please note significant differences between dominant overstory and understory vegetation among the patches. Document these differences with photographs whenever possible. Make sure to reference comments to photo number whenever available.

Site Name: **Moab Waste Water Treatment Plant**	Name of Reporting Individual **Adam Petry**
Phone # **970.462.8702**	Email **petry@westernbiology.com**

Attach the following: 1) Copy of USGS 7.5 minute quad/topographical map(s) of survey area, outlining survey site and location of YBCU detection; 2) Sketch or aerial photo showing site location, patch shape,openings, survey route, and location of any detected YBCU or their nests; 3) Photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments. Check your permits for required documentation.

Yellow-Billed Cuckoo (YBCU) Survey Form **Page:** 1 of 1

Surveyor Name: **A. Petry** Surveyor Email: **petry@westernbiology.com** Surveyor Phone: **970.462.8702**

Site Code:	**MWTP**	Site Name:	**Moab Water Treatment Plant**	Survey Period:	**2**	**Visit #:**	**1**	Date (mm/dd/yy):	**7/11/2016**
River Drainage:	**Colorado**	State:	**UT**	County:	**Grand County**			Observers:	**A. Petry**
Survey Start Time:	**5:50 AM**	Wind:	**0**	Cloud cover:	**0**	Precip:	**0**	Noise: **0**	Temp: **65** Humidity:
Survey End Time:	**11:22 AM**	Wind:	**4**	Cloud cover:	**0**	Precip:	**0**	Noise: **3**	Temp: **85** Humidity:
NAD:	**83**	Start Easting:		Start Northing:				GPS Acc. (m):	**12 ft.**
Zone:	**12S**	Stop Easting:		Stop Northing:				GPS Acc. (m):	**12 ft.**

Point Start Time	UTM Coordinates		Waypoint Number	YBCU Det #	Time of Detection	Detection Type	Compass Bearing	Estimated Distance (m)	Est. Dist. Ac	Vocal Code	Behavior / Breeding	Note #
	Easting	Northing										
6:20			MWTP03	0								
6:28			MWTP04	0								
6:35			MWTP05	0								
6:46			MWTP06	0								
6:58			MWTP09	0								
7:07			MWTP12	0								
7:17			MWTP15	0								
7:28			MWTP16	0								
7:35			MWTP18	0								
7:43			MWTP17	0								
7:50			MWTP14	0								
N/A			MWTP13	0	COHA							
N/A			MWTP11	0	COHA							
8:02			MWTP08	0								

Notes: No YBCU detections.

	Date	Initials
Data Entry:		
Data Proof:		
Data Scan :		

WIND		RAIN		CICADA		BEHAVIOR	CODE	BEHAVIOR	CODE	BREEDING	CODE	OCALIZATIO	CODE	CLOUD COVER
calm	0	none	0	0	0	No visual	NV	Catches Prey	CP	Copulation	COP	Contact	CON	
Smoke drifts	1	mist	1	1	1	Sitting	ST	Carry Food	CF	Fledgling	FL	Coo	COO	0-100%
Felt on face	2	drizzle	2	2 to 4	2	Forages	FO	Eats Food	EF	Brooding	BR	Knock/Alarm	ALA	**Temp humidity**
Leaves move	3	rain	3	5 to 10	3	Preen	PRE	At Nest	AN	Incubating	IN	Juvenile Calls	JCON	use kestrel
Small branches	4	Heavy rain	4	11 to 19	4	Flies	FLY	Juvenile	JUV	Feeds Young	FY	Other voc	VO	or online
Small trees move	5	snow	5	20+	5	Distraction Display	DD			Carry Nest Materia	CN	V Exchange	VEX	data

Point Start Time	UTM Coordinates		Waypoint Number	YBCU Det #	Time of Detection	Detection Type	Compass Bearing	Estimated Distance (m)	Est. Dist. Ac	Vocal Code	Behavior / Breeding	Note #
	Easting	Northing										
8:10			MWTP07	0								
8:19			MWTP02	0								
8:29			MWTP01	0								
8:43			MWTP27	0								
8:50			MWTP28	0								
8:58			MWTP29	0								
9:05			MWTP30	0								
9:14			MWTP31	0								
9:22			MWTP32	0								
9:30			MWTP33	0								
9:38			MWTP35	0								
9:46			MWTP36	0								
9:55			MWTP34	0								
10:07			MWTP19	0								
10:20			MWTP20	0								
10:47			MWTP21	0								
10:56			MWTP22	0								
11:04			MWTP23	0								
11:10			MWTP24	0								
11:19			MWTP25	0								

Notes:

Yellow-Billed Cuckoo (YBCU) Survey Form **Page:** 1 of 1

Surveyor Name: **A. Petry** Surveyor Email: **petry@westernbiology.com** Surveyor Phone: **970.462.8702**

Site Code:	**MWTP**	Site Name:	**Moab Water Treatment Plant**	Survey Period:	**2**	**Visit #:**	**2**	Date (mm/dd/yy):			**7/23/2016**		
River Drainage:	**Colorado**	State:	**UT**	County:	**Grand County**			Observers:			**A. Petry**		
Survey Start Time:	**5:35 AM**	Wind:	**0**	Cloud cover:	**0**	Precip:	**0**	Noise:	**1**	Temp:	**65**	Humidity:	
Survey End Time:	**11:30 AM**	Wind:	**0**	Cloud cover:	**0**	Precip:	**0**	Noise:	**1**	Temp:	**90**	Humidity:	
NAD:	**83**	Start Easting:		Start Northing:				GPS Acc. (m):	**12 ft.**				
Zone:	**12S**	Stop Easting:		Stop Northing:				GPS Acc. (m):	**12 ft.**				

Point Start Time	UTM Coordinates		Waypoint Number	YBCU Det #	Time of Detection	Detection Type	Compass Bearing	Estimated Distance (m)	Est. Dist. Ac	Vocal Code	Behavior / Breeding	Note #
	Easting	Northing										
6:34			MWTP06	0								
6:44			MWTP09	0								
6:53			MWTP10	0								
7:02			MWTP12	0								
7:10			MWTP15	0								
7:19			MWTP16	0								
7:27			MWTP17	0								
7:36			MWTP18	0								
7:47			MWTP14	0								
7:56			MWTP13	0								
8:05			MWTP08	0								
8:18			MWTP03	0								
8:27			MWTP04	0								
8:34			MWTP05	0								

Notes: No WYBCU detections.

	Date	Initials
Data Entry:		
Data Proof:		
Data Scan :		

WIND		RAIN		CICADA		BEHAVIOR	CODE	BEHAVIOR	CODE	BREEDING	CODE	OCALIZATIO	CODE	CLOUD
calm	0	none	0	0	0	No visual	NV	Catches Prey	CP	Copulation	COP	Contact	CON	**COVER**
Smoke drifts	1	mist	1	1	1	Sitting	ST	Carry Food	CF	Fledgling	FL	Coo	COO	0-100%
Felt on face	2	drizzle	2	2 to 4	2	Forages	FO	Eats Food	EF	Brooding	BR	Knock/Alarm	ALA	**Temp**
Leaves move	3	rain	3	5 to 10	3	Preen	PRE	At Nest	AN	Incubating	IN	Juvenile Calls	JCON	**humidity**
Small branches	4	Heavy rain	4	11 to 19	4	Flies	FLY	Juvenile	JUV	Feeds Young	FY	Other voc	VO	use kestrel
Small trees move	5	snow	5	20+	5	Distraction Display	DD			Carry Nest Materia	CN	V Exchange	VEX	or online data

Point Start Time	UTM Coordinates		Waypoint Number	YBCU Det #	Time of Detection	Detection Type	Compass Bearing	Estimated Distance (m)	Est. Dist. Ac	Vocal Code	Behavior / Breeding	Note #
	Easting	Northing										
8:45			MWTP02	0								
8:53			MWTP01	0								
9:00			MWTP27	0								
9:10			MWTP30	0								
9:26			MWTP31	0								
9:35			MWTP32	0								
9:43			MWTP33	0								
9:52			MWTP35	0								
10:02			MWTP36	0								
10:20			MWTP34	0								
10:46			NEW	0								
10:54			MWTP39	0								
11:02			MWTP38	0								
11:10			MWTP37	0								
11:21			MWTP40	0								

Notes: 2 fledgling COHA hunting near MWTP 11 and 13

Yellow-Billed Cuckoo (YBCU) Survey Form **Page:** 1 of 1

Surveyor Name: **A. Petry** Surveyor Email: **petry@westernbiology.com** Surveyor Phone: **970.462.8702**

Site Code:	**MWTP**	Site Name:	**Moab Water Treatment Plant**	Survey Period:	**3**	**Visit #:**	**1**	Date (mm/dd/yy):			**8/6/2016**		
River Drainage:	**Colorado**	State:	**UT**	County:	**Grand County**			Observers:			**A. Petry**		
Survey Start Time:	**5:55 AM**	Wind:	**0**	Cloud cover:	**90**	Precip:	**0**	Noise:	**1**	Temp:	**65**	Humidity:	
Survey End Time:	**12:00 AM**	Wind:	**1**	Cloud cover:	**10**	Precip:	**0**	Noise:	**1**	Temp:	**90**	Humidity:	
NAD:	**83**	Start Easting:		Start Northing:				GPS Acc. (m):	**12 ft.**				
Zone:	**12S**	Stop Easting:		Stop Northing:				GPS Acc. (m):	**12 ft.**				

Point Start Time	UTM Coordinates		Waypoint Number	YBCU Det #	Time of Detection	Detection Type	Compass Bearing	Estimated Distance (m)	Est. Dist. Ac	Vocal Code	Behavior / Breeding	Note #
	Easting	Northing										
6:15			MWTP03	0								
6:26			MWTP08	0								
6:38			MWTP11	0								
6:45			MWTP13	0								
6:54			MWTP14	0		COHA						
7:05			MWTP12	0								
7:13			MWTP10	0								
7:21			MWTP09	0								
7:32			MWTP06	0								
7:45			MWTP01	0								
7:52			MWTP02	0								
8:01			MWTP04	0								
8:08			MWTP05	0								
8:16			MWTP19	0								

No WYBCU detections.

	Date	Initials
Data Entry:		
Data Proof:		
Data Scan :		

WIND		RAIN		CICADA		BEHAVIOR	CODE	BEHAVIOR	CODE	BREEDING	CODE	OCALIZATIO	CODE	CLOUD
calm	0	none	0	0	0	No visual	NV	Catches Prey	CP	Copulation	COP	Contact	CON	**COVER**
Smoke drifts	1	mist	1	1	1	Sitting	ST	Carry Food	CF	Fledgling	FL	Coo	COO	0-100%
Felt on face	2	drizzle	2	2 to 4	2	Forages	FO	Eats Food	EF	Brooding	BR	Knock/Alarm	ALA	**Temp**
Leaves move	3	rain	3	5 to 10	3	Preen	PRE	At Nest	AN	Incubating	IN	Juvenile Calls	JCON	**humidity**
Small branches	4	Heavy rain	4	11 to 19	4	Flies	FLY	Juvenile	JUV	Feeds Young	FY	Other voc	VO	use kestrel
Small trees move	5	snow	5	20+	5	Distraction Display	DD			Carry Nest Materia	CN	V Exchange	VEX	or online data

Point Start Time	UTM Coordinates		Waypoint Number	YBCU Det #	Time of Detection	Detection Type	Compass Bearing	Estimated Distance (m)	Est. Dist. Ac	Vocal Code	Behavior / Breeding	Note #
	Easting	Northing										
8:23			MWTP20	0								
8:30			MWTP21	0								
8:40			MWTP22	0								
8:48			MWTP23	0								
8:55			MWTP24	0								
9:03			MWTP25	0								
9:10			MWTP26	0								
9:20			MWTP18	0								
9:29			MWTP17	0								
9:36			MWTP16	0								
9:47			MWTP15	0								
10:21			MWTP27	0								
10:31			MWTP29	0								
10:43			MWTP31	0								
10:52			MWTP32	0								
11:01			MWTP33	0								
11:09			MWTP35	0								
11:22			MWTP36	0								
11:35			MWTP34	0								
11:44			MWTP30	0								

Notes:

Yellow Billed Cuckoo Survey Form

Site Name: **Moab Waste Water Treatment Plant** County: **Grand County** State: **Utah**

USGS Quad Name: Elevation: **4,000 feet**

Creek, River, Wetland, or Lake Name **Colorado River (Matheson Preserve)**

Site Coordinates: Start: **E** **N** UTM Zone: **12S**

Stop: **E** **N** Datum: **NAD83**

Ownership: BLM Reclamation NPS USFWS USFS Tribal State **Private** Other (Municipal/County)

Was site surveyed in previous year? Yes **No** Unknown If yes, what site name was used?

Survey # Observer(s) (Last Name, First Initial)	Date (m/d/y) Survey, Time, Total Hours	Total Number of YBCUs detected.	Time Detected (AM):	Detect Type: I=Incidental P=Playback A=aural V=visual B=both	Voc. Type: CN=Contact CO=coo AL=alarm OT=other (describe)	Playback #: Number of times 'Kowlp' call played before YBCU responded	Behavior code	Surveyor Detection Coordinates		Distance (m)	Bearing	Cuckoo #	Corrected Coordinates	
								UTM E	UTM N				UTM E	UTM N
Survey #1	Date:													
Observer(s):	Start:													
N/A	Stop:													
	Total hrs:	Total:												
Survey #2	Date:													
	7.11.16													
Observer(s):	Start:													
	5:50 AM													
A. Petry	Stop:													
	11:22 AM													
	Total hrs:	Total:												
	5.50	**0**												
Survey #3	Date:													
	7.23.16													
Observer(s):	Start:													
	5:35 AM													
A. Petry	Stop:													
	11:30 AM													
	Total hrs:	Total:												
	6.00	**0**												
Survey #4	Date:													
	8.6.16													
Observer(s):	Start:													
	5:55 AM													
A. Petry	Stop:													
	12:00AM													
	Total hrs:	Total:												
	6.00	**0**												
Survey #5 (Optional)	Date:													
Observer(s):	Start:													
N/A	Stop:													
	Total hrs:	Total:												

Survey Summary:	# Det	#PO	#PR	#CO	#Nests found	Total Survey Hours:
Total YBCUs*	**0**	**0**	**0**	**0**	**0**	**17.50**

Notes (refer to Cuckoo # associated with individual detections)

Approximately 3 total additional hours (1 hour each survey) for walking/observing/listening (no calling) during morning survey window as a result of accessing survey route start and endpoints. Survey time should total up to 20 hours.

*Include justification for these designations.

Behavior Codes: AN = at nest, BI = brooding or incubating, CF = adult carrying food, CN = carrying nest material, COP = copulation, CP = catches prey, DD = distraction displays/defense of nesting area, EF = eats food, FL = recently fledged young of species incapable of flight, FLY = flying, FO = foraging, FS = adult carrying a fecal sac, FY = adults feeding nestlings, JUV = juvenile, NB = nest building, NE = active nest with unbroken eggs in it, NY = nest with young seen or heard in it, ON = occupied nest, PR = preening, SI = sitting, US = used, inactive nest with blue-green eggshells.

Fill in the following information completely

Name of Reporting Individual: **Adam Petry** Date Report completed: **8/5/2016**

Affiliation: **Western Biology, LLC for Bowen Collins and Associates** Phone: **970.462.8702** Email: **petry@westernbiology.com**

USFWS Permit #: **TE66521B-0** State Permit #:

Site Name: **Moab Waste Water Treatment Plant**

Length of area surveyed: **~5 Mile Loop Circuit** (in kilometers = km): **~8 km**

Did you survey the same general area during each visit to this site this year? **Yes** / No If no, summarize in comments below_____

If site was surveyed last year, did you survey the same general area this year? Yes / No If no, summarize in comments below_____

Overall Vegetation Characteristics: Overall, are the species in tree/shrub layer at this site comprised predominantly of (check one):

Native broadleaf plants (>75% native)		Mixed native and exotic plants (mostly native 51%	
Exotic/introduced plants (>75% exotic)		Mixed native and exotic plants (mostly exotic 51%	**X**

Average height of canopy (m)_____8_____ (specify units)_____

Estimated Canopy Cover (percent)_____40_____

Overstory Vegetation: (provide percent estimate of the following dominant species). Use <1%; 10%, 25%, 50%, 75%, 90%, 100%.

75%	Cottonwood		Goodding's Willow	**1%**	Coyote Willow		Other (specify)
1%	Tamarisk	**25%**	Russian Olive		Other (specify)		Other (specify)

Average height of understory canopy (m)_____2_____ (specify units)_____

Estimated Understory Cover (percent)_____70_____

Understory Vegetation: (provide percent estimate of the following dominant species).Use <1%; 10%, 25%, 50%, 75%, 90%, 100%.

10%	Cottonwood		Goodding's Willow	**25%**	Coyote Willow	_____	Other (specify)
10%	Tamarisk	**50%**	Russian Olive	**1%**	Other (Skunkbrush)	____	Other (specify)
	Baccharis		New Mexico Oli				

Was surface water or saturated soil present at or adjacent to site within 300 meters? **Yes** No (circle one)

Was surface water or saturated soil present at or adjacent to all patches surveyed? **Yes** No (circle one)

Comments. Please provide comments regarding differences between the survey patches within the site. For example, if the average canopy for this site is 30% cover, but within one patch it is 60% cover - please note. Also, please note significant differences between dominant overstory and understory vegetation among the patches. Document these differences with photographs whenever possible. Make sure to reference comments to photo number whenever available.

Please provide USGS 7.5 minute quad (or similar)showing survey area to each survey form_____

Photo 1. Looking north-northeast from Call Point MWTP05 toward two habitat patches (7.11.16).

Photo 2. Looking south from Call Point MWTP03 toward Matheson Preserve entrance (7.11.16).

Photo 3. Looking northeast from Call Point MWTP09 (7.11.16).

Photo 4. Looking east from Call Point MWTP15 (7.11.16).

Photo 5. Looking southeast near Call Point MWTP14 (7.11.16).

Photo 6. Representative multi-layered canopy (7.11.16).

Photo 7. Looking north from Call Point MWTP13 (7.11.16).

Photo 8. Looking toward scattered Russian olive, young cottonwood and reed canarygrass (7.11.16)

Photo 9. Looking at three Cooper's hawk fledglings just south of the proposed project parcel (8.6.16).

Photo 10. Representative western yellow-billed cuckoo open area and foraging habitat (7.11.16).

Photo 11. Looking northwest from Call Point MWTP08 (7.11.16).

Photo 12. Looking north from Call Point MWTP35 toward Matheson Preserve (7.11.16).

APPENDIX J

WATER QUALITY STANDARDS

Utah Division of Water Quality
ADDENDUM
Statement of Basis
Wasteload Analysis for Treatment Plant Upgrade - FINAL

Date: **February 4, 2015**

Facility: **Moab POTW**
UPDES No. UT0020419

Receiving water: **Colorado River (1C, 2A, 3B, 4)**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge

Outfall 001: Located at latitude 38°34'40" and longitude 109°34'47". The discharge is through a 2,000-lineal-foot, 18-inch diameter reinforced concrete pipeline to the Colorado River.

The design flow for the treatment plant is 1.75 MGD maximum monthly average and 3.38 MGD maximum daily discharge, as provided by the permittee. The design discharge was used for this wasteload analysis.

Data obtained from 2004-2014 for sampling site 4956550 Moab WWTP was used to characterize the temperature, pH and hardness of the effluent.

Receiving Water

The receiving water for the discharge is the Colorado River, which per UAC R317-2-13.1 has designated uses of 1C, 2A, 3B, and 4.

- *Class 1C - Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.*
- *Class 2A - Protected for frequent primary contact recreation where there is a high likelihood of ingestion of water or a high degree of bodily contact with the water. Examples include, but are not limited to, swimming, rafting, kayaking, diving, and water skiing.*
- *Class 3B - Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.*
- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

The critical flow for the wasteload analysis was considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Flow records from USGS stream gage # 09180500 - COLORADO RIVER NEAR CISCO, UT, for the period 1913 – 2010 was obtained. The 7Q10 was calculated using the EPA computer software DFLOW V3.1b.

7Q10 Flow (Annual) = 1,220 cfs

Data obtained from 2004-2014 for sampling site 4957000 Colorado River at US191 Crossing Near Moab was used to characterize background water quality conditions.

Mixing Zone

The allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone. Individual mixing zones may be further limited or disallowed in consideration of the following factors in the area affected by the discharge: Zone of passage for migrating fish or other species (including access to tributaries).

Mill Creek confluence with the Colorado River is approximately 1,400 feet downstream of the Moab POTW outfall pipe. Therefore, in consideration of potential fish migration concerns between Mill Creek and Colorado River, the acute mixing zone is limited to 1,400 feet (calculated to be 10.2 minutes travel time).

Dilution Factor

The EPA Region 8 stream mixing zone analysis (STREAMIX1, 1994), was used to determine the plume width and mixed flow rate for both acute and chronic conditions. A rectangular channel with a width of 300 feet, channel slope of 0.001 feet/feet, and roughness coefficient of 0.030 was assumed for channel geometry. Mannings equation was used to solve for the flow depth (1.8 feet) and velocity for the 7Q10 flow.

Table 1: Summary of plume characteristics at mixing zone boundary.

Criteria	Distance to End of Mixing Zone (feet)	Plume Width		Flow	Dilution Factor
		feet	% of River	cfs	
Acute	1,400	35.4	11.6	142	62:1
Chronic	2,500	49.1	16.2	198	86:1

Parameters of Concern

The potential parameters of concern for the discharge/receiving water identified were total dissolved solids (TDS), total suspended solids (TSS), and ammonia, as determined in consultation with the UPDES Permit Writer.

TMDL

The Colorado River from Green River confluence to Moab was listed as impaired for selenium according to the 2010 303(d) list. The receiving water does not have an approved TMDL for any parameters.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC_{25}

Season	Percent Effluent
Annual	1.4%

Effluent Limits

Effluent limits for pollutants were determined using a mass balance mixing analysis (UDWQ 2012). The mass balance analysis is summarized in Appendix A.

The water quality standard for chronic ammonia toxicity is dependent on temperature and pH, and the water quality standard for acute ammonia toxicity is dependent on pH. The analysis to determine the ammonia criteria is summarized in Appendix B.

Due to the high dilution factor, secondary standards for BOD_5 were considered sufficiently protective to meet instream criteria for DO.

Table 3: Water Quality Based Effluent Limits Summary

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Flow (MGD)		3.38	1 day		1.75	30 days
Ammonia (mg/L)						
Summer (Jul-Sep)	2.9	210		1.1	75	
Fall (Oct-Dec)	1.3	94	1 hour	1.2	83	30 days
Winter (Jan-Mar)	3.0	218		1.7	122	
Spring (Apr-Jun)	2.5	180		1.7	121	
BOD_5 (mg/L)	N/A	35	7 days	N/A	25	30 days

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload.

The pollutant concentration and load from the facility is being increased under the proposed treatment plant upgrade; therefore, a Level II Antidegradation Review (ADR) is required for this discharge.

Prepared by: Nicholas von Stackelberg, P.E.
Standards and Technical Services Section

Documents:

WLA Document: *moab_potw_upgrade_wla_2015_final.docx*
Analysis: *moab_potw_upgrade_wla_2015.xlsx*

References:

Utah Wasteload Analysis Procedures Version 1.0. 2012. Utah Division of Water Quality.

WASTELOAD ANALYSIS [WLA] Date: 2/4/2016

Appendix A: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Moab WWTP		
UPDES No:	UT-0020419		
Permit Flow [MGD]:	3.38	Annual	Max. Daily
	1.75	Annual	Max. Monthly
Receiving Water:	Colorado River		
Stream Classification:	1C, 2B, 3B, 4		
Stream Flows [cfs]:	1220	Summer	Critical Low Flow
	197	Chronic	
	142	Acute	
Fully Mixed:	NO		
Acute River Width:	11.6%	Plume Model Used	
Chronic River Width:	16.2%	Plume Model Used	

Modeling Information

A simple mixing analysis was used to determine the effluent limits.

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort reflect the environmental conditions expected at low stream flows.

Effluent Limitations for Protection of Drinking Water (Class 1C Waters)

No dilution in unnamed irrigation ditch.

	Maximum Concentration		
Dissolved Metals (ug/L)	**Standard**	**Background**	**Limit**
Arsenic	10.0	1.30	246
Barium	1000	140.60	24,275
Beryllium	4.0	2.68	39.7
Cadmium	10.0	0.10	278
Chromium	50.0	2.00	1,350
Lead	15.0	0.20	416
Mercury	2.0	0.2	51
Selenium	50.0	2.20	1,345
Silver	50.0	0.5	1,391

	Maximum Concentration		
Inorganics (mg/L)	**Standard**	**Background**	**Limit**
Bromate	0.01	0.007	0.10
Chlorite	1.0	0.67	9.9
Fluoride	1.4	0.94	13.9
Nitrate	10.0	0.51	267

	Maximum Concentration		
Radiological (pCi/L)	**Standard**	**Background**	**Limit**
Gross Alpha	15.0	10.1	149
Gross Beta	4.0	2.7	39.7
Strontium 90	8.0	5.4	79
Tritium	20000	13400	198749
Uranium	30.0	20.1	298

Bacteriological (#/100 mL)	**Standard**
E. coli (30 Day Geometric Mean)	206
E. coli (Maximum)	668

Effluent Limitations for Protection of Recreation (Class 2B Waters)

Physical Parameter	**Standard**	**Limit**
pH Minimum	6.5	6.5
pH Maximum	9.0	9.0
Turbidity Increase (NTU)	10.0	

Bacteriological (#/100 mL)	**Standard**
E. coli (30 Day Geometric Mean)	206
E. coli (Maximum)	668

Effluent Limitations for Protection of Aquatic Wildlife (Assumed Class 3B Waters)

Temperature (deg C)	**Standard**
Instantaneous Maximum	27.0
Change Maximum	4.0

pH	**Standard**	**Limit**
Minimum	6.5	6.5
Maximum	9.0	9.0

Dissolved Oxygen (mg/L)	**Standard**
Instantaneous Minimum	5.0
7-day Average Minimum	6.0
30-day Average Minimum	5.5

BOD5 (mg/L)	**Standard**	**Limit**
7-day Average	N/A	35.0
30-day Average	N/A	25.0

Ammonia-Total (mg/L)

	Chronic (30-day ave)			Acute (1-hour ave)		
Season	**Standard**	**Background**	**Limit**	**Standard**	**Background**	**Limit**
Summer	1.1	0.07	75.2	2.9	0.07	210.2
Fall	1.2	0.07	83.2	1.3	0.07	94.3
Winter	1.7	0.07	121.8	3.0	0.07	218.5
Spring	1.7	0.07	121.4	2.5	0.07	180.2

Inorganics Parameter	Chronic Standard (4 Day Average) Standard	Acute Standard (1 Hour Average) Standard
Phenol (mg/L)		0.010
Hydrogen Sulfide (Undissociated) [mg/L]		0.002

Metals-Total Recoverable

	Chronic (4-day ave)			Acute (1-hour ave)		
Parameter	Standard[1]	Background	Limit	Standard[1]	Background	Limit
Aluminum (µg/L)	N/A[3]	19.0	N/A	750	19.0	20,548
Arsenic (µg/L)	150	1.3	10,994	340	1.3	9,513
Cadmium (µg/L)	0.6	0.10	34.8	6.5	0.10	180
Chromium III (µg/L)	11.0	2.0	667	16.0	2.0	395
Chromium VI (µg/L)	199	2.0	14,602	1534	2.0	43,014
Copper (µg/L)	25.2	2.7	1,663	42.0	2.7	1,106
Cyanide (µg/L)[2]	5.2	3.5	130	22.0	3.5	523
Iron (µg/L)				1000	27.0	27,352
Lead (µg/L)	9.1	0.2	659	234	0.2	6,564
Mercury (µg/L)[2]	0.012	0.008	0.301	2.4	0.008	67.2
Nickel (µg/L)	145	5.0	10,327	1302	5.0	36,432
Selenium (µg/L)[4]	4.6	2.2	4.6	18.4	2.2	18.4
Silver (µg/L)				25.7	0.5	709
Tributylin (µg/L)[2]	0.072	0.048	1.8	0.46	0.048	11.61
Zinc (µg/L)	329	17.0	23,086	326	17.0	8,705

1: Based upon a hardness of 335 mg/l as CaCO3

2: Background concentration assumed 67% of chronic standard

3: Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as $CaCO_3$ in the receiving water after mixing, the 87 ug/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 ug/L acute aluminum criterion (expressed as total recoverable).

4: Due to impairment, limit is same as standard.

Organics [Pesticides]

	Chronic (4-day ave)		Acute (1-hour ave)	
Parameter	Standard	Limit	Standard	Limit
Aldrin (µg/L)			1.5	1.5
Chlordane (µg/L)	0.0043	0.0043	1.2	1.2
DDT, DDE (µg/L)	0.001	0.001	0.55	0.55
Diazinon (µg/L)	0.17	0.17	0.17	0.17
Dieldrin (µg/L)	0.0056	0.0056	0.24	0.24
Endosulfan, a & b (µg/L)	0.056	0.056	0.11	0.11
Endrin (µg/L)	0.036	0.036	0.086	0.086
Heptachlor & H. epoxide (µg/L)	0.0038	0.0038	0.26	0.26
Lindane (µg/L)	0.08	0.08	1.0	1.0
Methoxychlor (µg/L)			0.03	0.03
Mirex (µg/L)			0.001	0.001
Nonylphenol (µg/L)	6.6	6.6	28.0	28.0
Parathion (µg/L)	0.0130	0.0130	0.066	0.066
PCB's (µg/L)	0.014	0.014		
Pentachlorophenol (µg/L)	15.0	15.0	19.0	19.0
Toxephene (µg/L)	0.0002	0.0002	0.73	0.73

Radiological	Maximum Concentration
Parameter	Standard
Gross Alpha (pCi/L)	15

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

	Maximum Concentration		
Parameter	Standard	Background	Limit
Total Dissolved Solids (mg/L)	1200	634	16,529
Boron (µg/L)	750	81.5	302,004
Arsenic, Dissolved (µg/L)	100	1.3	44,578
Cadmium, Dissolved (µg/L)	10	0.1	4,471
Chromium, Dissolved (µg/L)	100	2.0	44,263
Copper, Dissolved (µg/L)	200	2.7	89,112
Lead, Dissolved (µg/L)	100	0.2	45,074
Selenium, Dissolved (µg/L)	50	2.2	21,591
Gross Alpha (pCi/L)	15	10.1	2,246

Appenix B: Freshwater total ammonia criteria based on Title R317-2-14 Utah Administrative Code
Acute Conditions

INPUT				
	Summer	Fall	Winter	Spring
pH:	8.6	9.0	8.5	8.6
Beneficial use classification:	3B	3B	3B	3B
OUTPUT				
Total ammonia nitrogen criteria (mg N/L):				
Acute:	2.912	1.345	3.025	2.507

Appendix B: Freshwater total ammonia criteria based on Title R317-2-14 Utah Administrative Code
Chronic Conditions

INPUT	Summer	Fall	Winter	Spring
Temperature (deg C):	22.9	9.1	4.5	14.2
pH:	8.2	8.4	8.2	8.2
Are fish early life stages present?	Yes	Yes	Yes	Yes
OUTPUT				
Total ammonia nitrogen criteria (mg N/L):				
Chronic - Fish Early Life Stages Present:	1.086	1.195	1.717	1.711
Chronic - Fish Early Life Stages Absent:	1.086	1.694	2.788	1.751

Month	Flow, MGD		E coli		TRC		pH		O&G	BOD5, mg/L		TSS, mg/L	
	Ave	Max	Ave	Max	mg/L	mg/L	Min	Max	mg/L	Ave	Max	Ave	Max
Limit	1.5		126	157	1.4	1.55	6.5	9	10	25	35	25	35
Apr-11	1.04	1.19	71	2400		2.10	7.5	7.7	NA	21	26	17	21
May-11	1.08	1.23	3	16		2.10	7.4	7.7	NA	24	30	22	34
Jun-11	1.10	1.23	2	4		2.10	7.4	7.6	NA	24	26	20	22
Jul-11	1.08	1.25	2	11		2.00	7.3	7.5	NA	26	32	24	28
Aug-11	1.03	1.03	16	84		2.00	7.3	7.5	NA	28	37	26	33
Sep-11	1.02	1.12	10	25		2.20	7.3	7.6	NA	27	33	18	22
Oct-11	1.03	1.30	15	2400		1.70	7.5	7.7	NA	24	26	17	19
Nov-11	0.87	1.02	2	5		1.50	7.6	7.8	NA	19	22	15	15
Dec-11	0.80	0.91	2	6		1.40	7.6	7.8	NA	23	30	18	20
Jan-12	0.80		2	9	1.1	1.50	7.7	7.8	NA	26	30	19	21
Feb-12	0.82		1	2	1.1	1.50	7.6	7.8	NA	26	29	18	19
Mar-12	0.97		2	4	0.9	1.60	7.6	7.8	NA	29	52	15	18
Apr-12	1.07		1	3	0.8	1.50	7.5	7.8	NA	18	22	16	17
May-12	1.08		5	7	0.8	1.50	7.4	7.7	NA	17	20	18	21
Jun-12	1.06		43	2400	0.4	1.60	7.3	7.6	NA	25	30	20	24
Jul-12	1.03		427	2400	0.7	1.60	7.3	7.5	NA	26	29	16	16
Aug-12	1.03		466	3100	0.9	1.60	7.3	7.6	NA	18	20	15	16
Sep-12	1.01		257	2400	1.0	1.60	7.3	7.6	NA	26	29	17	20
Oct-12	1.02		6	16	1.1	1.60	7.5	7.7	NA	22	24	21	25
Nov-12	0.90		16	2400	1.1	1.60	7.5	7.7	NA	34	54	17	19
Dec-12	0.84		3	16	1.1	1.60	7.6	7.8	NA	30	43	15	19
Jan-13	0.90		19	2400	1.2	1.60	7.7	7.9	NA	28	45	9	10
Feb-13	0.83		1	2	1.3	1.60	7.7	7.9	NA	30	36	14	18
Mar-13	0.97		1	1	1.1	1.60	7.5	7.8	NA	36	39	21	26
Apr-13	1.03		58	2400	1.1	1.60	7.5	7.7	NA	28	40	21	30
May-13	1.09		2	6	1.1	1.60	7.3	7.7	NA	29	36	20	22
Jun-13	1.04		18	76	0.9	1.60	7.3	7.5	NA	26	34	18	20
Jul-13	1.04		18	76	0.9	1.60	7.3	7.5	NA	26	34	18	20
Aug-13	1.04		11	34	0.8	1.60	7.2	7.5	NA	27	34	17	20
Sep-13	1.02		10	2400	0.8	1.60	7.3	7.6	NA	22	24	18	20
Oct-13	0.97		2	6	0.9	1.60	7.4	7.7	NA	24	26	20	22
Nov-13	0.89		2	5	1.0	1.60	7.6	7.8	NA	26	32	20	22
Dec-13	0.82		1	1	1.3	1.60	7.6	7.8	NA	29	34	15	21
Jan-14	0.79		1	2	0.8	1.60	7.6	7.8	NA	31	48	16	18
Feb-14	0.80		1	2	1.1	1.60	7.5	7.8	NA	42	56	14	17
Mar-14	0.96		2	9	0.4	1.60	7.6	7.8	NA	35	45	17	22
Apr-14	1.05		2	3	1	1.60	7.4	7.8	NA	24	30	14	22
May-14	1.06		2	3	1	1.60	7	7.8	NA	31	42	14	16
Jun-14	1.10		8	11	0.7	1.60	7.3	7.7	0	25	33	15	16
Jul-14	1.12		84	2400	0.6	1.60	7.3	7.6	7	32	40	22	28
Aug-14	1.09		5	190	0.7	1.50	6.8	7.5	5	27	34	19	20
Sep-14	1.09		4	56	0.8	1.50	7.3	7.6	6	26	42	29	51
Oct-14	1.07		12	27	1	1.50	7.5	7.7	19	27	32	20	24
Nov-14	0.93		3	10	1	1.50	7.6	7.8	7	34	54	21	29
Dec-14	0.84		2	5	1.3	1.50	7.6	7.7	0	25	36	14	22
Jan-15	0.82		1	5	1.3	1.50	7.4	7.7	6	12	15	16	19
Feb-15	0.83		1	1	1.3	1.50	7.4	7.7	9	25	32	35	56
Mar-15	0.99		2	9	1.2	1.50	7.3	7.6	9	27	33	20	22
Apr-15	1.06		11	49	1.1	1.50	7.4	7.8	5	32	40	19	24
May-15	1.09		11	2400	1.2	1.50	7.2	7.8	5	22	26	12	16
Jul-15	1.11		13	580	1.4	1.50	7.3	7.7	5	38	43	28	33
Aug-15	1.05		165	2400	1.1	1.50	7.4	7.6	6	38	49	29	36
Sep-15	1.07		15	84	1.1	1.50	7.5	8.3	5	28	35	21	26
Oct-15	1.04		102	2400	0.6	1.50	7.2	7.9	5	19	20	24	28
Nov-15	0.92		36	330	1.3	1.50	7.2	7.7	5	26	30	26	31
Dec-15	0.80		8	310	1.4	1.50	7.4	7.7	5	23	38	22	26
Jan-16	0.82		2	8	1.3	1.50	7.4	7.7	5	31	41	3	58
Feb-16	0.85		26	2400	1.5	1.50	7.4	7.7	5	24	28	25	31
Mar-16	0.99		2	6	1.4	1.50	7.3	7.6	6	33	42	21	23

Month	Ammonia, mg/L				Phosphorus	
	Effluent			Influent	Effluent	Influent
Limit	TKN	NH3	)	TKN	Total	Limit
Jul-15	27.0	26.0	5.0	59.0	6.0	14.0
Aug-15	25.0	21.0	6.0	39.0	4.0	5.0
Sep-15	27.0	16.0	4.0	61.0	4.0	7.0
Oct-15	18.0	16.0	7.0	47.0	3.0	6.0
Nov-15	28.0	32.0	2.0	54.0	5.0	5.0
Feb-16	23.0	25.0	2.0	67.0	5.0	8.0

Solids, total dissolved			
Month	Source	EFF	Increase
Dec-11	152	464	312
Dec-12	128	360	232
Dec-13	128	312	184
Dec-14	336	380	44
Dec-15	145	388	243

Quarter	WET TEST	Result
Spring 2011	48Hr Acute Ceriodaphnia	PASS
Summer 2011	96Hr Acute Pimephales Promelas	PASS
Fall 2011	48Hr Acute Ceriodaphnia	PASS
Winter 2012	96Hr Acute Pimephales Promelas	PASS
Spring 2012	48Hr Acute Ceriodaphnia	PASS
Summer 2012	96Hr Acute Pimephales Promelas	PASS
Fall 2012	48Hr Acute Ceriodaphnia	PASS
Winter 2013	96Hr Acute Pimephales Promelas	PASS
Spring 2013	48Hr Acute Ceriodaphnia	PASS
Summer 2013	96Hr Acute Pimephales Promelas	PASS
Fall 2013	48Hr Acute Ceriodaphnia	PASS
Winter 2014	96Hr Acute Pimephales Promelas	FAIL
Spring 2014	48Hr Acute Ceriodaphnia	PASS
Summer 2014	96Hr Acute Pimephales Promelas	PASS
Fall 2014	48Hr Acute Ceriodaphnia	PASS
Winter 2015	96Hr Acute Pimephales Promelas	NA
Spring 2015	48Hr Acute Ceriodaphnia	
Summer 2015	96Hr Acute Pimephales Promelas	PASS
Fall 2015	48Hr Acute Ceriodaphnia	PASS
Winter 2016	96Hr Acute Pimephales Promelas	PASS
Spring 2016	48Hr Acute Ceriodaphnia	
Summer 2016	96Hr Acute Pimephales Promelas	
Fall 2016	48Hr Acute Ceriodaphnia	

Quarter	WET TEST	Result
Spring 2011	48Hr Acute Ceriodaphnia	PASS
Summer 2011	96Hr Acute Pimephales Promelas	PASS
Fall 2011	48Hr Acute Ceriodaphnia	PASS
Winter 2012	96Hr Acute Pimephales Promelas	PASS
Spring 2012	48Hr Acute Ceriodaphnia	PASS
Summer 2012	96Hr Acute Pimephales Promelas	PASS
Fall 2012	48Hr Acute Ceriodaphnia	PASS
Winter 2013	96Hr Acute Pimephales Promelas	PASS
Spring 2013	48Hr Acute Ceriodaphnia	PASS
Summer 2013	96Hr Acute Pimephales Promelas	PASS
Fall 2013	48Hr Acute Ceriodaphnia	PASS
Winter 2014	96Hr Acute Pimephales Promelas	FAIL
Spring 2014	48Hr Acute Ceriodaphnia	PASS
Summer 2014	96Hr Acute Pimephales Promelas	PASS
Fall 2014	48Hr Acute Ceriodaphnia	PASS
Winter 2015	96Hr Acute Pimephales Promelas	NA
Spring 2015	48Hr Acute Ceriodaphnia	
Summer 2015	96Hr Acute Pimephales Promelas	PASS
Fall 2015	48Hr Acute Ceriodaphnia	PASS
Winter 2016	96Hr Acute Pimephales Promelas	PASS
Spring 2016	48Hr Acute Ceriodaphnia	
Summer 2016	96Hr Acute Pimephales Promelas	
Fall 2016	48Hr Acute Ceriodaphnia	

									Metals, Effluent
	Jun-11	Sep-11	Dec-11	Mar-12	Jun-12	Sep-12	Dec-12	Mar-13	Jun-13
Cyanide	0.02	0.023	0.0127	0.0217	0.005	0.0189	0.0191	0.0185	0.0226
Arsenic	0.00083	0.0009	0.0008	0.00111	0.00099	0.002	0.002	0.002	0.002
Cadnium	0.00018	0.00018	0.00018	0.00018	0.00018	0.0005	0.0005	0.0005	0.005
Chromium	0.01	0.01	0.01	0.01	0.01	0.002	0.002	0.002	0.002
Copper	0.0304	0.00063	0.0243	0.0215	0.0344	0.0163	0.0186	0.0306	0.002
Lead	0.02	0.02	0.00061	0.00073	0.00068	0.002	0.002	0.002	0.002
Molybdenum	0.0071	0.0055	0.02	0.02	0.0332	0.002	0.02	0.00277	0.002
Nickel	0.0071	0.0055	0.00434	0.00421	0.00425	0.002	0.002	0.00234	0.002
Silver	0.00046	0.0004	0.0004	0.0004	0.0004	0.002	0.002	0.002	0.002
Zinc	0.0813	0.0584	0.0643	0.0709	0.0676	0.0486	0.0605	0.092	0.0566
Selenium	0.00111	0.00107	0.00082	0.00089	0.0011	0.002	0.002	0.002	0.002
Mercury	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
									Metals, Influent
Cyanide	0.005	0.005	0.005	0.005	0.0227	0.005	0.005	0.005	0.0055
Arsenic	0.0012	0.0009	0.00146	0.00115	0.00141	0.002	0.002	0.002	0.002
Cadnium	0.00018	0.00021	0.00018	0.00018	0.00019	0.0005	0.0005	0.0005	0.005
Chromium	0.01	0.01	0.01	0.01	0.01	0.002	0.002	0.002	0.002
Copper	0.0569	0.00122	0.0469	0.0408	0.0608	0.0163	0.0261	0.0302	0.002
Lead	0.0236	0.02	0.00136	0.00216	0.00173	0.002	0.002	0.002	0.002
Molybdenum	0.00726	0.00632	0.02	0.02	0.0399	0.00255	0.02	0.00264	0.002
Nickel	0.00726	0.00632	0.00796	0.00446	0.00462	0.00209	0.002	0.002	0.002
Silver	0.0004	0.0004	0.0004	0.0004	0.00066	0.002	0.002	0.002	0.002
Zinc	0.198	0.122	0.108	0.122	0.144	0.12	0.103	0.085	0.0796
Selenium	0.00263	0.00188	0.00156	0.00171	0.00136	0.002	0.002	0.002	0.002
Mercury	0.00015	0.00015	0.00015	0.00015	0.00016	0.00015	0.00015	0.00015	NA

