COPY

CONSOLENERGY™

Consolidation Coal Company
P.O. Box 566
Sesser, IL 62884
(618) 625-2041

April 07, 2010

Daron Haddock, Permit Supervisor
Utah Coal Regulatory Program
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

RE: Emery Mine
Permit No. ACT/015/015
2009 Annual Report

Dear Mr. haddock:

Per your January 11, 2010 memo, enclosed please find two (2) copies of Consolidation Coal Company's, 2009 Annual Report for the Emery Mine.
A cd-rom has been included with the report in PDF format.

If you have any questions or need further information, please contact me at (618)-625-6850

Sincerely,

John Gefferth
Environmental Engineer

JAG/jag Emeryannual09.doc

File in:
☐ Confidential
☒ Shelf
☐ Expandable
Date Folder Annual Report C/015/015
See Incoming For additional information

RECEIVED
APR 22 2010

ORIGINAL

CONSOLIDATION COAL COMPANY

EMERY MINE

PERMIT ACT/015/015

ANNUAL REPORT FOR 2009

This Annual Report shows information the Division has for your mine. Please review the information to see if it is current. If the information needs to be updated please do so in this document. At the end of each section the operator is asked to verify if the information is correct. Please answer these questions and make all comments on this document. Submit the completed document and any additional information identified in the Appendices to the Division by April 30, 2010. During a complete inspection an inspector will check and verify the information. To enter text, click in the cell and type your response. You can use the tab key to move from one field to the next. To enter an X in a box, click next to the box, right click, and select properties, then the checked circle, then hit enter, or hit the unchecked circle if the X is to be removed.

GENERAL INFORMATION

Permittee Name	Consolidation Coal Company
Mine Name	Emery Deep Mine
Operator Name (If other then Permittee)	NA
Permit Expiration Date	January 7, 2011
Permit Number	C/015/0015
Authorized Representative Title	John Gefferth
Phone Number	(618) 625-6850
Fax Number	(618) 625-6844
E-mail Address	johngefferth@consolenergy.com
Mailing Address	P.O. Box 566, Sesser, IL 62884
Designated Representative	John Gefferth
Resident Agent	CT Corporation Systems
Resident Agent Mailing Address	50 W. Broadway, 8th Floor, Salt Lake City, UT 84101-2006
Number of Binders Submitted	2

Operator, please update any incorrect information.

IDENTIFICATION OF OTHER PERMITS

Identify other permits that are required in conjunction with mining and reclamation activities.

Permit Type	ID Number	Description	Expiration Date
MSHA Mine ID(s)	42-00079	Emery Mine	N/A
MSHA Impoundment(s)			
NPDES/UPDES Permit(s)	UT0022616	Minor Industrial	Nov. 30,2011
PSD Permit(s) (Air)	DAQE-AN00229004-04	Approval Order Issued 07/30/04	N/A
Other			

Operator, please update any incorrect information.

CERTIFIED REPORTS

List the certified inspection reports as required by the rules and under the approved plan that must be periodically submitted to the Division. Specify whether the information is included as Appendix A to this report or currently on file with the Division.

Certified Reports:	**Required** Yes	No	**Included** Included	**or**	**DOGM file location** Vol, Chapter, Page
Excess Spoil Piles	☐	☒	☐		
Refuse Piles	☒	☐	☐		See Appendix A-1-Annual inspections
Impoundments	☒	☐	☐		See Appendix A-1-Annual inspections
Other					
	☐	☐	☐		
	☐	☐	☐		

Operator Comments:

Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this section? Yes ☐ No ☐
Inspector Comments:

COMMITMENTS AND CONDITIONS

The Permittee is responsible for ensuring annual technical commitments in the MRP and conditions accepted with the permit are completed throughout the year. The Division has identified these commitments below and has provided space for you to report what you have done during the past year for each commitment. If the particular section is blank, no commitment has been identified and no response is required for this report. If additional written response is required, it should be filed under Appendix B to this report.