Metals, Effluent									
	Jun-11	Sep-11	Dec-11	Mar-12	Jun-12	Sep-12	Dec-12	Mar-13	Jun-13
Cyanide	0.02	0.023	0.0127	0.0217	0.005	0.0189	0.0191	0.0185	0.0226
	=	=	=	=	ND	=	=	=	=
Arsenic	0.00083	0.0009	0.0008	0.00111	0.00099	0.002	0.002	0.002	0.002
	=	=	=	=	=	ND	ND	ND	ND
Cadnium	0.00018	0.00018	0.00018	0.00018	0.00018	0.0005	0.0005	0.0005	0.005
	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	0.01	0.01	0.01	0.01	0.01	0.002	0.002	0.002	0.002
	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.0304	0.00063	0.0243	0.0215	0.0344	0.0163	0.0186	0.0306	0.002
	=	=	=	=	=	=	=	=	ND
Lead	0.02	0.02	0.00061	0.00073	0.00068	0.002	0.002	0.002	0.002
	ND	ND	=	=	=	ND	ND	ND	ND
Molybdenum	0.0071	0.0055	0.02	0.02	0.0332	0.002	0.02	0.00277	0.002
	=	=	ND	ND	=	ND	ND	=	ND
Nickel	0.0071	0.0055	0.00434	0.00421	0.00425	0.002	0.002	0.00234	0.002
	=	=	=	=	=	ND	ND	=	ND
Silver	0.00046	0.0004	0.0004	0.0004	0.0004	0.002	0.002	0.002	0.002
	=	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	0.0813	0.0584	0.0643	0.0709	0.0676	0.0486	0.0605	0.092	0.0566
	=	=	=	=	=	=	=	=	=
Selenium	0.00111	0.00107	0.00082	0.00089	0.0011	0.002	0.002	0.002	0.002
	=	=	=	=	=	ND	ND	ND	ND

Mercury	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
	ND	ND	ND	ND	ND	ND	ND	ND	ND

Metals, Influent									
	Jun-11	Sep-11	Dec-11	Mar-12	Jun-12	Sep-12	Dec-12	Mar-13	Jun-13
Cyanide	0.005	0.005	0.005	0.005	0.0227	0.005	0.005	0.005	0.0055
	ND	ND	ND	ND	=	ND	ND	ND	=
Arsenic	0.0012	0.0009	0.00146	0.00115	0.00141	0.002	0.002	0.002	0.002
	=	=	=	=	=	ND	ND	ND	ND
Cadnium	0.00018	0.00021	0.00018	0.00018	0.00019	0.0005	0.0005	0.0005	0.005
	ND	=	ND	ND	=	ND	ND	ND	ND
Chromium	0.01	0.01	0.01	0.01	0.01	0.002	0.002	0.002	0.002
	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.0569	0.00122	0.0469	0.0408	0.0608	0.0163	0.0261	0.0302	0.002
	=	=	=	=	=	=	=	=	ND
Lead	0.0236	0.02	0.00136	0.00216	0.00173	0.002	0.002	0.002	0.002
	=	ND	=	=	=	ND	ND	ND	ND
Molybdenum	0.00726	0.00632	0.02	0.02	0.0399	0.00255	0.02	0.00264	0.002
	=	=	ND	ND	=	=	ND	=	ND
Nickel	0.00726	0.00632	0.00796	0.00446	0.00462	0.00209	0.002	0.002	0.002
	=	=	=	=	=	=	ND	ND	ND
Silver	0.0004	0.0004	0.0004	0.0004	0.00066	0.002	0.002	0.002	0.002
	ND	ND	ND	ND	=	ND	ND	ND	ND
Zinc	0.198	0.122	0.108	0.122	0.144	0.12	0.103	0.085	0.0796
	=	=	=	=	=	=	=	=	=
Selenium	0.00263	0.00188	0.00156	0.00171	0.00136	0.002	0.002	0.002	0.002
	=	=	=	=	=	ND	ND	ND	ND
Mercury	0.00015	0.00015	0.00015	0.00015	0.00016	0.00015	0.00015	0.00015	NA
	ND	ND	ND	ND	=	ND	ND	ND	

Sep-13	Dec-13	Mar-14	Jun-14	Sep-14	Dec-14	Mar-15	Sep-15
0.0266	0.0232	0.0093	0.00855	0.042	0.006	0.004	0.005
0.002	0.002	0.002	0.002	0.0008	0.0008	0.001	0.002
0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.005	0.0005
0.002	0.002	0.002	0.002	0.0007	0.0011	0.0012	0.002
0.0187	0.002	0.0324	0.0235	0.0179	0.0182	0.0182	0.0167
0.002	0.00251	0.002	0.00264	0.0005	0.0005	0.0006	0.002
0.00227	0.00226	0.00261	0.00264	0.0023	0.0023	0.0026	0.00235
0.002	0.002	0.00471	0.002	0.0041	0.0037	0.0034	0.002
0.002	0.0637	0.002	0.002	0.002	0.002	0.002	0.002
0.0525	0.002	0.084	0.0762	0.04	0.04	0.07	0.0461
0.002	0.00015	0.002	0.002	0.0014	0.0014	0.0014	0.002
0.00015	0.0349	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015

0.005	0.005	0.0116	0.005	0.005	0.005	0.005	0.005
0.002	0.002	0.002	0.002	0.0009	0.0009	0.0012	0.002
0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0005
0.002	0.002	0.002	0.002	0.0014	0.0018	0.0025	0.002
0.0363	0.002	0.0393	0.0452	0.0263	0.0345	0.0347	0.0247
0.002	0.0027	0.002	0.00514	0.0006	0.0012	0.0012	0.002
0.00278	0.00244	0.00286	0.00514	0.0028	0.0024	0.0031	0.0026
0.00254	0.002	0.00424	0.002	0.0046	0.004	0.0043	0.002
0.002	0.0738	0.002	0.002	0.002	0.002	0.002	0.002
0.151	0.002	0.0877	0.73	0.07	0.22	0.13	0.0754
0.002	0.00015	0.002	0.002	0.0015	0.0016	0.0016	0.00015
0.00015	0.0289	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015

Sep-13	Dec-13	Mar-14	Jun-14	Sep-14	Dec-14	Mar-15	Sep-15
0.0266	0.0232	0.0093	0.00855	0.042	0.006	0.004	0.005
=	=	=	=	=	=	=	ND
0.002	0.002	0.002	0.002	0.0008	0.0008	0.001	0.002
ND	ND	ND	ND	=	=	=	ND
0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.005	0.0005
ND	ND	ND	ND	ND	ND	ND	ND
0.002	0.002	0.002	0.002	0.0007	0.0011	0.0012	0.002
ND	ND	ND	ND	=	=	=	ND
0.0187	0.002	0.0324	0.0235	0.0179	0.0182	0.0182	0.0167
=	ND	=	=	=	=	=	=
0.002	0.00251	0.002	0.00264	0.0005	0.0005	0.0006	0.002
ND	=	ND	=	=	=	=	ND
0.00227	0.00226	0.00261	0.00264	0.0023	0.0023	0.0026	0.00235
=	=	=	=	=	=	=	=
0.002	0.002	0.00471	0.002	0.0041	0.0037	0.0034	0.002
ND	ND	=	ND	=	=	=	ND
0.002	0.0637	0.002	0.002	0.002	0.002	0.002	0.002
ND	=	ND	ND	ND	ND	ND	ND
0.0525	0.002	0.084	0.0762	0.04	0.04	0.07	0.0461
=	ND	=	=	=	=	=	=
0.002	0.00015	0.002	0.002	0.0014	0.0014	0.0014	0.002
ND	ND	ND	ND	=	=	=	ND

0.00015	0.0349	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
ND	=	ND	ND	ND	ND	ND	ND

Sep-13	Dec-13	Mar-14	Jun-14	Sep-14	Dec-14	Mar-15	Sep-15
0.005	0.005	0.0116	0.005	0.005	0.005	0.005	0.005
ND	ND	=	ND	ND	ND	ND	ND
0.002	0.002	0.002	0.002	0.0009	0.0009	0.0012	0.002
ND	ND	ND	ND	=	=	=	ND
0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0005
ND	ND	ND	ND	ND	ND	=	ND
0.002	0.002	0.002	0.002	0.0014	0.0018	0.0025	0.002
ND	ND	ND	ND	=	=	=	ND
0.0363	0.002	0.0393	0.0452	0.0263	0.0345	0.0347	0.0247
=	ND	=	=	=	=	=	=
0.002	0.0027	0.002	0.00514	0.0006	0.0012	0.0012	0.002
ND	=	ND	=	=	=	=	ND
0.00278	0.00244	0.00286	0.00514	0.0028	0.0024	0.0031	0.0026
=	=	=	=	=	=	=	=
0.00254	0.002	0.00424	0.002	0.0046	0.004	0.0043	0.002
=	ND	=	ND	=	=	=	ND
0.002	0.0738	0.002	0.002	0.002	0.002	0.002	0.002
ND	=	ND	ND	ND	ND	ND	ND
0.151	0.002	0.0877	0.73	0.07	0.22	0.13	0.0754
=	ND	=	=	=	=	=	=
0.002	0.00015	0.002	0.002	0.0015	0.0016	0.0016	0.00015
ND	ND	ND	ND	=	=	=	ND
0.00015	0.0289	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
ND	=	ND	ND	ND	ND	ND	ND

Month	Param	Loc	Value	Qual
Jun-11	Arsenic	Eff	0.00083	=
Sep-11	Arsenic	Eff	0.0009	=
Dec-11	Arsenic	Eff	0.0008	=
Mar-12	Arsenic	Eff	0.00111	=
Jun-12	Arsenic	Eff	0.00099	=
Sep-12	Arsenic	Eff	0.002	<
Dec-12	Arsenic	Eff	0.002	<
Mar-13	Arsenic	Eff	0.002	<
Jun-13	Arsenic	Eff	0.002	<
Sep-13	Arsenic	Eff	0.002	<
Dec-13	Arsenic	Eff	0.002	<
Mar-14	Arsenic	Eff	0.002	<
Jun-14	Arsenic	Eff	0.002	<
Sep-14	Arsenic	Eff	0.0008	=
Dec-14	Arsenic	Eff	0.0008	=
Mar-15	Arsenic	Eff	0.001	=
Sep-15	Arsenic	Eff	0.002	<
Jun-11	Cadmium	Eff	0.00018	<
Sep-11	Cadmium	Eff	0.00018	<
Dec-11	Cadmium	Eff	0.00018	<
Mar-12	Cadmium	Eff	0.00018	<
Jun-12	Cadmium	Eff	0.00018	<
Sep-12	Cadmium	Eff	0.0005	<
Dec-12	Cadmium	Eff	0.0005	<
Mar-13	Cadmium	Eff	0.0005	<
Jun-13	Cadmium	Eff	0.005	<
Sep-13	Cadmium	Eff	0.0005	<
Dec-13	Cadmium	Eff	0.0005	<
Mar-14	Cadmium	Eff	0.0005	<
Jun-14	Cadmium	Eff	0.0005	<
Sep-14	Cadmium	Eff	0.0005	<

Month	Loc	Cyanide	Qual	Arsenic	Qual	Cadmium	Qual	Chromium	Qual	Copper	Qual
Jun-11	Eff	0.02	=	0.00083	=	0.00018	<	0.01	<	0.0304	=
Sep-11	Eff	0.023	=	0.0009	=	0.00018	<	0.01	<	0.00063	=
Dec-11	Eff	0.0127	=	0.0008	=	0.00018	<	0.01	<	0.0243	=
Mar-12	Eff	0.0217	=	0.00111	=	0.00018	<	0.01	<	0.0215	=
Jun-12	Eff	0.005	<	0.00099	=	0.00018	<	0.01	<	0.0344	=
Sep-12	Eff	0.0189	=	0.002	<	0.0005	<	0.002	<	0.0163	=
Dec-12	Eff	0.0191	=	0.002	<	0.0005	<	0.002	<	0.0186	=
Mar-13	Eff	0.0185	=	0.002	<	0.0005	<	0.002	<	0.0306	=
Jun-13	Eff	0.0226	=	0.002	<	0.005	<	0.002	<	0.002	<
Sep-13	Eff	0.0266	=	0.002	<	0.0005	<	0.002	<	0.0187	=
Dec-13	Eff	0.0232	=	0.002	<	0.0005	<	0.002	<	0.002	<
Mar-14	Eff	0.0093	=	0.002	<	0.0005	<	0.002	<	0.0324	=
Jun-14	Eff	0.00855	=	0.002	<	0.0005	<	0.002	<	0.0235	=
Sep-14	Eff	0.042	=	0.0008	=	0.0005	<	0.0007	=	0.0179	=
Dec-14	Eff	0.006	=	0.0008	=	0.0005	<	0.0011	=	0.0182	=
Mar-15	Eff	0.004	=	0.001	=	0.005	<	0.0012	=	0.0182	=
Sep-15	Eff	0.005	<	0.002	<	0.0005	<	0.002	<	0.0167	=

Month	Loc	Cyanide	Qual	Arsenic	Qual	Cadmium	Qual	Chromium	Qual	Copper	Qual
Jun-11	Inf	0.005	<	0.0012	=	0.00018	<	0.01	<	0.0569	=
Sep-11	Inf	0.005	<	0.0009	=	0.00021	=	0.01	<	0.00122	=
Dec-11	Inf	0.005	<	0.00146	=	0.00018	<	0.01	<	0.0469	=
Mar-12	Inf	0.005	<	0.00115	=	0.00018	<	0.01	<	0.0408	=
Jun-12	Inf	0.0227	=	0.00141	=	0.00019	=	0.01	<	0.0608	=
Sep-12	Inf	0.005	<	0.002	<	0.0005	<	0.002	<	0.0163	=
Dec-12	Inf	0.005	<	0.002	<	0.0005	<	0.002	<	0.0261	=
Mar-13	Inf	0.005	<	0.002	<	0.0005	<	0.002	<	0.0302	=
Jun-13	Inf	0.0055	=	0.002	<	0.005	<	0.002	<	0.002	<
Sep-13	Inf	0.005	<	0.002	<	0.0005	<	0.002	<	0.0363	=
Dec-13	Inf	0.005	<	0.002	<	0.0005	<	0.002	<	0.002	<
Mar-14	Inf	0.0116	=	0.002	<	0.0005	<	0.002	<	0.0393	=

Dec-14	Cadmium	Eff	0.0005 <	Jun-14	Inf	0.005 <	0.002 <	0.0005 <	0.002 <	0.0452 =
Mar-15	Cadmium	Eff	0.005 <	Sep-14	Inf	0.005 <	0.0009 =	0.0005 <	0.0014 =	0.0263 =
Sep-15	Cadmium	Eff	0.0005 <	Dec-14	Inf	0.005 <	0.0009 =	0.0005 <	0.0018 =	0.0345 =
Jun-11	Chromium	Eff	0.01 <	Mar-15	Inf	0.005 <	0.0012 =	0.0002 =	0.0025 =	0.0347 =
Sep-11	Chromium	Eff	0.01 <	Sep-15	Inf	0.005 <	0.002 <	0.0005 <	0.002 <	0.0247 =
Dec-11	Chromium	Eff	0.01 <							
Mar-12	Chromium	Eff	0.01 <							
Jun-12	Chromium	Eff	0.01 <							
Sep-12	Chromium	Eff	0.002 <							
Dec-12	Chromium	Eff	0.002 <							
Mar-13	Chromium	Eff	0.002 <							
Jun-13	Chromium	Eff	0.002 <							
Sep-13	Chromium	Eff	0.002 <							
Dec-13	Chromium	Eff	0.002 <							
Mar-14	Chromium	Eff	0.002 <							
Jun-14	Chromium	Eff	0.002 <							
Sep-14	Chromium	Eff	0.0007 =							
Dec-14	Chromium	Eff	0.0011 =							
Mar-15	Chromium	Eff	0.0012 =							
Sep-15	Chromium	Eff	0.002 <							
Jun-11	Copper	Eff	0.0304 =							
Sep-11	Copper	Eff	0.00063 =							
Dec-11	Copper	Eff	0.0243 =							
Mar-12	Copper	Eff	0.0215 =							
Jun-12	Copper	Eff	0.0344 =							
Sep-12	Copper	Eff	0.0163 =							
Dec-12	Copper	Eff	0.0186 =							
Mar-13	Copper	Eff	0.0306 =							
Jun-13	Copper	Eff	0.002 <							
Sep-13	Copper	Eff	0.0187 =							
Dec-13	Copper	Eff	0.002 <							
Mar-14	Copper	Eff	0.0324 =							
Jun-14	Copper	Eff	0.0235 =							
Sep-14	Copper	Eff	0.0179 =							

Dec-14	Copper	Eff	0.0182	=
Mar-15	Copper	Eff	0.0182	=
Sep-15	Copper	Eff	0.0167	=
Jun-11	Cyanide	Eff	0.02	=
Sep-11	Cyanide	Eff	0.023	=
Dec-11	Cyanide	Eff	0.0127	=
Mar-12	Cyanide	Eff	0.0217	=
Jun-12	Cyanide	Eff	0.005	<
Sep-12	Cyanide	Eff	0.0189	=
Dec-12	Cyanide	Eff	0.0191	=
Mar-13	Cyanide	Eff	0.0185	=
Jun-13	Cyanide	Eff	0.0226	=
Sep-13	Cyanide	Eff	0.0266	=
Dec-13	Cyanide	Eff	0.0232	=
Mar-14	Cyanide	Eff	0.0093	=
Jun-14	Cyanide	Eff	0.00855	=
Sep-14	Cyanide	Eff	0.042	=
Dec-14	Cyanide	Eff	0.006	=
Mar-15	Cyanide	Eff	0.004	=
Sep-15	Cyanide	Eff	0.005	<
Jun-11	Lead	Eff	0.02	<
Sep-11	Lead	Eff	0.02	<
Dec-11	Lead	Eff	0.00061	=
Mar-12	Lead	Eff	0.00073	=
Jun-12	Lead	Eff	0.00068	=
Sep-12	Lead	Eff	0.002	<
Dec-12	Lead	Eff	0.002	<
Mar-13	Lead	Eff	0.002	<
Jun-13	Lead	Eff	0.002	<
Sep-13	Lead	Eff	0.002	<
Dec-13	Lead	Eff	0.00251	=
Mar-14	Lead	Eff	0.002	<
Jun-14	Lead	Eff	0.00264	=
Sep-14	Lead	Eff	0.0005	=

Dec-14	Lead	Eff	0.0005	=
Mar-15	Lead	Eff	0.0006	=
Sep-15	Lead	Eff	0.002	<
Jun-11	Mercury	Eff	0.00015	<
Sep-11	Mercury	Eff	0.00015	<
Dec-11	Mercury	Eff	0.00015	<
Mar-12	Mercury	Eff	0.00015	<
Jun-12	Mercury	Eff	0.00015	<
Sep-12	Mercury	Eff	0.00015	<
Dec-12	Mercury	Eff	0.00015	<
Mar-13	Mercury	Eff	0.00015	<
Jun-13	Mercury	Eff	0.00015	<
Sep-13	Mercury	Eff	0.00015	<
Dec-13	Mercury	Eff	0.0349	=
Mar-14	Mercury	Eff	0.00015	<
Jun-14	Mercury	Eff	0.00015	<
Sep-14	Mercury	Eff	0.00015	<
Dec-14	Mercury	Eff	0.00015	<
Mar-15	Mercury	Eff	0.00015	<
Sep-15	Mercury	Eff	0.00015	<
Jun-11	Molybdenum	Eff	0.0071	=
Sep-11	Molybdenum	Eff	0.0055	=
Dec-11	Molybdenum	Eff	0.02	<
Mar-12	Molybdenum	Eff	0.02	<
Jun-12	Molybdenum	Eff	0.0332	=
Sep-12	Molybdenum	Eff	0.002	<
Dec-12	Molybdenum	Eff	0.02	<
Mar-13	Molybdenum	Eff	0.00277	=
Jun-13	Molybdenum	Eff	0.002	<
Sep-13	Molybdenum	Eff	0.00227	=
Dec-13	Molybdenum	Eff	0.00226	=
Mar-14	Molybdenum	Eff	0.00261	=
Jun-14	Molybdenum	Eff	0.00264	=
Sep-14	Molybdenum	Eff	0.0023	=

Dec-14	Molybdenum	Eff	0.0023	=
Mar-15	Molybdenum	Eff	0.0026	=
Sep-15	Molybdenum	Eff	0.00235	=
Jun-11	Nickel	Eff	0.0071	=
Sep-11	Nickel	Eff	0.0055	=
Dec-11	Nickel	Eff	0.00434	=
Mar-12	Nickel	Eff	0.00421	=
Jun-12	Nickel	Eff	0.00425	=
Sep-12	Nickel	Eff	0.002	<
Dec-12	Nickel	Eff	0.002	<
Mar-13	Nickel	Eff	0.00234	=
Jun-13	Nickel	Eff	0.002	<
Sep-13	Nickel	Eff	0.002	<
Dec-13	Nickel	Eff	0.002	<
Mar-14	Nickel	Eff	0.00471	=
Jun-14	Nickel	Eff	0.002	<
Sep-14	Nickel	Eff	0.0041	=
Dec-14	Nickel	Eff	0.0037	=
Mar-15	Nickel	Eff	0.0034	=
Sep-15	Nickel	Eff	0.002	<
Jun-11	Selenium	Eff	0.00111	=
Sep-11	Selenium	Eff	0.00107	=
Dec-11	Selenium	Eff	0.00082	=
Mar-12	Selenium	Eff	0.00089	=
Jun-12	Selenium	Eff	0.0011	=
Sep-12	Selenium	Eff	0.002	<
Dec-12	Selenium	Eff	0.002	<
Mar-13	Selenium	Eff	0.002	<
Jun-13	Selenium	Eff	0.002	<
Sep-13	Selenium	Eff	0.002	<
Dec-13	Selenium	Eff	0.00015	<
Mar-14	Selenium	Eff	0.002	<
Jun-14	Selenium	Eff	0.002	<
Sep-14	Selenium	Eff	0.0014	=

Dec-14	Selenium	Eff	0.0014	=
Mar-15	Selenium	Eff	0.0014	=
Sep-15	Selenium	Eff	0.002	<
Jun-11	Silver	Eff	0.00046	=
Sep-11	Silver	Eff	0.0004	<
Dec-11	Silver	Eff	0.0004	<
Mar-12	Silver	Eff	0.0004	<
Jun-12	Silver	Eff	0.0004	<
Sep-12	Silver	Eff	0.002	<
Dec-12	Silver	Eff	0.002	<
Mar-13	Silver	Eff	0.002	<
Jun-13	Silver	Eff	0.002	<
Sep-13	Silver	Eff	0.002	<
Dec-13	Silver	Eff	0.0637	=
Mar-14	Silver	Eff	0.002	<
Jun-14	Silver	Eff	0.002	<
Sep-14	Silver	Eff	0.002	<
Dec-14	Silver	Eff	0.002	<
Mar-15	Silver	Eff	0.002	<
Sep-15	Silver	Eff	0.002	<
Jun-11	Zinc	Eff	0.0813	=
Sep-11	Zinc	Eff	0.0584	=
Dec-11	Zinc	Eff	0.0643	=
Mar-12	Zinc	Eff	0.0709	=
Jun-12	Zinc	Eff	0.0676	=
Sep-12	Zinc	Eff	0.0486	=
Dec-12	Zinc	Eff	0.0605	=
Mar-13	Zinc	Eff	0.092	=
Jun-13	Zinc	Eff	0.0566	=
Sep-13	Zinc	Eff	0.0525	=
Dec-13	Zinc	Eff	0.002	<
Mar-14	Zinc	Eff	0.084	=
Jun-14	Zinc	Eff	0.0762	=
Sep-14	Zinc	Eff	0.04	=

Dec-14	Zinc	Eff	0.04	=
Mar-15	Zinc	Eff	0.07	=
Sep-15	Zinc	Eff	0.0461	=
Jun-11	Arsenic	Inf	0.0012	=
Sep-11	Arsenic	Inf	0.0009	=
Dec-11	Arsenic	Inf	0.00146	=
Mar-12	Arsenic	Inf	0.00115	=
Jun-12	Arsenic	Inf	0.00141	=
Sep-12	Arsenic	Inf	0.002	<
Dec-12	Arsenic	Inf	0.002	<
Mar-13	Arsenic	Inf	0.002	<
Jun-13	Arsenic	Inf	0.002	<
Sep-13	Arsenic	Inf	0.002	<
Dec-13	Arsenic	Inf	0.002	<
Mar-14	Arsenic	Inf	0.002	<
Jun-14	Arsenic	Inf	0.002	<
Sep-14	Arsenic	Inf	0.0009	=
Dec-14	Arsenic	Inf	0.0009	=
Mar-15	Arsenic	Inf	0.0012	=
Sep-15	Arsenic	Inf	0.002	<
Jun-11	Cadmium	Inf	0.00018	<
Sep-11	Cadmium	Inf	0.00021	=
Dec-11	Cadmium	Inf	0.00018	<
Mar-12	Cadmium	Inf	0.00018	<
Jun-12	Cadmium	Inf	0.00019	=
Sep-12	Cadmium	Inf	0.0005	<
Dec-12	Cadmium	Inf	0.0005	<
Mar-13	Cadmium	Inf	0.0005	<
Jun-13	Cadmium	Inf	0.005	<
Sep-13	Cadmium	Inf	0.0005	<
Dec-13	Cadmium	Inf	0.0005	<
Mar-14	Cadmium	Inf	0.0005	<
Jun-14	Cadmium	Inf	0.0005	<
Sep-14	Cadmium	Inf	0.0005	<

Dec-14	Cadmium	Inf	0.0005	<
Mar-15	Cadmium	Inf	0.0002	=
Sep-15	Cadmium	Inf	0.0005	<
Jun-11	Chromium	Inf	0.01	<
Sep-11	Chromium	Inf	0.01	<
Dec-11	Chromium	Inf	0.01	<
Mar-12	Chromium	Inf	0.01	<
Jun-12	Chromium	Inf	0.01	<
Sep-12	Chromium	Inf	0.002	<
Dec-12	Chromium	Inf	0.002	<
Mar-13	Chromium	Inf	0.002	<
Jun-13	Chromium	Inf	0.002	<
Sep-13	Chromium	Inf	0.002	<
Dec-13	Chromium	Inf	0.002	<
Mar-14	Chromium	Inf	0.002	<
Jun-14	Chromium	Inf	0.002	<
Sep-14	Chromium	Inf	0.0014	=
Dec-14	Chromium	Inf	0.0018	=
Mar-15	Chromium	Inf	0.0025	=
Sep-15	Chromium	Inf	0.002	<
Jun-11	Copper	Inf	0.0569	=
Sep-11	Copper	Inf	0.00122	=
Dec-11	Copper	Inf	0.0469	=
Mar-12	Copper	Inf	0.0408	=
Jun-12	Copper	Inf	0.0608	=
Sep-12	Copper	Inf	0.0163	=
Dec-12	Copper	Inf	0.0261	=
Mar-13	Copper	Inf	0.0302	=
Jun-13	Copper	Inf	0.002	<
Sep-13	Copper	Inf	0.0363	=
Dec-13	Copper	Inf	0.002	<
Mar-14	Copper	Inf	0.0393	=
Jun-14	Copper	Inf	0.0452	=
Sep-14	Copper	Inf	0.0263	=

Dec-14	Copper	Inf	0.0345	=
Mar-15	Copper	Inf	0.0347	=
Sep-15	Copper	Inf	0.0247	=
Jun-11	Cyanide	Inf	0.005	<
Sep-11	Cyanide	Inf	0.005	<
Dec-11	Cyanide	Inf	0.005	<
Mar-12	Cyanide	Inf	0.005	<
Jun-12	Cyanide	Inf	0.0227	=
Sep-12	Cyanide	Inf	0.005	<
Dec-12	Cyanide	Inf	0.005	<
Mar-13	Cyanide	Inf	0.005	<
Jun-13	Cyanide	Inf	0.0055	=
Sep-13	Cyanide	Inf	0.005	<
Dec-13	Cyanide	Inf	0.005	<
Mar-14	Cyanide	Inf	0.0116	=
Jun-14	Cyanide	Inf	0.005	<
Sep-14	Cyanide	Inf	0.005	<
Dec-14	Cyanide	Inf	0.005	<
Mar-15	Cyanide	Inf	0.005	<
Sep-15	Cyanide	Inf	0.005	<
Jun-11	Lead	Inf	0.0236	=
Sep-11	Lead	Inf	0.02	<
Dec-11	Lead	Inf	0.00136	=
Mar-12	Lead	Inf	0.00216	=
Jun-12	Lead	Inf	0.00173	=
Sep-12	Lead	Inf	0.002	<
Dec-12	Lead	Inf	0.002	<
Mar-13	Lead	Inf	0.002	<
Jun-13	Lead	Inf	0.002	<
Sep-13	Lead	Inf	0.002	<
Dec-13	Lead	Inf	0.0027	=
Mar-14	Lead	Inf	0.002	<
Jun-14	Lead	Inf	0.00514	=
Sep-14	Lead	Inf	0.0006	=

Dec-14	Lead	Inf	0.0012	=
Mar-15	Lead	Inf	0.0012	=
Sep-15	Lead	Inf	0.002	<
Jun-11	Mercury	Inf	0.00015	<
Sep-11	Mercury	Inf	0.00015	<
Dec-11	Mercury	Inf	0.00015	<
Mar-12	Mercury	Inf	0.00015	<
Jun-12	Mercury	Inf	0.00016	=
Sep-12	Mercury	Inf	0.00015	<
Dec-12	Mercury	Inf	0.00015	<
Mar-13	Mercury	Inf	0.00015	<
Jun-13	Mercury	Inf	NA	
Sep-13	Mercury	Inf	0.00015	<
Dec-13	Mercury	Inf	0.0289	=
Mar-14	Mercury	Inf	0.00015	<
Jun-14	Mercury	Inf	0.00015	<
Sep-14	Mercury	Inf	0.00015	<
Dec-14	Mercury	Inf	0.00015	<
Mar-15	Mercury	Inf	0.00015	<
Sep-15	Mercury	Inf	0.00015	<
Jun-11	Molybdenum	Inf	0.00726	=
Sep-11	Molybdenum	Inf	0.00632	=
Dec-11	Molybdenum	Inf	0.02	<
Mar-12	Molybdenum	Inf	0.02	<
Jun-12	Molybdenum	Inf	0.0399	=
Sep-12	Molybdenum	Inf	0.00255	=
Dec-12	Molybdenum	Inf	0.02	<
Mar-13	Molybdenum	Inf	0.00264	=
Jun-13	Molybdenum	Inf	0.002	<
Sep-13	Molybdenum	Inf	0.00278	=
Dec-13	Molybdenum	Inf	0.00244	=
Mar-14	Molybdenum	Inf	0.00286	=
Jun-14	Molybdenum	Inf	0.00514	=
Sep-14	Molybdenum	Inf	0.0028	=

Dec-14	Molybdenum	Inf	0.0024	=
Mar-15	Molybdenum	Inf	0.0031	=
Sep-15	Molybdenum	Inf	0.0026	=
Jun-11	Nickel	Inf	0.00726	=
Sep-11	Nickel	Inf	0.00632	=
Dec-11	Nickel	Inf	0.00796	=
Mar-12	Nickel	Inf	0.00446	=
Jun-12	Nickel	Inf	0.00462	=
Sep-12	Nickel	Inf	0.00209	=
Dec-12	Nickel	Inf	0.002	<
Mar-13	Nickel	Inf	0.002	<
Jun-13	Nickel	Inf	0.002	<
Sep-13	Nickel	Inf	0.00254	=
Dec-13	Nickel	Inf	0.002	<
Mar-14	Nickel	Inf	0.00424	=
Jun-14	Nickel	Inf	0.002	<
Sep-14	Nickel	Inf	0.0046	=
Dec-14	Nickel	Inf	0.004	=
Mar-15	Nickel	Inf	0.0043	=
Sep-15	Nickel	Inf	0.002	<
Jun-11	Selenium	Inf	0.00263	=
Sep-11	Selenium	Inf	0.00188	=
Dec-11	Selenium	Inf	0.00156	=
Mar-12	Selenium	Inf	0.00171	=
Jun-12	Selenium	Inf	0.00136	=
Sep-12	Selenium	Inf	0.002	<
Dec-12	Selenium	Inf	0.002	<
Mar-13	Selenium	Inf	0.002	<
Jun-13	Selenium	Inf	0.002	<
Sep-13	Selenium	Inf	0.002	<
Dec-13	Selenium	Inf	0.00015	<
Mar-14	Selenium	Inf	0.002	<
Jun-14	Selenium	Inf	0.002	<
Sep-14	Selenium	Inf	0.0015	=

Dec-14	Selenium	Inf	0.0016	=
Mar-15	Selenium	Inf	0.0016	=
Sep-15	Selenium	Inf	0.00015	<
Jun-11	Silver	Inf	0.0004	<
Sep-11	Silver	Inf	0.0004	<
Dec-11	Silver	Inf	0.0004	<
Mar-12	Silver	Inf	0.0004	<
Jun-12	Silver	Inf	0.00066	=
Sep-12	Silver	Inf	0.002	<
Dec-12	Silver	Inf	0.002	<
Mar-13	Silver	Inf	0.002	<
Jun-13	Silver	Inf	0.002	<
Sep-13	Silver	Inf	0.002	<
Dec-13	Silver	Inf	0.0738	=
Mar-14	Silver	Inf	0.002	<
Jun-14	Silver	Inf	0.002	<
Sep-14	Silver	Inf	0.002	<
Dec-14	Silver	Inf	0.002	<
Mar-15	Silver	Inf	0.002	<
Sep-15	Silver	Inf	0.002	<
Jun-11	Zinc	Inf	0.198	=
Sep-11	Zinc	Inf	0.122	=
Dec-11	Zinc	Inf	0.108	=
Mar-12	Zinc	Inf	0.122	=
Jun-12	Zinc	Inf	0.144	=
Sep-12	Zinc	Inf	0.12	=
Dec-12	Zinc	Inf	0.103	=
Mar-13	Zinc	Inf	0.085	=
Jun-13	Zinc	Inf	0.0796	=
Sep-13	Zinc	Inf	0.151	=
Dec-13	Zinc	Inf	0.002	<
Mar-14	Zinc	Inf	0.0877	=
Jun-14	Zinc	Inf	0.73	=
Sep-14	Zinc	Inf	0.07	=

Dec-14	Zinc	Inf	0.22	=
Mar-15	Zinc	Inf	0.13	=
Sep-15	Zinc	Inf	0.0754	=

Lead		Molybdenum		Nickel		Silver		Zinc		Selenium		Mercury	
Lead	Qual	Molybder	Qual	Nickel	Qual	Silver	Qual	Zinc	Qual	Selenium	Qual	Mercury	Qual
0.02	<	0.0071	=	0.0071	=	0.00046	=	0.0813	=	0.00111	=	0.00015	<
0.02	<	0.0055	=	0.0055	=	0.0004	<	0.0584	=	0.00107	=	0.00015	<
0.00061	=	0.02	<	0.00434	=	0.0004	<	0.0643	=	0.00082	=	0.00015	<
0.00073	=	0.02	<	0.00421	=	0.0004	<	0.0709	=	0.00089	=	0.00015	<
0.00068	=	0.0332	=	0.00425	=	0.0004	<	0.0676	=	0.0011	=	0.00015	<
0.002	<	0.002	<	0.002	<	0.002	<	0.0486	=	0.002	<	0.00015	<
0.002	<	0.02	<	0.002	<	0.002	<	0.0605	=	0.002	<	0.00015	<
0.002	<	0.00277	=	0.00234	=	0.002	<	0.092	=	0.002	<	0.00015	<
0.002	<	0.002	<	0.002	<	0.002	<	0.0566	=	0.002	<	0.00015	<
0.002	<	0.00227	=	0.002	<	0.002	<	0.0525	=	0.002	<	0.00015	<
0.00251	=	0.00226	=	0.002	<	0.0637	=	0.002	<	0.00015	<	0.0349	=
0.002	<	0.00261	=	0.00471	=	0.002	<	0.084	=	0.002	<	0.00015	<
0.00264	=	0.00264	=	0.002	<	0.002	<	0.0762	=	0.002	<	0.00015	<
0.0005	=	0.0023	=	0.0041	=	0.002	<	0.04	=	0.0014	=	0.00015	<
0.0005	=	0.0023	=	0.0037	=	0.002	<	0.04	=	0.0014	=	0.00015	<
0.0006	=	0.0026	=	0.0034	=	0.002	<	0.07	=	0.0014	=	0.00015	<
0.002	<	0.00235	=	0.002	<	0.002	<	0.0461	=	0.002	<	0.00015	<

Lead	Qual	Molybder	Qual	Nickel	Qual	Silver	Qual	Zinc	Qual	Selenium	Qual	Mercury	Qual
0.0236	=	0.00726	=	0.00726	=	0.0004	<	0.198	=	0.00263	=	0.00015	<
0.02	<	0.00632	=	0.00632	=	0.0004	<	0.122	=	0.00188	=	0.00015	<
0.00136	=	0.02	<	0.00796	=	0.0004	<	0.108	=	0.00156	=	0.00015	<
0.00216	=	0.02	<	0.00446	=	0.0004	<	0.122	=	0.00171	=	0.00015	<
0.00173	=	0.0399	=	0.00462	=	0.00066	=	0.144	=	0.00136	=	0.00016	=
0.002	<	0.00255	=	0.00209	=	0.002	<	0.12	=	0.002	<	0.00015	<
0.002	<	0.02	<	0.002	<	0.002	<	0.103	=	0.002	<	0.00015	<
0.002	<	0.00264	=	0.002	<	0.002	<	0.085	=	0.002	<	0.00015	<
0.002	<	0.002	<	0.002	<	0.002	<	0.0796	=	0.002	<	NA	
0.002	<	0.00278	=	0.00254	=	0.002	<	0.151	=	0.002	<	0.00015	<
0.0027	=	0.00244	=	0.002	<	0.0738	=	0.002	<	0.00015	<	0.0289	=
0.002	<	0.00286	=	0.00424	=	0.002	<	0.0877	=	0.002	<	0.00015	<

0.00514 =	0.00514 =	0.002 <	0.002 <	0.73 =	0.002 <	0.00015 <
0.0006 =	0.0028 =	0.0046 =	0.002 <	0.07 =	0.0015 =	0.00015 <
0.0012 =	0.0024 =	0.004 =	0.002 <	0.22 =	0.0016 =	0.00015 <
0.0012 =	0.0031 =	0.0043 =	0.002 <	0.13 =	0.0016 =	0.00015 <
0.002 <	0.0026 =	0.002 <	0.002 <	0.0754 =	0.00015 <	0.00015 <

					Metals, Effluent		
Month	Cyanide	Arsenic	Cadnium	Chromium	Copper	Lead	Molybdenum
Jun-11	0.02	0.0008	0.00018	0.01	0.0304	0.02	0.0071
Sep-11	0.023	0.0009	0.00018	0.01	0.0006	0.02	0.0055
Dec-11	0.0127	0.0008	0.00018	0.01	0.0243	0.00061	0.02
Mar-12	0.0217	0.0011	0.00018	0.01	0.0215	0.00073	0.02
Jun-12	0.005	0.001	0.00018	0.01	0.0344	0.00068	0.0332
Sep-12	0.0189	0.002	0.0005	0.002	0.0163	0.002	0.002
Dec-12	0.0191	0.002	0.0005	0.002	0.0186	0.002	0.02
Mar-13	0.0185	0.002	0.0005	0.002	0.0306	0.002	0.00277
Jun-13	0.0226	0.002	0.005	0.002	0.002	0.002	0.002
Sep-13	0.0266	0.002	0.0005	0.002	0.0187	0.002	0.00227
Dec-13	0.0232	0.002	0.0005	0.002	0.002	0.00251	0.00226
Mar-14	0.0093	0.002	0.0005	0.002	0.0324	0.002	0.00261
Jun-14	0.00855	0.002	0.0005	0.002	0.0235	0.00264	0.00264
Sep-14	0.042	0.0008	0.0005	0.0007	0.0179	0.0005	0.0023
Dec-14	0.006	0.0008	0.0005	0.0011	0.0182	0.0005	0.0023
Mar-15	0.004	0.001	0.005	0.0012	0.0182	0.0006	0.0026
Sep-15	0.005	0.002	0.0005	0.002	0.0167	0.002	0.00235

					Metals, Influent		
Month	Cyanide	Arsenic	Cadnium	Chromium	Copper	Lead	Molybdenum
Jun-11	0.005	0.0012	0.00018	0.01	0.0569	0.0236	0.00726
Sep-11	0.005	0.0009	0.00021	0.01	0.0012	0.02	0.00632
Dec-11	0.005	0.0015	0.00018	0.01	0.0469	0.00136	0.02
Mar-12	0.005	0.0012	0.00018	0.01	0.0408	0.00216	0.02
Jun-12	0.0227	0.0014	0.00019	0.01	0.0608	0.00173	0.0399
Sep-12	0.005	0.002	0.0005	0.002	0.0163	0.002	0.00255
Dec-12	0.005	0.002	0.0005	0.002	0.0261	0.002	0.02
Mar-13	0.005	0.002	0.0005	0.002	0.0302	0.002	0.00264
Jun-13	0.0055	0.002	0.005	0.002	0.002	0.002	0.002
Sep-13	0.005	0.002	0.0005	0.002	0.0363	0.002	0.00278
Dec-13	0.005	0.002	0.0005	0.002	0.002	0.0027	0.00244
Mar-14	0.0116	0.002	0.0005	0.002	0.0393	0.002	0.00286
Jun-14	0.005	0.002	0.0005	0.002	0.0452	0.00514	0.00514
Sep-14	0.005	0.0009	0.0005	0.0014	0.0263	0.0006	0.0028
Dec-14	0.005	0.0009	0.0005	0.0018	0.0345	0.0012	0.0024
Mar-15	0.005	0.0012	0.0002	0.0025	0.0347	0.0012	0.0031
Sep-15	0.005	0.002	0.0005	0.002	0.0247	0.002	0.0026

Nickel	Silver	Zinc	Selenium	Mercury
0.0071	0.0005	0.0813	0.00111	0.00015
0.0055	0.0004	0.0584	0.00107	0.00015
0.0043	0.0004	0.0643	0.00082	0.00015
0.0042	0.0004	0.0709	0.00089	0.00015
0.0043	0.0004	0.0676	0.0011	0.00015
0.002	0.002	0.0486	0.002	0.00015
0.002	0.002	0.0605	0.002	0.00015
0.0023	0.002	0.092	0.002	0.00015
0.002	0.002	0.0566	0.002	0.00015
0.002	0.002	0.0525	0.002	0.00015
0.002	0.0637	0.002	0.00015	0.0349
0.0047	0.002	0.084	0.002	0.00015
0.002	0.002	0.0762	0.002	0.00015
0.0041	0.002	0.04	0.0014	0.00015
0.0037	0.002	0.04	0.0014	0.00015
0.0034	0.002	0.07	0.0014	0.00015
0.002	0.002	0.0461	0.002	0.00015

Nickel	Silver	Zinc	Selenium	Mercury
0.0073	0.0004	0.198	0.00263	0.00015
0.0063	0.0004	0.122	0.00188	0.00015
0.008	0.0004	0.108	0.00156	0.00015
0.0045	0.0004	0.122	0.00171	0.00015
0.0046	0.0007	0.144	0.00136	0.00016
0.0021	0.002	0.12	0.002	0.00015
0.002	0.002	0.103	0.002	0.00015
0.002	0.002	0.085	0.002	0.00015
0.002	0.002	0.0796	0.002	NA
0.0025	0.002	0.151	0.002	0.00015
0.002	0.0738	0.002	0.00015	0.0289
0.0042	0.002	0.0877	0.002	0.00015
0.002	0.002	0.73	0.002	0.00015
0.0046	0.002	0.07	0.0015	0.00015
0.004	0.002	0.22	0.0016	0.00015
0.0043	0.002	0.13	0.0016	0.00015
0.002	0.002	0.0754	0.00015	0.00015

Soltero written 5/13/94

PERMITTING AND ENFORCEMENT GUIDANCE DOCUMENT FOR WHOLE EFFLUENT TOXICITY CONTROL (BIOMONITORING)

BUREAU OF WATER POLLUTION CONTROL

February 15, 1991

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PERMITTING AND ENFORCEMENT

GUIDANCE DOCUMENT

FOR

WHOLE EFFLUENT TOXICITY CONTROL (BIOMONITORING)

Introduction and Background

The Federal Clean Water Act states that ". . . it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." In addressing the concerns of human health protection and aquatic biota protection, EPA and the states use an integrated strategy consisting of both biological and chemical methods to identify and control the release of toxic chemicals from industrial and municipal sources. The control of toxics in wastewater effluent is an important objective of the NPDES program. The integration of biomonitoring requirements with the most stringent of technology-based and water quality standard-based numeric permit limits is a means to accomplish this objective.

The Federal Clean Water Act requires that NPDES permits contain limitations to assure compliance with state water quality standards. Both EPA and state regulations dictate that NPDES permits prohibit any pollutant or pollutant parameter that is or may be discharged at a level which causes or has the reasonable potential to cause any state water quality criterion to be exceeded. Where state standards contain numerical criteria for toxic pollutants, permits contain limits necessary to assure compliance with these standards. It follows that Whole Effluent Toxicity (WET) limits in NPDES permits comprise an important element for protection of water quality, in particular the "free from toxics" narrative standard.

Many states have adopted or are preparing to adopt biomonitoring and WET control programs. The state programs vary in some degree from one another, as do the policies and programs currently being implemented by each of the EPA Regions. It is desirable for Utah to establish its own program suited to the unique circumstances and needs of the state. However, in doing so it is recognized that the program must be consistent with the goals of the national program and meet minimum EPA regulations and policy requirements. In order to enhance the maintenance of water quality standards and to comply with federal requirements the Bureau of Water Pollution Control (Bureau) will integrate WET requirements into new and renewal UPDES discharge permits.

Permittees have expressed uncertainty as to how the biomonitoring and WET control program will be integrated into the UPDES program as enforceable requirements. Although the state intends to continue carrying out its enforcement responsibilities in a reasonable, fair and consistent manner, a primary concern among dischargers is that WET limits may significantly increase their potential liability for effluent violations.

In view of the above, this permitting and enforcement guidance document is intended to provide clarification to Bureau Staff and to permittees for implementing the WET control program in Utah. In general, the overall approach can be outlined as follows with the more specific details and explanation contained in the text of this document:

- Major facilities, as a minimum, will require routine WET testing. The magnitude of the testing program is tiered based on the demonstrated absence of toxicity.

- Generally, numeric WET limits will be imposed where WET testing data, impairment of receiving water, or other criteria has demonstrated the reasonable potential for toxicity. (Other criteria is to be used where sufficient WET testing data is unavailable to allow for a reasonable potential determination).

- Where numeric WET limits are incorporated into new permits, the limits will be effective immediately. For renewal permits, or modifications, there will be up to a three year compliance date before the limits become effective.

- If violations of the WET limits occur, enforcement will be guided by the permittee's good faith efforts in investigating and eliminating the source of toxicity.

- The "good faith effort" approach is built on concepts of accelerated testing, patterns of toxicity, and automatic triggering of toxicity investigations.

- Other enforcement action is discretionary, but will be reserved for situations where there is actual or significant potential for environmental damage or a public health risk, or where there is fault, negligence or a showing of lack of good faith effort on the part of the permittee.

- When violations require penalty considerations, the State's Civil Penalty Policy will apply.

PERMITTING GUIDANCE

General Principles

1. It is the State's policy that the discharge of toxics must be controlled consistent with the beneficial use of the stream or body of water to which the discharge is made. It is recognized that even Class 6 waters generally have aquatic life protection needs.

2. The state will adhere to the "EPA, January 25, 1989, Basic Permitting Principles for Whole Effluent Toxicity" (Appendix A) as the standard for water-quality based permits.

3. Routine WET testing will be incorporated into new permits and into existing permits (as they are renewed) for all major municipal, major industrial, and significant minor permits. The magnitude of the testing (frequency and number of test species) can be reduced based on actual test data demonstrating the absence of toxicity.

4. All permits will contain, at a minimum, the state narrative standard of "no toxics in toxic amounts" as an effluent limit. Where toxicity exists or there is a reasonable potential for toxicity, the permit will contain numeric WET limits.

General Permitting Implementation Guidance

The basic approach for incorporating WET requirements into permits is shown in Figure 1. Standard permit language is attached as Appendix B. It is expected that permits for all major and all significant minor dischargers will contain the essence of the diagram. As noted in footnote (1) of the diagram, exceptions can be made for those minor facilities where there is no reasonable potential for having a toxic discharge. Permits will contain numeric WET limits where toxicity exists or it is determined that there is a "reasonable potential" for toxic discharge based on the following as a minimum:

a. Existence of a pretreatment program and the prevalence of commercial and categorical industrial users that discharge priority pollutants, or in the case of industry, if it is a categorical industry.

b. Variability of the pollutant or pollutant parameter in the effluent.

c. Receiving water characteristics such as classification, Q7-10, dilution ratios, etc.

d. Analysis of the discharge, including volume, variability, WET testing data, and other monitoring and inspection information.

e. Compliance record, history of fish kills or use impairment of receiving water.

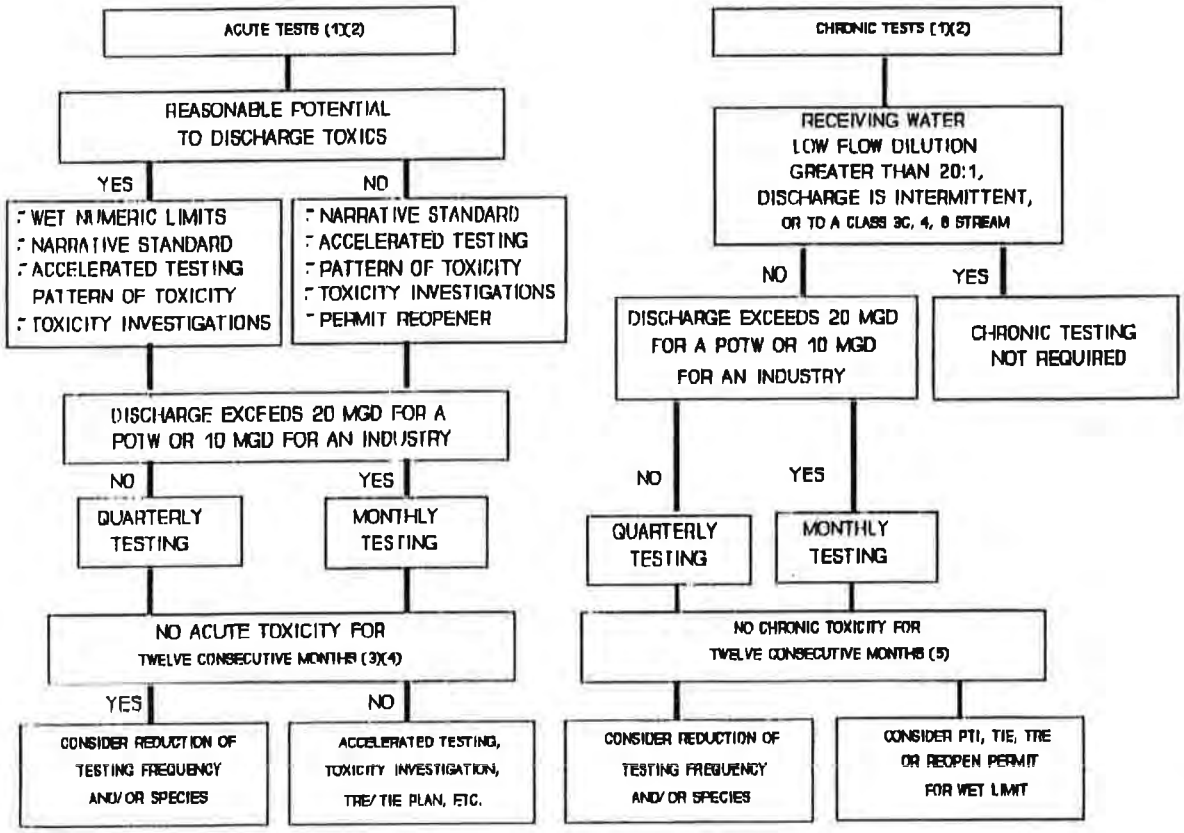
To provide an adequate administrative record, all Statement of Bases for permits will include a detailed discussion of the rationale for including or excluding WET limits.

If there is no known or documented impairment of the receiving waters resulting from toxics releases, and if WET testing data is available to demonstrate no toxicity is currently and has historically not been present in the discharge, permit renewals will not initially include numeric WET limits, but will include routine WET monitoring and reopener provisions. However, such permits will contain the State narrative standard, accelerated testing, pattern of toxicity, and toxicity investigation requirements as discussed below, similar to those permits that contain numeric WET limits. These permits will also contain a reopener clause calling for the inclusion of WET limits if toxicity occurs. There will be up to three years before the compliance date of these limits become effective. The amount of time provided will be governed by the need to assure toxicity problems are being addressed in a timely manner, considering such factors as the good faith efforts of the permittee, use impairments, compliance schedules for toxicity studies and for implementation of toxicity control mechanisms.

Flexibility exists in the type of species selected (permittee may select an alternate species if testing protocols and the species suitability is established), monitoring frequency, and exact dates for implementation by the permittee. All major and minor permits, for which it has been concluded that a reasonable potential to discharge toxicity exists, will contain two-species testing, the State narrative standard, accelerated testing requirements, and the completion of a preliminary toxicity investigation (PTI) if toxicity occurs and an appropriate immediate or delayed limitation of WET. The amount of the delay in the application of limits can be up to as long as three years, but is discretionary and dependant on physical characteristics and other restrictions such as deadlines under Section 304(l) of the 1987 CWA Amendments. The definition of when toxicity has actually occurred will be incorporated in the permit.

WHOLE EFFLUENT TOXIC CONTROL PROGRAM

Figure 1



(1) Applicable to all major and significant minor permits.

(2) Use two species consisting of Ceriodaphnia and Fathead Minnows.

(3) Fifty percent or greater mortality for either species at any effluent concentration constitutes acute toxicity. Mortality in the control must simultaneously be 10% or less for the results to be considered valid. (Dilution considerations can be granted if the permittee can conclusively demonstrate that instantaneous mixing occurs naturally below the discharge, or if a properly designed diffuser is installed on the end of the pipe.)

(4) An alternate numeric WET limit different than that specified above, can be established on a case-by-case basis, if adequately justified by the permittee as being more appropriate.

(5) Chronic toxicity occurs when the survival growth, or reproduction for either test species at a specified dilution is significantly less (at the 95% confidence level) than that of the control specimens.

Numerical Limits

Compliance with WET limits does not exclude the imposition of additional numerical limits on specific pollutants when appropriate. These limits may be based on (1) numerical water quality standards if they exist; (2) section 304 (a) human health and/or aquatic life criteria (see EPA 440/5-86-001, "the gold book" or its successor); (3) drinking water maximum concentration levels (MCLs); or, a combination of all three as circumstances warrant.

WET Testing and Reporting

Testing protocols and reporting guidance are presented in Appendices C and D respectively and depicted in Figure 2. The major purpose of WET controls is to detect and alleviate toxicity in those cases where its presence is unknown, or caused by interaction between otherwise innocuous substances. It must be emphasized that if WET is demonstrated, and it is established that it is due to a known pollutant, the pollutant may be controlled by WET limits, specific numerical limits, or by both methods. If the Executive Secretary feels that the discharged substance in question is under control, or is in compliance with existing numeric or narrative water quality standards, WET testing or sampling procedures may be modified. This will assure that the main purpose of the test does not continue to be masked by the known parameter. As an example, if it is established that whole effluent toxicity is caused by ammonia, and the discharger is on an acceptable compliance schedule to reduce its ammonia levels or is already complying with existing numerical ammonia standards or the State narrative standard for the receiving water, the whole effluent protocol could be modified by the Executive Secretary simply by allowing the pH of the test samples to be reduced by one or two units. Actual numerical water quality standards for ammonia must be in place for this example to apply. Although this modification may mask some other pH dependent toxicant, the test will still adhere closely to its basic intent.

Accelerated Testing

When the toxicity limit is exceeded during routine effluent biomonitoring, the permittee will be required by the permit to perform an accelerated schedule of biomonitoring to establish whether a pattern of toxicity exists. Accelerated testing will begin within seven days after the permittee becomes aware of the test results, and once every week for up to five consecutive weeks.

Pattern of Toxicity

A pattern of toxicity will be defined in the permit as determined by the results of a series of up to five biomonitoring tests pursuant to the accelerated testing requirements, as discussed above, using 100 percent effluent and the single species found to be more sensitive. The establishment of a pattern of toxicity triggers a preliminary toxicity investigation.

Preliminary Toxicity Investigations

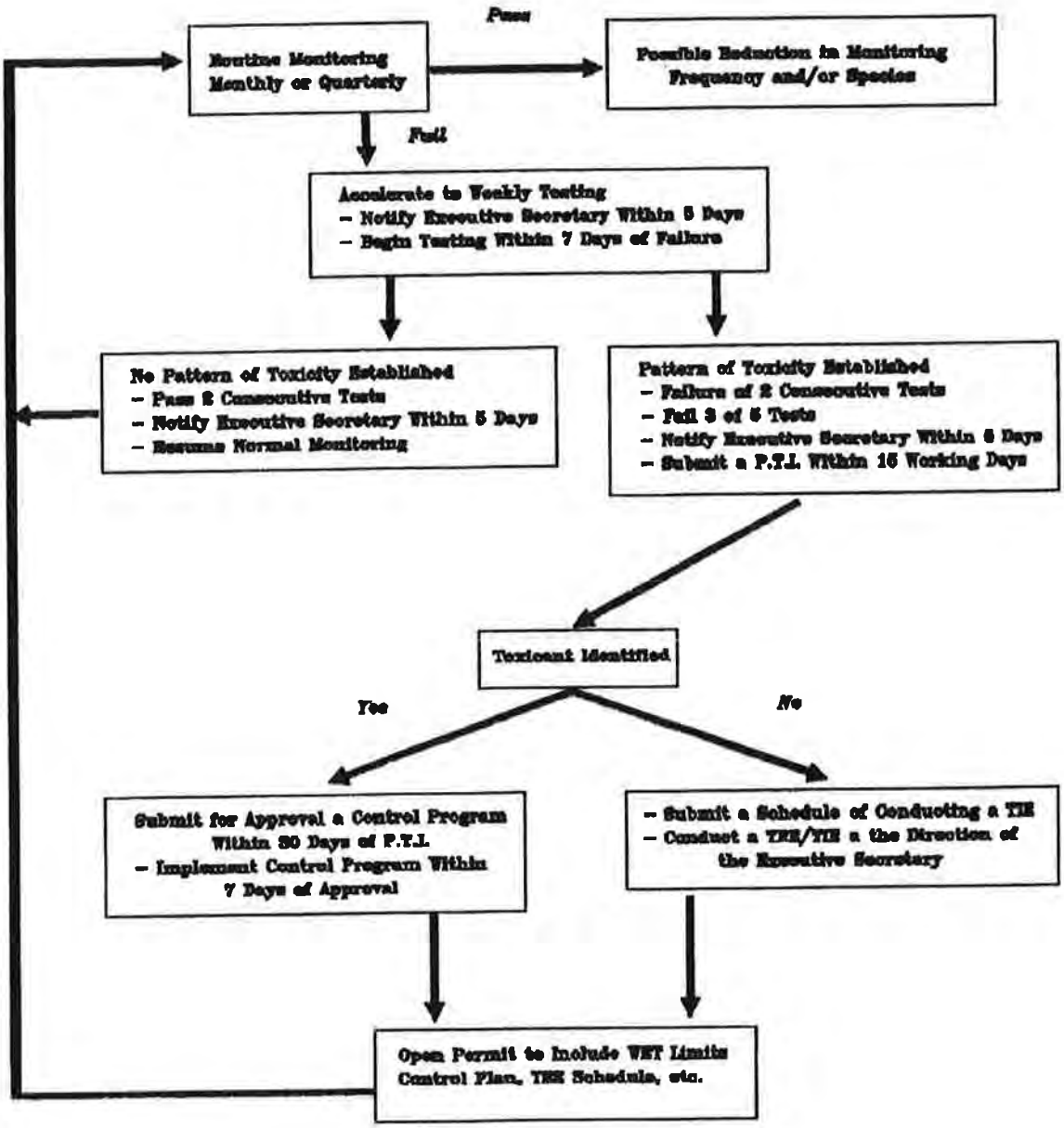
A pattern of toxicity requires the permittee to automatically begin an evaluation of the possible causes of the toxicity. A short period of time (15 days) is allowed for this evaluation. Close coordination and communication with the Executive Secretary is also required. The results of this investigation will aid in determining the need for further investigations/studies, permit modification, and/or enforcement action.

Chronic Toxicity

With respect to chronic toxicity biomonitoring, some questions have been raised regarding the sensitivity and reliability of the chronic test methodology. Although others would argue these points, it is clear that standardized toxicity characterization methods have not been developed for chronic toxicity to the extent they have for acute toxicity. Therefore, only testing for chronic toxicity will be required at this time. The testing data will be used to obtain supplemental information to begin addressing some of these issues and to learn more about the discharge impact on the receiving waters, but not imposed as a permit limit initially. Chronic limits may be required if it is concluded that a discharge violates water quality standards exclusively due to chronic toxicity, in order to assure correction of the problem.

GENERAL ACUTE BIOMONITORING TESTING GUIDE

Figure 2



Enforcement of WET Limit Violations

The state's enforcement philosophy is built on the premise that similar violations will be handled in a similar manner, and that more serious violations will be addressed with more stringent enforcement responses. While violations are subject to the full range of enforcement responses it is essential to maintain flexibility to avoid locking the state or the permittee into an unrealistic cookbook approach to addressing violations, and to encourage innovative approaches to resolving problems. Therefore, enforcement discretion is an essential element to the state's enforcement response plan and may be of particular importance in instances, for example, where a permittee has done everything technically feasible, but is still unable to identify or control toxicity.

The primary interest of the Executive Secretary is to identify and eliminate toxicity whenever it occurs. In nearly all cases enforcement will be reserved for situations where an in-stream use impairment occurs in association with a WET test failure, or a pattern of toxicity is demonstrated after the first test failure. However, a single test failure which reveals severe toxicity and is determined to have been caused by negligence on the part of the permittee may result in enforcement by the Executive Secretary.

Permittee Performance

Enforcement of WET limit violations will, in part, be based on the permittee's performance in pursuing the necessary investigations and elimination of the source of toxicity. If a violation of the WET limit occurs, the permit automatically triggers accelerated testing. A pattern of toxicity will also automatically require the permittee to undertake a Preliminary Toxicity Investigation (PTI) within specified time frames. Based on the results of the toxicity investigation the Executive Secretary may direct the permittee to undertake a Toxicity Reduction Evaluation (TRE) which could include (1) Phase I - Toxicity Characterization, (2) Phase II - Toxicity Identification Procedures, (3) Phase III - Toxicity Confirmation Procedures, and/or (4) other additional procedures for source evaluation and control. In determining the appropriate enforcement response, the permittee's performance in conducting the accelerated testing and the acceptable completion of investigations within the specified time frames will be considered. Generally, no additional enforcement action will be taken for conditions present during the course of compliance schedule implementation as long as the permittee meets the requirements of the compliance schedule.

Enforcement Liability

The toxicity limit will be construed as a single day of violation. Administrative or civil enforcement actions containing additional liabilities may also be pursued when in the opinion of the Executive Secretary, the permittee is not diligently pursuing investigation and mitigation of an established pattern of toxicity.

WET test failures are violations if conducted pursuant to permit routine or accelerated monitoring requirements, and tests which are conducted or directed by the Executive Secretary, or EPA. WET test failures occurring on extra or special monitoring performed during the course of investigations conducted to identify and eliminate a source of toxicity will not be considered as permit violations.

The permittee may request relief from further biological and chemical investigation and testing if the source or cause of the toxicity could not be located or resolved in spite of completing all technically feasible investigations. The permittee may be directed by the Executive Secretary to pursue other types of investigations, such as for illicit discharges. Management practices may be required. For example, a pretreatment program or a public information program aimed at controlling discharges of toxics from households might comprise a reasonable strategy to eliminate the ongoing toxic discharge. In cases where toxicity continues following completion of the toxicity incident response, the permittee shall maintain the underlying obligation to eliminate the toxicity in the discharge.

The Executive Secretary will evaluate the following factors in determining the degree of enforcement action to be taken for WET violations.

1. Damage or Severity Considerations:

   a. Use Impairment

   This factor considers the actual or potential damage to one or more of the beneficial uses of the receiving water caused by WET in a discharge. The phrase "use impairment" refers to events such as an in-stream fish kill, the need for recreational restrictions such as for whole body contact, or closure of a water supply intake or agricultural diversion or bioaccumulation, and sediment build up containing undesirable amounts of toxic materials. When an actual use impairment is attributable to WET in a discharge, an enforcement response by the Executive Secretary is probable.

   b. Pattern of Toxicity

   Any single WET failure is a permit violation where the permit contains WET limits. The permit will require further tests for demonstration of a pattern of toxicity to determine whether toxicity is still present. If a pattern is demonstrated it is indicative of an ongoing discharge of toxicity and a potential use impairment. If no pattern is demonstrated the Executive Secretary will not take enforcement action based solely on the first WET test failure unless; 1) the exceedance of the toxicity limit occurs in an intermittent discharge and no flow remains with which to demonstrate the presence or lack of a pattern of toxicity, or; 2) a potential use impairment is indicated, but where no information on in-stream impact is available. In such cases, the decision to pursue enforcement action would be based on the Executive Secretary's perception of the severity of the toxicity and whether other aggravating or contributing factors such as negligence by the permittee were present.

   For permittees with enforceable biomonitoring requirements who are discharging to segments not classified for aquatic life use, the Executive Secretary will consider any available information regarding why that use was not deemed attainable in exercising its enforcement discretion for WET failures. If attainability is limited by nonpoint sources of pollution, or other point sources, the impact from which may be eliminated or minimized in the future, the full range of biomonitoring requirements may be applied. Such requirements may be appropriate to assure that permitted discharges will not cause toxicity that limits the options for overall improvement of the water quality.

2. Fault Considerations:

Fault will be assessed using factors such as: degree of intent; any derived economic benefit; the strength of the correlation between a specific event for which the permittee was responsible and the violation itself; the impact of the violation(s) on water quality; and, the documented frequency with which similar instances have occurred.

a. Ability to Control Toxicity

Industrial dischargers tend to have a high degree of control over the content of their effluent. This is because specific processes supervised and directed by the industrial facility's management result in the discharge. However, variability in influent water and/or raw material may limit this control. Toxicity incidents specific to publicly owned treatment works may arise from commercial or industrial users of the system, household chemical or insecticide disposal or illicit waste dumping into the collection system. Such waste streams are more difficult to control. While aggressive implementation of industrial pretreatment programs is expected to reduce toxicity from industrial users, toxicity from households may be ameliorated only through education programs or more drastic product bans imposed at a state or national level.

The problem of illegal dumping into collection systems must be addressed through a combination of potentially costly system security measures and criminal enforcement. These problems may be very persistent.

b. Inadequate Facility Design, Operation and Maintenance

Toxicity in the effluent of any permitted facility, may be present as a result of operational and maintenance problems within the permittee's control. When a permittee should have been aware of a circumstance which led to violation(s) is an example of this category. Other examples include improper facility design or modification, or inadequate preparation for reasonably foreseeable circumstances (e.g., weather extremes, inadequate facility monitoring or maintenance of adequate chemical supplies, flood protection, etc.)

c. Intentional (Knowing/Willful) Actions

Any case where violations resulted from an intentional action or inaction on the part of the permittee (e.g. failure to operate equipment) or where the permittee had specific knowledge (e.g. Executive Secretary inspection report, internal communications, etc.) that violation(s) were imminent and did not take steps to prevent them, falls into this category. Failure to follow an operation and maintenance (O&M) manual, where one has been developed, will be considered to fall within this category. Where the permittee has benefitted economically from non-compliance with the toxicity limit, through savings on delayed design and construction costs, monitoring costs, etc., the violation(s) are be considered to be more serious. In this case, a detailed accounting of the economic benefit using EPA's BEN program or a similar procedure, will be made.

3. Prior History Considerations:

   The permittee's history of toxicity in the discharge will be a factor in the Executive Secretary's decision to pursue enforcement for violations of the toxicity limit, especially where it is determined that the toxicity could have been prevented by proper and responsible operation of the facility. The permittee's history of cooperation in other compliance and enforcement matters will be considered in this category.

4. Administrative (Compliance Schedule) Considerations:

   The principal type of administrative violation for which penalties will be assessed under this guidance will be failure to submit items and follow through with required actions in accordance with compliance schedules established by the Executive Secretary.

Civil Penalty Policy for WET Violations

In determining whether a civil penalty should be pursued, the Executive Secretary will consider the following factors:

1. The degree of actual environmental harm or the potential for such harm;

2. Response and/or investigative costs incurred by the State or others;

3. Any economic advantage gained through noncompliance;

4. Recidivism of the violator;

5. Good faith efforts by the violator;

6. Ability of the violator to pay;

7. Possible deterrent effect.

The following describes the Executive Secretary's approach for determining reasonable and appropriate penalties for WET violations which conform with R448-1.9, Penalty Policy for Civil Settlement Negotiations (Appendix E). Categories of violation applicable to whole effluent toxicity (WET) are as follows:

Category A - $7,000 to $10,000 per day. Violations with high impact on public health and the environment:

These are toxic discharges which result in documented public health impacts or use impairment. The impacts/impairment may be as a result of a one-time discharge or a pattern of toxicity.

The phrase "use impairment" refers to a condition such as in-stream fish kill, the need for recreational restrictions such as for whole body contact, or closure of a water supply intake or agricultural diversion or bioaccumulation, and sediment build up containing undesirable amounts of toxic material.

Category B - $2,000 to $7,000 per day. Violations with high potential for public health impacts and/or use impairment impacts:

These are toxic discharges with a high potential for public health and/or use impairment impacts.

The concept of "potential public health impact/use impairment" is relevant only where the Executive Secretary does not have site-specific data on the impact the violation(s) had on public health or the beneficial uses of the receiving water. A violation of the WET limit followed by a demonstration of a pattern of toxicity may fit in this category. If the permittee can show through in-stream flow sampling data, WET testing using representative stream samples, or actual stream flow data in combination with biomonitoring results, that actual conditions in the receiving water would have resulted in little or no damage to the beneficial uses, the Executive Secretary may consider the applicability of a lower category (C or D).

Where the receiving water is not classified or Class 6, the potential damage component will be determined based on established uses, or as otherwise determined by the Executive Secretary such as an agricultural use where a discharge is to an irrigation ditch.

Category C - $500 to $2,000 per day. Violations of a less severe nature than Category B.

Toxic discharges with low potential for adverse public health affects and/or environmental damage.

Compliance schedule violations.

Category D - up to $500 per day. Minor violations of effluent toxicity limits not meeting Category A, B or C criteria to include:

Toxicity clears up spontaneously and/or not traceable to a specific cause, or cause is determined and corrected.

A single failure of a whole effluent toxicity test.

To determine where the penalty amount will fall within that range certain factors must be taken into account. The applicability of the following factors will be determined on a case-by-case basis:

1. History of compliance or non-compliance. History of non-compliance includes consideration of previous violations and degree of recidivism.

2. Degree of willfulness and/or negligence. Factors to be considered include how much control the violator had over and the foreseeability of the events constituting the violation, whether the violator made or could have made reasonable efforts to prevent the violation, whether the violator knew of the legal requirements which were violated, and degree of recalcitrance.

3. Good faith efforts to comply. Good faith takes into account the openness in dealing with the violations, promptness in correction of problems, and the degree of cooperation with the State.

APPENDIX A

EPA, BASIC PERMITTING PRINCIPLES

FOR

WHOLE EFFLUENT TOXICITY
January 25, 1989

EPA, BASIC PERMITTING PRINCIPLES FOR WHOLE EFFLUENT TOXICITY, January 25,1989

1. Permits must be protective of water quality

   a. At a minimum, all major permits and minors of concern must be evaluated for potential or known toxicity (chronic or acute if more limiting).

   b. Final whole effluent toxicity limits must be included in permits where necessary to ensure that State Water Quality Standards are met. These limits must properly account for effluent variability, available dilution, and species sensitivity.

2. Permits must be written to avoid ambiguity and ensure enforceability.

   a. Whole effluent toxicity limits must appear in Part I of the permit with other effluent limitations.

   b. Permits contain generic re-opener clauses which are sufficient to provide permitting authorities the means to re-open, modify, or reissue the permit where necessary. Re-opener clauses covering effluent toxicity will not be included in the Special Conditions section of the permit where they imply that limit revision will occur based on permittee inability to meet the limit. Only schedules or other special requirements will be added to the permit.

   c. If the permit includes provisions to increase monitoring frequency subsequent to a violation, it must be clear that the additional tests only determine the continued compliance status with the limit; they are <u>not</u> to verify the original test results.

   d. Toxicity testing species and protocols will be accurately referenced/cited in the permit.

3. Where not in compliance with a whole effluent toxicity limit, permittees must be compelled to come into compliance with the limit as soon as possible

   a. Compliance dates must be specified.

   b. Permits can contain requirements for corrective actions, such as Toxicity Reduction Evaluations (TREs), but corrective actions cannot be delayed pending EPA/State approval, unless State regulations require prior approval. Automatic corrective actions subsequent to the effective date of a final whole-effluent toxicity limit will not be included in the permit.

APPENDIX B

STANDARD PERMIT LANGUAGE

- Whole Effluent Testing - Acute Toxicity
- Whole Effluent Testing - Chronic Toxicity
- Toxicity Reduction Evaluation (TRE)
- Toxicity Limitation - Reopener Provision
- Accelerated Testing
- Pattern of Toxicity
- Preliminary Toxicity Investigation

Whole Effluent Testing - Acute Toxicity

Starting on _____, the permittee shall (monthly, quarterly), conduct acute static replacement toxicity tests on a composite sample of the final effluent. The sample shall be collected at outfall ___. A composite sample, shall be flow proportioned and contain a minimum of at least four (4) samples collected at evenly spaced intervals over a 24 hour period. The volume of each sample collected shall be proportioned to the flow rate measured at the time of the sample collection.

The monitoring frequency for acute tests shall be (monthly, quarterly) unless a sample is found to be acutely toxic during a routine test. If that occurs, the monitoring frequency shall become weekly (See Part___ Accelerated Testing Provisions). Samples shall be collected on a two day progression; i.e., if the first sample is on a Monday, during the next sampling period, the sampling shall begin on a Wednesday, etc.

The replacement static acute toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of "Methods of Measuring the Acute Toxicity of Effluent to Freshwater and Marine Organisms", EPA/600-4-85-013 (Rev. March 1985) and the "Region VIII EPA NPDES Acute Test Conditions - Static Renewal Whole Effluent Toxicity Tests". In the case of conflicts, the Region VIII procedures will prevail. The permittee shall conduct the acute 48-hour static replacement toxicity test using Ceriodaphnia sp. and the acute 96-hour static replacement toxicity test using fathead minnows.

Acute toxicity occurs when 50 percent or more mortality is observed for either species at any effluent concentration. Mortality in the control must simultaneously be 10 percent or less for the results to be considered valid. If more than 10 percent control mortality occurs, the test shall be repeated until satisfactory control mortality is achieved. A variance to this requirement may be granted by the Executive Secretary if a morality of less than 10 percent was observed in higher effluent dilutions.

If the permit contains a total residual chlorine limitation greater than 0.20 mg/L, the permittee may request from the Executive Secretary approval to dechlorinate the sample, or collect the sample prior to chlorination.

(Monthly, Quarterly) test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting calendar (month, quarter) (e.g., biomonitoring results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, with the remaining biomonitoring reports submitted with DMRs due each July 28, October 28, and January 28). Monthly test results shall be reported along with the DMR submitted for that month. The format for the report shall be consistent with the latest revision of the Region VIII Guidance for Acute Whole Effluent Reporting, and shall include all chemical and physical data as specified.

If the results for one year of testing indicate no acute toxicity, the permittee may request a reduction in testing frequency and/or reduction to one species. The Executive Secretary may approve, partially approve, or deny the request based on results and other available information. If approval is given, the modification will take place without a public notice.

Whole Effluent Testing - Chronic Toxicity

Starting on _____, the permittee shall (monthly, quarterly), conduct chronic short-term toxicity tests on a composite sample of the final effluent. The sample shall be collected at outfall __. A composite sample, shall be flow proportioned and contain a minimum of at least four (4) samples collected at evenly spaced intervals over a 24 hour period. The volume of each sample collected shall be proportioned to the flow rate measured at the time of the sample collection.

The monitoring frequency shall be (monthly, quarterly). Samples shall be collected on a two day progression: i.e., if the first sample is on a Monday, during the sampling period, sampling shall be on a Wednesday. If chronic toxicity is detected, the test shall be repeated in less than four weeks from the date the initial sample was taken. The need for any additional samples shall be determined by the Executive Secretary.

The chronic toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of "Short Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms", EPA/600-4-89-001, and the "Region VIII EPA NPDES Chronic Test Conditions - Static Renewal Whole Effluent Toxicity Test". In case of conflicts, the Region VIII procedure will prevail. Test species shall consist of Ceriodaphnia sp. and fathead minnows.

Chronic toxicity occurs when the survival, growth, or reproduction for either test species, when exposed to a dilution of _ percent effluent or lower, is significantly less (at the 95% confidence level) than that of the control specimens. Dilutions of _ percent only will be required, plus the control. If any of the acceptable control performance criteria are not met, the test shall be considered invalid.

(Monthly, Quarterly) test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting calendar (month, quarter) (e.g., biomonitoring results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, with the remaining biomonitoring reports submitted with DMRs due each July 28, October 28, and January 28). Monthly test results shall be reported along with the DMR submitted for that month. The format for the report shall be consistent with the latest revision of the Region VIII Guidance for Chronic Whole Effluent Reporting, and shall include all the physical testing as specified.

If the results for one year of testing indicate no chronic toxicity, the permittee may request a reduction in testing frequency and/or reduction to one species. The Executive Secretary may approve, partially approve, or deny the request based on results and other available information. If approval is given, the modification will take place without a public notice.

Toxicity Reduction Evaluation (TRE)

If toxicity is detected prior to _____, and it is determined by the Executive Secretary that a TRE is necessary, the permittee shall be so notified and shall initiate a TRE immediately thereafter. The purpose of the TRE will be to establish the cause of the toxicity, locate the source(s) of the toxicity, and control or provide treatment for the toxicity.

A TRE may include but is not limited to one, all, or a combination of the following:

1. Phase I - Toxicity Characterization

2. Phase II - Toxicity Identification Procedures

3. Phase III - Toxicity Control Procedures

4. Any other appropriate procedures for toxicity source elimination and control

If the TRE establishes that the toxicity cannot be immediately eliminated the permittee shall submit a proposed compliance plan to the Executive Secretary. The plan shall include the proposed approach to control toxicity and a proposed compliance schedule for achieving control. If the approach and schedule are acceptable to the Executive Secretary, this permit may be reopened and modified.

If the TRE shows that the toxicity is caused by a toxicant(s) that may be controlled with specific numerical limitations, the permittee may:

1. Submit an alternative control program for compliance with the numerical requirements.

2. If necessary, provide a modified biomonitoring protocol which compensates for the pollutant(s) being controlled numerically.

If acceptable to the Executive Secretary, this permit may be reopened and modified to incorporate any additional numerical limitations, a modified compliance schedule if judged necessary by the Executive Secretary, and/or a modified biomonitoring protocol.

Failure to conduct an adequate TRE, or failure to submit a plan or program as described above, or the submittal of a plan or program judged inadequate by the Executive Secretary, shall be considered a violation of this permit.

Toxicity Limitation - Reopener Provision (Existing WET Limits)

This permit may be reopened and modified following proper administrative procedures to include a new compliance date, additional or modified numerical limitations, a new or different compliance schedule, a change in the whole effluent protocol, or any other conditions related to the control of toxicants if one or more of the following events occur:

1. Toxicity was detected late in the life of the permit near or past the deadline for compliance.

2. The TRE results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the Executive Secretary agrees with the conclusion.

3. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits, and the Executive Secretary agrees that numerical controls are the most appropriate course of action.

4. Following the implementation of numerical controls on toxicants, the Executive Secretary agrees that a modified whole effluent protocol is necessary to compensate for those toxicants that are controlled numerically.

5. The TRE reveals other unique conditions or characteristics which, in the opinion of the Executive Secretary, justify the incorporation of unanticipated special conditions in the permit.

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Toxicity Limitation - Reopener Provision (No Existing WET Limits)

This permit may be reopened and modified following proper administrative procedures to include whole effluent toxicity limitations if one or more of the following events occur:

1. Toxicity was detected in the discharge as a result of whole effluent testing.

2. Other information indicates the presence of toxicity in the discharge.

Accelerated Testing

When the acute toxicity criteria is exceeded during routine biomonitoring as specified in this permit, the permittee shall notify the Executive Secretary in writing within 5 days after becoming aware of the test result. The permittee shall perform an accelerated schedule of biomonitoring to establish whether a pattern of toxicity exists. Accelerated testing will begin within seven days after the permittee becomes aware of the test result. Accelerated testing shall be conducted as specified under Part ____ Pattern of Toxicity. If the accelerated testing demonstrates no pattern of toxicity, routine monitoring shall be resumed.

Pattern of Toxicity

A pattern of toxicity is defined by the results of a series of up to five biomonitoring tests pursuant to the accelerated testing requirements using 100 percent effluent on the single species found to be more sensitive, once every week for up to five consecutive weeks.

If two (2) consecutive tests (not including the scheduled quarterly or monthly test which triggered the search for a pattern of toxicity) do not result in ~~an exceedance of the~~ acute toxicity ~~criteria~~, no further accelerated testing will be required and no pattern of toxicity will be found to exist. The permittee will provide written verification to the Executive Secretary within 5 days, and resume routine monitoring.

A pattern of toxicity is established if one of the following occurs:

1. If two (2) consecutive test results (not including the scheduled quarterly or monthly test which triggered the search for a pattern of toxicity) ~~exceed of the~~ indicate acute toxicity ~~criteria~~. This constitutes an established pattern of toxicity.

2. If consecutive tests continue to yield differing results each time, the permittee will be required to conduct up to a maximum of five (5) acute tests (not including the scheduled quarterly or monthly test which triggered the search for a pattern of toxicity). If three out of five test results ~~exceed of the~~ indicate acute toxicity ~~criteria~~, this will constitute an established pattern of toxicity.

Preliminary Toxicity Investigation

1. When a pattern of toxicity is detected the permittee will notify the Executive Secretary in writing within 5 days and begin an evaluation of the possible causes of the toxicity. The permittee will have 15 working days from demonstration of the pattern of toxicity to complete a Preliminary Toxicity Investigation (PTI) and submit a written report of the results to the Executive Secretary. The PTI may include, but is not limited to: additional chemical and biological monitoring, examination of pretreatment program records, examination of discharge monitoring reports, a thorough review of the testing protocol, evaluation of treatment processes and chemical use, inspection of material storage and transfer areas to determine if a spill may have occurred, and similar procedures.

2. If the PTI identifies a probable toxicant and/or a probable source of toxicity, the permittee shall submit, as part of its final results, written notification of that effect to the Executive Secretary. Within thirty days of completing the PTI the permittee shall submit for approval a control program to control effluent toxicity and shall proceed to implement such plan within seven days following approval. The control program, as submitted to or revised by the Executive Secretary, may be incorporated into the permit.

3. If no probable explanation for toxicity is identified in the PTI, the permittee shall notify the Executive Secretary as part of its final report, along with a schedule for conducting a Phase I Toxicity Reduction Evaluation (TRE) (See Part __ Toxicity Reduction Evaluation).

4. If toxicity spontaneously disappears during the PTI, the permittee shall submit written notification to that effect to the Executive Secretary as part of the reporting requirements of paragraph 1 of this section.