Admin R645-301-100
Soils R645-301-200

Title: CONTROL OF COAL FINES DEPOSITION
Objective: Prevent coal fines from accumulating on undisturbed soils
Frequency: Annual inspection of three transects, (three sample sites each) for % coal surface cover, % live vegetative cover, and presence of cryptogrammic cover and soil color.
Status: Implement three general comments reported in 2008 annual report.
Reports: Provide results of monitoring and name of qualified person conducting monitoring in the annual report. Build on the table provided in Chap X-C, p. 5, with the inclusion of a column for soil color.
Citation: Chap X-C page 5b and discussion with John Gefferth on 11/24/2009.

Operator: Has this commitment been acted on this year?
Yes ☒ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:
Refer to Appendix B-3 for 2009 data

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: IDENTIFY CHEMICAL CHARACTERISTICS OF MATERIAL AS IT IS PLACED ON THE TEMPORARY COAL MINE WASTE STOCKPILE.
Objective: In accordance with R645-301-731.300, sample and analyze waste for acid toxic parameters.
Frequency: 1 sample/600 cu yds of coal mine waste brought to the temporary stockpile.
Status: commitment
Reports: Provide analysis in annual report.
Citation: Chap. II, pg. 10

Operator: Has this commitment been acted on this year?
Yes ☐ No ☒ Not required this year. ☐ If yes, comment;
Operator Comments:

No coal mine waste was added to the pile in 2009

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Biology R645-301-300

Title: CULTURAL RESOURCES
Objective: If during the course of mining operations, previously unidentified cultural resources are discovered, the Permittee shall ensure that the site(s) is not disturbed and shall notify the Division of Oil, Gas, and Mining. The Division, after coordination with OSM, shall inform the Permittee of necessary actions required. The Permittee shall implement the mitigation measures required by the Division within the time frame specified by the Division.
Frequency: As needed.
Status: Ongoing
Reports: Annual.
Citation: Permit Condition **Sec. 16.**

Operator: Has this commitment been acted on this year?
Yes ☐ No ☒ Not required this year. ☐ If yes, comment;
Operator Comments:

Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: MONITOR FIVE ELIGIBLE SITES IN THE ZERO ZERO NORTH AREA FOR IMPACTS FROM MINING

Objective: To monitor eligible cultural resource sites that could be damaged as a result of subsidence. Sites include: 42Em3964, 42Em3965, 42Em3966, 42Em3969, 42Em3974.
Frequency: Annually after undermining until the Division determines subsidence is no longer an impact.
Status: Ongoing
Reports: Annual
Citation: Chap. X, Part A. Section X.A page 1; Confidential Binder, Chapter X, Appendix 5-10 Cultural Resource Report MOAC-08-095, page 19.

Operator: Has this commitment been acted on this year?
Yes ☐ No ☒ Not required this year. ☐ If yes, comment;
Operator Comments:

Mining and subsidence of these sites will not occur until late 2010.
The referenced report number is incorrect and the site listing is incomplete.
Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: PROTECTION AND ENHANCEMENT PLAN
Objective: Prior to extraction or second mining the permittee will need to revise chapter nine of the Mining and Reclamation plan. That revision will need to include a narrative and or plan that describes how wildlife will be protected and enhanced as a result of the potential impacts from subsidence. The information required updating the MRP prior to extraction or second mining must be submitted to the Division by no later than sixty days after the approval of this incidental boundary change.
Frequency: as needed depending on the initiation of full extraction.
Status: OVERDUE, the Permittee has referred the reviewer to the deficiency response (3/6/2007). This response only includes a reference to Plate 10-1 and no narrative for a protection and enhancement plan. Please provide this plan.
Reports: Annual.
Citation: Master TA, operation plan, fish and wildlife information, protection and enhancement plan, page 55.

Operator: Has this commitment been acted on this year?
Yes ☐ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: WETLANDS AND HABITATS OF UNUSUALLY HIGH VALUE FOR FISH AND WILDLIFE
Objective: Prior to extraction or second mining the MRP must be updated to include a protection plan for wetlands from potential impacts due to subsidence and a burrowing owl survey for the permit area expansion.
Frequency: As needed depending on the initiation of full extraction.
Status: Ongoing, Wetland protection plan is located in chapter V page 41. Burrowing Owl survey is complete and located in Chapter VIII. Please provide the protection and enhancement plan for habitats of unusually high value for fish and wildlife.
Reports: Annual Report
Citation: Master TA, operation plan, fish and wildlife information, Wetlands and Habitats of Unusually High Value for Fish and Wildlife, page 56.