APPENDIX C

REGION VIII ACUTE AND CHRONIC TESTING PROTOCOLS

REGION VIII EPA NPDES ACUTE TEST CONDITIONS
STATIC RENEWAL WHOLE EFFLUENT TOXICITY TEST

	CERIODAPHNIA	FATHEAD MINNOWS
1. Temperature:	20° C ± 2°	20° C ± 2°
2. Light Duration and Type:	16 hours-ambient	16 hours-ambient
3. Test Vessel Size:	30 - 100 ml	200 - 1000 ml
4. Volume of test solution:(a)	15 - 50 ml	150 - 900 ml
5. Age of test animals:	less than 24 hr	5 ± 2 days (b)
6. No of animals per container:	5	10
7. No of replicates:	4	2 (minimum)
8. Renewal frequency:	daily	daily (solids removal)
9. No of dilutions (minimum):	5 (+control)	5 (+control)
10. Feeding:	none	0.1 ml brine shrimp prior to selection, and at 48 hrs
11. Test duration:	48 hours	96 hours
12. Acceptable control: mortality	10 % or less (c)	10% or less (c)

13. Dilution Series: 100%, 75%, 50%, 25%, 12.5%, 6%, 0% (control).

14. Dilution water: Dilution water shall consist of the receiving water if not toxic. If receiving water toxicity exists, the test shall be repeated with reconstituted water of similar hardness to the receiving water (±15%).

15. Holding time: A maximum of 36 hours from the conclusion of sampling until the initiation of testing should be maintained. Additional time is acceptable if unavoidable shipping delays occur. Samples must be maintained at less than 4°C during the entire holding period.

16. Filtration: Acceptable if aquatic organisms are present. Filters as small as 60 microns may be used (110 microns in special cases).

17. CO_2 atmospheres: Permittees may receive individual case by case permission to introduce CO_2 enriched atmospheres over 100% and 75% dilutions if necessary to inhibit "rising pH creep".

(a) Uniform volume shall be used in all replicates in a test series.
(b) All fish used in a test series must be born within 48 hours of each other.
(c) An individual, case by case exception may be granted if less than 10% mortality was observed at the dilutions containing high effluent concentrations.

1/3/91

REGION VIII EPA NPDES CHRONIC TEST CONDITIONS
STATIC RENEWAL WHOLE EFFLUENT TOXICITY TESTS

	CERIODAPHNIA	FATHEAD MINNOWS
1. Temperature:	25° C ± 1°	25° C ± 1°
2. Light Duration and Type:	16 hours-ambient	16 hours-ambient
3. Test Vessel Size:	30 ml (minimum)	200 - 1000 ml
4. Test solution volume: (a)	15 ml (minimum)	150 - 900 ml
5. Age of test animals:	less than 24 hr (b)	up to 7 days (c)
6. No of animals per vessel:	1	10 (minimum)
7. No of replicates:	10	3 (minimum)
8. Renewal frequency:	daily (d)	daily (d)
9. Feeding:	(e)	(f)
10. Test duration:	until 60% have 3 broods in the control	7 days
11. Acceptable control performance:	20 % mortality or less; three brood average total of 15 or more.	20% mortality or less; avg. dry weight gain per fish = 0.25 mg or more.

12. Aeration: If D.O. falls below 40% saturation, repeat test with aeration.

13. Dilutions: 0% (control), and other dilution(s) as specified in permit.

14. Dilution water: Dilution water shall consist of the receiving water if not toxic. If receiving water toxicity exists, the test shall be repeated with reconstituted water of similar hardness to the receiving water (±15%).

15. Holding time: A maximum of 36 hours from the end of sampling until the initiation of testing should be maintained. Additional time is acceptable if unavoidable shipment delay occur. Samples must be maintained at less than 4°C during the entire holding period.

16. Filtration: Acceptable if aquatic organisms are present. Use filters as small as 60 microns (110 microns in special cases).

(a) Uniform volume shall be used in all replicates in a test series.
(b) Ceriodaphnia used in a test series must be born within 8 hrs of each other.
(c) All fish used in a test series must be born within 24 hours of each other.
(d) Permittee shall use a minimum of three fresh effluent samples taken at intervals of tw or three days depending on weekend shipping arrangements.
(e) Recommendation: 0.1 ml/day of "YCT" and up to 0.1 ml/day of Selenastrum suspension containing 3-4 x 10^7 cells.
(f) 0.1 ml of brine shrimp three times a day at four hour intervals or longer, or 0.15 ml twice a day at a six hour interval or longer.

1/3/91

APPENDIX D

ACUTE AND CHRONIC REPORTING GUIDANCE

REGION VIII GUIDANCE FOR ACUTE WHOLE EFFLUENT REPORTING

PERMITTEE NAME _____ **NPDES NO** _____

50% MORTALITY TEST: ___ **pass** ___ **fail** **LC50** _____ **%** **OUTFALL NO** _____

TEST ANIMAL & AGE _____ SAMPLE TYPE, TIME & DATE _____

Analysis Time & Date: Begin _____ End _____

	Dilutions (% Effluent)*						
Measurements	0%	6%	12.5%	25%	50%	75%	100%
No @ Start of Test							
No live after 24 hrs							
No live after 48 hrs							
No live after 72 hrs							
No live after 96 hrs							

	Dilutions (% Effluent)*						
Max/Min Values	0%	6%	12.5%	25%	50%	75%	100%
Dissolved Oxygen	/	/	/	/	/	/	/
Temperature °C	/	/	/	/	/	/	/

Receiving Water Used For Dilution (Y or N)? _____

Hardness: Receiving Water_____ **Effluent**_____ **Recon. Water (if used)**_____

Initial Total Residual Cl_2 in 100% Effluent _____

Initial NH_3 (as N) in 100% Effluent: _____

pH in 100% Effluent: Initial _____ **After 24 Hours:** _____

ANALYST'S NAME _____

LABORATORY_____

SIGNATURE_____ **DATE**_____

* normally, a minimum of five plus control (0%)

COMMENTS _____

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REGION VIII GUIDANCE FOR CHRONIC WHOLE EFFLUENT REPORTING
CERIODAPHNIA

PERMIT NAME _____ **NPDES No** _____

MEAN NO PRODUCED: CONTROL____**EFFLUENT**_____ **pass**___**fail**___ Outfall No_____

Sample Type, Time, & Dates _____ Analyses: Time & Date

No 1 _____ Beginning _____

No 2 _____ Ending _____

No 3 _____ Initial Organism Age _____

Control = 0% Effluent Effluent Sample =_____% Effluent (see Permit)

Receiving Water Hardness _____ Reconstituted Water Hardness (if used) _____

CERIODAPHNIA

Total Number of Young Produced in Three Broods ("D"=dead)

	Replicates											
Sample	A	B	C	D	E	F	G	H	I	J	K**	L**
Control												
Effluent												

PHYSICAL DATA - CONTROL

Measurement	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO old/new		/	/	/	/	/	/	
T °C old/new		/	/	/	/	/	/	

PHYSICAL DATA - EFFLUENT

Measurement	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO old/new		/	/	/	/	/	/	
T °C old/new		/	/	/	/	/	/	
Hardness*								

* Testing Required only on days when fresh effluent is received in laboratory (normally, initially, and days 3 and 5).

ANALYST'S NAME _____

LABORATORY _____ **SIGNATURE/DATE** _____

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REGION VIII GUIDANCE FOR CHRONIC WHOLE EFFLUENT REPORTING
FATHEAD MINNOWS

PERMIT NAME _____ **NPDES No** _____

FINAL MEAN WEIGHT:CONTROL _____ **EFFL** _____ **pass** ___ **fail** ___ **Outfall No** _____

Sample Type, Time, & Dates _____ Analyses: Time & Date

No 1 _____ Beginning _____

No 2 & 3 _____ Ending _____

_____ Initial Organism: Age _____ Mean Weight _____

Control = 0% Effluent Effluent Sample = _____ % Effluent (see Permit)

Receiving Water Hardness ____ Reconstituted Water Hardness (if used) ____

FATHEAD MINNOWS

	No of Organisms / Replicates				Percent Survival Replicates				Mean Weight After 7 Days (milligrams) Replicates			
	A	B	C	D	A	B	C	D	A	B	C	D
Control	/	/	/	/								
Effluent	/	/	/	/								

PHYSICAL DATA - CONTROL

Measurement	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO old/new		/	/	/	/	/	/	
T °C old/new		/	/	/	/	/	/	

PHYSICAL DATA - EFFLUENT

Measurement	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO old/new		/	/	/	/	/	/	
T °C old/new		/	/	/	/	/	/	
Hardness*								

* Testing Required only on days when fresh effluent is received in laboratory (normally; initially, and days 3, and 5).

ANALYST'S NAME _____

LABORATORY _____ **SIGNATURE/DATE** _____

1/3/91

APPENDIX E

PENALTY POLICY

FOR

CIVIL SETTLEMENT NEGOTIATIONS

PENALTY POLICY

FOR

CIVIL SETTLEMENT NEGOTIATIONS

STATE OF UTAH

WATER POLLUTION CONTROL COMMITTEE

Effective Date: October 23, 1987

R448-19 Penalty Policy for Civil Settlement Negotiations

R448-19-1 Introduction

Section 26-11-16 of the Utah Water Pollution Control Act (UWPCA) provides for penalties of up to $10,000 per day for violations of the act or any permit, rule, or order adopted under it and up to $25,000 per day for willful violations. Because the law does not provide for assessment of administrative penalties, the Attorney General initiates legal proceedings to recover penalties where appropriate.

R448-19-2 Purpose And Applicability

This policy outlines the principles used by the State in civil settlement negotiations with water pollution sources for violations of the UWPCA and/or any permit, rule or order adopted under it. It is designed to be used as a logical basis to determine a reasonable and appropriate penalty for all types of violations to promote a more swift resolution of environmental problems and enforcement actions.

To guide settlement negotiations on the penalty issue, the following principles apply: (1) penalties should be based on the nature and extent of the violation; (2) penalties should at a minimum, recover the economic benefit of noncompliance; (3) penalties should be large enough to deter noncompliance; and (4) penalties should be consistent in an effort to provide fair and equitable treatment of the regulated community.

In determining whether a civil penalty should be sought, the State will consider the magnitude of the violations; the degree of actual environmental harm or the potential for such harm created by the violation(s); response and/or investigative costs incurred by the State or others; any economic advantage the violator may have gained through noncompliance; recidivism of the violator; good faith efforts of the violator; ability of the violator to pay; and the possible deterrent effect of a penalty to prevent future violations.

R448-19-3 Penalty Calculation Methodology

The statutory maximum penalty should first be calculated, for comparison purposes, to determine the potential maximum penalty liability of the violator. The penalty which the State seeks in settlement may not exceed this statutory maximum amount.

The civil penalty figure for settlement purposes should then be calculated based on the following formula:

CIVIL PENALTY = PENALTY + ADJUSTMENTS - ECONOMIC AND LEGAL CONSIDERATIONS

PENALTY: Violations are grouped into four main penalty categories based upon the nature and severity of the violation. A penalty range is associated with each category. To determine where the penalty amount will fall within that range certain factors must be taken into account. The applicability of the following factors will be determined on a case-by-case basis:

1. History of compliance or non-compliance. History of non-compliance includes consideration of previous violations and degree of recidivism.

2. Degree of willfulness and/or negligence. Factors to be considered include how much control the violator had over and the forseeability of the events constituting the violation, whether the violator made or could have made reasonable efforts to prevent the violation, whether the violator knew of the legal requirements which were violated, and degree of recalcitrance.

3. Good faith efforts to comply. Good faith takes into account the openness in dealing with the violations, promptness in correction of problems, and the degree of cooperation with the State.

Category A - $7,000 to $10,000 per day. Violations with high impact on public health and the environment to include:

a. Discharges which result in documented public health effects and/or significant environmental damage.

b. Any type of violation not mentioned above severe enough to warrant a penalty assessment under category A.

Category B - $2,000 to $7,000 per day. Major violations of the Utah Water Pollution Control Act, associated regulations, permits or orders to include:

a. Discharges which likely caused or potentially would cause (undocumented) public health effects or significant environmental damage.

b. Creation of a serious hazard to public health or the environment.

c. Illegal discharges containing significant quantities or concentrations of toxic or hazardous materials.

d. Any type of violation not mentioned previously which warrants a penalty assessment under Category B.

Category C - $500 to $2,000 per day. Violations of the Utah Water Pollution Control Act, associated regulations, permits or orders to include:

a. Significant excursion of permit effluent limits.

b. Substantial non-compliance with the requirements of a compliance schedule.

c. Substantial non-compliance with monitoring and reporting requirements.

d. Illegal discharge containing significant quantities or concentrations of non toxic or non hazardous materials.

e. Any type of violation not mentioned previously which warrants a penalty assessment under Category C.

Category D - up to $500 per day. Minor violations of the Utah Water Pollution Control Act, associated regulations, permits or orders to include:

a. Minor excursion of permit effluent limits.

b. Minor violations of compliance schedule requirements.

c. Minor violations of reporting requirements.

d. Illegal discharges not covered in Categories A, B and C.

e. Any type of violations not mentioned previously which warrants a penalty assessment under category D.

ADJUSTMENTS: The civil penalty shall be calculated by adding the following adjustments to the penalty amount determined above: 1) economic benefit gained as a result of non-compliance; 2) investigative costs incurred by the State and/or other governmental levels; 3) documented monetary costs associated with environmental damage.

ECONOMIC AND LEGAL CONSIDERATIONS: An adjustment downward may be made or a delayed payment schedule may be used based on a documented inability of the violator to pay. Also, an adjustment downward may be made in consideration of the potential for protracted litigation, an attempt to ascertain the maximum penalty the court is likely to award, and/or the strength of the case.

R448-19-4 Mitigation Projects

In some exceptional cases, it may be appropriate to allow the reduction of the penalty assessment in recognition of the violator's good faith undertaking of an environmentally beneficial mitigation project. The following criteria should be used in determining the eligibility of such projects:

a. The project must be in addition to all regulatory compliance obligations;

b. The project preferably should closely address the environmental effects of the violation;

c. The actual cost to the violator, after consideration of tax benefits, must reflect a deterrent effect;

d. The project must primarily benefit the environment rather than benefit the violator;

e. The project must be judicially enforceable.

f. The project must not generate positive public perception for violations of the law.

R448-19-5 Intent Of Policy/Information Requests

The policies and procedures in this document are intended solely for the guidance of the State. They are not intended, and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the State.

Key Words: Water Pollution, Enforcement(Admin.), Penalties.
1987

Order of Adoption

The Water Pollution Control Committee of the Utah Department of Health, having reviewed the "Penalty Policy for Civil Settlement Negotiations", and having reviewed the case file in this regards, hereby orders approved the proposed rule and directs the Executive Secretary to take such steps as necessary to comply with the rules of the Division of Administrative Rules and the requirements of the Utah Administrative Rulemaking Act, Section 63-46a, et. seq., Utah Code Annotated 1953, as amended, to effectuate said rule.

Witness my signature the 23 day of October, 1987

Chairman

WATER POLLUTION CONTROL COMMITTEE

FORWARD

This document outlines guidance to be used by Utah Bureau of Water Pollution Control Staff and by permittees for implementation of Whole Effluent Toxicity (WET) control through the UPDES discharge permit program pursuant to federal NPDES requirements and state water quality standards. The guidance addresses both permitting and enforcement aspects of WET. It is intended to assist permit writers in developing logical and consistent permits and to serve as an administrative guide towards reasonable and appropriate enforcement. This document is intended solely as guidance and, as such, cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the state.

MOAB WATER RECLAMATION FACILITY

LEVEL II ANTI-DEGRADATION REVIEW

City of Moab
217 East Center Street
Moab, UT 84532

Greg Fosse
Lead Operator

Prepared By:
Bowen, Collins & Associates

August 2016

Antidegradation Review Form

Part A: Applicant Information

Facility Name: Moab Water Reclamation Facility

Facility Owner: City of Moab, Utah

Facility Location: 1007 West 400 North Street, Moab, Utah

Form Prepared By: Bowen, Collins & Associates

Outfall Number: 001

Receiving Water: Colorado River

What Are the Designated Uses of the Receiving Water (R317-2-6)?
Domestic Water Supply: 1C
Recreation: 2A - Primary Contact
Aquatic Life: 3B - Warm Water Aquatic Life
Agricultural Water Supply: 4
Great Salt Lake: None

Category of Receiving Water (R317-2-3.2, -3.3, and -3.4): Category 3

UPDES Permit Number (if applicable): UT0020419

Effluent Flow Reviewed: 1.75 MGD peak month daily flow
Typically, this should be the maximum daily discharge at the design capacity of the facility. Exceptions should be noted.

What is the application for? (check all that apply)

☐ A UPDES permit for a new facility, project, or outfall.

☒ A UPDES permit renewal with an expansion or modification of an existing wastewater treatment works.

☐ A UPDES permit renewal requiring limits for a pollutant not covered by the previous permit and/or an increase to existing permit limits.

☐ A UPDES permit renewal with no changes in facility operations.

Part B. Is a Level II ADR required?

This section of the form is intended to help applicants determine if a Level II ADR is required for specific permitted activities. In addition, the Executive Secretary may require a Level II ADR for an activity with the potential for major impact on the quality of waters of the state (R317-2-3.5a.1).

B1. The receiving water or downstream water is a Class 1C drinking water source.

☒ **Yes** A Level II ADR is required (Proceed to Part C of the Form)

☐ **No** (Proceed to Part B2 of the Form)

B2. The UPDES permit is new or is being renewed and the proposed effluent concentration and loading limits are higher than the concentration and loading limits in the previous permit and any previous antidegradation review(s).

☐ **Yes** (Proceed to Part B3 of the Form)

☐ **No** No Level II ADR is required and there is no need to proceed further with review questions.

B3. Will any pollutants use assimilative capacity of the receiving water, i.e. do the pollutant concentrations in the effluent exceed those in the receiving waters at critical conditions? For most pollutants, effluent concentrations that are higher than the ambient concentrations require an antidegradation review? For a few pollutants such as dissolved oxygen, an antidegradation review is required if the effluent concentrations are less than the ambient concentrations in the receiving water. (Section 3.3.3 of Implementation Guidance)

☐ **Yes** (Proceed to Part B4 of the Form)

☐ **No** No Level II ADR is required and there is no need to proceed further with review questions.

B4. Are water quality impacts of the proposed project temporary and limited (Section 3.3.4 of Implementation Guidance)? Proposed projects that will have temporary and limited effects on water quality can be exempted from a Level II ADR.

☐ **Yes** Identify the reasons used to justify this determination in Part B4.1 and proceed to Part G. No Level II ADR is required.

☐ **No** A Level II ADR is required (Proceed to Part C)

B4.1 Complete this question only if the applicant is requesting a Level II review exclusion for temporary and limited projects (see R317-2-3.5(b)(3) and R317-2-3.5(b)(4)). For projects requesting a temporary and limited exclusion please indicate the factor(s) used to justify this determination (check all that apply and provide details as appropriate) (Section 3.3.4 of Implementation Guidance):

☐ Water quality impacts will be temporary and related exclusively to sediment or turbidity and fish spawning will not be impaired.

Factors to be considered in determining whether water quality impacts will be temporary and limited:

a) The length of time during which water quality will be lowered:
b) The percent change in ambient concentrations of pollutants:
c) Pollutants affected:
d) Likelihood for long-term water quality benefits:
e) Potential for any residual long-term influences on existing uses:
f) Impairment of fish spawning, survival and development of aquatic fauna excluding fish removal efforts:

Additional justification, as needed:

Level II ADR

Part C, D, E, and F of the form constitute the Level II ADR Review. The applicant must provide as much detail as necessary for DWQ to perform the antidegradation review. Questions are provided for the convenience of applicants; however, for more complex permits it may be more effective to provide the required information in a separate report. Applicants that prefer a separate report should record the report name here and proceed to Part G of the form.

Optional Report Name:

Part C. Is the degradation from the project socially and economically necessary to accommodate important social or economic development in the area in which the waters are located?

The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in this section. More information is available in Section 6.2 of the Implementation Guidance.

C1. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

See Part C - Attachment.

C2. Describe any environmental benefits to be realized through implementation of the proposed project.

See Part C - Attachment.

C3. Describe any social and economic losses that may result from the project, including impacts to recreation or commercial development.

See Part C - Attachment.

C4. Summarize any supporting information from the affected communities on preserving assimilative capacity to support future growth and development.

See Part C - Attachement.

C5. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

See Part C - Attachment.

Part D. Identify and rank (from increasing to decreasing potential threat to designated uses) the parameters of concern.

Parameters of concern are parameters in the effluent at concentrations greater than ambient concentrations in the receiving water. The applicant is responsible for identifying parameter concentrations in the effluent and DWQ will provide parameter concentrations for the receiving water. More information is available in Section 3.3.3 of the Implementation Guidance.

Parameters of Concern:

Rank	Pollutant	Ambient Concentration	Effluent Concentration
1	See Part D - Attachement		
2			
3			
4			
5			

Pollutants Evaluated that are not Considered Parameters of Concern:

Pollutant	Ambient Concentration	Effluent Concentration	Justification

Part E. Alternative Analysis Requirements of a Level II Antidegradation Review.

Level II ADRs require the applicant to determine whether there are feasible less-degrading alternatives to the proposed project. More information is available in Section 5.5 and 5.6 of the Implementation Guidance.

E1. The UPDES permit is being renewed without any changes to flow or concentrations. Alternative treatment and discharge options including changes to operations and maintenance were considered and compared to the current processes. No economically feasible treatment or discharge alternatives were identified that were not previously considered for any previous antidegradation review(s).

☐ **Yes** (Proceed to Part F)

☒ **No or Does Not Apply** (Proceed to E2)

E2. Attach as an appendix to this form a report that describes the following factors for all alternative treatment options (see 1) a technical description of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.

Report Name: *See Part E - Attachment.*

E3. Describe the proposed method and cost of the baseline treatment alternative. The baseline treatment alternative is the minimum treatment required to meet water quality based effluent limits (WQBEL) as determined by the preliminary or final wasteload analysis (WLA) and any secondary or categorical effluent limits.

E4. Were any of the following alternatives feasible and affordable?

Alternative	Feasible	Reason Not Feasible/Affordable
Pollutant Trading	No	See attachment.
Water Recycling/Reuse	No	See attachment.
Land Application	No	See attachment
Connection to Other Facilities	No	See attachment.
Upgrade to Existing Facility	No	See attachment.
Total Containment	No	See attachment.
Improved O&M of Existing Systems	No	See attachment.
Seasonal or Controlled Discharge	No	See attachment.
New Construction	Yes	See attachment.
No Discharge	No	See attachment.

E5. From the applicant's perspective, what is the preferred treatment option?

New sequencing batch reactor activated sludge wastewater treatment plant construction.

E6. Is the preferred option also the least polluting feasible alternative?

☒ **Yes**

☐ **No**

If no, what were less degrading feasible alternative(s)?

If no, provide a summary of the justification for not selecting the least polluting feasible alternative and if appropriate, provide a more detailed justification as an attachment.

Part F. Optional Information

F1. Does the applicant want to conduct optional public review(s) in addition to the mandatory public review? Level II ADRs are public noticed for a thirty day comment period. More information is available in Section 3.7.1 of the Implementation Guidance.

☒ **No**

☐ **Yes**

F2. Does the project include an optional mitigation plan to compensate for the proposed water quality degradation?

☒ **No**

☐ **Yes**

Report Name: ☐

Part G. Certification of Antidegradation Review

G1. Applicant Certification

The form should be signed by the same responsible person who signed the accompanying permit application or certification.

Based on my inquiry of the person(s) who manage the system or those persons directly responsible for gathering the information, the information in this form and associated documents is, to the best of my knowledge and belief, true, accurate, and complete.

Print Name: Greg Fosse

Signature: Greg Fosse

Date: 7/11/2016

G2. DWQ Approval

To the best of my knowledge, the ADR was conducted in accordance with the rules and regulations outlined in UAC R-317-2-3.

Water Quality Management Section

Print Name: NICHOLAS VON STACKELBERG

Signature: Nicholas von Stackelberg

Date: 8/24/2016

SUPPORTING ATTACHMENTS

PART C – STATEMENT OF SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPORTANCE

C1. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

The existing Moab wastewater plant is aged (over 56 years old) and deteriorated, and can no longer provide effective and reliable treatment to meet current discharge permit requirements and supply the required human health and environmental benefits. Both the capacity and condition of the existing plant are inadequate to meet current and future wastewater disposal needs of the community, and the facility must be extensively upgraded or replaced for that purpose.

The nature of the existing single stage, fixed film trickling filter process effectively prevents it from accomplishing biological nutrient removal. Also, portions of the existing plant are no longer operable (anaerobic digesters) and dewatering of raw biosolids is accomplished using an outdoor trailer-mounted temporary belt filter press instead of the old drying beds. This odorous operation is exposed to the environment, and complaints from residents are periodically received by the City.

Moab is experiencing high wastewater loadings to the plant due to significantly increased visitation of nearby national parks and increased outdoor recreational activities in the area including rafting, four-wheeling, motor cycling, biking, hiking, camping, fishing, etc. Moab is the center for these activities with motels, restaurants, gas and food outlets, etc., all of which discharge wastewater to the existing sewer system and treatment plant. Developments supporting the outdoor recreation are rapidly occurring. Septage from pit privies and similar facilities serving the parks and camping areas is also hauled to and disposed of at the plant, which constitutes significant wastewater loading to the facility.

Moab City is highly dependent economically on tourism as its primary source of commercial and employment income and associated tax revenues. The majority of growth in the area is directly related to outdoor recreation, and this trend is expected to continue and increase in the future. Little manufacturing or other industrial growth is anticipated. However, the local Utah State University branch campus is planning a significant expansion in the near future.

All of the current and future domestic sewage treatment and disposal needs for the City and surrounding area and residents must be met and provided for by the Moab wastewater facility. There are no other facilities in the area. The plant must reliably provide both the capacity and level of performance needed to protect human health and the environment for existing and future development, and the existing plant is unable to meet this goal as discussed above. Without this project, future development, commercial

and employment income and tax revenues will be curtailed, and existing effluent discharges will not reliably meet discharge permit standards.

C2. Describe any environmental benefits to be realized through implementation of the proposed project.

See response to C1.

C3. Describe and social or economic losses that may result from the project, including impacts to recreation and commercial development.

No social or economic losses due to the project have been identified, but quite the opposite. The proposed project will provide increased protection of human health and the environment, will improve aesthetic conditions in the area of the existing and new facilities, will support increased recreational and commercial development, and enhance tax revenues for local governments.

C5. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

All of the new treatment plant facilities will be located approximately 1800 feet from the bank of the Colorado River, adjacent to the existing plant site. The outfall for effluent discharge to the river will terminate at the river's edge.

PART D – PARAMETERS OF CONCERN

The Antidegradation Review process requires the identification of the parameters of concern (POCs). POCs are measured characteristics of the discharge that exceed, or potentially exceed ambient concentrations. The list of POCs is ultimately used in the ADR process to select the least degrading project alternative. The following documents were reviewed to identify the Parameters of Concern: existing UPDES Permit, DWQ Wasteload Analysis, and EPA Form 2A that was submitted as part of the permit renewal application. Each of these documents are included in Appendix A.

Upon review of these documents the following POC were identified:

Parameters of Concern

Rank	Pollutant	Ambient Concentration	Effluent Concentration	Source of Values
1	Biochemical Oxygen Demand		25 mg/l	UPDES Permit
2	Total Suspended Solids		25 mg/l	UPDES Permit
3	E-Coli		126 NO./100 mL	UPDES Permit
4	Total Phosphorus		1.0 mg/l (w/o variance) 3.0 mg/l (w/ variance)	With chemical BNR Process
5	Total Nitrogen		10 mg/l	Design Criteria
6	Total Dissolved Solids		400 mg/l > than Culinary	UPDES Permit
7	Ammonia Summer Fall Winter Spring		 75 mg/l 83 mg/l 122 mg/l 121 mg/l	Waste Load Analysis
8	Temperature		27 Degrees Celsius	Waste Load Analysis
9	pH		6.5-9.0	Waste Load Analysis

The following metals were evaluated and determined to not be considered Parameters of Concern. See EPA Form 2A for testing results for these metals.

Parameters of Not of Concern

No.	Parameter	Justification
1	Arsenic	Historical low concentrations in effluent.
2	Cadmium	Historical low concentrations in effluent.
3	Copper	Historical low concentrations in effluent.
4	Cyanide	Historical low concentrations in effluent.
5	Lead	Historical low concentrations in effluent.
6	Mercury	Historical low concentrations in effluent.
7	Molybdenum	Historical low concentrations in effluent.
8	Nickel	Historical low concentrations in effluent.
9	Selenium	Historical low concentrations in effluent.
10	Silver	Historical low concentrations in effluent.
11	Zinc	Historical low concentrations in effluent.

PART E – ALTERNATIVE ANALYSIS REQUIREMENTS OF A LEVEL II ANTIDEGRADATION REVIEW

The following paragraphs provide information regarding Parts E2 and E3.

Note: Much of the following text has been taken from the Facilities Master Plan and Preliminary Engineering Report and edited for this document.

GENERAL

A number of potential wastewater treatment bioreactor types and configurations are available that are capable of providing the treatment capacity and performance required for the new Moab wastewater facility. All of them depend on variations of the oxic suspended growth activated sludge process for BOD_5 and TSS conversion and removal. They also provide anaerobic and anoxic zones with associated equipment in order to accomplish removal of phosphorous and nitrogen compounds to acceptable levels. Fixed film processes (trickling filters, biotowers, etc.) do not provide the necessary environment to grow organisms for this type of nutrient removal and are not considered. Two alternative process configurations were selected for evaluation as given below. Each of the identified processes provide the desired BOD_5, TSS and nutrient removals using the activated sludge process, but the reactor configurations, equipment, process control and other elements differ. Furthermore, there are significant variations in configuration, basins, equipment, control, mixing, pumping, aeration, etc. within each of these categories depending on manufacturer offerings and preferences. The evaluated process alternatives included Oxidation Ditches and Sequencing Batch Reactors.

These alternatives are described further below. Also included is some basic process information for further understanding of how the organic and nutrient contents of the wastewater are converted and removed. This analysis and report does not attempt to identify and select a specific process configuration and/or manufacturer for the recommended process. Rather, the benefits and costs of each (oxidation ditch and sequencing batch reactor) are compared, relying on information provided by vendors, and a representative selection from each category is used for that purpose.

Process alternatives including more conventional activated sludge configurations, combined fixed and suspended growth processes, Aerotor/Biowheel® systems, membrane bioreactors, etc. were given limited consideration. However, these technologies were judged not to provide substantial benefit in terms of cost, performance, maintenance, etc. to warrant inclusion and more detailed evaluation. The processes selected for evaluation are among the most widely used and applied mechanical systems across the United States for municipal wastewater treatment for smaller facilities (5 MGD or less), with hundreds of installations of each over many years. The City can be confident that the selection will provide the performance, cost-effectiveness, operability and low maintenance required for its new wastewater treatment facility.

Basic Process Information

1. Removal of Organic Constituents and Ammonia. As indicated above, variations of the activated sludge process are considered for this evaluation, and the selected version will be implemented for the new Moab WWTP. The basic requirements for the activated

sludge process to convert organic BOD_5 and TSS constituents to biomass and thus remove them from the wastewater are well understood and have been applied and used for nearly 100 years. The biomass, mainly bacteria, use the organic wastewater constituents as a food source. This heterotrophic suspended growth aerobic process requires aeration for oxygen for metabolic activities, mixing, alkalinity, sufficient biomass to adsorb and metabolize the constituents, sufficient hydraulic and solids retention times for the biological reactions to occur, and gravity separation of the biomass from the effluent before discharge. Removal of ammonia, a nitrogen compound and wastewater contaminant, requires additional aeration and solids detention time for the slower growing autotrophic bacteria that convert ammonia to nitrites and nitrates (other nitrogen compounds) via an oxidative process called "nitrification".

2. Removal of Nitrogen Compounds. In order to reduce the total nitrogen content to lower levels, the nitrites and nitrates in the wastewater must be converted to elemental nitrogen gas that can be released into the atmosphere and thus removed. This "denitrification" process is also accomplished biologically by a group of facultative bacteria that use oxygen from the nitrites and nitrates for their metabolic processes instead of dissolved oxygen from aeration. Basins or zones with low dissolved oxygen levels that favor the facultative bacteria are required for this process to occur. Adequate detention times, mixing, and a sufficient organic food source are necessary to obtain acceptable results. This process is essentially added to the above conventional activated process and results in biological nutrient removal (BNR) of the nitrogen compounds. A portion of both the alkalinity and oxygen are returned to the wastewater via this process.

3. Removal of Phosphorus. Phosphorous is removed biologically by yet another process variation which requires essentially zero dissolved oxygen to be present in the wastewater in a separate basin or zone provided with sufficient detention time and mixing. Orthophosphate compounds are released into the wastewater in this anaerobic or fermentation zone which are then taken up by phosphorous accumulating organisms (PAOs) in subsequent aerobic basins. This process is also added to the above activated sludge processes for further BNR treatment of the wastewater. Since the phosphorous remains present in the biomass and is not used up or converted to other compounds, care must be taken to avoid releasing it back into the effluent before discharge.

   It is estimated that the biological phosphorus removal process will reduce the effluent phosphorus levels to 1.0–3.0 mg/l. The Moab WRF will also include facilities required for chemical phosphorus removal to further reduce concentrations in the effluent as needed. Chemical phosphorus removal occurs with the addition of metal salts (usually Ferric Chloride or Alum – aluminum sulfate) that coagulates and precipitates with much of the remaining phosphorus compounds. The coagulated and precipitated phosphorus is then settled and wasted through the solids disposal process. Chemical phosphorus removal will be utilized to reduce the effluent phosphorus to below the Utah DWQ Regulation of 1.0 mg/l.

It should be noted that the City of Moab will be applying for an exception variance from the impending nutrient discharge regulations. The requested exception will be based upon the expected minimal impact on water quality in the Colorado River caused by effluent discharged

from the Moab WRF. The exception variance would eliminate the phosphorus standards from the Moab WFF discharge permit requirements. However, the City believes that it is prudent that the any major wastewater treatment facility upgrade or new construction project be capable of biological nutrient removal, whether or not permit standards require that level of treatment. It is estimated that biological nutrient removal would reduce the phosphorus concentration in the effluent to 1.0-3.0 mg/l.

EVALUATED TREATMENT PROCESSES

Two treatment processes were identified for the Moab Treatment Facility. These processes include Oxidation Ditch and Sequencing Batch Reactors. The following paragraphs briefly describe each of these processes.

Oxidation Ditch

An oxidation ditch (Ox-Ditch) is a modified activated sludge biological treatment process that uses a continuous loop reactor. Oxidation ditches were developed originally in the Netherlands and designed to operate in the extended aeration activated sludge mode which requires longer hydraulic and solids retention times and more oxygen than conventional active sludge systems. These systems were introduced widely in the United States and in Utah specifically, and designed according to extended aeration process parameters. Over time those parameters have migrated toward conventional activated sludge values and loadings, resulting in increased performance.

The Ox-Ditch process may accomplish a certain amount of denitrification internally, but the majority of the denitrification takes place in separate basins or zones where low oxygen (anoxic) conditions exist. Biological phosphorous removal capability is generally provided by use of separate anaerobic basins prior to the Ox-ditch. Separation of biosolids by gravity sedimentation from the effluent to be disinfected and discharged is accomplished in separate clarifiers.

Sequencing Batch Reactor

Sequencing batch reactors (SBR) can operate in either a continuous or semi-continuous batch mode and creates differing reactor conditions sequentially in a single basin (commonly with two or more parallel basins) by a series of fill, anaerobic react, aerobic react, anoxic react, settle and decant/discharge and solids wasting cycles. A holding basin to equalize flows for disinfection is also be provided. Aeration, mixing and inflow are turned on and off during the different periods as required to help create the desired process conditions. The basins are typically square or rectangular, as opposed to looped reactors, and employ extensive common wall construction. However, the basic aerobic, anoxic and anaerobic processes are similar between the two approaches, and the resulting performance results are comparable. Only one SBR type plant has been installed in Utah. Oxidation ditches have found wider use, possibly due moderate land prices and greater availability that favor their larger footprint and other factors. However, sequencing batch reactors represent a suitable and cost-effective alternative that would provide excellent service for Moab.

Common Features

A number of proposed treatment plant features and equipment will be similar or identical for the two process alternatives. Detailed information regarding these facilities including individual

capacities, sizes, performance, materials, etc. will be developed and/or confirmed during the design phase of the work authorized following this study. The items are given in Table 1 below.

Table 1
Wastewater Treatment Plant Features Common to the Alternatives

Facility	Process or Equipment	Comments
Headworks	• Mechanical screens (6 mm) and screenings washing and compacting, conveying and disposal equipment • Mechanical grit removal, classifying, washing, conveying and disposal • Parshall flume with flow measurement and recording • Septage receiving facility	Grit and screenings loaded to a truck or dumpster for landfill disposal
Influent Pumping Station	Non-clog type wastewater pumps with flow matching control operation	
Chemical Addition for P Removal	Aluminum or iron salt storage, metering, injection and mixing	If required
Filtration	Cloth filters	If required
Disinfection	Low pressure high output UV	
Utility Water Pumping Station	High efficiency vertical turbine pumps with filter/strainer	
Biosolids Holding Basin	Coarse bubble aeration for mixing and freshening. Decant capability.	
Biosolids Dewatering Facility	• Polymer storage, dilution, activation, metering, injection and mixing • Biosolids pumping/metering • Mechanical biosolids dewatering • Dewatered biosolids conveying, storage and disposal	Dewatered biosolids loaded to a truck or dumpster for landfill disposal
Standby Power Engine-Generator Set	Diesel powered unit with self-contained fuel tank and outdoor enclosure. 24-hr. capacity.	Capacity to operate essential facilities
Administration Building	Office, small meeting room, control/media room with printer, fax, computer and file storage, restroom, shower.	
Maintenance and Electrical Building	Tools, supplies and parts storage, work area, single vehicle bay, plant electrical center	
Civil/Site Improvements	• Influent sewer, yard piping, utilities • Access roads • Grading, drainage, flood prevention • Low maintenance landscaping • Security fencing, signage	

Several of the facilities listed in the above table require or typically require a building, cover or enclosure to house equipment for purposes of security, odor and noise control, aesthetics and protection of staff and equipment from the elements. For larger plants this is often accomplished using different buildings for each process area and creation of a compound or campus situation. However, for a facility such as the size and capacity of the new Moab WWTP, it is more cost effective to combine these facilities into a limited number of buildings and similar structures, and in so doing also simplify operation and maintenance requirements with the various elements being grouped together and more closely at hand. This consolidation approach will be implemented wherever it can provide reasonable economic and/or operational benefit for the City.

Environmental Evaluation

Construction of new treatment plant facilities on the proposed site requires a NEPA study which has been accomplished. The environmental impact of the two alternatives processes is believed to be equal. A new wastewater treatment plant for Moab will generate a higher quality effluent that has lower concentrations of BOD_5, TSS, chlorine and nitrogen and phosphorous compounds as compared to the existing plant and the current effluent quality.

COMPARISON OF ALTERNATIVES

General

As described above, a number of features and facilities planned for the new Moab WWTP are common to both alternatives and will be provided irrespective of the recommended core wastewater treatment process. These elements will not be included in the examination since their impact is similar and does not sway the outcome. The following Tables 2 and 3 present the items that are considered unique to their respective individual process. Instrumentation, electrical power and controls for equipment are assumed as required and are not specifically listed.

Table 2
Process Elements Unique to the Oxidation Ditch Alternative

Facility	Process or Equipment
Bioreactors	• Anaerobic, anoxic and aerobic basins • Aeration (typically diffusers and blowers or mechanical aerator/mixers) • Mixers for anaerobic and anoxic basins • Recycle pumps (if required)
Secondary Clarifiers	Circular, center feed, peripheral withdrawal, 12 ft. min. SWD, energy dissipating inlets, Stamford baffles, sludge collection/removal mechanisms, scum collection/removal systems and algae prevention systems
RAS/WAS Pumping Station	• Return activated sludge pumps • Waste activated sludge pumps
Blower Building or Enclosure	Blowers (if required, depending on selected aeration technology)

Table 3
Process Elements Unique to the Sequencing Batch Reactor Alternative

Facility	Process or Equipment
Bioreactors	• Common basins for anaerobic, anoxic and aerobic processes • Aeration system • Mixing equipment • Decanting equipment • Sludge removal system • Recycle pumping (if needed) • Transfer pumping (if required)
Equalization Basin	• Single effluent basin to equalize effects of upstream sequencing bioreactor operation on UV disinfection system. Some UV systems may not require equalization and which will be further considered during the design effort. • Transfer pumping (if required)
Blower Building or Enclosure	Blowers (if required, depending on selected aeration technology)

Both Ox-Ditches and SBRs are offered as engineered process packages by a number of manufacturers who include their unique offerings of equipment, control systems, configuration, operating methods and requirements and other features. This is common practice for smaller treatment plants for which a custom designed process likely would be more costly and without significant process performance, operational, efficiency or other advantages. These manufacturers typically have furnished their respective systems for many years, with many installations and have extensive experience with varying treatment goals and requirements. This experience should prove beneficial to Moab regardless of which system is recommended.

Several manufacturers submitted proposals with their recommended processes, configuration and equipment for each alternative. It is not within the scope of this study to consider in depth the various elements of each proposal and the associated advantages and disadvantages within each competing alternative. Rather, the report separates and compares Ox-Ditches and SBRs on a selected representative basis in order to develop a perspective of the general benefits offered by each alternative. This and related information will allow a process recommendation to be made which can be confidently implemented in the upcoming design phase. At that time, differing manufacturer systems and equipment will be evaluated in greater detail for determination of a final selection for design, bidding and construction of the new facility.

Process Loading and Performance Requirements.

Plant capacity and load requirements used for this analysis for the Moab WWTP are shown in Table 4. Influent sampling and analyses will need to be performed to confirm the alkalinity, VFAs, ammonia or TKN and total phosphorous concentration and any other questioned values prior to performing the final design. The plant elevation is 4000 ft. AMSL.

Table 4
Plant Capacity and Load Requirements

Influent Criteria	20-Year Design	50-Year Expansion
Peak Month Ave. Daily Sum. Flow	1.5 mgd	3.0 mgd
Peak Month Ave. Daily Winter Flow	1.2 mgd	2.4 mgd
Peak Hourly Flowrate	3.38 mgd	6.0 mgd
Ave. Annual BOD_5 Concentration	345 mg/l	345 mg/l
Peak Month BOD_5 Daily Load	5,035 ppd	10,070 ppd
Ave. Annual TSS Concentration	325 mg/l	325 mg/l
Peak Month TSS Daily Load	4,743 ppd	9,486 ppd
Min./Ave./Max. Wastewater Temps.	11°/18°/27° C	11°/18°/27° C
Min./Ave./Max pH	7.2/8.0/9.0 Units	7.2/8.0/9.0 Units
Alkalinity	Ample	Ample
VFAs	Ample	Ample
Ammonia	40 mg/l	40 mg/l
Total Phosphorous	8 mg/l	8 mg/l

Projected effluent discharge permit requirements used for this analysis for the Moab WWTP are shown in Table 5. Current and/or projected UPDES permit requirements will need to be confirmed prior to completing the final design.