Operator: Has this commitment been acted on this year?
Yes ☐ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Engineering R645-301-500

Title: SUBSIDENCE MONITORING
Objective: 1a The Permittee will inspect the area outlined on Plate V-5 as full extraction areas when pillar splitting begins.
Frequency: Monthly until there is no record of additional subsidence.
Status: On going.
Reports: Annual report.
Citation: Chapter V 1 of 3 Chapter V page 36.

Operator: Has this commitment been acted on this year?
Yes ☒ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

Monthly subsidence reports are being sent to the Division
Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: SUBSIDENCE MONITORING
Objective: New monitoring points established over partial pillar sections will be resurveyed within six months after final mining bas taken place beneath them.
Frequency: As needed.
Status: On going.
Reports: Annual report.
Citation: Chapter V 1 of 3 Chapter V page 36.

Operator: Has this commitment been acted on this year?
Yes ☒ No ☐ Not required this year. ☐ If yes, comment,
Operator Comments:

Refer to Appendix B-1 (Annual Subsidence Monitoring)
Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: SUBSIDENCE MONITORING
Objective: New monitoring points established over advancing sections such as mains and sub mains will be resurveyed within one year after mining has been completed beneath the station.
Frequency: As needed.
Status: On going.
Reports: Annual report.
Citation: Chapter V 1 of 3 Chapter V page 36.

Operator: Has this commitment been acted on this year?
Yes ☒ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

Refer to Appendix B-1 (Annual Subsidence Monitoring)
Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: SUBSIDENCE MONITORING
Objective: The Permittee will provide 3 copies of a subsidence monitoring report to DOGM within one month after completion of any subsidence monitoring field survey conducted pursuant to the approved subsidence control plan. Subsidence monitoring reports shall contain 1) Mine maps showing where pillars have been pulled and the month and year that such pillars were removed or partially removed, 2) Maps showing the location of survey monitoring stations and tension cracks and/or compression feature visible on the surface, 2a) The subsidence monitoring points above the areas outlined on Plate V-5 as full extraction areas will have photographs taken to record pre and post subsidence, 3) The differential level and horizontal survey summary, 4) a narrative.
Frequency: As needed.
Status: On going.
Reports: Annual report.
Citation: Chapter V 1 of 3 Chapter V page 37.

Operator: Has this commitment been acted on this year?
Yes ☒ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

Refer to Appendix B-1 (Annual Subsidence Monitoring)
Not an annual report commitment in the MRP, please remove from annual report
For 2010, the operator will begin complying with the above MRP text by submitting the subsidence monitoring report one month after completion of field survey, and will not include in the annual report.

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: SUBSIDENCE MONITORING
Objective: Subsidence monitoring should, at a minimum, be established: a) at a point coincident to the geometric center of high extraction panels at least three months before mining occurs beneath the station and b) at periodic intervals over mains and sub mains at least every three months before mining activities occur beneath the station.
Frequency: As needed.
Status: On going.
Reports: Annual report.
Citation: Chapter V 1 of 3 Chapter V page 36.

Operator: Has this commitment been acted on this year?
Yes ☐ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

And what was the question ??
Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: SUBSIDECNE MONITORING
Objective: The Permittee will establish pre-mining elevations and gradients of any irrigation ditches and pond embankments within the angle of draw. The Permittee will monitor these areas by visual inspection and post-subsidence ground survey to establish the effects of subsidence.
Frequency: As needed.
Status: On going.
Reports: Annual report.
Citation: Chapter V 1 of 3 Chapter V page 37.

Operator: Has this commitment been acted on this year?
Yes ☐ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Title: SUBSIDENCE MONITORING
Objective: The Permittee will update the existing pre-subsidence survey and plates six (6) months before full extraction and provide copies to the surface land owner, DOGM and the Water Conservancy District.
Frequency: As needed.
Status: On going.
Reports: Annual report.
Citation: Chapter V 1 of 3 Chapter V page 37.

Operator: Has this commitment been acted on this year?
Yes ☐ No ☐ Not required this year. ☐ If yes, comment;
Operator Comments:

Pre Subsidence surveys are up to date. Refer to Chapter V Appendicies
Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this commitment? Yes ☐ No ☐
Inspector Comments:

Geology R645-301-600
Hydrology R645-301-700
Bonding & Insurance R645-301-800

Other Commitments	

*Reminder: If equipment has been abandoned during 2009, an amendment must be submitted that includes a map showing its location, a description of what was abandoned, whether there were any hazardous or toxic materials and any revision to the PHC as necessary.

REPORTING OF OTHER TECHNICAL DATA

List other technical data and information as required under the approved plan, which must be periodically submitted to the Division. Specify whether the information is included as Appendix B to this report or currently on file with the Division.

Operator Comments:
See Appendix B-3 for 2009 Macroinvertebrate study

Inspector:
Has the operator complied with this section? Yes ☐ No ☐
Inspector Comments:

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

Change in administration or corporate structure can often bring about necessary changes to information found in the mining and reclamation plan. The Division is Requesting that each permittee review and update the legal, financial, compliance and related information in the plan as part of the annual report. Please provide the Department of Commerce, Annual Report of Officers, or other equivalent information as necessary to ensure that the information provided in the plan is current. Provide any other change as necessary regarding land ownership, lease acquisitions, legal results from appeals of violations, or other changes as necessary to update information required in the mining and reclamation plan. Include certified financial statements, audits or worksheets, which may be required to meet bonding requirements. Specify whether the information is currently on file with the Division or included as Appendix C to the report.

Legal / Financial Update	Required Yes	Required No	Included or DOGM File location Included	Vol, Chapter, Page	Comments
	☐	☐	☐		
Other					
	☐	☐	☐		
	☐	☐	☐		
	☐	☐	☐		

Operator Comments:

Inspector:
Has the operator complied with this section? Yes ☐ No ☐
Inspector Comments:

MAPS

Copies of mine maps, current and up-to-date through at least December 31, 2009, are to be provided to the Division as Appendix D to this report in accordance with the requirements of R 645-301-525.240. The map copies shall be made in accordance with 30 CFR 75.1200 as required by MSHA. Mine maps are not considered confidential. (Please provide a CD.)

Confidential information is limited to:

R645-300-124.310. Information that pertains only to the analysis of the chemical and physical properties of the coal to be mined, except information on components of such coal which are potentially toxic in the environment.

R645-300-124.330. Information on the nature and location of archeological resources on public land and Indian land as required under the Archeological Resources Protection Act of 1979 (P. L. 96-95, 93 Stat. 721, 16 U.S.C. 470).

R645-301-322, Fish and Wildlife Information; R645-301-322.100, the scope and level of detail for such information will be determined by the Division in consultation with state and federal agencies with responsibilities for fish and wildlife and will be sufficient to design the protection and enhancement plan required under R645-301-333 and R645-301-322.230, other species or habitats identified through agency consultation as requiring special protection under state or federal law; R645-301-333.300, Include protective measures that will be used during the active mining phase of operation.

The Division will provide procedures, including notice and opportunity to be heard for persons both seeking and opposing disclosure.

Map Number(s)	Map Title/ Description		
Annual subsidence map			
Mine map			
Other maps		Confidential Yes	No
Annual mine map	2009 annual mine map	☐	☒
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Operator Comments:

R 645-301-525.240 does not require that the MSHA Annual Mine Map be submitted to DOGM in an annual report. A map satisfying this regulation can be found in the approved MRP. Not an annual report commitment in the MRP, please remove from annual report

Inspector:
Has the operator complied with this section? Yes ☐ No ☐
Inspector Comments:

OTHER INFORMATION

Please provide any comments of further information to be included as part of the Annual Report. Any other attachments are to be provided as Appendix E to this report. If information is submitted as a group rather then by individual mine, please identify each of the mine's data in the list below.