Table 5
Projected Effluent Discharge Permit Requirements

Parameter	Monthly Ave.	Weekly Ave.	Min.	Max.	Comments
BOD_5 Conc.	25 mg/l	-	-	-	Current Permit
BOD_5 Removal	85%	-	-	-	Current Permit
TSS Conc.	25 mg/l	-	-	-	Current Permit
TSS Removal	85%	-	-	-	Current Permit
E-coli	126/100 ml	158/100 ml	-	-	Current Permit
WET, Acute	-	-	-	LC_{50} >10% Effl.	Current Permit
Oil & Grease	-	-	-	10 mg/l	Current Permit
pH	-	-	6.5 units	9.0 units	Current Permit
TDS	<400 mg/l incr.	-	-	-	Current Permit
TP (avg annual)	3.0 mg/l 1.0 mg/l				(with variance) (w/o variance)
TN	10.0 mg/l		-	-	Assumed Future

Oxidation Ditch

An oxidation ditch proposal from Westech Engineering of Salt Lake City, Utah was used for analysis of this process alternative. Several proposals were provided, and this one is used as a representation from that group. Related information is provided in Table 6 and as follows and based on the capacity and performance requirements shown in Tables 4 and 5.

Table 6
Oxystream® Oxidation Ditch Partial Design Information

Parameter	Values @ 1.5 MGD ADF
Effluent Conc. (mg/l)	
BOD5	10
TSS	10
TN	10
TP	1 (with chemical)
Process Parameters	
SRT (days)	16
MLSS (mg/l)	4000
Yield (lb./lb.)	0.78
AOR (lb. O2/day)	7,475
SOR (lb. O2/day)	13,848
Recycle Rate	4-6 Q
RAS Rate	0.5-1 Q
Mech. Aeration % (lb. O2/hp-hr.)	3.8
Aerobic Volume (MG)	1.558
Anoxic Volume (MG)	0.309
Anaerobic Volume (MG)	0.094
SVI (ml/g)	100 or less
Ave. Clarifier Loading Rate (gpd/sf)	400 or less
Electrical Power (hp)	
Aeration – Required/Provided (4 aerators)	152/300
Mixing	
- Anoxic (2 mixers)	10
- Anaerobic (2 mixers)	2
Pumping	
- RAS (0.5 Q @ 20 ft. TDH)	5
- Recycle	Internal
Clarifier Drives (2 drives)	1
Total	170
Depths (ft.)	
Bioreactors – SWD	14

Parameter	Values @ 1.5 MGD ADF
– Total	15.5
Clarifiers	
– SWD	12
– Total	15.5
Gross Surface Area (sf)	
Bioreactors	22,000
Clarifiers (50 ft. dia.)	4,000
Total	26,000
Concrete Volumes (CY)	
Bioreactors	2,200
Clarifiers	400
Total	2,600
Basic Process Equipment Costs (sales tax incl., not installed)	
Bioreactors	$700,000
Clarifiers	$200,000
Total	$900,000

Sequencing Batch Reactor

A sequencing batch reactor proposal from Aqua-Aerobic Systems, Inc. of Loves Park, IL was used for analysis of this process alternative. Several proposals were provided, and this one was used as a representation from that group. Related information is provided in Table 7 and as follows and based on the capacity and performance requirements shown in Tables 4 and 5.

Table 7
AquaSBR® Sequencing Batch Reactor Partial Design Information

Values	1.5 MGD ADF
Effluent Conc. (mg/l)	
BOD5	<25 (Est. 10)
TSS	<25 (Est. 10)
TN	10
TP	1 (with chemical)
Process Parameters	
SRT (days)	12.7
HRT (days)	0.973
MLSS (mg/l)	4500
Yield (lb./lb.)	0.719
AOR (lb. O2/day)	7,963
Air Flowrate (scfm)	6,350
F/M Ratio (lb./lb.)	0.099
Cycles/Day, Hrs./Cycle	5, 4.8
Electrical Power (hp)	
Aeration Blowers –Req'd./Provided	

Values	1.5 MGD ADF
(2 blowers)	250/375
Mixing (2 mixers)	20
Transfer Pumping (2 pumps)	6
Average Power Used	145
Gross Surface Area (sf)	
Bioreactors (2)	15,000
Equalization Basin	7,500
Total	22,500
Bioreactor & EQ Basin Depth (ft.)	
– SWD	16
– Total	18
Concrete Volumes (CY)	
Bioreactors	1200
Equalization Basin	600
Total	1800
Basic Process Equipment Costs (sales tax incl., not installed)	
Bioreactors	$850,000
Equalization Basin (assumed)	$50,000
Total	$900,000

Treatment Performance Comparison of Alternatives

As discussed previously, both the oxidation ditch and SBR treatment processes are modifications to the activated sludge process. Each process has proven treatment reliability and demonstrated the ability to produced treated effluent that will meet or exceed the established design criteria. The following table summarizes the typical treatment performance for oxidation ditches and SBRs based upon review of manufacturer proposals and available literature. The performance projections were also confirmed during site visits to several treatment facilities utilizing each these technologies.

	Oxidation Ditch		Sequencing Batch Reactor		Design Criteria	
	Effluent	Removal	Effluent	Removal	Effluent	Removal
BOD5	10 mg/l	95%	10 mg/l	95%	25 mg/l	85%
TSS	10 mg/l	95%	10 mg/l	95%	25 mg/l	85%
Total N	10 mg/l		10 mg/l		10 mg/l	
Total P	1 mg/l	(w/ chem)	1 mg/l	(w/ chem)	3 mg/l	(w/ variance)

1) Oxidation ditch performance includes an anaerobic selector.

The oxidation ditch and sequencing batch reactor treatment processes provide similar treated effluent water quality. There is no inherent treatment advantage of one system over the other. However, there are some potential operational advantages to sequencing batch reactors that

would benefit the City of Moab. One of the advantages, includes the flexibility in treating organic spikes in the influent. Moab WRF experiences high organic spikes when septage is discharged into the system. The batch processes allows the operators flexibility in handling these high organic spikes, by modifying reactor aeration time as needed.

Economic Comparison of Alternatives

Both the oxidation ditch and sequencing batch reactor processes will provide the capacity and treatment performance required to meet increasing demands and conform to projected effluent permit requirements. Table 8 contains pertinent information for the two process facilities for side-by-side comparison of size, power and other cost-related parameters.

Table 8
Process Facility Comparison for 1.4 MGD ADF

Parameter	Oxidation Ditch*	Sequencing Batch Reactor**
Total Hydraulic Volume (MG)	2.40	2.41
Max. Basin Depth (ft.)	15.5	18
Gross Area (sf)	26,000	22,500
Lineal Wall Footage (lf)	1,550	850
Concrete Volume (CY)	2,600	1,800
Ave. Power Required (hp)	170	145
Equipment Cost	$900,000	$900,000

*****Includes bioreactors and clarifiers

******Includes bioreactors and EQ basin

In every case, except for basin depth, the SBR process facility appears to exhibit equal or smaller quantities and related costs compared to the Ox-Ditch option. A significant difference shown is the estimated additional cost for reinforced concrete installation for the ox-ditch facilities of 800 CY. This difference is due to the basin configurations, with thinner wall sections due to circular design, etc. Additional costs for excavation, backfill and dewatering for the Ox-Ditch facility would also accrue. Costs for a RAS/WAS pumping station must be added.

Table 9
Estimated Treatment Plant Construction Costs at 1.4 MGD ADF

Facility	Ox-Ditch System	SBR System Cost
Headworks w/ CMU Building	$ 1,230,000	$ 1,230,000
Influent Pump Station	$ 264,000	$ 264,000
SBR Bioreactors	--	$ 2,210,000
Flow EQ Basin	--	$ 530,000
Blower Building (CMU)	--	$ 135,000
Ox-Ditch Bioreactors	$ 2,780,000	--
Secondary Clarifiers	$ 670,000	--
RAS/WAS Pump Station (CMU Bldg.)	$ 279,000	--
UV Disinfection (CMU Building)	$ 405,000	$ 405,000

Utility Water Pump Sta.	$ 142,500	$ 142,500
Biosolids Holding Basin	$ 295,000	$ 295,000
Biosolids Dewatering (CMU Building)	$ 600,000	$ 600,000
Administration Building	$ 187,500	$ 187,500
Maintenance Building	$ 240,000	$ 240,000
Flood Protection	$ 250,000	$ 250,000
Yard Piping, Utilities & Site Improvements	$ 500,000	$ 500,000
Electrical Power & Control System	$ 900,000	$ 900,000
Standby Electrical Generator	$ 100,000	$ 100,000
Demolition of Existing Facilities	$ 150,000	$ 150,000
Totals	$ 8,993,000*	$ 8,139,000*

*Contingencies, engineering, legal, financial, administration, easements, rights of way and property costs are not included.

General cost reducing assumptions that are inherent with the above estimates are as follows.

- Odor control systems not provided
- Turf grass landscaping only
- Concrete curbs, gutters or sidewalks not provided
- Asphalt paving only from main road to Administration Building. All other roads and paths to be gravel.
- Pre-engineered metal canopy for UW pumps
- Pre-engineered metal building(s) for Administration and Maintenance. Plant electrical center included in Maintenance Building. These may all be combined into a single building. UV disinfection building may be changed from CMU to a pre-engineered metal building.
- Engine generator with outdoor enclosure and integral fuel storage
- Submersible type pumping systems are used where applicable
- Intermediate and final pump stations are not required
- Plant security system not provided
- CMU buildings to be colored, smooth face with flat membrane roofs. Headworks and Biosolids Dewatering Buildings may be combined. Blower Building and RAS/WAS Pump Station may be combined.

Typical operation and maintaince costs are similar for both options. The only difference between the two options is power consumption. Power requirements for the ox-ditch process (excluding the RAS/WAS Pump Station) are higher than the SBR system. The power consumption the ox-ditch process alone (excluding common treatment demands) is estimated at 170 Hp continuously. The SBR process is estimated to use 145 Hp continuously.

The following table summarizes the 20-yr life cycle costs for the two options.

Table 10
Present Worth Cost Estimate

	Ox-Ditch System	SBR System
Initial Capital Cost	$ 8,993,000	$ 8,139,000
Common Annual O&M	$ 500,000	$ 500,000
Treatment Power Cost	$ 100,100	$ 85,400
20 Yr Net Present Cost	$20.6 million	$19.5 million
SBR NPV Cost Savings		**$ 1.1 million Savings**

- Based upon 3% inflation and 3% interest.

The SBR system estimated costs result in $854,000 capital savings over the Ox-Ditch system, and $1.1 million savings in 20-year net present worth costs. Based on both capital and operating costs, the SBR process facilities are less expensive than the comparable Ox-Ditch facilities and would be preferred. The spread between the two options is due to the differences in cost of the bioreactors and related facilities including clarifiers, RAS/WAS pump station, flow EQ basin and blower building.

Non-Economic Comparison of Processes

Non-economic factors that can affect selection of the preferred treatment process for the new Moab facility include noise, traffic, odor, appearance, environmental impacts, simplicity and ease of operation, maintenance and repair/replacement requirements and familiarity and wide use in Utah and implementability. The capital and operating cost comparison is shown above.

Table 11 presents the identified non-economic criteria and ratings on a 10-point scale based on judgments regarding how well each facility performs against the other. The higher rated facility receives full credit for the individual factor and the lower rate facility receives a reduced rating. Ties result in the maximum rating for each.

Table 11
Non-Economic Comparison of SBR and Ox-Ditch Systems

Factor	Oxidation Ditch	SBR
Noise	10	10
Traffic	10	10
Odors	10	10
Appearance	10	10
Environmental	10	10
Familiarity and Wide Use in Utah	10	6
Simplicity – Ease of Operation	10	9
Maintenance and Repair Requirements	10	9
Implementability	10	10
Process Flexibility	7	10

Totals Points	97	94

Over half of the factors are rated equal between the two facilities, and the Ox-Ditch system receives the maximum rating in each category. The low rating for the SBR system in "Familiarity and Wide Use in Utah" is due to the fact that only one other similar system is known to exist in the state, but Ox-Ditches have been used extensively for over 30 years, with numerous installations. Lower scores in both the "Simplicity-Ease of Operation" and "Maintenance and Repair/Replacement Requirements" also stem in part from the limited number of installations in Utah and relative uncertainties regarding these issues.

On the basis of the non-economic ratings, the Ox-Ditch treatment facility cwould be preferred, but based on capital and operating costs, the SBR facility is the more desirable option. The net present worth advantage of over $1M for the SBR system argues strongly in favor of that system, but the extensive successful use of Ox-Ditches for many years in Utah gives that technology an edge.

FINAL SELECTION

General

Sequencing batch reactors and oxidation ditches were verified as viable options for meeting the Moab current and future wastewater treatment requirements. The Facilities Master Plan identified conceptual costs and advantages/disadvantages for each biological treatment option. Subsequently, Moab City and BC&A staff visited several treatment facilities that utilized both of these treatment options. Based upon information and impressions from these visits, and the lower estimated construction and long term life cycle costs associated with SBRs, this technology was selected as the biological treatment process for the proposed Moab WWTP.

SBRs accomplish all of the biological treatment for removal of BOD5, TSS, ammonia and nitrogen and phosphorus nutrients in a single pair of reactors that operate in parallel. The SBRs operate in sequential fill, react, settle and decant stages, with the cycles for the two basins offset so that the different stages do not overlap. With all the biological (and physical settling and removal) treatment occurring within single parallel basins, the need for secondary clarifiers is eliminated, and costs for equipment, concrete structures, civil/site improvements and related items are reduced. Operating costs are also lower due to reduced aeration, mixing and pumping requirements.

Proposals were originally submitted by several SBR manufacturers, and that larger field was reduced to two vendors based on their respective experience in designing and furnishing this type of equipment and process, and upon the equipment types and technologies used in their systems. Sanitaire, a Xylem brand, and Aqua-Aerobic Systems, Inc. both submitted second proposals based on updated design, performance, experience and technical requirements. The remaining SBR suppliers were eliminated from further consideration as they did not meet the more stringent requirements.

Evaluation of Proposals

The revised proposals contained process design and sizing calculations for the respective SBR systems, basin layouts and volumes, equipment selections and configurations, technical data, and pricing information. Both round and rectangular or square basins were included in the proposals as requested in the revised RFP. The two SBR processes differ in that the Sanitaire ICEAS (Intermittent Cycle Extended Aeration System) process allows wastewater flows into both of its parallel basins continuously during all cycle stages. The AquaSBR system uses a true batch approach that does not allow flow to enter the basins when they operate in certain stages. For purposes of the evaluation, the processes were considered equivalent in performance since each manufacturer has a large number of successful installations that have operated over many years. Table 12 provides information for comparison from both proposals.

Table 12
Information Summary from SBR Proposals

	Initial Cost[1]		Annual Power Cost		Net Present Worth[2]	
	Square/Rect. Tanks	Round Tanks	Square/Rect. Tanks	Round Tanks	Square/Rect. Tanks	Round Tanks
AquaSBR	$1,655,800	$1,506,300	$110,179	$110,179	$2,919,553	$2,770,053
ICEAS SBR	$1,665,300	$1,447,300	$82,749	$82,749	$2,614,431	$2,396,431

[1]Includes equipment, installation and concrete basins
[2]6% interest for 20 years, PWF = 11.47

The differences in initial costs for the comparable basin configurations between the two vendors was 4% or less. However, power costs for the Sanitaire ICEAS SBR system were lower due to higher aeration efficiencies and reduced blower operating requirements. This difference is also reflected in the net present worth figures that favor the ICEAS system. However, the AquaSBR system offers a labor and time saving maintenance feature and advantage regarding aeration diffuser inspection and replacement tasks which helps offset the power savings of the other system. Both systems use fine bubble EPDM membrane rubber diffusers to distribute air/oxygen into the wastewater. These diffusers foul and age and fail over time and require periodic inspection and cleaning to assure continued efficient operation, and must be replaced on a typical 5-10 year schedule. A recommended inspection interval is 1-2 years.

The Sanitaire ICEAS disk type membrane diffuser system is permanently fixed to the floor of the concrete basin which must be drained for inspections and entered by operators for diffuser cleaning and replacement. However, due to the full floor coverage of the diffusers, a relatively high aeration efficiency is achieved. The AquaSBR fine bubble diffusers are tube type membrane units assembled into panels and installed around the perimeter of the concrete basins. Because they do not provide full floor coverage, aeration efficiency is lower and blower operating requirements and energy usage are greater.

However, the AquaSBR diffuser panels are designed for individual removal from the basins via a mechanical hoist system for inspection, cleaning and replacement. The basins do not require draining and operators are not required to enter them to service the diffusers or address any other maintenance requirements associated with the SBRs. The SBRs continue operating normally as

each panel is removed and replaced. Diffusers in each panel can be easily inspected, cleaned and replaced as needed by operators working from a walkway situated above and around the basin.

Results and Recommendations

The field visits to operating facilities of each vendor were conducted in order to observe and understand the differences, advantages and disadvantages of each system so that City staff could help identify the factors most significant to them in deciding between these two excellent systems.

Ultimately it was determined that the AquaSBR system was preferred due in part to the removable aeration panel system. This feature was important to Moab City personnel who operate with limited human resources and may lack sufficient staffing to dedicate personnel to the periodic task of aerator inspection, cleaning and replacement when this work is done. The removable panels allow a single operator to remove, inspect, repair, replace and reinstall diffusers without taking a basin out of service or entering it. The function can be accomplished periodically, one panel at time, in order to proactively maintain desired aerator function as part of a good preventative maintenance program.

The other primary deciding factor in favor of the Aqua-Aerobic system was their customer service program which was perceived to be superior to that offered by Sanitaire. Operations personnel at both of the AquaSBR plants were highly complementary of the Aqua-Aerobic customer service and indicated that their responsiveness and helpfulness were very important to ongoing operations and maintenance at their respective facilities. This input was provided by operators without prompting by Moab staff or Aqua-Aerobic representatives. It appeared to be a well-organized and staffed formal service department that provided 24-hours/day service and support by qualified process and electrical engineers. Although Sanitaire also offered a similar service, it did not appear to be as well organized or possibly as responsive. Operators at the Sanitaire ICEAS plant that was visited did not offer comment on their customer service.

The following paragraphs provide information regarding Part E4. The following alternatives were evaluated based upon feasibility and affordability:

A. Pollutant Trading

No viable pollutant trading options were identified or evaluated.

B. Water Recycle and Reuse

Moab City does not have infrastructure or other facilities necessary for reuse of treated effluent. These facilities include tertiary treatment processed, effluent storage, distribution systems, and pump stations. Construction of such facilities would be costly and prohibitive

C. Land Application

Potential requirements to store large quantities of effluent over the non-irrigation season related to land application, limited space available in the area for that purpose, impacts on local residents and the judged high cost for construction of those facilities resulted in elimination of this process alternative.

D. Connection to Other Wastewater Treatment Facilities

No other sufficient wastewater treatment facilities exist in Moab, nor within 60 miles in any direction. The Moab WWTP is the sole regional facility for that area.

E. Upgrade to Existing Facility

Upgrades to the existing facility were evaluated as part of the Facilities Master Plan Update. The evaluation determined that upgrades to the existing facilities, necessary to meet future requirements, would be more costly than construction of new facility.

F. Total Containment

Total containment for the wastewater flows from Moab would require even larger storage ponds than for land application discussed above. Limited space, impacts on local residents and potential high costs for this alternative were cause for its elimination.

G. Improved Operation and Maintenance of Existing Treatment Systems

Staff at the Moab WWTP operate that aged facility to meet existing effluent permit standards under current flow and loading conditions that are challenging given the continuing increases in these parameters and the limited capacity and operability of the plant. The condition and process capability of the existing facility are insufficient to meet future capacity and performance requirements; thus improved operation and maintenance was not considered as a viable long-term approach to meeting these requirements. Addition of chemical precipitants was recommended to increase removals of BOD5 and TSS in the short term to help meet discharge permit standards, but is not considered to be a cost-effective long term solution, nor would it help reduce ammonia or other nitrogen compounds.

H. Seasonal or Controlled Discharge Options to Minimize During Critical Water Quality Periods.

No seasonal or controlled discharge options were identified or evaluated. Municipal wastewater flows discharge to treatment facility on a continual basis and which cannot be reasonably limited or regulated.

I. New Construction

Construction of a new treatment facility has been determined as the best alternative for Moab City to meet it current and future wastewater treatment needs. The new facility is the least cost alternative for meeting current and future water quality regulations.

J. No Discharge

Eliminating discharge to the Colorado River would require another discharge options such as land application or water reuse. These other discharge options would require significant additional facilities and have been determined to be too costly.

K. Water Conservation

Water conservation takes place in Moab City by use of low flush toilets and water limiting sinks, showers and similar plumbing devices and appliances. The result of these uses is demonstrated by the higher strength concentrations of wastewater constituents found in the current sewage flows. No additional water conservations measures were identified or evaluated.

L. Alternative Discharge Locations or Alternative Receiving Waters

1. Alternative Discharge Locations. The location of the existing outfall from the WWTP to the Colorado River is situated at the bank of the river approximately 1800 lineal feet from the plant, which is a reasonable, economical and effective outlet for the effluent. A change in this location to another point on the river may be justified on the basis of the condition of the existing line and which may also enhance effluent mixing and dispersion. The existing discharge is located on a side channel that is separated from the main river flow by a permanent, large sandbar island, and mixing and dispersion may be more limited there. A relocated outfall line upstream from the island where the effluent is better exposed to the main flow could improve mixing and dispersion, but would be costly to construct (about 2500 lineal feet) and require additional environmental permitting and easements.

   It should be noted that The Nature Conservancy has contacted the City of Moab in regard to utilization of the treated effluent within the Matheson Wetlands. Moab is not obligated to provide the effluent to the Nature Conservancy. However, the City may consider allowing The Nature Conservancy to utilize the effluent if there are no additional treatment or conveyance expenses to the City. Initial discussions with DWQ has indicated that discharge to the Matheson Wetlands would require lower ammonia limits and more stringent WET testing. Moab will continue to discuss this possibility with The Nature Conservancy; however, there is a significant number of potential contractual aspects that need to be resolved in order to determine if this is a viable discharge location. Some of these contractual aspects that need to be resolved include; effect on water rights ownership, cost of

additional treatment and operations, future discharge flow obligations, increase water quality requirements, etc. Discharge to the Matheson Wetlands does not appear viable at this time due to the many potential contractual and cost unknowns.

2. Alternative Receiving Waters. No other viable receiving waters are known to exist in the area except for local creeks that discharge nearby into the Colorado River. Any discharges to these creeks likely would be required to meet higher effluent quality standards compared to the river, and construction of a 1,750 foot outfall to the nearest creek (Mill Creek) would be costly.

APPENDIX A

PARAMETERS OF CONCERN DOCUMENTS

FILE COPY

STATE OF UTAH
DIVISION OF WATER QUALITY
DEPARTMENT OF ENVIRONMENTAL QUALITY
SALT LAKE CITY, UTAH

UTAH POLLUTANT DISCHARGE ELIMINATION SYSTEM (UPDES) PERMITS

Major Municipal Permit No. **UT0020419**
Biosolids Permit No. **UTL020419**
Storm Water Permit No. **UTR020419**

In compliance with provisions of the Utah *Water Quality Act, Title 19, Chapter 5, Utah Code Annotated ("UCA") 1953, as amended* (the *"Act"*),

MOAB WASTEWATER TREATMENT FACILITY

is hereby authorized to discharge from its wastewater treatment facility to receiving waters named **COLORADO RIVER**,

to dispose of biosolids,

and to discharge storm water,

in accordance with specific limitations, outfalls, and other conditions set forth herein.

This permit shall become effective on January 1, 2012

This permit expires at midnight on September 30, 2016.

Signed this 1st day of November, 2011.

Walter L. Baker, P.E.
Executive Secretary
Utah Water Quality Board

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I. DISCHARGE LIMITATIONS AND REPORTING REQUIREMENTS

A. Description of Discharge Point. The authorization to discharge wastewater provided under this part is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under a UPDES permit are violations of the *Act* and may be subject to penalties under the *Act*. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge may be subject to criminal penalties as provided under the *Act*.

Outfall Number	Location of Discharge Outfall
001	Located at latitude 38°34'40" and longitude 109°34'47". The discharge is through a 2000 foot cement pipeline to the Colorado River.

B. Narrative Standard. It shall be unlawful, and a violation of this permit, for the permittee to discharge or place any waste or other substance in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum, or other nuisances such as color, odor or taste, or cause conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or result in concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, or undesirable human health effects, as determined by a bioassay or other tests performed in accordance with standard procedures.

C. Specific Limitations and Self-Monitoring Requirements.

1. Effective immediately, and lasting through the life of this permit, there shall be no acute or chronic toxicity in Outfall 001 as defined in *Part VIII*, and determined by test procedures described in *Part I. C.3.a & b* of this permit.

2. Effective immediately and lasting the duration of this permit, the permittee is authorized to discharge from Outfall 001. Such discharges shall be limited and monitored by the permittee as specified below:

Parameter	Effluent Limitations a/			
	Monthly Average	Weekly Average	Minimum	Maximum
Flow, MGD	1.5	NA	NA	NA
BOD_5, mg/L BOD_5 Min. % Removal	25 85	35 NA	NA NA	NA NA
TSS, mg/L TSS Min. % Removal	25 85	35 NA	NA NA	NA NA
E-Coli, No./100mL	126	158	NA	NA
TRC, mg/L	1.4	NA	NA	1.55
WET, Acute Biomonitoring	NA	NA	NA	LC_{50}> 10% effluent
Oil & Grease, mg/L	NA	NA	NA	10
pH, Standard Units	NA	NA	6.5	9.0
TDS, mg/L e/	<400 increase	NA	NA	NA

NA – Not Applicable

Parameter	Self-Monitoring and Reporting Requirements a/		
	Frequency	Sample Type	Units
Total Flow b/ c/	Continuous	Recorder	MGD
BOD_5, Influent d/ Effluent	Weekly Weekly	Composite Composite	mg/L mg/L
TSS, Influent d/ Effluent	Weekly Weekly	Composite Composite	mg/L mg/L
E. Coli	Weekly	Grab	No./100mL
TDS, Culinary Intake d/ Effluent	Quarterly Quarterly	Grab Grab	mg/L mg/L
TRC	Daily	Grab	mg/L
WET, Acute Biomonitoring	Quarterly	Composite	Pass/Fail
Oil & Grease	Monthly	Grab	mg/L
PH	3 x Weekly	Grab	SU
Metals, Influent Effluent	Quarterly Quarterly	Composite Composite	mg/L mg/L
Organic Toxics, Influent Effluent	1st, 3rd and 5th Year 1st, 3rd and 5th Year	Grab Grab	mg/L mg/L

a/ See Definitions, *Part VIII*, for definition of terms.

b/ Flow measurements of influent/effluent volume shall be made in such a manner that the permittee can affirmatively demonstrate that representative values are being obtained.

c/ If the rate of discharge is controlled, the rate and duration of discharge shall be reported.

d/ In addition to monitoring the final discharge, influent samples shall be taken and analyzed for this constituent at the same frequency as required for this constituent in the discharge.

e/ The effluent shall not exceed the culinary water intake by more than 400 mg/L of TDS (*******or the permittee could request 1 ton/day salt loading, or 366 tons/year*******).

3. Acute/Chronic Whole Effluent Toxicity (WET) Testing.

a. *Whole Effluent Testing – Acute Toxicity.* Starting on January 1, 2012, the permittee shall conduct quarterly acute static replacement toxicity tests on a composite sample of the final effluent. The sample shall be collected at outfall 001.

The monitoring frequency for acute tests shall be quarterly unless a sample is found to be acutely toxic during a routine test.. If that occurs, the monitoring frequency shall become weekly (See *Part I.C. 3 c Accelerated Testing*). Samples shall be collected on a two day progression; i.e., if the first sample is on a Monday, during the next sampling period, the sampling shall begin on a Wednesday, etc. If acute toxicity occurs in a test, the permittee shall promptly take all reasonable measures necessary to immediately reduce toxicity

The replacement static acute toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition, (EPA 821/R/02/012), October 2002,* as per *40 CFR 136.3(a) TABLE 1A-LIST OF APPROVED BIOLOGICAL METHODS.* The permittee shall conduct the 48-hour static replacement toxicity test using Ceriodaphnia dubia and the acute 96-hour static replacement toxicity test using Pimephales promelas (fathead minnow). A CO_2 atmosphere may be used (in conjunction with an unmodified test) in order to account for artificial pH drift, as previously authorized by the Executive Secretary.

Acute toxicity occurs when 50 percent or more mortality is observed for either species at any effluent concentration greater then or equal to 100 % effluent (LC_{50} lethal concentration to fifty percent of the population). Mortality in the control must simultaneously be 10 percent or less for the results to be considered valid. If more than 10 percent control mortality occurs, the test shall be repeated until satisfactory control mortality is achieved.

If the permit contains a total residual chlorine limitation greater than 0.20 mg/L, the permittee may request from the Executive Secretary approval to de-chlorinate the sample, or collect the sample prior to chlorination.

Quarterly test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting calendar quarter e.g., biomonitoring results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, with the remaining biomonitoring

reports submitted with DMRs due each July 28, October 28, and January 28. All test results shall be reported along with the DMR submitted for that reporting period. The format for the report shall be consistent with the EPA Region 8 website under Whole Effluent Toxicity Reporting forms: http://www.epa.gov/region8/water/wet/documents.html

If the results for a minimum of ten consecutive tests indicate no acute toxicity, the permittee may request a reduction in testing frequency and/or reduction to one species. The Executive Secretary may approve, partially approve, or deny the request based on results and other available information. If approval is given, the modification will take place without a public notice.

b. *Accelerated Testing.* When acute toxicity is indicated during routine biomonitoring as specified in this permit, the permittee shall notify the Executive Secretary in writing within five (5) days after becoming aware of the test result. The permittee shall perform an accelerated schedule of biomonitoring to establish whether a pattern of toxicity exists. Accelerated testing will begin within seven (7) days after the permittee becomes aware of the test result. Accelerated testing shall be conducted as specified under *Part I.C.3.c, Pattern of Toxicity*. If the accelerated testing demonstrates no pattern of toxicity, routine monitoring shall be resumed.

c. *Pattern of Toxicity.* A pattern of toxicity is defined by the results of a series of up to five (5) biomonitoring tests pursuant to the accelerated testing requirements using 100 percent effluent on the single species found to be more sensitive, once every week for up to five (5) consecutive weeks.

If two (2) consecutive tests (not including the scheduled quarterly or monthly test which triggered the search for a pattern of toxicity) do not result in acute toxicity, no further accelerated testing will be required and no pattern of toxicity will be found to exist. The permittee will provide written verification to the Executive Secretary within five (5) days, and resume routine monitoring.

A pattern of toxicity is established if one of the following occurs:

(1) If two (2) consecutive test results (not including the scheduled quarterly or monthly test, which triggered the search for a pattern of toxicity) indicate acute toxicity, this constitutes an established pattern of toxicity.

(2) If consecutive tests continue to yield differing results each time, the permittee will be required to conduct up to a maximum of five (5) acute tests (not including the scheduled quarterly or monthly test which triggered the search for a pattern of toxicity). If three out of five test results indicate acute toxicity, this will constitute an established pattern of toxicity.

d. *Preliminary Toxicity Investigation.*

(1) When a pattern of toxicity is detected the permittee will notify the Executive Secretary in writing within five (5) days and begin an evaluation of the possible causes of the toxicity. The permittee will have fifteen (15) working days from demonstration of the pattern to complete a Preliminary Toxicity Investigation (PTI) and submit a written report of the results to the Executive Secretary. The PTI may include, but is not limited to, additional chemical and biological monitoring, examination of pretreatment program records, examination of discharge monitoring reports, a thorough review of the testing protocol, evaluation of treatment processes and chemical use, inspection of material storage and transfer areas to determine if a spill may have occurred, and similar procedures.

(2) If the PTI identifies a probable toxicant and/or a probable source of toxicity the permittee shall submit, as part of its final results written notification of that effect to the Executive Secretary. Within thirty (30) days of completing the PTI the permittee shall submit for approval a control program to control effluent toxicity and shall proceed to implement such a plan within seven (7) days following approval. The control program, as submitted to or revised by the Executive Secretary, may be incorporated into the permit.

(3) If no probable explanation for toxicity is identified in the PTI, the permittee shall notify the Executive Secretary as part of its final report, along with a schedule for conducting a Phase I Toxicity Reduction Evaluation (TRE) (See *Part I.C.3.f, Toxicity Reduction Evaluation*).

(4) If toxicity spontaneously disappears during the PTI, the permittee shall submit written notification to that effect to the Executive Secretary as part of the reporting requirements of paragraph a of this section.

e. *Toxicity Reduction Evaluation (TRE).* If toxicity is detected during the life of this permit and it is determined by the Executive Secretary that a TRE is necessary, the permittee shall be so notified and shall initiate a TRE immediately thereafter. The purpose of the TRE will be to establish the cause of toxicity, locate the source(s) of the toxicity, and control or provide treatment for the toxicity.

A TRE may include but is not limited to one, all, or a combination of the following:

(1) Phase I – Toxicity Characterization

(2) Phase II – Toxicity Identification Procedures

(3) Phase III – Toxicity Control Procedures

(4) Any other appropriate procedures for toxicity source elimination and control.

If the TRE establishes that the toxicity cannot be immediately eliminated, the permittee shall submit a proposed compliance plan to the Executive Secretary. The plan shall include the proposed approach to control toxicity and a proposed compliance schedule for achieving control. If the approach and schedule are acceptable to the Executive Secretary, this permit may be reopened and modified.

If the TRE shows that the toxicity is caused by a toxicant(s) that may be controlled with specific numerical limitations, the permittee may:

(a) Submit an alternative control program for compliance with the numerical requirements.

(b) If necessary, provide a modified biomonitoring protocol, which compensates for the pollutant(s) being controlled numerically.

If acceptable to the Executive Secretary, this permit may be reopened and modified to incorporate any additional numerical limitations, a modified compliance schedule if judged necessary by the Executive Secretary, and/or a modified biomonitoring protocol.

Failure to conduct an adequate TRE, or failure to submit a plan or program as described above, or the submittal of a plan or program judged inadequate by the Executive Secretary, shall be considered a violation of this permit. Upon completion of the TIE/TRE, the permittee shall return to regular whole effluent toxicity monitoring and reporting as specified in the permit.

D. Reporting of Wastewater Monitoring Results. Monitoring results obtained during the previous month shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1) or by NetDMR, post-marked or entered into NetDMR no later than the 28th day of the month following the completed reporting period. The first report is due on April 28, 2012. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports including whole effluent toxicity (WET) test reports required herein, shall be signed and certified in accordance with the requirements of *Signatory Requirements (see Part VII.G)*, and submitted by NetDMR, or to the Division of Water Quality at the following address:

Department of Environmental Quality
Division of Water Quality
PO Box 144870
Salt Lake City, Utah 84114-4870

II. INDUSTRIAL PRETREATMENT PROGRAM

A. Self-Monitoring and Reporting Requirements.

1. Because the design capacity of this municipal wastewater treatment facility is less than 5 MGD, the permittee will not be required to develop a State-approved industrial pretreatment program at this time. However, in order to determine if development of an industrial pretreatment program is warranted, the permittee shall conduct an **industrial waste survey**, as described in *Part II.B.1*, and submit it to the Division of Water Quality within **sixty (60) calendar days** of the effective date of this permit and shall sample and analyze both the influent and effluent annually, for the following parameters.

Metals Monitoring for Pretreatment Program			
Parameter	**Sample Type**	**Frequency**	**Units**
Total Arsenic	Composite	Quarterly	mg/L
Total Cadmium			
Total Chromium			
Total Copper			
Total Cyanide			
Total Lead			
Total Mercury	Composite/Grab		
Total Molybdenum	Composite		
Total Nickel			
Total Selenium			
Total Silver			
Total Zinc			

The results of these analyses shall be submitted along with the Discharge Monitoring Report (DMR) at the end of that reporting period.

B. Industrial Wastes.

1. The "Industrial Waste Survey" as required by *Part II.A.1.* consists of; identifying each significant industrial user (SIU), determination of the qualitative and quantitative characteristics of each discharge, and appropriate production data. A (SIU) is defined as an industrial user discharging to a publicly-owned treatment works (POTW) that satisfies any of the following: (1) has a process wastewater flow of 25,000 gallons or more per average work day; (2) has a flow greater than five percent of the flow carried by the municipal system receiving the waste; (3) is subject to Categorical Pretreatment Standards, or (4) has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement.

2. The permittee must notify the Executive Secretary of any new introductions by new or existing SIUs or any substantial change in pollutants from any major industrial source. Such notice must contain the information described in 1. above

and be forwarded no later than sixty (60) days following the introduction or change.

3. Pretreatment Standards (*40 CFR 403.5*) developed pursuant to *Section 307* of *The Water Quality Act of 1987* require that under no circumstances shall the permittee allow introduction of the following pollutants into the waste treatment system from any source of non-domestic discharge:

   a. Pollutants which create a fire or explosion hazard in the publicly owned treatment works (POTW), including, but not limited to, wastestreams with a closed cup flashpoint of less than 140°F (60°C);

   b. Pollutants, which will cause corrosive structural damage to the POTW, but in no case, discharges with a pH lower than 5.0;

   c. Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in interference;

   d. Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a discharge at such volume or strength as to cause interference in the POTW;

   e. Heat in amounts, which will inhibit biological activity in the POTW, resulting in interference, but in no case, heat in such quantities that the influent to the sewage treatment works exceeds 104°F (40°C);

   f. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;

   g. Pollutants which result in the presence of toxic gases, vapor, or fumes within the POTW in a quantity that may cause worker health or safety problems; or,

   h. Any trucked or hauled pollutants, except at discharge points designated by the POTW.

   i. Any pollutant that causes pass through or interference at the POTW.

4. In addition to the general and specific limitations expressed above, more specific pretreatment limitations have been and will be promulgated for specific industrial categories under *Section 307* of *the Water Quality Act of 1987 as amended (WQA). (See 40 CFR, Subchapter N, Parts 400* through *500*, for specific information).

5. The permittee shall provide adequate notice to the Executive Secretary and the Division of Water Quality Industrial Pretreatment Coordinator of;

   a. Any new introduction of pollutants into the treatment works from an indirect discharger (i.e., industrial user) which would be subject to *Sections 301* or *306* of the *WQA* if it were directly discharging those pollutants;

b. Any substantial change in the volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into the treatment works at the time of issuance of the permit; and

c. For the purposes of this section, adequate notice shall include information on:

(1) The quality and quantity of effluent to be introduced into such treatment works; and,

(2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from such publicly owned treatment works.

6. At such time as a specific pretreatment limitation becomes applicable to an industrial user of the permittee, the Executive Secretary may, as appropriate, do the following:

a. Amend the permittee's UPDES discharge permit to specify the additional pollutant(s) and corresponding effluent limitation(s) consistent with the applicable national pretreatment limitation;

b. Require the permittee to specify, by ordinance, contract, or other enforceable means, the type of pollutant(s) and the maximum amount which may be discharged to the permittee's facility for treatment. Such requirement shall be imposed in a manner consistent with the POTW program development requirements of the *General Pretreatment Regulations* at *40 CFR 403*; and/or,

c. Require the permittee to monitor its discharge for any pollutant, which may likely be discharged from the permittee's facility, should the industrial user fail to properly pretreat its waste.

7. The Executive Secretary retains, at all times, the right to take legal action against the industrial user and/or the treatment works, in those cases where a permit violation has occurred because of the failure of an industrial user to discharge at an acceptable level. If the permittee has failed to properly delineate maximum acceptable industrial contributor levels, the Executive Secretary will look primarily to the permittee as the responsible party.

8. If local limits are developed per R317-8-8.5(4)(b) to protect the POTW from pass-through or interference, then the POTW must submit limits to DWQ for review and public notice R317-8-8.5(4)(c).

III. BIOSOLIDS REQUIREMENTS

A. Biosolids Treatment and Disposal.

The authorization to dispose of biosolids provided under this permit is limited to those biosolids produced from the treatment works owned and operated by the permittee. The treatment methods and disposal practices are specifically designated below.

1. Treatment.

   Biosolids produced at the permittee are stabilized in the anaerobic digesters for at least 15 days at a temperature of at least 35° C (95° F). The biosolids are removed from the drying beds and formed into small windrows 3-4 feet high, and 5-6 feet wide, stored on a concrete pad and turned several times during the summer and will be tested for pathogens to meet Class A Standards.

2. Description of Biosolids Disposal Method.

   The Class B biosolids are disposed in the Klondike landfill.

3. Changes in Treatment Systems and Disposal Practices.

   Should the MWTF change their disposal methods or the biosolids generation and handling processes of the plant, the MWTF must notify the Executive Secretary at least 180 days in advance. This includes, but is not limited to, the addition or removal of any biosolids treatment units (e.g., digesters, drying beds, etc.) and/or any other change that would require a major modification of the permit.

   All biosolids land filled must meet the requirements of *40 CFR 258, Utah Administrative Code R315-301-5* and *Section 2.12* of the latest version of the *EPA Region VIII Biosolids Management Handbook.*

B. Specific Limitations and Monitoring Requirements.

All biosolids generated by this facility to be sold or given away to the public shall meet the requirements of *Part III.B.1, 2, 3* and *4* listed below.

1. Vector Attraction Reduction Requirements.

   The MWTF will meet vector attraction reduction through a volatile solids reduction of at least 38%

   There are additional vector attraction reduction alternatives available in *40 CFR 503.33*. If the permittee intends to use one of these alternatives, the Executive

Secretary and the EPA must be informed at least thirty (30) days prior to its use. This change may be made without additional public notice.

2. Self-Monitoring Requirements.

At a minimum, upon the effective date of this permit, vector attraction reduction and paint filter tests requirements shall be monitored according to *40 CFR Part 503.16*.

Minimum Frequency of Monitoring

Amount of Biosolids Disposed Per Year	Monitoring Frequency
> 0 to < 290 DMT	**One Time Per Year**
> 290 to < 1500 DMT	**Four times Per Year**

Sample collection, preservation and analysis shall be performed in a manner consistent with the requirements of *40 CFR Part 503* and/or other criteria specified in this permit.

C. Special Conditions on Biosolids Storage.

For biosolids or material derived from biosolids that are stored in piles for one year or longer, measures shall be taken to ensure that erosion (whether by wind or water) does not occur. Permanent storage of biosolids is prohibited. Biosolids shall not be temporarily stored for more than two years. Written permission to store biosolids for more than two years must be obtained from the Executive Secretary. Storage of biosolids for more than two years will be allowed only if it is determined that significant treatment is occurring.