Additional attachment to this report? **Yes** ☐ **No** ☐

Operator Comments:

Inspector:
Has the operator complied with this section? Yes ☐ No ☐
Inspector Comments:

APPENDIX A

Certified Reports

Excess Spoil Piles
Refuse Piles
Impoundments

As required under R645-301-514

CONTENTS

To enter text, click in the box and type your response. If a box already contains an entry select the entry and type the replacement. You can use the tab key to move from one field to the next. To select a check box, click in the box or type an x.

GENERAL INFORMATION

Report Date	30 Nov 2009
Permit Number	ACT 015/015
Mine Name	Emery Mine
Company Name	Consolidated Coal Company

IMPOUNDMENT IDENTIFICATION

Impoundment Name	Pond 1
Impoundment Number	UPDES Outfall 001
UPDES Permit Number	UT0022616
MSHA ID Number	NA

IMPOUNDMENT INSPECTION

Inspection Date	18 Nov 2009
Inspected by	R.B. White
Reason for Inspection	Annual

(Annual, quarterly or other periodic inspections, critical installation , or completion of construction.)

1. **Describe any appearance of any instability, structural weakness, or any other hazardous condition.**

None

Questions a and b are required for an impoundment, which functions as a Sedimentation pond.

a. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and estimated average elevation of existing sediment.

Design sediment storage volume = 10.3 AF
60% sediment cleanout volume = 6.2 AF
Sediment cleanout elevation = 5935.7 ft

b. Principle and emergency spillway elevations.

Spillway elevation = 5939.3 ft
With stop logs in place, the spillway elevation can be raise a minimum of 12 inches.

2. Field Information

Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/ instrumentation information, inlet/ outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/ repairs, monitoring information, vegetation on outslopes of embankments, etc.

At the time of the inspection, the flow depth in the 9-inch Parshall flume at the pond outlet was 0.26 ft, representing 0.39 cfs. Water was discharging into the pond at the time of the inspection.

3. Field Evaluation.

Describe any changes in the geometry of the impounding structure, average and maximum depths and elevation of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period

The pond discharge measurement flume and the 18-inch diameter culvert downstream from this flume have ben replaced to avoid leaks that previously occurred.

QUALIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous condition of the structure affecting stability.

Signature: Richard B Wilcox Date: 30 Nov 2009

CERTIFIED REPORT

IMPOUNDMENT EVALUATION

If you answer NO to these questions, please explain under comments

		YES	NO
1.	Is impoundment designed and constructed in accordance with the approved plan?	☒	☐
2.	Is impoundment free of instability, structural weakness, or any other hazardous conditions?	☒	☐
3.	Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	☒	☐

COMMENTS/ OTHER INFORMATION

Consol operates this pond and the other mine-water discharge pond (Pond 6). Occasional exceedances of the discharge standards have occurred. Consol is negotiating with the Utah Division of Water Quality and is evaluating alternative uses for the mine water to ensure that effluent standards can be consistently met in the future.

CERTIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

By: Richard B. White, P.E. - President, EarthFax Engineering, Inc.

Full Name and Title

Signature: Richard B White Date 30 Nov 2009

P.E. Number & State 168246, UT

[P.E. Cert. Stamp]

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To enter text, click in the box and type your response. If a box already contains an entry select the entry and type the replacement. You can use the tab key to move from one field to the next. To select a check box, click in the box or type an x.

GENERAL INFORMATION

Report Date	30 Nov 2009
Permit Number	ACT 015/015
Mine Name	Emery Mine
Company Name	Consolidated Coal Company

IMPOUNDMENT IDENTIFICATION

Impoundment Name	Pond 2
Impoundment Number	UPDES Outfall 002
UPDES Permit Number	UT0022616
MSHA ID Number	NA

IMPOUNDMENT INSPECTION

Inspection Date	18 Nov 2009
Inspected by	R.B. White
Reason for Inspection	Annual

(Annual, quarterly or other periodic inspections, critical installation , or completion of construction.)

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

None

Questions a and b are required for an impoundment, which functions as a Sedimentation pond.

a. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and estimated average elevation of existing sediment.

Design sediment storage volume = 0.83 AF
Design sediment storage elevation = 5905.3 ft
60% sediment cleanout volume = 0.50 AF
60% sediment cleanout elevation = 5903.0 ft
Approximate average current sediment storage elevation = 5900 ft

b. Principle and emergency spillway elevations.

Spillway elevation = 5908.5 ft

2. Field Information

Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/ instrumentation information, inlet/ outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/ repairs, monitoring information, vegetation on outslopes of embankments, etc.

Water flows into this pond via a 12-inch diameter PVC pipe, which discharges onto riprap daown the inside embankment. There was neither water nor a substantial amount of sediment in the pond at the time of the inspection. Large boulders have been placed downstream from the pond outlet. No signs of erosion were observed during the inspection. The dewatering culvert has been fitted with a skimmer. The pond appears to be in good, functional shape.

3. Field Evaluation.

Describe any changes in the geometry of the impounding structure, average and maximum depths and elevation of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period

No problems were observed.

QUALIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous condition of the structure affecting stability.

Signature: Richard Bowley Date: 30 Nov 2009

CERTIFIED REPORT

IMPOUNDMENT EVALUATION

If you answer NO to these questions, please explain under comments

		YES	NO
1.	Is impoundment designed and constructed in accordance with the approved plan?	☒	☐
2.	Is impoundment free of instability, structural weakness, or any other hazardous conditions?	☒	☐
3.	Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	☒	☐

COMMENTS/ OTHER INFORMATION

The pond appears to be functioning as designed.

CERTIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

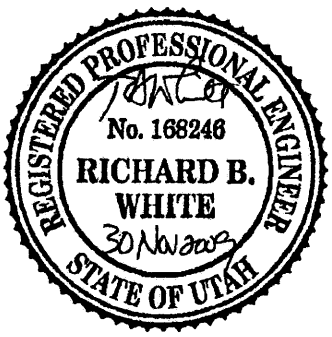
By: Richard B. White, P.E. - President, EarthFax Engineering, Inc.

Full Name and Title

Signature: Richard B White Date 30 Nov 2009

P.E. Number & State 168246, UT

[P.E. Cert. Stamp]



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*To enter text, click in the box and type your response. If a box already contains an entry select the entry and type the replacement. You can use the **tab** key to move from one field to the next. To select a check box, click in the box or type an x.*

GENERAL INFORMATION

Report Date	30 Nov 2009
Permit Number	ACT 015/015
Mine Name	Emery Mine
Company Name	Consolidated Coal Company

IMPOUNDMENT IDENTIFICATION

Impoundment Name	Pond 3
Impoundment Number	UPDES Outfall 005
UPDES Permit Number	UT0022616
MSHA ID Number	NA

IMPOUNDMENT INSPECTION

Inspection Date	18 Nov 2009
Inspected by	R.B. White
Reason for Inspection	Annual

(Annual, quarterly or other periodic inspections, critical installation , or completion of construction.)

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

None

Questions a and b are required for an impoundment, which functions as a Sedimentation pond.

a. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and estimated average elevation of existing sediment.

Design sediment storage volume = 1.14 AF
Design sediment storage elevation = 5906.5 ft
60% sediment cleanout volume = 0.68 AF
60% sediment cleanout elevation = 5905.0 ft
Approximate average current sediment storage elevation = 5902 ft

b. Principle and emergency spillway elevations.

Spillway elevation = 5907.8 ft

2. Field Information

Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/ instrumentation information, inlet/ outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/ repairs, monitoring information, vegetation on outslopes of embankments, etc.

There was neither water nor a substantial amount of sediment in the pond at the time of the inspection. The overflow consists of a 42-inch diameter riser with two 6-inch diameter side inlets (one with its invert located 15.5 inches below the top of the riser and the other with its invert 58 inches below the top of the riser). The riser outlet invert is located 69 inches below the top of the riser. There were no signs of recent water on the inside of the riser, indicating that the pond has not recently filled to this elevation. No signs of instability were observed, including on the steep, natural outslope on the north embankment.

3. Field Evaluation.

Describe any changes in the geometry of the impounding structure, average and maximum depths and elevation of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period

The pond appears to be functioning as designed.

QUALIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous condition of the structure affecting stability.