D. Representative Sampling.

Biosolids samples used to measure compliance with Part *III.B* of this permit shall be collected at locations representative of the quality of biosolids generated at the treatment works and immediately prior to land application.

E. Reporting of Monitoring Results.

1. The MWTF shall provide the results of all monitoring performed in accordance with *Part III.B.* of the permit and information on management practices, and certifications shall be provided no later than February 19 of each year. Each report is for the previous calendar year. If no biosolids were applied to the land during the reporting period, "no biosolids were applied" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with Record Keeping (see *Part III.G.)*, and submitted to the Utah Division of Water Quality and the EPA at the following addresses:

Original to: Biosolids Coordinator
Utah Division of Water Quality
P. O. Box 144870
Salt Lake City Utah, 84114-4870

Copy to: Biosolids Coordinator, 8P-W-P
U. S. Environmental Protection Agency
Region VIII
1595 Wynkoop Street
Denver, CO 80202-1129

F. Additional Monitoring by the Permittee

If the MWTF monitors any pollutant more frequently than required by this permit, using test procedures approved under *40 CFR Part 503* or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted on the biosolids report form. Such increased frequency shall also be indicated

G. Record Keeping

1. If so notified by the Executive Secretary the MWTF may be required to add additional record keeping if information provided indicates that this is necessary to protect public health and the environment.

2. The MWTF is required to keep the following information for at least 5 years:

   "I certify under the penalty of law, that the vector attraction requirements in *Part III.B.1*, have been met. This determination has been made under my direction and supervision in accordance with the system designed to assure that qualified personnel properly gathered and evaluated the information used to determine that the vector attraction reduction requirements have been met. I am aware that there are significant penalties for false certification including the possibility of imprisonment."

3. Records of monitoring information shall include:

   a. The date, exact place, and time of sampling or measurements;

   b. The initials or name(s) of the individual(s) who performed the sampling or measurements;

   c. The date(s) analyses were performed;

   d. The time(s) analyses were initiated;

   e. The initials or name(s) of individual(s) who performed the analyses;

f. References and written procedures, when available, for the analytical techniques or methods used; and,

g. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.

4. The MWTF shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit and records of all data used to complete the application for this permit for the life of the permit. Data collected on site, copies of Biosolids Report forms, and a copy of this UPDES biosolids-only permit must be maintained on site during the duration of activity at the permitted location.

H. Twenty-four Hour Notice of Noncompliance Reporting

1. The MWTF shall report any noncompliance including transportation accidents and spills from the transfer of biosolids which may seriously endanger health or the environment as soon as possible, but no later than 24 hours from the time the MWTF first became aware of the circumstances. The report shall be made to the Division of Water Quality at (801) 538-6146 or (801) 536-4123 (24-hour answering machine).

2. A written submission shall also be provided within five days of the time that the MWTF becomes aware of the circumstances. The written submission shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

3. The Executive Secretary may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Division of Water Quality, by phone, at (801) 538-6146.

4. Reports shall be submitted to the addresses in *Part III.E.1*, Reporting of Monitoring Results..

I. Other Noncompliance Reporting.

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for *Part III.B* are submitted. The reports shall contain the information listed in *Part III.F*

IV. STORM WATER REQUIREMENTS.

A. Coverage of This Section. The requirements listed under this section shall apply to storm water discharges. Storm water discharges from the following portions of the facility may be eligible for coverage under this permit: biosolids drying beds, haul or access roads on which transportation of biosolids may occur, grit screen cleaning areas, chemical loading, unloading and storage areas, salt or sand storage areas, vehicle or equipment storage and maintenance areas, or any other wastewater treatment device or system, used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including lands dedicated to the disposal of sewage sludge that are located within the confines of the facility that may have a reasonable expectation to contribute to pollutants in a storm water discharge.

B. Prohibition of Non-Storm Water Discharges. Except for discharges identified in *Part I.*, and discharges described below in this paragraph, non-storm water discharges are prohibited. The following non-storm water discharges may be authorized under this permit provided the non-storm water component of the discharge is in compliance with this section; discharges from fire fighting activities; fire hydrant flushing; potable water sources including waterline flushing; drinking fountain water; irrigation drainage and lawn watering; routine external building wash down water where detergents or other compounds have not been used in the process; pavement wash waters where spills or leaks of toxic or hazardous materials (including oils and fuels) have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated compressor condensate; uncontaminated springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

C. Storm Water Pollution Prevention Plan Requirements. The permittee must have (on site) or develop and implement a storm water pollution prevention plan as a condition of this permit.

1. Contents of the Plan. The plan shall include, at a minimum, the following items:

a. *Pollution Prevention Team.* Each plan shall identify a specific individual or individuals within the facility organization as members of a storm water Pollution Prevention Team who are responsible for developing the storm water pollution prevention plan and assisting the facility or plant manager in its implementation, maintenance, and revision. The plan shall clearly identify the responsibilities of each team member. The activities and responsibilities of the team shall address all aspects of the facility's storm water pollution prevention plan.

b. *Description of Potential Pollutant Sources.* Each plan shall provide a description of potential sources which may reasonably be expected to add significant amounts of pollutants to storm water discharges or which may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each plan shall identify all activities and significant materials, which may be reasonably expected to have the potential as a significant pollutant source. Each plan shall include, at a minimum:

(1) *Drainage.* A site map indicating drainage areas and storm water outfalls. For each area of the facility that generates storm water discharges associated with the waste water treatment related activity with a reasonable potential for containing significant amounts of pollutants, a prediction of the direction of flow and an identification of the types of pollutants that are likely to be present in storm water discharges associated with the activity. Factors to consider include the toxicity of the pollutant; quantity of chemicals used, produced or discharged; the likelihood of contact with storm water; and history of significant leaks or spills of toxic or hazardous pollutants. Flows with a significant potential for causing erosion shall be identified. The site map shall include but not be limited to:

(a) Drainage direction and discharge points from all wastewater associated activities including but not limited to grit screen cleaning, bio-solids drying beds and transport, chemical/material loading, unloading and storage areas, vehicle maintenance areas, salt or sand storage areas.

(b) Location of any erosion and sediment control structure or other control measures utilized for reducing pollutants in storm water runoff.

(c) Location of bio-solids drying beds where exposed to precipitation or where the transportation of bio-solids may be spilled onto internal roadways or tracked off site.

(d) Location where grit screen cleaning or other routinely performed industrial activities are located and are exposed to precipitation.

(e) Location of any handling, loading, unloading or storage of chemicals or potential pollutants such as caustics, hydraulic fluids, lubricants, solvents or other petroleum products, or hazardous wastes and where these may be exposed to precipitation.

(f) Locations where any major spills or leaks of toxic or hazardous materials have occurred.

(g) Location of any sand or salt piles.

(h) Location of fueling stations or vehicle and equipment maintenance and cleaning areas that are exposed to precipitation.

(i) Location of receiving streams or other surface water bodies.

(j) Locations of outfalls and the types of discharges contained in the drainage areas of the outfalls.

(2) *Inventory of Exposed Materials*. An inventory of the types of materials handled at the site that potentially may be exposed to precipitation. Such inventory shall include a narrative description of significant materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water between the time of 3 years prior to the effective date of this permit and the present; method and location of onsite storage or disposal; materials management practices employed to minimize contact of materials with storm water runoff between the time of 3 years prior to the effective date of this permit and the present; the location and a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives.

(3) *Spills and Leaks*. A list of significant spills and significant leaks of toxic or hazardous pollutants that occurred at areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility after the date of 3 years prior to the effective date of this permit. Such list shall be updated as appropriate during the term of the permit.

(4) *Sampling Data*. A summary of existing discharge sampling data describing pollutants in storm water discharges from the facility, including a summary of sampling data collected during the term of this permit.

(5) *Summary of Potential Pollutant Sources and Risk Assessment*. A narrative description of the potential pollutant sources from the following activities associated with treatment works: access roads/rail lines; loading and unloading operations; outdoor storage activities; material handling sites; outdoor vehicle storage or maintenance sites; significant dust or particulate generating processes; and onsite waste disposal practices. Specific potential pollutants shall be identified where known.

(6) *Measures and Controls*. The permittee shall develop a description of storm water management controls appropriate for the facility, and implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at the facility. The description of storm water management controls shall address the following minimum components, including a schedule for implementing such controls:

(7) *Good Housekeeping*. All areas that may contribute pollutants to storm waters discharges shall be maintained in a clean, orderly manner. These are practices that would minimize the generation of pollutants at the source or before it would be necessary to employ sediment ponds or other control measures at the discharge outlets. Where applicable, such measures or other equivalent measures would include the following: sweepers and covered storage to minimize dust generation and storm runoff; conservation of vegetation where possible to minimize erosion;

sweeping of haul roads, bio-solids access points, and exits to reduce or eliminate off site tracking; sweeping of sand or salt storage areas to minimize entrainment in storm water runoff; collection, removal, and proper disposal of waste oils and other fluids resulting from vehicle and equipment maintenance; other equivalent measures to address identified potential sources of pollution.

(8) *Preventive Maintenance*. A preventive maintenance program shall involve timely inspection and maintenance of storm water management devices (e.g., cleaning oil/water separators, catch basins) as well as inspecting and testing facility equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters, and ensuring appropriate maintenance of such equipment and systems.

(9) *Spill Prevention and Response Procedures*. Areas where potential spills that can contribute pollutants to storm water discharges can occur, and their accompanying drainage points, shall be identified clearly in the storm water pollution prevention plan. Where appropriate, specifying material handling procedures, storage requirements, and use of equipment such as diversion valves in the plan should be considered. Procedures and equipment for cleaning up spills shall be identified in the plan and made available to the appropriate personnel.

(10) *Inspections*. In addition to the comprehensive site evaluation required under paragraph *(Part IV.C.1.b.(16))* of this section, qualified facility personnel shall be identified to inspect designated equipment and areas of the facility on a periodic basis. The following areas shall be included in all inspections: access roads/rail lines, equipment storage and maintenance areas (both indoor and outdoor areas); fueling; material handling areas, residual treatment, storage, and disposal areas; and wastewater treatment areas. A set of tracking or follow-up procedures shall be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections shall be maintained. The use of a checklist developed by the facility is encouraged.

(11) *Employee Training*. Employee training programs shall inform personnel responsible for implementing activities identified in the storm water pollution prevention plan or otherwise responsible for storm water management at all levels of responsibility of the components and goals of the storm water pollution prevention plan. Training should address topics such as spill response, good housekeeping and material management practices. The pollution prevention plan shall identify how often training will take place, but training should be held at least annually (once per calendar year). Employee training must, at a minimum, address the following areas when applicable to a facility: petroleum product management; process chemical management; spill prevention and control; fueling procedures; general good housekeeping

practices; proper procedures for using fertilizers, herbicides and pesticides.

(12) *Record keeping and Internal Reporting Procedures.* A description of incidents (such as spills, or other discharges), along with other information describing the quality and quantity of storm water discharges shall be included in the plan required under this part. Inspections and maintenance activities shall be documented and records of such activities shall be incorporated into the plan.

(13) *Non-storm Water Discharges.*

(a) *Certification.* The plan shall include a certification that the discharge has been tested or evaluated for the presence of non-storm water discharges. The certification shall include the identification of potential significant sources of non-storm water at the site, a description of the results of any test and/or evaluation for the presence of non-storm water discharges, the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the onsite drainage points that were directly observed during the test. Certifications shall be signed in accordance with *Part VII.G* of this permit.

(b) *Exceptions.* Except for flows from fire fighting activities, sources of non-storm water listed in *Part IV.B.* (Prohibition of Non-storm Water Discharges) of this permit that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

(c) *Failure to Certify.* Any facility that is unable to provide the certification required (testing for non-storm water discharges), must notify the *Executive Secretary* within 180 days after the effective date of this permit. If the failure to certify is caused by the inability to perform adequate tests or evaluations, such notification shall describe: the procedure of any test conducted for the presence of non-storm water discharges; the results of such test or other relevant observations; potential sources of non-storm water discharges to the storm sewer; and why adequate tests for such storm sewers were not feasible. Non-storm water discharges to waters of the State, which are not, authorized by a *UPDES* permit are unlawful, and must be terminated.

(14) *Sediment and Erosion Control.* The plan shall identify areas, which, due to topography, activities, or other factors, have a high potential for significant soil erosion, and identify structural, vegetative, and/or stabilization measures to be used to limit erosion.

(15) *Management of Runoff.* The plan shall contain a narrative consideration of the appropriateness of traditional storm water management practices (practices other than those which control the generation or source(s) of pollutants) used to divert, infiltrate, reuse, or otherwise manage storm water runoff in a manner that reduces pollutants in storm water discharges from the site. The plan shall provide that measures that the permittee determines to be reasonable and appropriate shall be implemented and maintained. The potential of various sources at the facility to contribute pollutants to storm water discharges associated with industrial activity *Part IV.C.1.b* (Description of Potential Pollutant Sources) of this permit] shall be considered when determining reasonable and appropriate measures. Appropriate measures or other equivalent measures may include: vegetative swales and practices, reuse of collected storm water (such as for a process or as an irrigation source), inlet controls (such as oil/water separators), snow management activities, infiltration devices, wet detention/retention devices and discharging storm water through the waste water facility for treatment.

(16) *Comprehensive Site Compliance Evaluation.* Qualified personnel shall conduct site compliance evaluations at appropriate intervals specified in the plan, but in no case less than once a year. Such evaluations shall provide:

(a) Areas contributing to a storm water discharge associated with industrial activity shall be visually inspected for evidence of, or the potential for, pollutants entering the drainage system. Measures to reduce pollutant loadings shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly. A visual inspection of equipment needed to implement the plan, such as spill response equipment, shall be made.

(b) Based on the results of the evaluation, the description of potential pollutant sources identified in the plan in accordance with *Part IV.C.1.b* (Description of Potential Pollutant Sources) of this section and pollution prevention measures and controls identified in the plan in accordance with *Part IV.C.1.b.(6)* (Measures and Controls) of this section shall be revised as appropriate within 2 weeks of such evaluation and shall provide for implementation of any changes to the plan in a timely manner, but in no case more than 12 weeks after the evaluation.

(c) A report summarizing the scope of the evaluation, personnel making the evaluation, the date(s) of the evaluation, major observations relating to the implementation of the storm water pollution

prevention plan, and actions taken in accordance with paragraph *i.* (above) shall be made and retained as part of the storm water pollution prevention plan for at least 3 years after the date of the evaluation. The report shall identify any incidents of noncompliance. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with *Part VII.G* (Signatory Requirements) of this permit.

(17) *Deadlines for Plan Preparation and Compliance.* The permittee shall prepare and implement a plan in compliance with the provisions of this section within 270 days of the effective date of this permit. If the permittee already has a plan, it shall be revised according to *Part IV.C.1.b.(16)*, Comprehensive Site Evaluation.

(18) *Keeping Plans Current.* The permittee shall amend the plan whenever there is a change in design, construction, operation, or maintenance, that has a significant effect on the potential for the discharge of pollutants to the waters of the state or if the storm water pollution prevention plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified by the plan, or in otherwise achieving the general objective of controlling pollutants in storm water discharges associated with the activities at the facility.

D. Monitoring and Reporting Requirements.

1. Quarterly Visual Examination of Storm Water Quality. Facilities shall perform and document a visual examination of a storm water discharge associated with industrial activity from each outfall, except discharges exempted below. The examination must be made at least once in each of the following designated periods during daylight hours unless there is insufficient rainfall or snow melt to produce a runoff event: January through March; April through June; July through September; and October through December.

   a. *Sample and Data Collection.* Examinations shall be made of samples collected within the first 30 minutes (or as soon thereafter as practical, but not to exceed 1 hour) of when the runoff or snowmelt begins discharging. The examinations shall document observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution. The examination must be conducted in a well lit area. No analytical tests are required to be performed on the samples. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. Where practicable, the same individual should carry out the collection and examination of discharges for entire permit term.

b. *Visual Storm Water Discharge Examination Reports.* Visual examination reports must be maintained onsite in the pollution prevention plan. The report shall include the examination date and time, examination personnel, the nature of the discharge (i.e., runoff or snow melt), visual quality of the storm water discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution), and probable sources of any observed storm water contamination.

c. *Representative Discharge.* When the permittee has two or more outfalls that, based on a consideration of industrial activity, significant materials, and management practices and activities within the area drained by the outfall, the permittee reasonably believes discharge substantially identical effluents, the permittee may collect a sample of effluent of one of such outfalls and report that the observation data also applies to the substantially identical outfall(s) provided that the permittee includes in the storm water pollution prevention plan a description of the location of the outfalls and explains in detail why the outfalls are expected to discharge substantially identical effluents. In addition, for each outfall that the permittee believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area [e.g., low (under 40 percent), medium (40 to 65 percent), or high (above 65 percent)] shall be provided in the plan.

d. *Adverse Conditions.* When a discharger is unable to collect samples over the course of the visual examination period as a result of adverse climatic conditions, the discharger must document the reason for not performing the visual examination and retain this documentation onsite with the results of the visual examination. Adverse weather conditions, which may prohibit the collection of samples, include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricane, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

e. *Inactive and Unstaffed Site.* When a discharger is unable to conduct visual storm water examinations at an inactive and unstaffed site, the operator of the facility may exercise a waiver of the monitoring requirement as long as the facility remains inactive and unstaffed. The facility must maintain a certification with the pollution prevention plan stating that the site is inactive and unstaffed so that performing visual examinations during a qualifying event is not feasible.

V. MONITORING, RECORDING & GENERAL REPORTING REQUIREMENTS

A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under *Part I* shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge. Samples of biosolids shall be collected at a location representative of the quality of biosolids immediately prior to the use-disposal practice.

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under *Utah Administrative Code ("UAC") R317-2-10 and 40CFR Part 503*, unless other test procedures have been specified in this permit.

C. Penalties for Tampering. The *Act* provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

E. Additional Monitoring by the Permittee. If the permittee monitors any parameter more frequently than required by this permit, using test procedures approved under *UAC R317-2-10* and *40 CFR 503* or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or the Biosolids Report Form. Such increased frequency shall also be indicated. Only those parameters required by the permit need to be reported.

F. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements:
2. The individual(s) who performed the sampling or measurements;
3. The date(s) and time(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and,
6. The results of such analyses.

G. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least five years from the date of the sample, measurement, report or application. This period may be extended by request of the

Executive Secretary at any time. A copy of this UPDES permit must be maintained on site during the duration of activity at the permitted location

H. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall (orally) report any noncompliance including transportation accidents, spills, and uncontrolled runoff from biosolids transfer or land application sites which may seriously endanger health or environment, as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of circumstances. The report shall be made to the Division of Water Quality, (801) 536-4300, or 24-hour answering service (801) 536-4123.

2. The following occurrences of noncompliance shall be reported by telephone (801) 536-4123 as soon as possible but no later than 24 hours from the time the permittee becomes aware of the circumstances:

   a. Any noncompliance which may endanger health or the environment;

   b. Any unanticipated bypass, which exceeds any effluent limitation in the permit (See *Part VI.G, Bypass of Treatment Facilities.)*;

   c. Any upset which exceeds any effluent limitation in the permit (See *Part VI.H, Upset Conditions.*);

   d. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit; or,

   e. Violation of any of the Table 3 metals limits, the pathogen limits, the vector attraction reduction limits or the management practices for biosolids that have been sold or given away.

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected;

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and,

   e. Steps taken, if any, to mitigate the adverse impacts on the environment and human health during the noncompliance period.

4. The Executive Secretary may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Division of Water Quality, (801) 538-6146.

5. Reports shall be submitted to the addresses in *Part I.D, Reporting of Monitoring Results*.

I. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for *Part I.D* are submitted. The reports shall contain the information listed in *Part V.H.3*

J. Inspection and Entry The permittee shall allow the Executive Secretary, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, including but not limited to, biosolids treatment, collection, storage facilities or area, transport vehicles and containers, and land application sites;

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the *Act*, any substances or parameters at any location, including, but not limited to, digested biosolids before dewatering, dewatered biosolids, biosolids transfer or staging areas, any ground or surface waters at the land application sites or biosolids, soils, or vegetation on the land application sites; and,

5. The permittee shall make the necessary arrangements with the landowner or leaseholder to obtain permission or clearance, the Executive Secretary, or authorized representative, upon the presentation of credentials and other documents as may be required by law, will be permitted to enter without delay for the purposes of performing their responsibilities.

VI. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions. The *Act* provides that any person who violates a permit condition implementing provisions of the *Act* is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions or the Act is subject to a fine not exceeding $25,000 per day of violation. Any person convicted under *UCA 19-5-115(2)* a second time shall be punished by a fine not exceeding $50,000 per day. Except as provided at *Part VI.G, Bypass of Treatment Facilities* and *Part VI.H, Upset Conditions*, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment. The permittee shall also take all reasonable steps to minimize or prevent any land application in violation of this permit.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Removed Substances. Collected screening, grit, solids, sludge, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digester supernatant and filter backwash

shall not directly enter either the final effluent or waters of the state by any other direct route.

G. Bypass of Treatment Facilities.

1. Bypass Not Exceeding Limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to paragraph 2 and 3 of this section.

2. Prohibition of Bypass.

   a. Bypass is prohibited, and the Executive Secretary may take enforcement action against a permittee for bypass, unless:

      (1) Bypass was unavoidable to prevent loss of human life, personal injury, or severe property damage;

      (2) There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance, and

      (3) The permittee submitted notices as required under *section VI.G.3.*

   b. The executive Secretary may approve an anticipated bypass, after considering its adverse effects, if the Executive Secretary determines that it will meet the three conditions listed in *sections VI.G.2.a (1), (2) and (3).*

3. Notice.

   a. *Anticipated bypass.* Except as provided above in *section VI.G.2* and below in *section VI.G.3.b*, if the permittee knows in advance of the need for a bypass, it shall submit prior notice, at least ninety days before the date of bypass. The prior notice shall include the following unless otherwise waived by the Executive Secretary:

      (1) Evaluation of alternative to bypass, including cost-benefit analysis containing an assessment of anticipated resource damages:

(2) A specific bypass plan describing the work to be performed including scheduled dates and times. The permittee must notify the Executive Secretary in advance of any changes to the bypass schedule;

(3) Description of specific measures to be taken to minimize environmental and public health impacts;

(4) A notification plan sufficient to alert all downstream users, the public and others reasonably expected to be impacted by the bypass;

(5) A water quality assessment plan to include sufficient monitoring of the receiving water before, during and following the bypass to enable evaluation of public health risks and environmental impacts; and,

(6) Any additional information requested by the Executive Secretary.

b. *Emergency Bypass*. Where ninety days advance notice is not possible, the permittee must notify the Executive Secretary, and the Director of the Department of Natural Resources, as soon as it becomes aware of the need to bypass and provide to the Executive Secretary the information in *section VI.G.3.a.(1) through (6)* to the extent practicable.

c. *Unanticipated bypass*. The permittee shall submit notice of an unanticipated bypass to the Executive Secretary as required under *Part IV.H*, Twenty Four Hour Reporting. The permittee shall also immediately notify the Director of the Department of Natural Resources, the public and downstream users and shall implement measures to minimize impacts to public health and environment to the extent practicable.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 2 of this section are met. Executive Secretary's administrative determination regarding a claim of upset cannot be judiciously challenged by the permittee until such time as an action is initiated for noncompliance.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate,

through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the permittee can identify the cause(s) of the upset;

b. The permitted facility was at the time being properly operated;

c. The permittee submitted notice of the upset as required under *Part V.H, Twenty-four Hour Notice of Noncompliance Reporting*; and,

d. The permittee complied with any remedial measures required under *Part VI.D, Duty to Mitigate.*

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

VII. GENERAL REQUIREMENTS

A. Planned Changes. The permittee shall give notice to the Executive Secretary as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of parameters discharged or pollutant sold or given away. This notification applies to pollutants, which are not subject to effluent limitations in the permit. In addition, if there are any planned substantial changes to the permittee's existing sludge facilities or their manner of operation or to current sludge management practices of storage and disposal, the permittee shall give notice to the Executive Secretary of any planned changes at least 30 days prior to their implementation.

B. Anticipated Noncompliance. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee shall apply for and obtain a new permit. The application shall be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information. The permittee shall furnish to the Executive Secretary, within a reasonable time, any information which the Executive Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Executive Secretary, upon request, copies of records required to be kept by this permit.

F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Executive Secretary, it shall promptly submit such facts or information.

G. Signatory Requirements. All applications, reports or information submitted to the Executive Secretary shall be signed and certified.

1. All permit applications shall be signed by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Executive Secretary shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Executive Secretary, and,

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. A duly authorized representative may thus be either a named individual or any individual occupying a named position.

3. Changes to authorization. If an authorization under *paragraph VII.G.2* is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of *paragraph VII.G.2.* must be submitted to the Executive Secretary prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports. The *Act* provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than

$10,000.00 per violation, or by imprisonment for not more than six months per violation, or by both.

I. Availability of Reports. Except for data determined to be confidential under *UAC R317-8-3.2*, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the office of Executive Secretary. As required by the *Act*, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the permittee of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under the *Act*.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Executive Secretary at least 20 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittee's containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Executive Secretary does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph *2* above.

N. State or Federal Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by *UCA 19-5-117* and *Section 510* of the *Act* or any applicable Federal or State transportation

regulations, such as but not limited to the Department of Transportation regulations.

O. Water Quality - Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. Water Quality Standards for the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.

3. Revisions to the current CWA § 208 areawide treatment management plans or promulgations/revisions to TMDLs (40 CFR 130.7) approved by the EPA and adopted by DWQ which calls for different effluent limitations than contained in this permit.

P. Biosolids – Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate biosolids limitations (and compliance schedule, if necessary), management practices, other appropriate requirements to protect public health and the environment, or if there have been substantial changes (or such changes are planned) in biosolids use or disposal practices; applicable management practices or numerical limitations for pollutants in biosolids have been promulgated which are more stringent than the requirements in this permit; and/or it has been determined that the permittees biosolids use or land application practices do not comply with existing applicable state of federal regulations.

Q. Toxicity Limitation - Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include, whole effluent toxicity (WET) limitations, a compliance date, a compliance schedule, a change in the whole effluent toxicity (biomonitoring) protocol, additional or modified numerical limitations, or any other conditions related to the control of toxicants if one or more of the following events occur;

1. Toxicity is detected, as per *Part I.C.3.b* of this permit, during the duration of this permit.

2. The TRE results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the Executive Secretary agrees with the conclusion.

3. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits, and the Executive Secretary agrees that numerical controls are the most appropriate course of action.

4. Following the implementation of numerical control(s) of toxicant(s), the Executive Secretary agrees that a modified biomonitoring protocol is necessary to compensate for those toxicant that are controlled numerically.

5. The TRE reveals other unique conditions or characteristics, which in the opinion of the permit issuing authority justify the incorporation of unanticipated special conditions in the permit.

R. Storm Water-Reopener Provision. At any time during the duration (life) of this permit, this permit may be reopened and modified (following proper administrative procedures) as per *UAC R317.8*, to include, any applicable storm water provisions and requirements, a storm water pollution prevention plan, a compliance schedule, a compliance date, monitoring and/or reporting requirements, or any other conditions related to the control of storm water discharges to "waters-of-State".

VIII. DEFINITIONS

A. Wastewater.

1. The "7-day (and weekly) average", other than for e-coli bacteria, fecal coliform bacteria, and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for e-coli bacteria, fecal coliform bacteria, and total coliform bacteria. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week, which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains Saturday.

2. The "30-day (and monthly) average," other than for e-coli bacteria, fecal coliform bacteria and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for e-coli bacteria, fecal coliform bacteria and total coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.

3. "Act," means the *Utah Water Quality Act.*

4. "Acute toxicity" occurs when 50 percent or more mortality is observed for either test species at any effluent concentration (lethal concentration or "LC_{50}").

5. "Bypass," means the diversion of waste streams from any portion of a treatment facility.

6. "Chronic toxicity" occurs when the survival, growth, or reproduction for either test species exposed to a specific percent effluent dilution is significantly less (at the 95 percent confidence level) than the survival, growth, or reproduction of the control specimens.

7. "IC_{25}" is the concentration of toxicant (given in % effluent) that would cause a 25% reduction in mean young per female, or a 25% reduction in overall growth for the test population.

8. "Composite Samples" shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

    a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;

    b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;

    c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,

    d. Continuous sample volume, with sample collection rate proportional to flow rate.

9. "CWA," means *The Federal Water Pollution Control Act*, as amended, by *The Clean Water Act of 1987.*

10. "Daily Maximum" (Daily Max.) is the maximum value allowable in any single sample or instantaneous measurement.

11. "EPA," means the United States Environmental Protection Agency.

12. "Executive Secretary," means Executive Secretary of the Utah Water Quality Board.

13. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

14. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

15. "Severe Property Damage," means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe

property damage does not mean economic loss caused by delays in production.

16. "Upset," means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

B. Biosolids.

1. "Biosolids," means any material or material derived from sewage solids that have been biologically treated.

2. "Dry Weight-Basis," means 100 percent solids (i.e. zero percent moisture).

3. "Land Application" is the spraying or spreading of biosolids onto the land surface; the injection of biosolids below the land surface; or the incorporation of biosolids into the land so that the biosolids can either condition the soil or fertilize crops or vegetation grown in the soil. Land application includes distribution and marketing (i.e. the selling or giving away of the biosolids).

4. "Pathogen," means an organism that is capable of producing an infection or disease in a susceptible host.

5. "Pollutant" for the purposes of this permit is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or pathogenic organisms that after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food-chain, could on the basis of information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms.

6. "Runoff" is rainwater, leachate, or other liquid that drains over any part of a land surface and runs off the land surface.

7. "Similar Container" is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

8. "Total Solids" are the materials in the biosolids that remain as a residue if the biosolids are dried at 103° or 105° Celsius.

9. "Treatment Works" are either Federally owned, publicly owned, or privately owned devices or systems used to treat (including recycling and reclamation) either domestic sewage or a combination of domestic sewage and industrial waste or liquid manure.

10. "Vector Attraction" is the characteristic of biosolids that attracts rodents, flies mosquito's or other organisms capable of transporting infectious agents.

11. "Animals" for the purpose of this permit are domestic livestock.

12. "Annual Whole Sludge Application Rate" is the amount of sewage sludge (dry-weight basis) that can be applied to a unit area of land during a cropping cycle.

13. "Agronomic Rate is the whole sludge application rate (dry-weight basis) designed to: (1) provide the amount of nitrogen needed by the crop or vegetation grown on the land; and (2) minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

14. "Annual Pollutant Loading Rate" is the maximum amount of a pollutant (dry-weight basis) that can be applied to a unit area of land during a 365-day period.

15. "Application Site or Land Application Site" means all contiguous areas of a users' property intended for sludge application.

16. "Cumulative Pollutant Loading Rate" is the maximum amount of an inorganic pollutant (dry-weight basis) that can be applied to a unit area of land.

17. "Grit and Screenings" are sand, gravel, cinders, other materials with a high specific gravity and relatively large materials such as rags generated during preliminary treatment of domestic sewage at a treatment works and shall be disposed of according to *40 CFR 258*.

18. "High Potential for Public Contact Site" is land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

19. "Low Potential for Public Contact Site" is the land with a low potential for contact by the public. This includes, but is not limited to, farms, ranches, reclamation areas, and other lands which are private lands, restricted public lands, or lands which are not generally accessible to or used by the public.

20. "Monthly Average" is the arithmetic mean of all measurements taken during the month.

21. "Volatile Solids" is the amount of the total solids in sewage sludge lost when the sludge is combusted at 550 degrees Celsius for 15-20 minutes in the presence of excess air.

C. Storm Water.

1. "Best Management Practices" ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

2. "Coal pile runoff" means the rainfall runoff from or through any coal storage pile.

3. "Co-located industrial activity" means when a facility has industrial activities being conducted onsite that are described under more than one of the coverage sections of *Appendix II* in the General Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activity. Facilities with co-located industrial activities shall comply with all applicable monitoring and pollution prevention plan requirements of each section in which a co-located industrial activity is described.

4. "Commercial Treatment and Disposal Facilities" means facilities that receive, on a commercial basis, any produced hazardous waste (not their own) and treat or dispose of those wastes as a service to the generators. Such facilities treating and/or disposing exclusively residential hazardous wastes are not included in this definition.

5. "Landfill" means an area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile.

6. "Land application unit" means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

7. "Municipal separate storm sewer system" (large and/or medium) means all municipal separate storm sewers that are either:

   a. Located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (at the issuance date of this permit, Salt Lake City is the only city in Utah that falls in this category); or

   b. Located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships or towns within such counties (at the issuance date of this permit Salt Lake County is the only county that falls in this category); or

   c. Owned or operated by a municipality other than those described in paragraph *a.* or *b.* (above) and that are designated by the *Executive Secretary* as part of the large or medium municipal separate storm sewer system.

8. "NOI" means "notice of intent", it is an application form that is used to obtain coverage under the General Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activity.

9. "NOT" means "notice of termination", it is a form used to terminate coverage under the General Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activity.

10. "Point source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

11. "Section 313 water priority chemical" means a chemical or chemical categories that:

    a. Are listed at *40 CFR 372.65* pursuant to *Section 313* of the *Emergency Planning and Community Right-to-Know Act* (*EPCRA*) (also known as *Title III of the Superfund Amendments and Reauthorization Act* (*SARA*) of 1986);

    b. Are present at or above threshold levels at a facility subject to *EPCRA Section 313* reporting requirements; and

    c. Meet at least one of the following criteria:

        (1) Are listed in *Appendix D* of *40 CFR Part 122* on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols) or Table V (certain toxic pollutants and hazardous substances);

        (2) Are listed as a hazardous substance pursuant to *Section 311(b)(2)(A)* of the *CWA* at *40 CFR 116.4*; or

        (3) Are pollutants for which EPA has published acute or chronic water quality criteria. See *Appendix III* of this permit. This appendix was revised based on final rulemaking EPA published in the *Federal Register* November 30, 1994.

12. "Significant materials" includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under *Section 101(14)* of *CERCLA*; any chemical the facility is required to report pursuant to *EPCRA Section 313*; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with storm water discharges.

13. "Significant spills" includes, but is not limited to: releases of oil or hazardous substances in excess of reportable quantities under *Section 311 of the Clean Water Act* (see *40 CFR 110.10* and *CFR 117.21*) or *Section 102* of *CERCLA* (see *40 CFR 302.4*).

14. "Storm water" means storm water runoff, snowmelt runoff, and surface runoff and drainage.

15. "SWDMR" means "storm water discharge monitoring report", a report of the results of storm water monitoring required by the permit. The Division of Water Quality provides the storm water discharge monitoring report form.

16. "Storm water associated with industrial activity" (*UAC R317-8-3.8(6)(c) & (d)*) means the discharge from any conveyance that is used for collecting and conveying storm water and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the *UPDES* program. For the categories of industries identified in paragraphs *(a)* through *(j)* of this definition, the term includes, but is not limited to, storm water discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined in *40 CFR Part 401*); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. For the categories of industries identified in paragraph *(k)* of this definition, the term includes only storm water discharges from all areas (except access roads and rail lines) listed in the previous sentence where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water. For the purposes of this paragraph, material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, finished product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the above described areas. Industrial facilities (including industrial facilities that are Federally, State, or municipally owned or operated that meet the description of the facilities listed in paragraphs *(a)* to *(k)* of this definition) include those facilities designated under *UAC R317-8-3.8(1)(a)5.* The following categories of facilities are considered to be engaging in "industrial activity" for purposes of this subsection:

    a. Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards

under *40 CFR Subchapter N* (except facilities with toxic pollutant effluent standards that are exempted under category (k) of this definition);

b. Facilities classified as Standard Industrial Classifications 24 (except 2434), 26 (except 265 and 267), 28 (except 283 and 285), 29, 311, 32 (except 323), 33, 3441, 373;

c. Facilities classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive mining operations (except for areas of coal mining operations no longer meeting the definition of a reclamation area under *40 CFR 434.11(l)* because the performance bond issued to the facility by the appropriate SMCRA authority has been released, or except for areas of non-coal mining operations that have been released from applicable State or Federal reclamation requirements after December 17, 1990) and oil and gas exploration, production, processing, or treatment operations, or transmission facilities that discharge storm water contaminated by contact with or that has come into contact with, any overburden, raw material, intermediate products, finished products, byproducts or waste products located on the site of such operations; inactive mining operations are mining sites that are not being actively mined, but that have an identifiable owner/operator;

d. Hazardous waste treatment, storage, or disposal facilities, including those that are operating under interim status or a permit under Subtitle C of RCRA;

e. Landfills, land application sites, and open dumps that have received any industrial wastes (waste that is received from any of the facilities described under this subsection) including those that are subject to regulation under *Subtitle D* of *RCRA*;

f. Facilities involved in the recycling of materials, including metal scrapyards, battery reclaimers, salvage yards, and automobile junkyards, including but limited to those classified as Standard Industrial Classification 5015 and 5093;

g. Steam electric power generating facilities, including coal handling sites;

h. Transportation facilities classified as Standard Industrial Classifications 40, 41, 42 (except 4221-25), 43, 44, 45 and 5171 that have vehicle maintenance shops, equipment cleaning operations, or

airport deicing operations. Only those portions of the facility that are either involved in vehicle maintenance (including vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication), equipment cleaning operations, airport deicing operations, or that are otherwise identified under paragraphs (a) to (g) or (I) to (k) of this subsection are associated with industrial activity;

i. Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge that are located within the confines of the facility, with a design flow of 1.0 mgd or more, or required to have an approved pretreatment program under *40 CFR Part 403*. Not included are farm lands, domestic gardens or lands used for sludge management where sludge is beneficially reused and that are not physically located in the confines of the facility, or areas that are in compliance with *40 CFR Part 503*;

j. Construction activity including clearing, grading and excavation activities except:. operations that result in the disturbance of less than 5 acres of total land area that are not part of a larger common plan of development or sale;

k. Facilities under Standard Industrial Classifications 20, 21, 22, 23, 2434, 25, 265, 267, 27, 283, 285, 30, 31 (except 311), 323, 34 (except 3441), 35, 36, 37 (except 373), 38, 39, 4221-25, (and that are not otherwise included within categories (a) to (j))

17. "Waste pile" means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

Utah Division of Water Quality
ADDENDUM
Statement of Basis
Wasteload Analysis for Treatment Plant Upgrade - PRELIMINARY

Date: **July 28, 2015**

Facility: **Moab POTW**
UPDES No. UT0020419

Receiving water: **Colorado River (1C, 2A, 3B, 4)**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge

Outfall 001: Located at latitude 38°34'40" and longitude 109°34'47". The discharge is through a 2,000-lineal-foot, 18-inch diameter reinforced concrete pipeline to the Colorado River.

The design flow for the treatment plant is 1.75 MGD maximum monthly average and 3.38 MGD maximum daily discharge, as provided by the permittee. The design discharge was used for this wasteload analysis.

Data obtained from 2004-2014 for sampling site 4956550 Moab WWTP was used to characterize the temperature, pH and hardness of the effluent.

Receiving Water

The receiving water for the discharge is the Colorado River, which per UAC R317-2-13.1 has designated uses of 1C, 2A, 3B, and 4.

- *Class 1C - Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.*

- *Class 2A - Protected for frequent primary contact recreation where there is a high likelihood of ingestion of water or a high degree of bodily contact with the water. Examples include, but are not limited to, swimming, rafting, kayaking, diving, and water skiing.*

- *Class 3B - Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.*

- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

The critical flow for the wasteload analysis was considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Flow records from USGS stream gage # 09180500 - COLORADO RIVER NEAR CISCO, UT, for the period 1913 – 2010 was obtained. The 7Q10 was calculated using the EPA computer software DFLOW V3.1b.

7Q10 Flow (Annual) = 1,220 cfs

Data obtained from 2004-2014 for sampling site 4957000 Colorado River at US191 Crossing Near Moab was used to characterize background water quality conditions.

Mixing Zone

The allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone. Individual mixing zones may be further limited or disallowed in consideration of the following factors in the area affected by the discharge: Zone of passage for migrating fish or other species (including access to tributaries).

Mill Creek confluence with the Colorado River is approximately 1,400 feet downstream of the Moab POTW outfall pipe. Therefore, in consideration of potential fish migration concerns between Mill Creek and Colorado River, the acute mixing zone is limited to 1,400 feet (calculated to be 10.2 minutes travel time).

Dilution Factor

The EPA Region 8 stream mixing zone analysis (STREAMIX1, 1994), was used to determine the plume width and mixed flow rate for both acute and chronic conditions. A rectangular channel with a width of 300 feet, channel slope of 0.001 feet/feet, and roughness coefficient of 0.030 was assumed for channel geometry. Mannings equation was used to solve for the flow depth (1.8 feet) and velocity for the 7Q10 flow.

Table 1: Summary of plume characteristics at mixing zone boundary.

Criteria	Distance to End of Mixing Zone (feet)	Plume Width		Flow	Dilution Factor
		feet	% of River	cfs	
Acute	1,400	35.4	11.6	142	62:1
Chronic	2,500	49.1	16.2	198	86:1

Parameters of Concern

The potential parameters of concern for the discharge/receiving water identified were total dissolved solids (TDS), total suspended solids (TSS), and ammonia, as determined in consultation with the UPDES Permit Writer.

TMDL

The Colorado River from Green River confluence to Moab was listed as impaired for selenium according to the 2010 303(d) list. The receiving water does not have an approved TMDL for any parameters.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC_{25}

Season	Percent Effluent
Annual	1.4%

Effluent Limits

Effluent limits for pollutants were determined using a mass balance mixing analysis (UDWQ 2012). The mass balance analysis is summarized in Appendix A.

The water quality standard for chronic ammonia toxicity is dependent on temperature and pH, and the water quality standard for acute ammonia toxicity is dependent on pH. The analysis to determine the ammonia criteria is summarized in Appendix B.

Due to the high dilution factor, secondary standards for BOD_5 were considered sufficiently protective to meet instream criteria for DO.

Table 3: Water Quality Based Effluent Limits Summary

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Flow (MGD)		3.38	1 day		1.75	30 days
Ammonia (mg/L)			1 hour			30 days
Summer (Jul-Sep)	2.9	210		1.1	75	
Fall (Oct-Dec)	1.3	94		1.2	83	
Winter (Jan-Mar)	3.0	218		1.7	122	
Spring (Apr-Jun)	2.5	180		1.7	121	
BOD_5 (mg/L)	N/A	35	7 days	N/A	25	30 days
Dissolved Oxygen (mg/L)	3.0	5.0	Minimum	5.0	5.0	30 days

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload.

The pollutant concentration and load from the facility is being increased under the proposed treatment plant upgrade; therefore, a Level II Antidegradation Review (ADR) is required for this discharge.

Prepared by: Nicholas von Stackelberg, P.E.
Standards and Technical Services Section

Documents:

WLA Document: *moab_potw_upgrade_wla_2015.docx*
Analysis: *moab_potw_upgrade_wla_2015.xlsx*

References:

Utah Wasteload Analysis Procedures Version 1.0. 2012. Utah Division of Water Quality.

WASTELOAD ANALYSIS [WLA] Date: 7/28/2015

Appendix A: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Moab WWTP		
UPDES No:	UT-0020419		
Permit Flow [MGD]:	3.38	Annual	Max. Daily
	1.75	Annual	Max. Monthly
Receiving Water:	Colorado River		
Stream Classification:	1C, 2B, 3B, 4		
Stream Flows [cfs]:	1220	Summer	Critical Low Flow
	197	Chronic	
	142	Acute	
Fully Mixed:	NO		
Acute River Width:	11.6%	Plume Model Used	
Chronic River Width:	16.2%	Plume Model Used	

Modeling Information

A simple mixing analysis was used to determine the effluent limits.

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort reflect the environmental conditions expected at low stream flows.

Effluent Limitations for Protection of Drinking Water (Class 1C Waters)

No dilution in unnamed irrigation ditch.

	Maximum Concentration		
Dissolved Metals (ug/L)	**Standard**	**Background**	**Limit**
Arsenic	10.0	1.30	246
Barium	1000	140.60	24,275
Beryllium	4.0	2.68	39.7
Cadmium	10.0	0.10	278
Chromium	50.0	2.00	1,350
Lead	15.0	0.20	416
Mercury	2.0	0.2	51
Selenium	50.0	2.20	1,345
Silver	50.0	0.5	1,391

	Maximum Concentration		
Inorganics (mg/L)	**Standard**	**Background**	**Limit**
Bromate	0.01	0.007	0.10
Chlorite	1.0	0.67	9.9
Fluoride	1.4	0.94	13.9
Nitrate	10.0	0.51	267

	Maximum Concentration		
Radiological (pCi/L)	**Standard**	**Background**	**Limit**
Gross Alpha	15.0	10.1	149
Gross Beta	4.0	2.7	39.7
Strontium 90	8.0	5.4	79
Tritium	20000	13400	198749
Uranium	30.0	20.1	298

Bacteriological	**Standard**
E. coli (30 Day Geometric Mean)	206 (#/100 mL)
E. coli (Maximum)	668 (#/100 mL)

Effluent Limitations for Protection of Recreation (Class 2B Waters)

Physical

Parameter	**Maximum Concentration**
pH Minimum	6.5
pH Maximum	9.0
Turbidity Increase (NTU)	10.0

Bacteriological	**Standard**
E. coli (30 Day Geometric Mean)	206 (#/100 mL)
E. coli (Maximum)	668 (#/100 mL)

Effluent Limitations for Protection of Aquatic Wildlife (Assumed Class 3B Waters)

Temperature (deg C)	**Maximum**
Instantaneous	27.0
Change	4.0

pH	**Concentration**
Minimum	6.5
Maximum	9.0

Dissolved Oxygen (mg/L)	**Standard**	**Limit**
Instantaneous Minimum	5.0	5.0
7-day Average Minimum	6.0	6.0
30-day Average Minimum	5.5	5.5

BOD5 (mg/L)	**Standard**	**Limit**
7-day Average	N/A	35.0
30-day Average	N/A	25.0

Ammonia-Total (mg/L)

	Chronic (30-day ave)			Acute (1-hour ave)		
Season	**Standard**	**Background**	**Limit**	**Standard**	**Background**	**Limit**
Summer	1.1	0.07	75.2	2.9	0.07	210.2
Fall	1.2	0.07	83.2	1.3	0.07	94.3
Winter	1.7	0.07	121.8	3.0	0.07	218.5
Spring	1.7	0.07	121.4	2.5	0.07	180.2

Inorganics	**Chronic Standard (4 Day Average)**	**Acute Standard (1 Hour Average)**
Parameter	**Standard**	**Standard**
Phenol (mg/L)		0.010
Hydrogen Sulfide (Undissociated) [mg/L]		0.002

Metals-Total Recoverable

	Chronic (4-day ave)			Acute (1-hour ave)		
Parameter	**Standard[1]**	**Background**	**Limit**	**Standard[1]**	**Background**	**Limit**
Aluminum (µg/L)	N/A[3]	19.0	N/A	750	19.0	20,548
Arsenic (µg/L)	150	1.3	10,994	340	1.3	9,513
Cadmium (µg/L)	0.6	0.10	34.8	6.5	0.10	180
Chromium III (µg/L)	11.0	2.0	667	16.0	2.0	395
Chromium VI (µg/L)	199	2.0	14,602	1534	2.0	43,014
Copper (µg/L)	25.2	2.7	1,663	42.0	2.7	1,106
Cyanide (µg/L)[2]	5.2	3.5	130	22.0	3.5	523
Iron (µg/L)				1000	27.0	27,352
Lead (µg/L)	9.1	0.2	659	234	0.2	6,564
Mercury (µg/L)[2]	0.012	0.008	0.301	2.4	0.008	67.2
Nickel (µg/L)	145	5.0	10,327	1302	5.0	36,432
Selenium (µg/L)[4]	4.6	2.2	4.6	18.4	2.2	18.4
Silver (µg/L)				25.7	0.5	709
Tributylin (µg/L)[2]	0.072	0.048	1.8	0.46	0.048	11.61
Zinc (µg/L)	329	17.0	23,086	326	17.0	8,705

1: Based upon a hardness of 335 mg/l as CaCO3

2: Background concentration assumed 67% of chronic standard

3: Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as $CaC0_3$ in the receiving water after mixing, the 87 ug/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 ug/L acute aluminum criterion (expressed as total recoverable).

4: Due to impairment, limit is same as standard.

Organics [Pesticides]

	Chronic (4-day ave)		Acute (1-hour ave)	
Parameter	**Standard**	**Limit**	**Standard**	**Limit**
Aldrin (µg/L)			1.5	1.5
Chlordane (µg/L)	0.0043	0.0043	1.2	1.2
DDT, DDE (µg/L)	0.001	0.001	0.55	0.55
Diazinon (µg/L)	0.17	0.17	0.17	0.17
Dieldrin (µg/L)	0.0056	0.0056	0.24	0.24
Endosulfan, a & b (µg/L)	0.056	0.056	0.11	0.11
Endrin (µg/L)	0.036	0.036	0.086	0.086
Heptachlor & H. epoxide (µg/L)	0.0038	0.0038	0.26	0.26
Lindane (µg/L)	0.08	0.08	1.0	1.0
Methoxychlor (µg/L)			0.03	0.03
Mirex (µg/L)			0.001	0.001
Nonylphenol (µg/L)	6.6	6.6	28.0	28.0
Parathion (µg/L)	0.0130	0.0130	0.066	0.066
PCB's (µg/L)	0.014	0.014		
Pentachlorophenol (µg/L)	15.0	15.0	19.0	19.0
Toxephene (µg/L)	0.0002	0.0002	0.73	0.73

Radiological	**Maximum Concentration**
Parameter	**Standard**
Gross Alpha (pCi/L)	15

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

	Maximum Concentration		
Parameter	**Standard**	**Background**	**Limit**
Total Dissolved Solids (mg/L)	1200	634	16,529
Boron (µg/L)	750	81.5	302,004
Arsenic, Dissolved (µg/L)	100	1.3	44,578
Cadmium, Dissolved (µg/L)	10	0.1	4,471
Chromium, Dissolved (µg/L)	100	2.0	44,263
Copper, Dissolved (µg/L)	200	2.7	89,112
Lead, Dissolved (µg/L)	100	0.2	45,074
Selenium, Dissolved (µg/L)	50	2.2	21,591
Gross Alpha (pCi/L)	15	10.1	2,246

Appenix B: Freshwater total ammonia criteria based on Title R317-2-14 Utah Administrative Code
Acute Conditions

INPUT				
	Summer	Fall	Winter	Spring
pH:	8.6	9.0	8.5	8.6
Beneficial use classification:	3B	3B	3B	3B

OUTPUT				
Total ammonia nitrogen criteria (mg N/L):				
Acute:	2.912	1.345	3.025	2.507

Appendix B: Freshwater total ammonia criteria based on Title R317-2-14 Utah Administrative Code
Chronic Conditions

INPUT	Summer	Fall	Winter	Spring
Temperature (deg C):	22.9	9.1	4.5	14.2
pH:	8.2	8.4	8.2	8.2
Are fish early life stages present?	Yes	Yes	Yes	Yes

OUTPUT				
Total ammonia nitrogen criteria (mg N/L):				
Chronic - Fish Early Life Stages Present:	1.086	1.195	1.717	1.711
Chronic - Fish Early Life Stages Absent:	1.086	1.694	2.788	1.751

FACILITY NAME AND PERMIT NUMBER:

Form Approved 1/14/99
OMB Number 2040-0086

FORM
2A
NPDES

NPDES FORM 2A APPLICATION OVERVIEW

APPLICATION OVERVIEW

Form 2A has been developed in a modular format and consists of a "Basic Application Information" packet and a "Supplemental Application Information" packet. The Basic Application Information packet is divided into two parts. All applicants must complete Parts A and C. Applicants with a design flow greater than or equal to 0.1 mgd must also complete Part B. Some applicants must also complete the Supplemental Application Information packet. The following items explain which parts of Form 2A you must complete.

BASIC APPLICATION INFORMATION:

A. **Basic Application Information for all Applicants.** All applicants must complete questions A.1 through A.8. A treatment works that discharges effluent to surface waters of the United States must also answer questions A.9 through A.12.

B. **Additional Application Information for Applicants with a Design Flow ≥ 0.1 mgd.** All treatment works that have design flows greater than or equal to 0.1 million gallons per day must complete questions B.1 through B.6.

C. **Certification.** All applicants must complete Part C (Certification).

SUPPLEMENTAL APPLICATION INFORMATION:

D. **Expanded Effluent Testing Data.** A treatment works that discharges effluent to surface waters of the United States and meets one or more of the following criteria must complete Part D (Expanded Effluent Testing Data):

1. Has a design flow rate greater than or equal to 1 mgd,
2. Is required to have a pretreatment program (or has one in place), or
3. Is otherwise required by the permitting authority to provide the information.

E. **Toxicity Testing Data.** A treatment works that meets one or more of the following criteria must complete Part E (Toxicity Testing Data):

1. Has a design flow rate greater than or equal to 1 mgd,
2. Is required to have a pretreatment program (or has one in place), or
3. Is otherwise required by the permitting authority to submit results of toxicity testing.

F. **Industrial User Discharges and RCRA/CERCLA Wastes.** A treatment works that accepts process wastewater from any significant industrial users (SIUs) or receives RCRA or CERCLA wastes must complete Part F (Industrial User Discharges and RCRA/CERCLA Wastes). SIUs are defined as:

1. All industrial users subject to Categorical Pretreatment Standards under 40 Code of Federal Regulations (CFR) 403.6 and 40 CFR Chapter I, Subchapter N (see instructions); and
2. Any other industrial user that:
   a. Discharges an average of 25,000 gallons per day or more of process wastewater to the treatment works (with certain exclusions); or
   b. Contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the treatment plant; or
   c. Is designated as an SIU by the control authority.

G. **Combined Sewer Systems.** A treatment works that has a combined sewer system must complete Part G (Combined Sewer Systems).

ALL APPLICANTS MUST COMPLETE PART C (CERTIFICATION)

FACILITY NAME AND PERMIT NUMBER:

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BASIC APPLICATION INFORMATION

PART A. BASIC APPLICATION INFORMATION FOR ALL APPLICANTS:

All treatment works must complete questions A.1 through A.8 of this Basic Application Information packet.

A.1. Facility Information.

Facility name: Moab Wastewater Treatment Plant

Mailing Address: 217 East Center Street
Moab, Utah 84532

Contact person: Greg Fosse

Title: Lead Operator

Telephone number: (435) 259-5577

Facility Address (not P.O. Box): 1070 West 400 North
Moab, UT

A.2. Applicant Information. If the applicant is different from the above, provide the following:

Applicant name:

Mailing Address:

Contact person:

Title:

Telephone number:

Is the applicant the owner or operator (or both) of the treatment works?

✓ owner ✓ operator

Indicate whether correspondence regarding this permit should be directed to the facility or the applicant.

✓ facility _____ applicant

A.3. Existing Environmental Permits. Provide the permit number of any existing environmental permits that have been issued to the treatment works (include state-issued permits).

NPDES	UT0020419	PSD	
UIC		Other	
RCRA		Other	

A.4. Collection System Information. Provide information on municipalities and areas served by the facility. Provide the name and population of each entity and, if known, provide information on the type of collection system (combined vs. separate) and its ownership (municipal, private, etc.).

Name	Population Served	Type of Collection System	Ownership
Moab City	5,200	Seperate	Municipal
GWSSA	4,000	Seperate	District

Total population served Approx 9,200

A.5. Indian Country.

a. Is the treatment works located in Indian Country?

_____ Yes ✓ No

b. Does the treatment works discharge to a receiving water that is either in Indian Country or that is upstream from (and eventually flows through) Indian Country?

_____ Yes ✓ No

A.6. Flow. Indicate the design flow rate of the treatment plant (i.e., the wastewater flow rate that the plant was built to handle). Also provide the average daily flow rate and maximum daily flow rate for each of the last three years. Each year's data must be based on a 12-month time period with the 12th month of "this year" occurring no more than three months prior to this application submittal.

a. Design flow rate 1.50 mgd

	2013 Two Years Ago	2014 Last Year	2015 This Year	
b. Annual average daily flow rate	0.97	1.01	0.99	mgd
c. Maximum daily flow rate	1.23	1.25	1.23	mgd

A.7. Collection System. Indicate the type(s) of collection system(s) used by the treatment plant. Check all that apply. Also estimate the percent contribution (by miles) of each.

✓	Separate sanitary sewer	_____ %
_____	Combined storm and sanitary sewer	_____ %

A.8. Discharges and Other Disposal Methods.

a. Does the treatment works discharge effluent to waters of the U.S.? ✓ Yes _____ No

If yes, list how many of each of the following types of discharge points the treatment works uses:

i. Discharges of treated effluent 100%

ii. Discharges of untreated or partially treated effluent _____

iii. Combined sewer overflow points _____

iv. Constructed emergency overflows (prior to the headworks) _____

v. Other _____ _____

b. Does the treatment works discharge effluent to basins, ponds, or other surface impoundments that do not have outlets for discharge to waters of the U.S.? _____ Yes ✓ No

If yes, provide the following for each surface impoundment:

Location: _____

Annual average daily volume discharged to surface impoundment(s) _____ mgd

Is discharge _____ continuous or _____ intermittent?

c. Does the treatment works land-apply treated wastewater? _____ Yes ✓ No

If yes, provide the following for each land application site:

Location: _____

Number of acres: _____

Annual average daily volume applied to site: _____ Mgd

Is land application _____ continuous or _____ intermittent?

d. Does the treatment works discharge or transport treated or untreated wastewater to another treatment works? _____ Yes ✓ No

If yes, describe the mean(s) by which the wastewater from the treatment works is discharged or transported to the other treatment works (e.g., tank truck, pipe).

If transport is by a party other than the applicant, provide:

Transporter name:

Mailing Address:

Contact person:

Title:

Telephone number:

For each treatment works that receives this discharge, provide the following:

Name:

Mailing Address:

Contact person:

Title:

Telephone number:

If known, provide the NPDES permit number of the treatment works that receives this discharge.

Provide the average daily flow rate from the treatment works into the receiving facility. mgd

e. Does the treatment works discharge or dispose of its wastewater in a manner not included in A.8.a through A.8.d above (e.g., underground percolation, well injection)? Yes ✓ No

If yes, provide the following for each disposal method:

Description of method (including location and size of site(s) if applicable):

Annual daily volume disposed of by this method:

Is disposal through this method continuous or intermittent?

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WASTEWATER DISCHARGES:

If you answered "yes" to question A.8.a, complete questions A.9 through A.12 **once for each outfall** (including bypass points) through which effluent is discharged. Do not include information on combined sewer overflows in this section. **If you answered "no" to question A.8.a**, go to Part B, "Additional Application Information for Applicants with a Design Flow Greater than or Equal to 0.1 mgd."

A.9. Description of Outfall.

a. Outfall number 001

b. Location

Moab City (City or town, if applicable)	84532 (Zip Code)
Grand County (County)	UT (State)
38°34'40" (Latitude)	109°34'47" (Longitude)

c. Distance from shore (if applicable) _____ ft.

d. Depth below surface (if applicable) _____ ft.

e. Average daily flow rate 1.00 mgd

f. Does this outfall have either an intermittent or a periodic discharge? _____ Yes ✓ No (go to A.9.g.)

If yes, provide the following information:

Number of times per year discharge occurs: _____

Average duration of each discharge: _____

Average flow per discharge: _____ mgd

Months in which discharge occurs: _____

g. Is outfall equipped with a diffuser? _____ Yes ✓ No

A.10. Description of Receiving Waters.

a. Name of receiving water Colorado River

b. Name of watershed (if known) _____

United States Soil Conservation Service 14-digit watershed code (if known): _____

c. Name of State Management/River Basin (if known): _____

United States Geological Survey 8-digit hydrologic cataloging unit code (if known): _____

d. Critical low flow of receiving stream (if applicable):
acute _____ cfs chronic _____ cfs

e. Total hardness of receiving stream at critical low flow (if applicable): _____ mg/l of $CaCO_3$

FACILITY NAME AND PERMIT NUMBER:

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A.11. Description of Treatment.

a. What levels of treatment are provided? Check all that apply.

✓ Primary ✓ Secondary

____ Advanced ____ Other. Describe: ____

b. Indicate the following removal rates (as applicable):

Design BOD_5 removal or Design $CBOD_5$ removal	85.00	%
Design SS removal	85.00	%
Design P removal	0.00	%
Design N removal	0.00	%
Other ____		%

c. What type of disinfection is used for the effluent from this outfall? If disinfection varies by season, please describe.

Chlorine Gas

If disinfection is by chlorination, is dechlorination used for this outfall? ____ Yes ✓ No

d. Does the treatment plant have post aeration? ____ Yes ✓ No

A.12. Effluent Testing Information. All Applicants that discharge to waters of the US must provide effluent testing data for the following parameters. Provide the indicated effluent testing required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least three samples and must be no more than four and one-half years apart.

Outfall number: ____

PARAMETER	MAXIMUM DAILY VALUE		AVERAGE DAILY VALUE		
	Value	Units	Value	Units	Number of Samples
pH (Minimum)	6.77	s.u.			
pH (Maximum)	8.27	s.u.			
Flow Rate	1.25	mgd	0.98	mgd	1,461.00
Temperature (Winter)		n/a			
Temperature (Summer)		n/a			

* For pH please report a minimum and a maximum daily value

POLLUTANT		MAXIMUM DAILY DISCHARGE		AVERAGE DAILY DISCHARGE			ANALYTICAL METHOD	ML / MDL
		Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NONCONVENTIONAL COMPOUNDS.								
BIOCHEMICAL OXYGEN	BOD-5	54.00	mg/l	24.92	mg/l	204.00	SM 5210 B	5
DEMAND (Report one)	CBOD-5							
FECAL COLIFORM		3,100.00	org/100 ml	261.00	org/100 ml	189.00	SM 9223 BQT	1
TOTAL SUSPENDED SOLIDS (TSS)		56.00	mg/l	19.14	mg/l	190.00	SM 2540 D	3

END OF PART A.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

BASIC APPLICATION INFORMATION

PART B. ADDITIONAL APPLICATION INFORMATION FOR APPLICANTS WITH A DESIGN FLOW GREATER THAN OR EQUAL TO 0.1 MGD (100,000 gallons per day).

All applicants with a design flow rate ≥ 0.1 mgd must answer questions B.1 through B.6. All others go to Part C (Certification).

B.1. Inflow and Infiltration. Estimate the average number of gallons per day that flow into the treatment works from inflow and/or infiltration.

100,000.00 gpd

Briefly explain any steps underway or planned to minimize inflow and infiltration.

Ongoing inspection of pipelines.

B.2. Topographic Map. Attach to this application a topographic map of the area extending at least one mile beyond facility property boundaries. This map must show the outline of the facility and the following information. (You may submit more than one map if one map does not show the entire area.)

a. The area surrounding the treatment plant, including all unit processes. SEE APPENDIX A - FIGURES

b. The major pipes or other structures through which wastewater enters the treatment works and the pipes or other structures through which treated wastewater is discharged from the treatment plant. Include outfalls from bypass piping, if applicable.

c. Each well where wastewater from the treatment plant is injected underground.

d. Wells, springs, other surface water bodies, and drinking water wells that are: 1) within 1/4 mile of the property boundaries of the treatment works, and 2) listed in public record or otherwise known to the applicant.

e. Any areas where the sewage sludge produced by the treatment works is stored, treated, or disposed.

f. If the treatment works receives waste that is classified as hazardous under the Resource Conservation and Recovery Act (RCRA) by truck, rail, or special pipe, show on the map where that hazardous waste enters the treatment works and where it is treated, stored, and/or disposed.

B.3. Process Flow Diagram or Schematic. Provide a diagram showing the processes of the treatment plant, including all bypass piping and all backup power sources or redundancy in the system. Also provide a water balance showing all treatment units, including disinfection (e.g, chlorination and dechlorination). The water balance must show daily average flow rates at influent and discharge points and approximate daily flow rates between treatment units. Include a brief narrative description of the diagram.

SEE APPENDIX A - FIGURES

B.4. Operation/Maintenance Performed by Contractor(s).

Are any operational or maintenance aspects (related to wastewater treatment and effluent quality) of the treatment works the responsibility of a contractor? ____Yes ✓ No

If yes, list the name, address, telephone number, and status of each contractor and describe the contractor's responsibilities (attach additional pages if necessary).

Name: _____

Mailing Address: _____

_____

Telephone Number: _____

Responsibilities of Contractor: _____

B.5. Scheduled Improvements and Schedules of Implementation. Provide information on any uncompleted implementation schedule or uncompleted plans for improvements that will affect the wastewater treatment, effluent quality, or design capacity of the treatment works. If the treatment works has several different implementation schedules or is planning several improvements, submit separate responses to question B.5 for each. (If none, go to question B.6.)

a. List the outfall number (assigned in question A.9) for each outfall that is covered by this implementation schedule.

001

b. Indicate whether the planned improvements or implementation schedule are required by local, State, or Federal agencies.

____Yes ✓ No

c If the answer to B.5.b is "Yes," briefly describe, including new maximum daily inflow rate (if applicable).

_____

d. Provide dates imposed by any compliance schedule or any actual dates of completion for the implementation steps listed below, as applicable. For improvements planned independently of local, State, or Federal agencies, indicate planned or actual completion dates, as applicable. Indicate dates as accurately as possible.

Implementation Stage	Schedule MM / DD / YYYY	Actual Completion MM / DD / YYYY
– Begin construction	10 / 15 / 2015	___/ ___/ _____
– End construction	6 / 15 / 2017	___/ ___/ _____
– Begin discharge	6 / 30 / 2018	___/ ___/ _____
– Attain operational level	___/ ___/ _____	___/ ___/ _____

e. Have appropriate permits/clearances concerning other Federal/State requirements been obtained? ____Yes ✓ No

Describe briefly: Construction of a new 1.75 mgd Treatment Facility

_____

B.6. EFFLUENT TESTING DATA (GREATER THAN O.1 MGD ONLY).

Applicants that discharge to waters of the US must provide effluent testing data for the following parameters. Provide the indicated effluent testing required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least three pollutant scans and must be no more than four and one-half years old.

Outfall Number: 001

POLLUTANT	MAXIMUM DAILY DISCHARGE		AVERAGE DAILY DISCHARGE			ANALYTICAL METHOD	ML / MDL
	Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NONCONVENTIONAL COMPOUNDS.							
AMMONIA (as N)	48.80	mg/l	26.80	mg/l	6.00	E350.1	0.1
CHLORINE (TOTAL RESIDUAL, TRC)	1.60	mg/l	1.02	mg/l	1,343.00		
DISSOLVED OXYGEN		n/a					
TOTAL KJELDAHL NITROGEN (TKN)	27.70	mg/l	24.30	mg/l	6.00	E351.2	
NITRATE PLUS NITRITE NITROGEN	6.70	mg/l	4.40	mg/l	6.00	E353.2	0.1
OIL and GREASE	19.00	mg/l	5.20	mg/l	18.00	EPA 1664A	5
PHOSPHORUS (Total)	6.20	mg/l	4.40	mg/l	6.00	SM4500-P-F	0.5
TOTAL DISSOLVED SOLIDS (TDS)	496.00	mg/l	389.00	mg/l	16.00	SM 2540 C	20
OTHER							

END OF PART B.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

FACILITY NAME AND PERMIT NUMBER:

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BASIC APPLICATION INFORMATION

PART C. CERTIFICATION

All applicants must complete the Certification Section. Refer to instructions to determine who is an officer for the purposes of this certification. All applicants must complete all applicable sections of Form 2A, as explained in the Application Overview. Indicate below which parts of Form 2A you have completed and are submitting. By signing this certification statement, applicants confirm that they have reviewed Form 2A and have completed all sections that apply to the facility for which this application is submitted.

Indicate which parts of Form 2A you have completed and are submitting:

_____ Basic Application Information packet

Supplemental Application Information packet:

✓ Part D (Expanded Effluent Testing Data)

✓ Part E (Toxicity Testing: Biomonitoring Data)

_____ Part F (Industrial User Discharges and RCRA/CERCLA Wastes)

_____ Part G (Combined Sewer Systems)

ALL APPLICANTS MUST COMPLETE THE FOLLOWING CERTIFICATION.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name and official title _____

Signature _____

Telephone number _____

Date signed _____

Upon request of the permitting authority, you must submit any other information necessary to assess wastewater treatment practices at the treatment works or identify appropriate permitting requirements.

SEND COMPLETED FORMS TO:

SUPPLEMENTAL APPLICATION INFORMATION

PART D. EXPANDED EFFLUENT TESTING DATA

Refer to the directions on the cover page to determine whether this section applies to the treatment works.

Effluent Testing: 1.0 mgd and Pretreatment Treatment Works. If the treatment works has a design flow greater than or equal to 1.0 mgd or it has (or is required to have) a pretreatment program, or is otherwise required by the permitting authority to provide the data, then provide effluent testing data for the following pollutants. Provide the indicated effluent testing information and any other information required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analyses conducted using 40 CFR Part 136 methods. In addition, these data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. Indicate in the blank rows provided below any data you may have on pollutants not specifically listed in this form. At a minimum, effluent testing data must be based on at least three pollutant scans and must be no more than four and one-half years old.

Outfall number: 001 (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
METALS (TOTAL RECOVERABLE), CYANIDE, PHENOLS, AND HARDNESS.											
ANTIMONY	na										
ARSENIC	.0011	mg/l			.0003	mg/l			16	EPA 200.8	.0006
BERYLLIUM	na										
CADMIUM	0	mg/l			0	mg/l			16	EPA 200.8	.00018
CHROMIUM	.0012	mg/l			.0002	mg/l			16	EPA 200.7	.0005
COPPER	.0349	mg/l			.0224	mg/l			16	EPA 200.8	.0008
LEAD	.0007	mg/l			.0002	mg/l			16	EPA 200.8	.0004
MERCURY	0	mg/l			0	mg/l			16	EPA 245.1	.00015
NICKEL	.0410	mg/l			.0044	mg/l			16	EPA 200.8	.0008
SELENIUM	.0014	mg/l			.0004	mg/l			16	EPA 200.8	.0008
SILVER	0	mg/l			0	mg/l			16	EPA 200.8	.0004
THALLIUM	na										
ZINC	.0922	mg/l			.0649	mg/l			16	EPA 200.8	.005
CYANIDE	.042	mg/l			.0159	mg/l			16	EPA 335.4	.005
TOTAL PHENOLIC COMPOUNDS	na										
HARDNESS (AS $CaCO_3$)											
Use this space (or a separate sheet) to provide information on other metals requested by the permit writer.											
Molybdenum	.0332	mg/l			.0032	mg/l			16	EPA 200.7	.02

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Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
VOLATILE ORGANIC COMPOUNDS.											
ACROLEIN	0	ug/l			0	ug/l			3	EPA 624	5
ACRYLONITRILE	0	ug/l			0	ug/l			3	EPA 624	10
BENZENE	0	ug/l			0	ug/l			3	EPA 624	2
BROMOFORM	0	ug/l			0	ug/l			3	EPA 624	2
CARBON TETRACHLORIDE	0	ug/l			0	ug/l			3	EPA 624	2
CLOROBENZENE	0	ug/l			0	ug/l			3	EPA 624	2
CHLORODIBROMO-METHANE	NA										
CHLOROETHANE	0	ug/l			0	ug/l			3	EPA 624	2
2-CHLORO-ETHYLVINYL ETHER	0	ug/l			0	ug/l			3	EPA 624	5
CHLOROFORM	0	ug/l			0	ug/l			3	EPA 624	2
DICHLOROBROMO-METHANE	0	ug/l			0	ug/l			3	EPA 624	2
1,1-DICHLOROETHANE	0	ug/l			0	ug/l			3	EPA 624	2
1,2-DICHLOROETHANE	0	ug/l			0	ug/l			3	EPA 624	2
TRANS-1,2-DICHLORO-ETHYLENE	NA										
1,1-DICHLOROETHYLENE	NA										
1,2-DICHLOROPROPANE	0	ug/l			0	ug/l			3	EPA 624	2
1,3-DICHLORO-PROPYLENE	NA										
ETHYLBENZENE	0	ug/l			0	ug/l			3	EPA 624	2
METHYL BROMIDE	NA										
METHYL CHLORIDE	0	ug/l			0	ug/l			3	EPA 624	2
METHYLENE CHLORIDE	NA										
1,1,2,2-TETRACHLORO-ETHANE	0	ug/l			0	ug/l			3	EPA 624	2
TETRACHLORO-ETHYLENE	0	ug/l			0	ug/l			3	EPA 624	2
TOLUENE	3.78	ug/l			1.26	ug/l			3	EPA 624	2

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Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
1,1,1-TRICHLOROETHANE	0	ug/l			0	ug/l			3	EPA 624	2
1,1,2-TRICHLOROETHANE	0	ug/l			0	ug/l			3	EPA 624	2
TRICHLORETHYLENE	0	ug/l			0	ug/l			3	EPA 624	2
VINYL CHLORIDE	0	ug/l			0	ug/l			3	EPA 624	1
Use this space (or a separate sheet) to provide information on other volatile organic compounds requested by the permit writer.											
ACID-EXTRACTABLE COMPOUNDS											
P-CHLORO-M-CRESOL	NA										
2-CHLOROPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
2,4-DICHLOROPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
2,4-DIMETHYLPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
4,6-DINITRO-O-CRESOL	NA										
2,4-DINITROPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
2-NITROPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
4-NITROPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
PENTACHLOROPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
PHENOL	0	ug/l			0	ug/l			3	EPA 625	10
2,4,6-TRICHLOROPHENOL	0	ug/l			0	ug/l			3	EPA 625	10
Use this space (or a separate sheet) to provide information on other acid-extractable compounds requested by the permit writer.											
BASE-NEUTRAL COMPOUNDS.											
ACENAPHTHENE	0	ug/l			0	ug/l			3	EPA 625	10
ACENAPHTHYLENE	0	ug/l			0	ug/l			3	EPA 625	10
ANTHRACENE	0	ug/l			0	ug/l			3	EPA 625	10
BENZIDINE	0	ug/l			0	ug/l			3	EPA 625	10
BENZO(A)ANTHRACENE	0	ug/l			0	ug/l			3	EPA 625	10
BENZO(A)PYRENE	0	ug/l			0	ug/l			3	EPA 625	10

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Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
3,4 BENZO-FLUORANTHENE	0	ug/l			0	ug/l			3	EPA 625	10
BENZO(GHI)PERYLENE	0	ug/l			0	ug/l			3	EPA 625	10
BENZO(K)FLUORANTHENE	0	ug/l			0	ug/l			3	EPA 625	10
BIS (2-CHLOROETHOXY) METHANE	0	ug/l			0	ug/l			3	EPA 625	10
BIS (2-CHLOROETHYL)-ETHER	0	ug/l			0	ug/l			3	EPA 625	10
BIS (2-CHLOROISO-PROPYL) ETHER	0	ug/l			0	ug/l			3	EPA 625	10
BIS (2-ETHYLHEXYL) PHTHALATE	11.7	ug/l			3.9	ug/l			3	EPA 625	10
4-BROMOPHENYL PHENYL ETHER	0	ug/l			0	ug/l			3	EPA 625	10
BUTYL BENZYL PHTHALATE	0	ug/l			0	ug/l			3	EPA 625	10
2-CHLORONAPHTHALENE	0	ug/l			0	ug/l			3	EPA 625	10
4-CHLORPHENYL PHENYL ETHER	0	ug/l			0	ug/l			3	EPA 625	10
CHRYSENE	0	ug/l			0	ug/l			3	EPA 625	10
DI-N-BUTYL PHTHALATE	0	ug/l			0	ug/l			3	EPA 625	10
DI-N-OCTYL PHTHALATE	0	ug/l			0	ug/l			3	EPA 625	10
DIBENZO(A,H) ANTHRACENE	0	ug/l			0	ug/l			3	EPA 625	10
1,2-DICHLOROBENZENE	0	ug/l			0	ug/l			3	EPA 625	10
1,3-DICHLOROBENZENE	0	ug/l			0	ug/l			3	EPA 625	10
1,4-DICHLOROBENZENE	0	ug/l			0	ug/l			3	EPA 625	10
3,3-DICHLOROBENZIDINE	0	ug/l			0	ug/l			3	EPA 625	10
DIETHYL PHTHALATE	0	ug/l			0	ug/l			3	EPA 625	10
DIMETHYL PHTHALATE	0	ug/l			0	ug/l			3	EPA 625	10
2,4-DINITROTOLUENE	0	ug/l			0	ug/l			3	EPA 625	10
2,6-DINITROTOLUENE	0	ug/l			0	ug/l			3	EPA 625	10
1,2-DIPHENYLHYDRAZINE	NA										

FACILITY NAME AND PERMIT NUMBER:

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Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
FLUORANTHENE	0	ug/l			0	ug/l			3	EPA 625	10
FLUORENE	0	ug/l			0	ug/l			3	EPA 625	10
HEXACHLOROBENZENE	0	ug/l			0	ug/l			3	EPA 625	10
HEXACHLOROBUTADIENE	0	ug/l			0	ug/l			3	EPA 625	10
HEXACHLOROCYCLO-PENTADIENE	0	ug/l			0	ug/l			3	EPA 625	10
HEXACHLOROETHANE	0	ug/l			0	ug/l			3	EPA 625	10
INDENO(1,2,3-CD)PYRENE	0	ug/l			0	ug/l			3	EPA 625	10
ISOPHORONE	0	ug/l			0	ug/l			3	EPA 625	10
NAPHTHALENE	0	ug/l			0	ug/l			3	EPA 625	10
NITROBENZENE	0	ug/l			0	ug/l			3	625.00	10
N-NITROSODI-N-PROPYLAMINE	0	ug/l			0	ug/l			3	EPA 625	10
N-NITROSODI- METHYLAMINE	0	ug/l			0	ug/l			3	EPA 625	10
N-NITROSODI-PHENYLAMINE	0	ug/l			0	ug/l			3	EPA 625	10
PHENANTHRENE	0	ug/l			0	ug/l			3	EPA 625	10
PYRENE	0	ug/l			0	ug/l			3	EPA 625	10
1,2,4-TRICHLOROBENZENE	0	ug/l			0	ug.l			3	EPA 625	10
Use this space (or a separate sheet) to provide information on other base-neutral compounds requested by the permit writer.											
Use this space (or a separate sheet) to provide information on other pollutants (e.g., pesticides) requested by the permit writer.											

END OF PART D.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

SUPPLEMENTAL APPLICATION INFORMATION

PART E. TOXICITY TESTING DATA

POTWs meeting one or more of the following criteria must provide the results of whole effluent toxicity tests for acute or chronic toxicity for each of the facility's discharge points: 1) POTWs with a design flow rate greater than or equal to 1.0 mgd; 2) POTWs with a pretreatment program (or those that are required to have one under 40 CFR Part 403); or 3) POTWs required by the permitting authority to submit data for these parameters.

- At a minimum, these results must include quarterly testing for a 12-month period within the past 1 year using multiple species (minimum of two species), or the results from four tests performed at least annually in the four and one-half years prior to the application, provided the results show no appreciable toxicity, and testing for acute and/or chronic toxicity, depending on the range of receiving water dilution. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136.
- In addition, submit the results of any other whole effluent toxicity tests from the past four and one-half years. If a whole effluent toxicity test conducted during the past four and one-half years revealed toxicity, provide any information on the cause of the toxicity or any results of a toxicity reduction evaluation, if one was conducted.
- If you have already submitted any of the information requested in Part E, you need not submit it again. Rather, provide the information requested in question E.4 for previously submitted information. If EPA methods were not used, report the reasons for using alternate methods. If test summaries are available that contain all of the information requested below, they may be submitted in place of Part E.

If no biomonitoring data is required, do not complete Part E. Refer to the Application Overview for directions on which other sections of the form to complete.

E.1. Required Tests. **SEE APPENDIX B - TOXICITY TESTING DATA**

Indicate the number of whole effluent toxicity tests conducted in the past four and one-half years.

____chronic ____acute

E.2. Individual Test Data. Complete the following chart for each whole effluent toxicity test conducted in the last four and one-half years. Allow one column per test (where each species constitutes a test). Copy this page if more than three tests are being reported.

	Test number:_____	Test number:_____	Test number:_____
a. Test information.			
Test species & test method number			
Age at initiation of test			
Outfall number			
Dates sample collected			
Date test started			
Duration			
b. Give toxicity test methods followed.			
Manual title			
Edition number and year of publication			
Page number(s)			
c. Give the sample collection method(s) used. For multiple grab samples, indicate the number of grab samples used.			
24-Hour composite			
Grab			
d. Indicate where the sample was taken in relation to disinfection. (Check all that apply for each)			
Before disinfection			
After disinfection			
After dechlorination			

	Test number:_____	Test number:_____	Test number:_____
e. Describe the point in the treatment process at which the sample was collected.			
Sample was collected:			
f. For each test, include whether the test was intended to assess chronic toxicity, acute toxicity, or both.			
Chronic toxicity			
Acute toxicity			
g. Provide the type of test performed.			
Static			
Static-renewal			
Flow-through			
h. Source of dilution water. If laboratory water, specify type; if receiving water, specify source.			
Laboratory water			
Receiving water			
i. Type of dilution water. It salt water, specify “natural” or type of artificial sea salts or brine used.			
Fresh water			
Salt water			
j. Give the percentage effluent used for all concentrations in the test series.			
k. Parameters measured during the test. (State whether parameter meets test method specifications)			
pH			
Salinity			
Temperature			
Ammonia			
Dissolved oxygen			
l. Test Results.			
Acute:			
Percent survival in 100% effluent	%	%	%
LC_{50}			
95% C.I.	%	%	%
Control percent survival	%	%	%
Other (describe)			

Chronic:			
NOEC	%	%	%
IC_{25}	%	%	%
Control percent survival	%	%	%
Other (describe)			
m. Quality Control/Quality Assurance.			
Is reference toxicant data available?			
Was reference toxicant test within acceptable bounds?			
What date was reference toxicant test run (MM/DD/YYYY)?			
Other (describe)			

E.3. Toxicity Reduction Evaluation. Is the treatment works involved in a Toxicity Reduction Evaluation?

____Yes____No If yes, describe: _____

_____

_____

E.4. Summary of Submitted Biomonitoring Test Information. If you have submitted biomonitoring test information, or information regarding the cause of toxicity, within the past four and one-half years, provide the dates the information was submitted to the permitting authority and a summary of the results.

Date submitted: _____ (MM/DD/YYYY)

Summary of results: (see instructions)

_____

_____

END OF PART E.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE.

SUPPLEMENTAL APPLICATION INFORMATION

PART F. INDUSTRIAL USER DISCHARGES AND RCRA/CERCLA WASTES N/A

All treatment works receiving discharges from significant industrial users or which receive RCRA, CERCLA, or other remedial wastes must complete Part F.

GENERAL INFORMATION:

F.1. Pretreatment Program. Does the treatment works have, or is it subject to, an approved pretreatment program?

____Yes____No

F.2. Number of Significant Industrial Users (SIUs) and Categorical Industrial Users (CIUs). Provide the number of each of the following types of industrial users that discharge to the treatment works.

a. Number of non-categorical SIUs. _____

b. Number of CIUs. _____

SIGNIFICANT INDUSTRIAL USER INFORMATION:

Supply the following information for each SIU. If more than one SIU discharges to the treatment works, copy questions F.3 through F.8 and provide the information requested for each SIU.

F.3. Significant Industrial User Information. Provide the name and address of each SIU discharging to the treatment works. Submit additional pages as necessary.

Name: _____

Mailing Address: _____

_____

F.4. Industrial Processes. Describe all of the industrial processes that affect or contribute to the SIU's discharge.

_____

F.5. Principal Product(s) and Raw Material(s). Describe all of the principal processes and raw materials that affect or contribute to the SIU's discharge.

Principal product(s): _____

Raw material(s): _____

F.6. Flow Rate.

a. Process wastewater flow rate. Indicate the average daily volume of process wastewater discharged into the collection system in gallons per day (gpd) and whether the discharge is continuous or intermittent.

_____ gpd (_____continuous or _____intermittent)

b. Non-process wastewater flow rate. Indicate the average daily volume of non-process wastewater flow discharged into the collection system in gallons per day (gpd) and whether the discharge is continuous or intermittent.

_____ gpd (_____continuous or _____intermittent)

F.7. Pretreatment Standards. Indicate whether the SIU is subject to the following:

a. Local limits ____Yes ____No

b. Categorical pretreatment standards ____Yes ____No

If subject to categorical pretreatment standards, which category and subcategory?

_____

F.8. Problems at the Treatment Works Attributed to Waste Discharged by the SIU. Has the SIU caused or contributed to any problems (e.g., upsets, interference) at the treatment works in the past three years?

____Yes____No If yes, describe each episode.

_____

_____

RCRA HAZARDOUS WASTE RECEIVED BY TRUCK, RAIL, OR DEDICATED PIPELINE:

F.9. RCRA Waste. Does the treatment works receive or has it in the past three years received RCRA hazardous waste by truck, rail, or dedicated pipe? ____Yes ___No (go to F.12.)

F.10. Waste Transport. Method by which RCRA waste is received (check all that apply):

_____Truck _____Rail _____Dedicated Pipe

F.11. Waste Description. Give EPA hazardous waste number and amount (volume or mass, specify units).

EPA Hazardous Waste Number	Amount	Units
_____	_____	_____
_____	_____	_____
_____	_____	_____

CERCLA (SUPERFUND) WASTEWATER, RCRA REMEDIATION/CORRECTIVE ACTION WASTEWATER, AND OTHER REMEDIAL ACTIVITY WASTEWATER:

F.12. Remediation Waste. Does the treatment works currently (or has it been notified that it will) receive waste from remedial activities?