Signature: Richard Bisley Date: 30 Nov 2009

CERTIFIED REPORT

IMPOUNDMENT EVALUATION

If you answer NO to these questions, please explain under comments

		YES	NO
1.	Is impoundment designed and constructed in accordance with the approved plan?	☒	☐
2.	Is impoundment free of instability, structural weakness, or any other hazardous conditions?	☒	☐
3.	Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	☒	☐

COMMENTS/ OTHER INFORMATION

The pond appears to be functioning as designed.

CERTIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

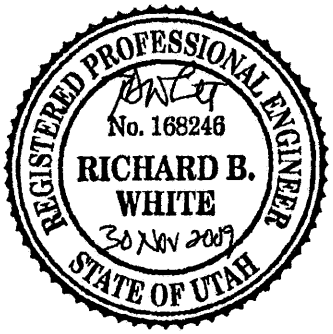
By: Richard B. White, P.E. - President, EarthFax Engineering, Inc.

Full Name and Title

Signature: Richard B White Date 30 Nov 2009

P.E. Number & State 168246, UT

[P.E. Cert. Stamp]



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IMPOUNDMENT INSPECTION AND CERTIFIED REPORT

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GENERAL INFORMATION

Report Date	30 Nov 2009
Permit Number	ACT 015/015
Mine Name	Emery Mine
Company Name	Consolidated Coal Company

IMPOUNDMENT IDENTIFICATION

Impoundment Name	Pond 5
Impoundment Number	UPDES Outfall 007
UPDES Permit Number	UT0022616
MSHA ID Number	NA

IMPOUNDMENT INSPECTION

Inspection Date	18 Nov 2009
Inspected by	R.B. White
Reason for Inspection	Annual

(Annual, quarterly or other periodic inspections, critical installation , or completion of construction.)

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

Exposure to the sunlight has caused deterioration of the HDPE inlet culverts. This causes water to leak from the culverts, thereby increasing erosion on the interior slope of the pond. These culverts should be cut where they protrude from the interior pond slope to avoid future degradation of the material. Riprap should then be placed down the pond slope from the culvert outlet to the pond bottom to prevent future erosion of the slope.

Questions a and b are required for an impoundment, which functions as a Sedimentation pond.

a. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and estimated average elevation of existing sediment.

Design sediment storage volume = 1.13 AF
Design sediment storage elevation = 5944.6 ft
60% sediment cleanout volume = 0.68 AF
60% sediment cleanout elevation = 5943.8 ft
Approximate average current sediment storage elevation = 5943 ft

b. Principle and emergency spillway elevations.

Spillway elevation = 5949.2 ft

2. Field Information

Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/ instrumentation information, inlet/ outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/ repairs, monitoring information, vegetation on outslopes of embankments, etc.

This pond has four 24-inch diameter inlet culverts (one CMP and three HDPE). As described above, the HDPE culverts have experienced degradation due to sunlight exposure. These inlets should be repaired as described above. A small amount of water (less than 6 inches) was in the pond at the time of the inspection. No substantial amount of sediment has accumulated in the pond. The open-channel outlet spillway shows no sign of erosion. No signs of erosion were observed around the dewatering device (6-inch diameter PVC).

3. **Field Evaluation.**

Describe any changes in the geometry of the impounding structure, average and maximum depths and elevation of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period

Other than the repairs that should be made to the inlet culverts, no stability or operational concerns were noted during the inspection.

QUALIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous condition of the structure affecting stability.

Signature: Richard BWLG Date: 30 Nov 2009

CERTIFIED REPORT

IMPOUNDMENT EVALUATION

If you answer NO to these questions, please explain under comments

		YES	NO
1.	Is impoundment designed and constructed in accordance with the approved plan?	☒	☐
2.	Is impoundment free of instability, structural weakness, or any other hazardous conditions?	☒	☐
3.	Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	☒	☐

COMMENTS/ OTHER INFORMATION

The pond appears to be functioning as designed.

COMMENTS/ OTHER INFORMATION

The pond appears to be functioning as designed.

CERTIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

By: Richard B. White, P.E. - President, EarthFax Engineering, Inc.