____Yes (complete F.13 through F.15.) ____No

Provide a list of sites and the requested information (F.13 - F.15.) for each current and future site.

F.13. Waste Origin. Describe the site and type of facility at which the CERCLA/RCRA/or other remedial waste originates (or is expected to originate in the next five years).

_____

_____

_____

F.14. Pollutants. List the hazardous constituents that are received (or are expected to be received). Include data on volume and concentration, if known. (Attach additional sheets if necessary).

_____

_____

F.15. Waste Treatment.

a. Is this waste treated (or will it be treated) prior to entering the treatment works?

____Yes ____No

If yes, describe the treatment (provide information about the removal efficiency):

_____

_____

b. Is the discharge (or will the discharge be) continuous or intermittent?

____Continuous ____Intermittent If intermittent, describe discharge schedule.

_____

END OF PART F.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

SUPPLEMENTAL APPLICATION INFORMATION

PART G. COMBINED SEWER SYSTEMS N/A

If the treatment works has a combined sewer system, complete Part G.

G.1. System Map. Provide a map indicating the following: (may be included with Basic Application Information)

a. All CSO discharge points.

b. Sensitive use areas potentially affected by CSOs (e.g., beaches, drinking water supplies, shellfish beds, sensitive aquatic ecosystems, and outstanding natural resource waters).

c. Waters that support threatened and endangered species potentially affected by CSOs.

G.2. System Diagram. Provide a diagram, either in the map provided in G.1. or on a separate drawing, of the combined sewer collection system that includes the following information:

a. Locations of major sewer trunk lines, both combined and separate sanitary.

b. Locations of points where separate sanitary sewers feed into the combined sewer system.

c. Locations of in-line and off-line storage structures.

d. Locations of flow-regulating devices.

e. Locations of pump stations.

CSO OUTFALLS:

Complete questions G.3 through G.6 once for each CSO discharge point.

G.3. Description of Outfall.

a. Outfall number _____

b. Location

_____
(City or town, if applicable) (Zip Code)

_____
(County) (State)

_____
(Latitude) (Longitude)

c. Distance from shore (if applicable) _____ft.

d. Depth below surface (if applicable) _____ft.

e. Which of the following were monitored during the last year for this CSO?

____Rainfall ____CSO pollutant concentrations ____CSO frequency

____CSO flow volume ____Receiving water quality

f. How many storm events were monitored during the last year? _____

G.4. CSO Events.

a. Give the number of CSO events in the last year.

_____ events (___ actual or ___ approx.)

b. Give the average duration per CSO event.

_____ hours (____ actual or ____ approx.)

c. Give the average volume per CSO event.

_____ million gallons (_____ actual or _____ approx.)

d. Give the minimum rainfall that caused a CSO event in the last year.

_____ inches of rainfall

G.5. Description of Receiving Waters.

a. Name of receiving water: _____

b. Name of watershed/river/stream system:_____

United States Soil Conservation Service 14-digit watershed code (if known): _____

c. Name of State Management/River Basin: _____

United States Geological Survey 8-digit hydrologic cataloging unit code (if known): _____

G.6. CSO Operations.

Describe any known water quality impacts on the receiving water caused by this CSO (e.g., permanent or intermittent beach closings, permanent or intermittent shell fish bed closings, fish kills, fish advisories, other recreational loss, or violation of any applicable State water quality standard).

_____

_____

END OF PART G.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE.

Additional information, if provided, will appear on the following pages.

Daniel Griffin <dgriffin@utah.gov>

Moab ADR Comments

2 messages

Daniel Griffin <dgriffin@utah.gov> Thu, Aug 4, 2016 at 2:17 PM
To: rdavidson@moabcity.org, Jeff Beckman <jbeckman@bowencollins.com>
Cc: William Damery <wdamery@utah.gov>, Skyler Davies <sdavies@utah.gov>, Nicholas Von Stackelberg <nvonstackelberg@utah.gov>

Rebecca, Jeff,

We received the Level II ADR a couple weeks ago, and I managed to get the comments back quickly. Here are the comments we had on it. They look rather

1. Part A: Category of receiving water should be 3.
2. Page 6, A-13 and A-15: Explanation of conformance to TBPEL and planned request for variance needs to be reworded. Should describe how the facility plans to meet 1.0 mg/L TP limit, state that a variance will be requested and discuss the anticipated effluent concentration if a variance is granted. Delete "Preliminary discussions with State DWQ regulators indicated that this exception likely would be granted."
3. Pg 14 says SBR Total P = 3 mg/L (w/chem)- I thought it could get to 1 mg/L (w/chem) and 3 mg/L w/ out chem
4. Pg 15 talks about the differences in concrete being due to common wall construction. I didn't see this in the preliminary design, I thought the decreased concrete was due to circular basins.
5. Pg 17 Table 10 why is the cost different here from the opinion of probable cost in the preliminary engineering report, and the facilities master plan?
6. Page 19: The evaluation of Aqua SBR vs. ICEAS SBR is beyond the detail required for the ADR, but is okay to include.
7. Page 22: Discharge of a portion of the effluent to the Matheson Wetlands should be discussed under Alternative Receiving Waters.
8. Appendix A See applicable comments from facilities master plan comments previously sent.
9. Overall Needs to have QA/QC done on it (for example: page 18 first sentence of paragraph before final selection has "Ox-Ditch treatment facility would be preferred", document in appendix A has two section 2s, page A-16 goes from 6.2.4 to 3.6. there is a ' at the beginning of the last paragraph on A-34, some chapter headings in Appendix A say "FACILITIES MASTER PLAN UPDATE" others say "PRELIMINARY ENGINEERING REPORT").

Comments 5 and 8 involve items related to the facilities master plan included in Appendix A. The best option might be to remove the Facilities Master Plan from the ADR. You defend your choice in the Part D Attachment, and including the plan seems to just add a little confusion.

If you wish to run the changes by us before formally submitting them, email them to me, and I will copy everyone and get there feedback.

Thanks
Dan

--
Daniel Griffin, P. E.
Daniel Griffin P.E. | Environmental Engineer | UPDES Surface Water Section
801.536.4387 (office) | 801.536.4301 (fax)

Jeff Beckman <jbeckman@bowencollins.com> Thu, Aug 4, 2016 at 2:22 PM
To: Daniel Griffin <dgriffin@utah.gov>, "rdavidson@moabcity.org" <rdavidson@moabcity.org>
Cc: William Damery <wdamery@utah.gov>, Skyler Davies <sdavies@utah.gov>, Nicholas Von Stackelberg <nvonstackelberg@utah.gov>

Dan,

Thank you for your quick turnaround. We will address these comments an get a revised version to you soon.

Thanks again.

Jeff

From: Daniel Griffin [mailto:dgriffin@utah.gov]
Sent: Thursday, August 04, 2016 2:18 PM
To: rdavidson@moabcity.org; Jeff Beckman <jbeckman@bowencollins.com>
Cc: William Damery <wdamery@utah.gov>; Skyler Davies <sdavies@utah.gov>; Nicholas Von Stackelberg <nvonstackelberg@utah.gov>
Subject: Moab ADR Comments

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If you wish to run the changes by us before formally submitting them, email them to me, and I will copy everyone and get there feedback.

Thanks

Dan

--

Daniel Griffin, P. E.

Daniel Griffin P.E. | Environmental Engineer | UPDES Surface Water Section

801.536.4387 (office) | 801.536.4301 (fax)

APPENDIX K

WETLAND DELINEATION

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

September 16, 2016

Regulatory Division (SPK-2016-00553)

City of Moab
Attn: Rebecca Davidson
217 East Center Street
Moab, Utah 84532

Dear Ms. Davidson:

We are responding to your July 20, 2016 request for an approved jurisdictional determination for the Moab Wastewater Treatment Plant site. The approximately 5-acre project site is located on the southwest corner of Stewart Lane and 400 North, Latitude 38.5787°, Longitude -109.5714°, Moab, Grand County, Utah (enclosure 1).

Based on available information, we concur with the estimate of waters of the United States, as depicted on the enclosed July 8, 2016, Moab Water Reclamation Facility drawing prepared by Bowen Collins & Associates (enclosure 2). There are no wetlands or other waters of the United States present within the survey area and, therefore, no features regulated under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act**.**

We are enclosing a copy of the Approved Jurisdictional Determination Form for your project site (enclosure 3). Please keep this document for your records.

This determination is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 Code of Federal Regulations (CFR) Part 331.

A Notification of Appeal Process and Request for Appeal form is enclosed (enclosure 4). If you request to appeal this determination you must submit a completed Request for Appeal form to the South Pacific Division Office at the following address: Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDO, 1455 Market Street, 2052B, San Francisco, California 94103-1399, Telephone: 415-503-6574, FAX: 415-503-6646.

In order for a Request for Appeal to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the Notification of Appeal Process. Should you decide to submit a Request for Appeal form, it must be received at the above address by 60 days from the date of this letter. It is not necessary to submit a Request for Appeal form to the Division Office if you do not object to the determination in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are U.S. Department of Agriculture (USDA) program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing our national Customer Survey from the link on our website at *www.spk.usace.army.mil/Missions/Regulatory.aspx*.

Please refer to identification number SPK-2016-00553 in any correspondence concerning this project. If you have any questions, please contact Michael Pectol at the Bountiful Regulatory Office, 533 West 2600 South, Suite 150, Bountiful, Utah 84010, by email at *Michael.A.Pectol@usace.army.mil*, or telephone at 801-295-8380, extension 15.

Sincerely,

Kristine Hansen
Senior Project Manager, Utah-Nevada Branch
Regulatory Division

Enclosures

cc:

Ms. Jamie Tsandes, Bowen Collins & Associates, Inc. (JTsandes@bowencollins.com)

Moab City Bonderman Property Wetland Delineation Report

Prepared for:

City of Moab
217 East Center St
Moab, UT 84532

Prepared by:

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

154 E. 14000 South
Draper, Utah 84020

June 2016

Executive Summary

The Moab City wetland delineation was conducted according to the Corps of Engineers Wetlands Delineation Manual (ACOE 1987) and the Arid West Supplement (ACOE 2008).

A total of 5 acres were surveyed as part of this delineation, although only 4 of the 5 acres are planned for development. The site is located 0.50 miles east of the Colorado River on the corner of 400 North and Stewart Lane. No aquatic resources were identified during the delineation. The Bonderman Property has a manmade berm (ranging between 3-5 feet in height) along the western edge of the property that disconnects the site from the floodplain. The site is also sloped at an average of 5% from east to west.

A site visit was conducted in May of 2015 to verify wetlands by Jamie Tsandes and Merissa Davis. Two sample points were taken that evaluated the soils, hydrology and vegetation. Sample point #1 did not have soils, hydrology or vegetation present. Sample point #2 did not have soils or hydrology present but did have hydrophytic vegetation that was primarily canary grass.

In addition to the sample points, a geotechnical investigation was conducted on the site at the same time that produced five borings. The groundwater elevation in each of the borings ranged between 3.5-8 feet below the surface, measured between 4-21 days after drilling and depending on the location of the boring. The site was filled with a berm on the west portion of the property over twenty ago according to historical aerials and it was likely used for staging vehicles and other mobilization activities.

It has been determined in this report that no wetlands exist on the Bonderman property as shown in Figure 4 – Wetland Delineation Map. Figure 5 shows the design of the new wastewater treatment plant.

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APPENDICES

INTRODUCTION

This document presents results of a delineation of jurisdictional waters of the United States conducted for the City of Moab (City) by Bowen Collins & Associates (BC&A) for a property known as the Bonderman Property. This site has been donated to the city for the future development of a wastewater treatment plant (WWTP) that will replace the old treatment plant located directly north of the site. The purpose of this delineation is to determine potential wetland impacts of the project. Based on a site visit it was determined that the site has been filled and no wetlands exist on the Bonderman Property.

SITE LOCATION AND METHODOLOGY

The project area is located in Grand County, Utah, Section 2 Township 26S Range 21E. Directions to the site are as follows: From U.S. Interstate 15 take exit 257 B-A for US 6 E towards Price. Merge onto I-70. Take Exist 182 toward Crescent Jct/Moab. Turn right onto US-191. Once in the town of Moab, turn right onto 400 north, continue for 1 mile. The destination will be on the left.

Field work for this delineation was conducted on May 4, 2015 by Jamie Tsandes, BC&A and Merissa Davis, BC&A. Field conditions during the survey were clear and sunny, with light winds.

The Soil Survey of Canyonlands, Part of Grand and San Juan Counties Area, Utah (NRCS 2016) was used to determine soil types for the area. National Wetlands Inventory (NWI) data was also examined to obtain the location of possible jurisdictional wetlands on the site (see NWI maps in Appendix B). The wetland delineation was conducted according to the US Army Corps of Engineers Wetlands Delineation Manual (ACOE 1987), Arid West Supplement (ACOE 2008), with a minimum of one sampling point per wetland area. Upland points were also sampled to further confirm wetland boundaries. A total of two points were sampled to delineate the wetlands on the site, which determined that no wetlands were found of the Bonderman Property. Points and boundaries were recorded using a Timble GeoXH GPS with sub-foot accuracy. Additionally, geotechnical borings were taken at five locations on the site and shown on Figure 4 – Wetland Delineation Map.

Based on the Manual, jurisdictional wetlands were identified using three criteria:

- Hydrophytic Vegetation
- Wetlands Hydrology
- Hydric Soils

All three criteria must be present for a wetland to be considered jurisdictional. An explanation of these wetland criteria follows.

Hydrophytic Vegetation

Hydrophytic plants are plants that are adapted to wet conditions. The National Wetland Plant List for the Arid West Region (ACOE 2012) was used to determine the wetland indicator status of dominant plant species encountered on sample plots. Sight-identification was used to determine most plant species.

Wetland Hydrology

Wetland hydrology is present when an area is inundated either permanently or periodically at mean water depths of two meters, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation. Primary hydrologic indicators also include high water tables, oxidized root channels, and sediment and drift deposits. Common secondary hydrologic indicators include watermarks, drainage patterns, and the FAC neutral test.

Hydric Soils

In Field Indicators of Hydric Soils in the U.S. (NRCS 2010) the Natural Resources Conservation Service (NRCS) defines hydric soils as soils that are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the top 12 to 20 inches of soil, depending on soil texture. Hydric properties of soils were assessed using a spade to excavate the soil pit, and Munsell soil color charts to determine soil color.

RESULTS

Vegetation

Vegetation was identified primarily based on flowering parts and structural characteristics. Vegetation data collected and photographs of the general vegetation for each sample point can be found in the Wetland Determination Data Forms (see Appendix C). The plants within the sampling locations are listed in Table 1 below. Hydrophytic vegetation was found at one sample point that was invaded by reed canary grass.

Table 1
Plants Observed at the Virgin River Restoration Site

Latin Binomial	Common Name	Region 8 Indicator Status
Populus fremontii	Freemont Cottonwood	FACW
Elaeagnus angustifolia	Russian Olive	FAC
Phalaris arundinacea	Reed Canary Grass	FACW
Equisetum arvense	Field Horsetail	FAC
Juncus articus	Artic Rush	FACW
Bromus tectorum	Cheatgrass	UPL
Salsola tragus	Prickly Russian Thistle	FACU
Sisymbrium altissimum	Tumble Mustard	FACU
Field Grasses	Grasses/Weeds	UPL

Note: Hydrophytic plant species are shaded gray.

Hydrology

No surface hydrology was present at the time of the delineation. Soil bearings indicated that the groundwater elevation of the parcel ranges between 3.5-8 feet below the surface. It is assumed that the berm on the west section of the parcel was filled over 20 years ago and it was likely used for staging vehicles. The sample points and soil borings were conducted in the spring, when hydrology would be at its highest elevation.

Soils

The Canyonlands, Part of Grand and San Juan Counties Area, Utah Soil Survey (NRCS 2016) was referenced to determine soil types for the area. The soil sample points both fell within the Begay fine sandy loam, moist 2-6% slopes soil type which is not found on the state or national hydric soils lists (NRCS 2015). Soil properties such as texture and Munsell soil color generally matched the soil descriptions found in the Soil Survey of Canyonlands, Part of Grand and San Juan Counties Area, (NRCS 2016). The soils were classified as 5YR 3/2, 5 YU 3/3, 5YR 4/4, 5YR 4/6. The soil textures included organic matter, silty loam, and sandy loam. Soil data collected at the sample points and photos of the soil pits dug at each sample point can be found in the Wetland Determination Data Forms (see Appendix C). Additionally, a custom soil resource report from the NRCS for the site is located in Appendix D.

Sample Points

None of the soil sample points taken were located in a wetlands. Wetland Delineation figures in Appendix E display the sample point locations and Table 2 summarizes the sample point data.

Table 2

Wetland Delineation Sample Point Summary and Determination Matrix

Sample Point	Hydrophytes Dominant?	Hydric Soils Present?	Primary Hydrologic Indicator(s) Present?	Is the Sample Point in a Wetland?
1	No	No	No	No
2	Yes	No	No	No

Wetland Boundaries

Within the delineated area, no wetlands were found as shown in Appendix E. Indicators for vegetation and hydric soils were clear and easily identified. The area appears to be influenced by the surrounding flood plain which explains the presence of some hydrophytic vegetation.

REFERENCES

Lichvar, R.W, D.L. Banks, W.N. Kirchner, and N.C. Melvin, 2016. *The National Wetland Plant List for the Arid West, 2016 wetland ratings.* Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X

U.S. Army Corps of Engineers (ACOE), 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL Tr-08-28. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

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USDA Natural Resources Conservation Service (NRCS). 2015a. *National Hydric Soils List*. Access online http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/

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Whitson, Tom D., Larry C. Burrill, Steven A. Dewey, David W. Cudney, B.E. Nelson, Richard D. Lee, and Robert Parker. Whitson, Tom D. (ed.) 2010. *Weeds of the West. 10th ed.* Laramie: University of Wyoming.

APPENDIX A

SITE LOCATION MAPS

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

City of Moab

MOAB WWTP WETLAND DELINEATION

SITE LOCATION MAP

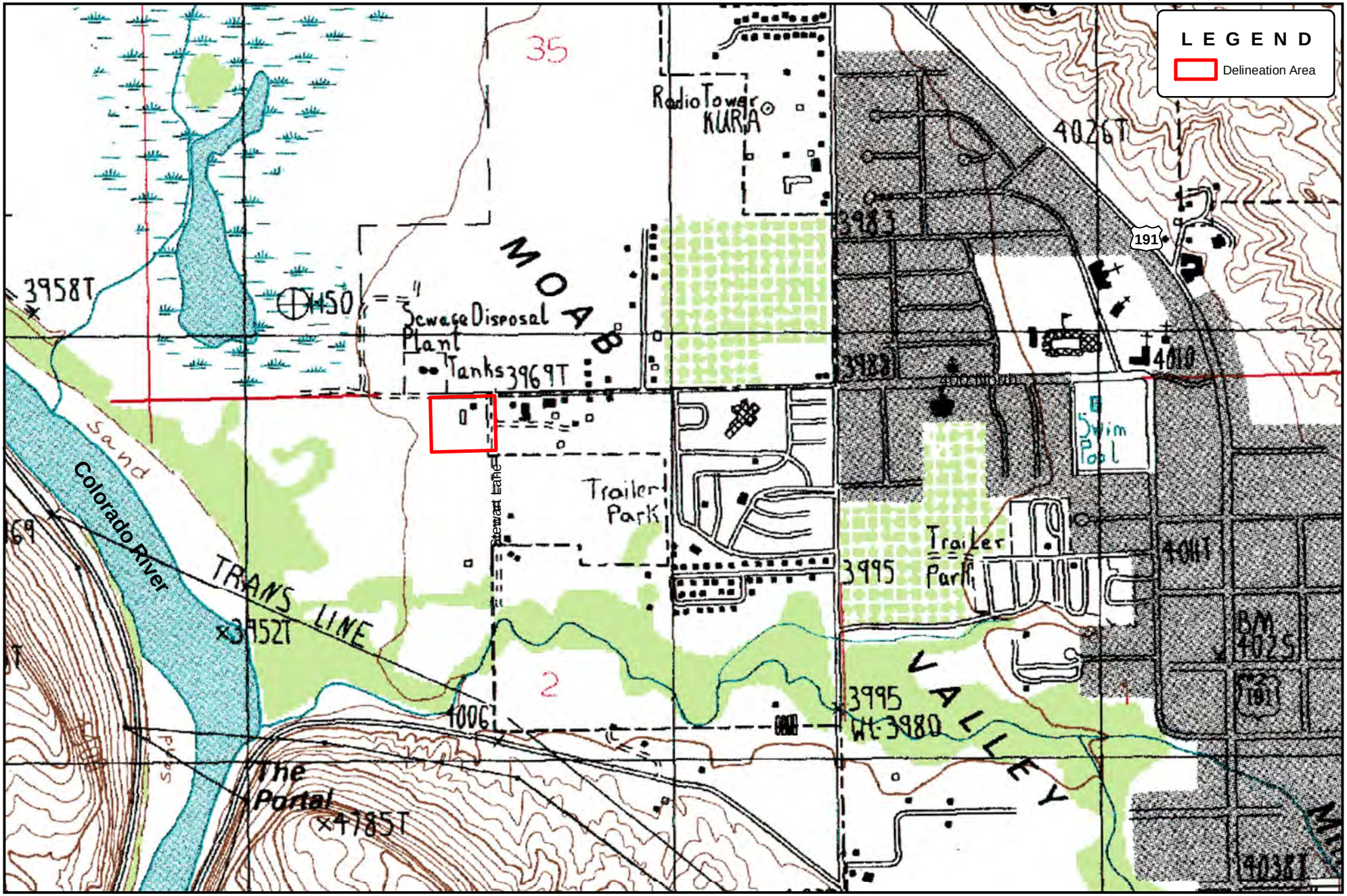
Imagery: USDA 2014 NAIP

NORTH:

SCALE: 0 500 1,000 Feet

FIGURE NO. 1A

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\Fig1A_Delin_SiteLocationMap.mxd mdavis 7/7/2016



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

City of Moab

MOAB WWTP WETLAND DELINEATION

SITE LOCATION MAP

USGS QUAD: Moab

NORTH:

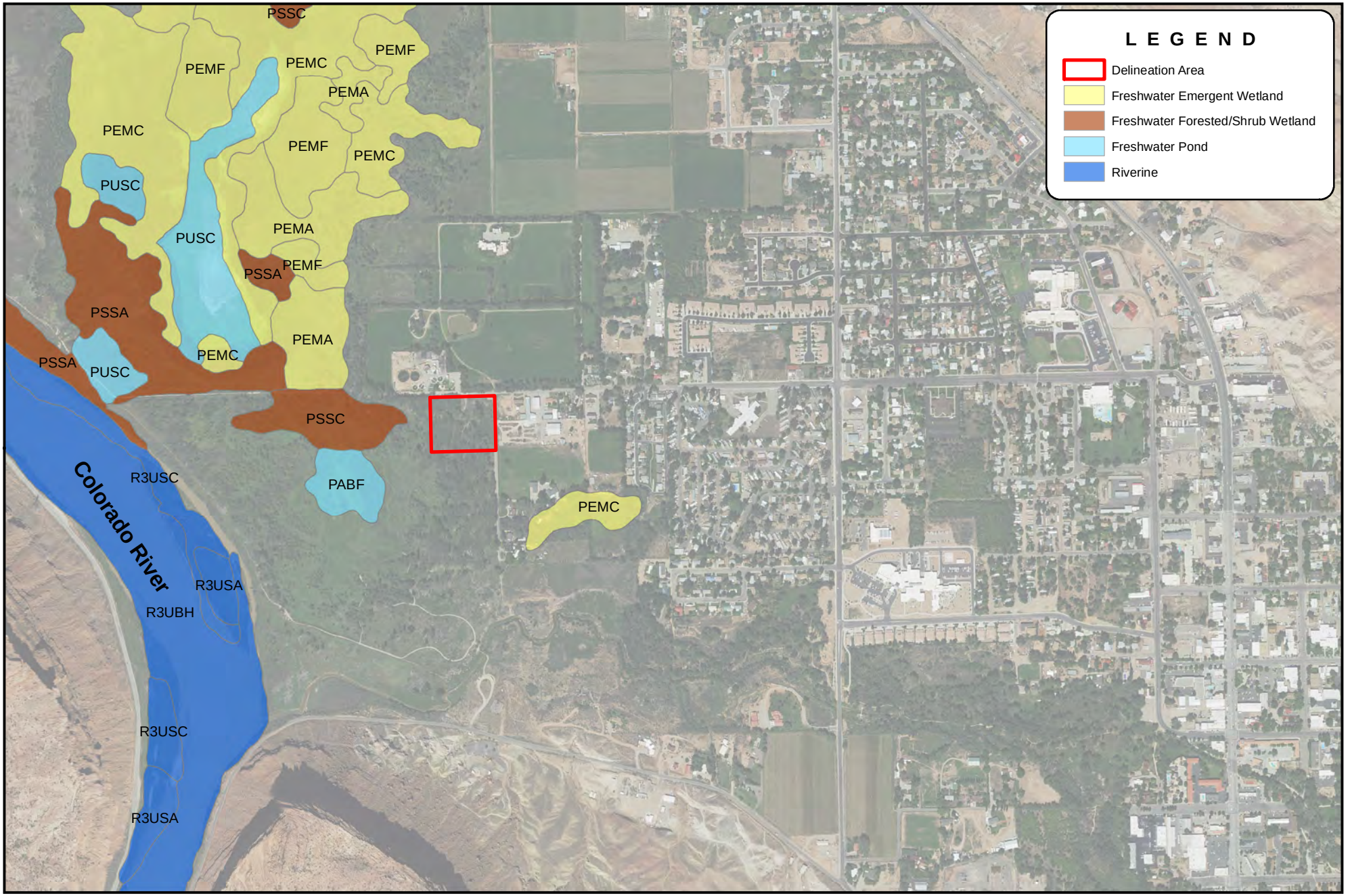
SCALE: 0 500 1,000 Feet

FIGURE NO. 1B

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\Fig1B_Delin_SiteLocationMap.mxd mdavis 7/7/2016

APPENDIX B

NWI WETLAND MAP



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

City of Moab

MOAB WWTP
WETLAND DELINEATION

NWI
WETLAND MAP

Imagery: USDA 2014 NAIP

NORTH:

SCALE: 0 500 1,000 Feet

FIGURE NO. 2

P:\Moab City\WWTP\Environmental\3.0 GIS\4.1 Projects\Fig2_Delin_NWI.mxd mdavis 7/7/2016

APPENDIX C

WETLAND DETERMINATION DATA FORM & SITE PHOTOGRAPHS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Moab WWTP City/County: Moab/Grand Sampling Date: 5/4/15

Applicant/Owner: Moab City State: UT Sampling Point: SP1

Investigator(s): J. Tsandes, M. Davis Section, Township, Range: Section 2, T26S, R21E

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): D Lat: 4271038.748 (E) Long: 624469.871 (N) Datum: UTM

Soil Map Unit Name: Begay fine sandy loam, moist, 2-6 percent slopes NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii (Freemont Cottonwood)	10		FACW
2. Elaeagnus angustifolia (Russian Olive)	5		FAC
3.			
4.			
	15 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: _____)			
1. Bromus tectorum (Cheatgrass)	20		UPL
2. Unknown upland grass	10		UPL
3. Sisymbrium altissimum (Tumble Mustard)	20		FACU
4. Salsola tragus (Prickly Russian Thistle)	20		FACU
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 15 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species 10	x 2 =	20
FAC species 5	x 3 =	15
FACU species 40	x 4 =	160
UPL species 30	x 5 =	150
Column Totals: 85 (A)		345 (B)

Prevalence Index = B/A = 4.05

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Not able to identify species for new grass growth (assumed upland plant)

SOIL

Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	5YR 4/4	100						organic matter
4-12	5YR 4/6	100						sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** ✓

Remarks:

Used soil sample from drillers taking soil samples at the same time the delineation was conducted at this sample point

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Sample Point 1 (Upland)

Sample Point 1

Sample Point 1 (east facing)

Sample Point 2 (north facing)

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Moab WWTP City/County: Moab/Grand Sampling Date: 5/4/15

Applicant/Owner: Moab City State: UT Sampling Point: SP2

Investigator(s): J. Tsandes, M. Davis Section, Township, Range: Section 2, T26S, R21E

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): D Lat: 42710934.377 (E) Long: 624436.321 (N) Datum: UTM

Soil Map Unit Name: Begay fine sandy loam, moist, 2-6 percent slopes NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____ No ✓	
Wetland Hydrology Present?	Yes _____ No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii (Freemont Cottonwood)	10		FACW
2. Elaeagnus angustifolia (Russian Olive)	10		FAC
3.			
4.			
	20 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: _____)			
1. Phalaris arundinacea (Reed Canary Grass)	40	Yes	FACW
2. Equisetum arvense (Field Horsetail)	5		FAC
3. Juncus articus (Artic Rush)	5		FACW
4.			
5.			
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species 55	x 2 =	110
FAC species 15	x 3 =	45
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: 70 (A)		155 (B)

Prevalence Index = B/A = 2.2

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: SP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	5YR 3/2	100						organic matter
4-12	5YR 3/3	100						silty loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Sample Point 2 (Upland)

Sample Point 2

APPENDIX D

NRCS CUSTOM SOILS RESOURCE REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Canyonlands Area, Utah - Parts of Grand and San Juan Counties

Maob WWTP Site

July 7, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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: http://websoilsurvey.nrcs.usda.gov
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: Canyonlands Area, Utah - Parts of Grand and San Juan Counties
Survey Area Data: Version 10, Aug 6, 2014

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

Date(s) aerial images were photographed: Jun 23, 2010—Jun 24, 2010

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

Canyonlands Area, Utah - Parts of Grand and San Juan Counties (UT633)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
8	Begay fine sandy loam, moist, 2 to 6 percent slopes	6.2	90.6%
97	Ustic Torrifluvents-Ustic Torrifluvents,sodic-Typic Ustifluvents complex, 0 to 6 percent slopes	0.6	9.4%
Totals for Area of Interest		**6.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments

on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Canyonlands Area, Utah - Parts of Grand and San Juan Counties

8—Begay fine sandy loam, moist, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1vn7
Elevation: 5,800 to 6,300 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 100 to 120 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Begay and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Begay

Setting

Landform: Cuestas, structural benches
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Eolian deposits derived from sandstone

Typical profile

A - 0 to 3 inches: fine sandy loam
Bw - 3 to 32 inches: fine sandy loam
Bk - 32 to 60 inches: loamy fine sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Upland Loam (Basin Big Sagebrush) (R035XY306UT)

Minor Components

Mivida

Percent of map unit: 10 percent

Mido

Percent of map unit: 10 percent

Ignacio

Percent of map unit: 5 percent

97—Ustic Torrifluvents-Ustic Torrifluvents,sodic-Typic Ustifluvents complex, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1vnv
Elevation: 3,900 to 4,400 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Ustic torrifluvents and similar soils: 35 percent
Ustic torrifluvents and similar soils: 30 percent
Typic ustifluvents and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ustic Torrifluvents

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

C1 - 0 to 13 inches: loamy very fine sand
C2 - 13 to 60 inches: stratified gravelly sandy loam to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Slightly saline to strongly saline (4.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0

Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R035XY011UT)
Other vegetative classification: Loamy Bottom (Basin Big Sagebrush) (035XY011UT_2)

Description of Ustic Torrifluvents

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

C1 - 0 to 3 inches: loamy very fine sand
C2 - 3 to 60 inches: stratified gravelly sandy loam to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Slightly saline to strongly saline (4.0 to 32.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Alkali Flat (Greasewood) (R035XY009UT)

Description of Typic Ustifluvents

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sandstone and shale

Typical profile

C1 - 0 to 1 inches: loam
C2 - 1 to 60 inches: stratified very gravelly sand to silt loam

Properties and qualities

Slope: 0 to 6 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Slightly saline to strongly saline (4.0 to 32.0 mmhos/cm)
Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: B
Ecological site: Semiwet Saline Streambank (Fremont Cottonwood) (R035XY012UT)

Minor Components

Riverwash

Percent of map unit: 7 percent
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave

Rock ourcrop

Percent of map unit: 3 percent

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APPENDIX E

WETLAND DELINEATION MAP (Including Boring Locations)

N

15 0 30 60
SCALE IN FEET

EXISTING
MOAB WWTP

400 NORTH

4' BERM

B-2

SP-1
B-1

HATCHED:
ACTUAL PROJECT
AREA

PROPERTY
BOUNDARY

B-3

B-4

STEWART LANE

SLOPE 5%

DELINEATION
BOUNDARY

EXISTING FENCE

3' BERM

SP-2

B-5

EXISTING FENCE

EXISTING SSMH
RIM = 3968.58
FL = COULD NOT OPEN

EXISTING SSMH
RIM = 3964.21
T.O.P. IE.I= 3960.25
T.O.P. IN.I= 3959.45
T.O.P. OUT = 3960.25
MANHOLE FULL OF MATERIAL
COULD NOT GET FL

EXISTING SSMH
RIM = 3968.67
FL = COULD NOT OPEN

EXISTING SSMH
RIM = 3971.53
FL IN = 3959.01
FL OUT = 3958.66

SS CONCRETE VAULT
RIM = 3975.46
FL = COULD NOT OPEN

EXISTING FENCE

GRAVEL ROAD

MARTY MITCHELL
BK 1045 PG 11

SHARLENE ABBOTT
BK 1045 PG 146

SPAH FAMILY LTD.
BK 638 PG 414

740.00' BEARING

FOUND REBAR & CAP
2004
(ILLEGIBLE)

THE NATURE CONSERVANCY
BK 472 PG 536-537

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

NOT FOR CONSTRUCTION
FOR REVIEW ONLY

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS

CITY OF MOAB, UTAH
MOAB WATER RECLAMATION FACILITY
MOAB, UTAH

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING

DESIGN — DESIGN —
DRAWN —
CHECKED —
APPROVED —
REVIEW

ENVIRONMENTAL
WETLAND DELINEATION MAP
BONDERMAN PROPERTY

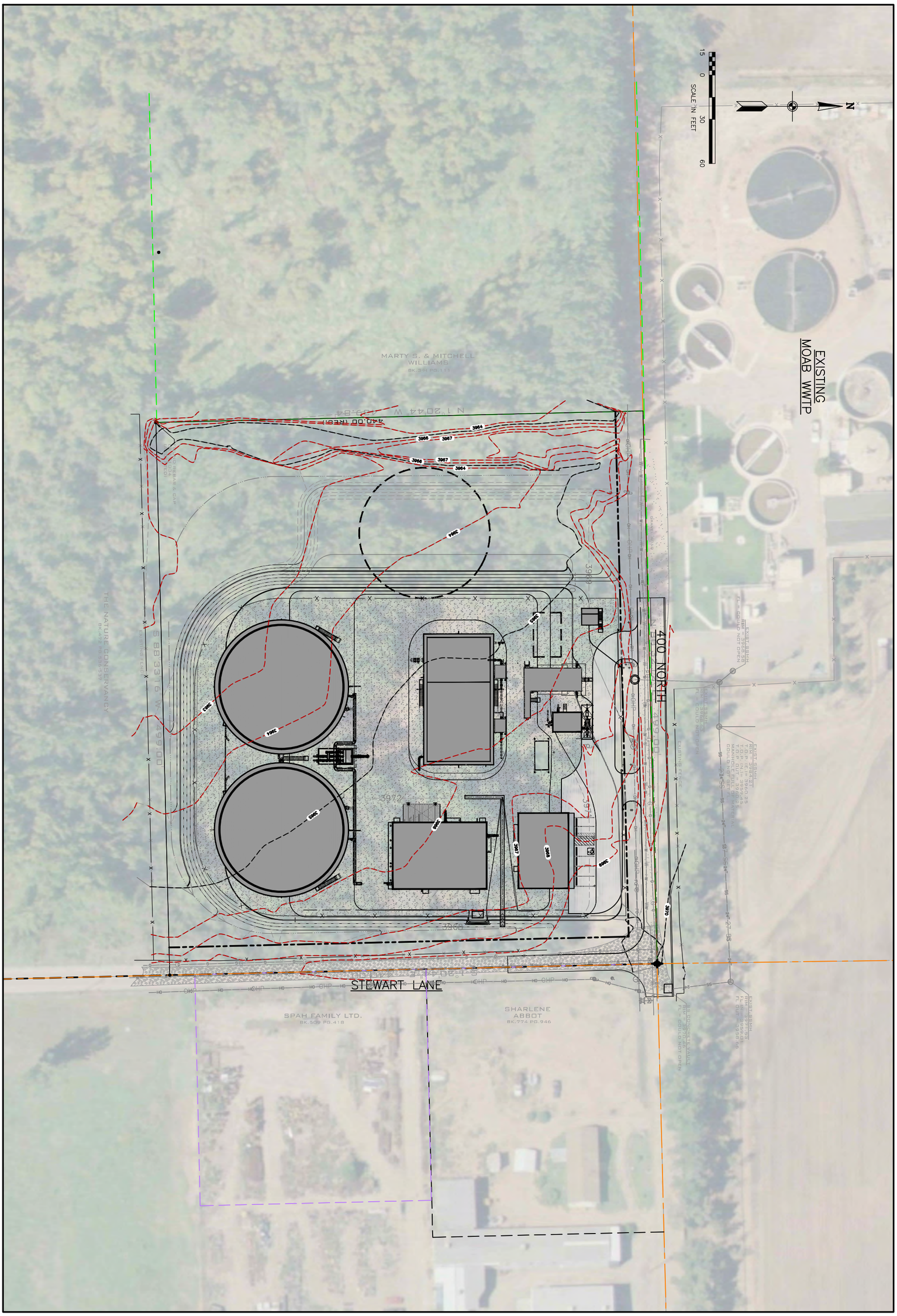
DATE: JULY 2016
PROJECT NUMBER 130-15-04

DRAWING NO.
FIG. 4

SHEET XX OF XX

P:\Moab City\WWTP\Environmental\4.0 Reports\2.0 Wetland Delineation\WETLAND DELINEATION.dwg Plotted: 7/8/2016 11:49 AM By: Jamie Tsandes

P:\Moab City WWTP\Environmental\4.0 Reports\2.0 Wetland Delineation\Figure 5.dwg Plotted: 7/8/2016 11:53 AM By: Jamie Tsosie



ENVIRONMENTAL

PROJECT DESIGN NEW WWTP BONDERMAN PROPERTY

DATE: JULY 2016

PROJECT NUMBER 130-15-04

CITY OF MOAB, UTAH

MOAB WATER RECLAMATION FACILITY

MOAB, UTAH

DESIGN	REVIEW
DESIGN—	CHECKED —
DRAWN—	APPROVED —

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING

NOT FOR CONSTRUCTION FOR REVIEW ONLY

NO.	DATE	REV. BY	DESCRIPTION

REVISIONS

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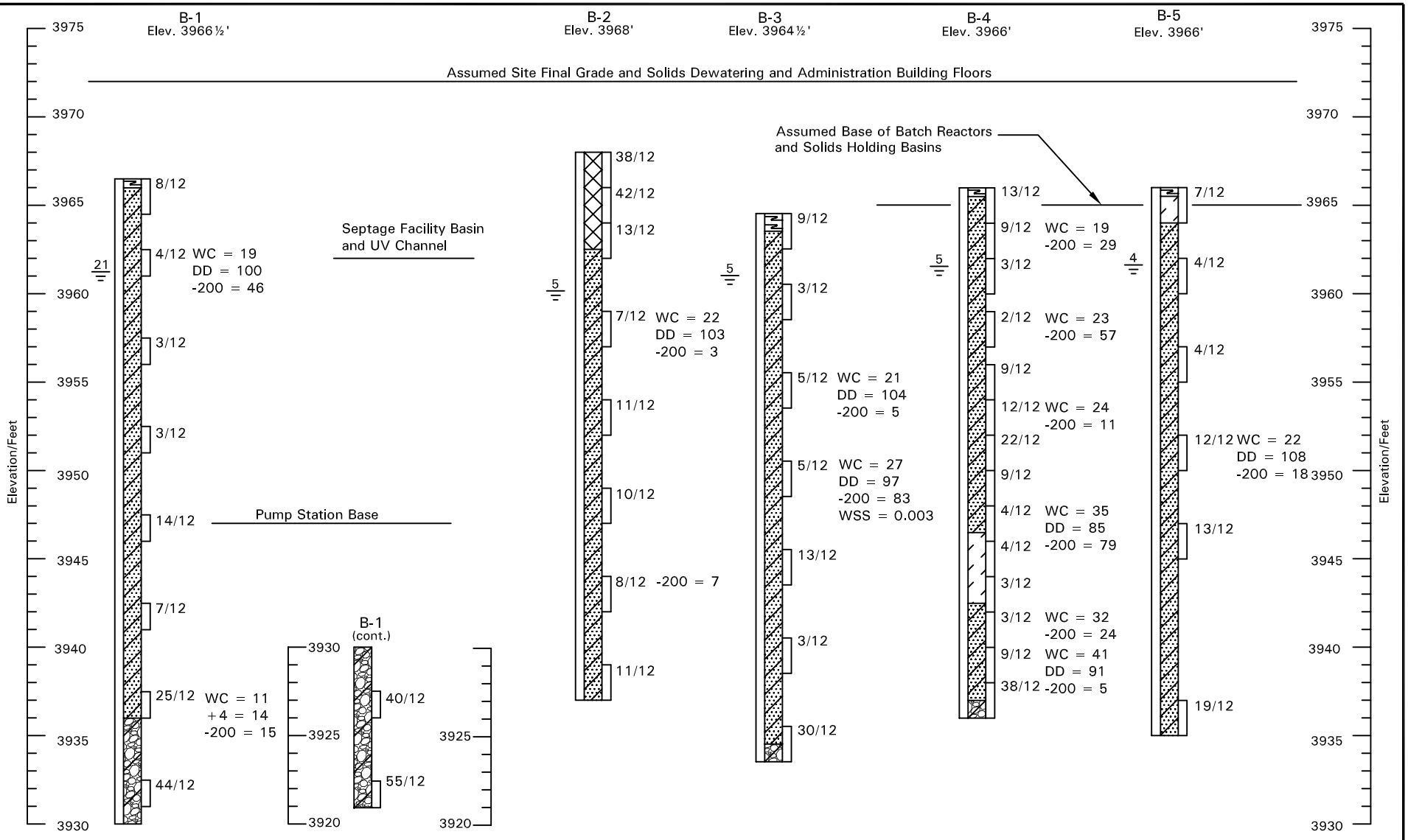
CONSULTING ENGINEERS

DRAWING NO. FIG. 5

SHEET XX OF XX

APPENDIX F

GEOTECHNICAL INVESTIGATION SOIL BORING DATA



Approximate Vertical Scale 1" = 8'

See Figure 4 for Legend and Notes

1150073	AGEC	Logs of Exploratory Borings	Figure 3