Full Name and Title

Signature: Richard B White Date 30 Nov 2009

P.E. Number & State 168246, UT

[P.E. Cert. Stamp]

*To enter text, click in the box and type your response. If a box already contains an entry select the entry and type the replacement. You can use the **tab** key to move from one field to the next. To select a check box, click in the box or type an x.*

GENERAL INFORMATION

Report Date	30 Nov 2009
Permit Number	ACT 015/015
Mine Name	Emery Mine
Company Name	Consolidated Coal Company

IMPOUNDMENT IDENTIFICATION

Impoundment Name	Pond 6
Impoundment Number	UPDES Outfall 003
UPDES Permit Number	UT0022616
MSHA ID Number	NA

IMPOUNDMENT INSPECTION

Inspection Date	18 Nov 2009
Inspected by	R.B. White
Reason for Inspection	Annual

(Annual, quarterly or other periodic inspections, critical installation , or completion of construction)

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

None

Questions a and b are required for an impoundment, which functions as a Sedimentation pond.

a. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and estimated average elevation of existing sediment.

Design sediment storage volume = 7.5 AF
60% sediment cleanout volume = 4.5 AF
Sediment cleanout elevation = 6012.5 ft

b. Principle and emergency spillway elevations.

Spillway elevation = 6016.0 ft

2. Field Information

Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/ instrumentation information, inlet/ outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/ repairs, monitoring information, vegetation on outslopes of embankments, etc.

At the time of the inspection, the flow depth in the 6-inch Parshall flume at the pond outlet was 0.97 ft, representing a discharge of 1.97 cfs. The pond elevation was approximately 4.5 inches above the spillway elevation at the time of the inspection.

3. Field Evaluation.

Describe any changes in the geometry of the impounding structure, average and maximum depths and elevation of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period

The CMP downstream from the discharge measurement flume has been replaced to avoid leakage that was occurring in the past.

QUALIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous condition of the structure affecting stability.

Signature: Richard Bowles Date: 30 Nov 2009

CERTIFIED REPORT

IMPOUNDMENT EVALUATION

If you answer NO to these questions, please explain under comments

		YES	NO
1.	Is impoundment designed and constructed in accordance with the approved plan?	☒	☐
2.	Is impoundment free of instability, structural weakness, or any other hazardous conditions?	☒	☐
3.	Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	☒	☐

COMMENTS/ OTHER INFORMATION

Consol operates this pond and the other mine-water discharge pond (Pond 1) in concert. Occasional exceedances of discharge standards have occurred. Consol is negotiating with the Utah Division of Water Quality and is evaluating alternative uses for the mine water to ensure that effluent standards can be consistently met in the future.

CERTIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

By: Richard B. White, P.E. - President, EarthFax Engineering, Inc.

Full Name and Title

Signature: Richard B White Date 30 Nov 2009

P.E. Number & State 168246, UT

[P.E. Cert. Stamp]

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT

*To enter text, click in the box and type your response. If a box already contains an entry select the entry and type the replacement. You can use the **tab** key to move from one field to the next. To select a check box, click in the box or type an x.*

GENERAL INFORMATION

Report Date	30 Nov 2009
Permit Number	ACT 015/015
Mine Name	Emery Mine
Company Name	Consolidated Coal Company

IMPOUNDMENT IDENTIFICATION

Impoundment Name	Pond 8
Impoundment Number	UPDES Outfall 006
UPDES Permit Number	UT0022616
MSHA ID Number	NA

IMPOUNDMENT INSPECTION

Inspection Date	18 Nov 2009
Inspected by	R.B. White
Reason for Inspection	Annual

(Annual, quarterly or other periodic inspections, critical installation , or completion of construction.)

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

None. Significant flow in Quitchupah Creek in September 2009 caused some erosion of the exterior of the Pond 8 embankment. This erosion was repaired prior to this inspection, by compacting soil into the erosion voids and placing riprap on the areas. It appears that this repair effort was adequate.

Questions a and b are required for an impoundment, which functions as a Sedimentation pond.

a. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and estimated average elevation of existing sediment.

Design sediment storage volume = 2.00 AF
Design sediment storage elevation = 5910.0 ft
60% sediment cleanout volume = 1.35 AF
60% sediment cleanout elevation = 5909.0 ft
Approximate average current sediment storage elevation = 5907 ft

b. Principle and emergency spillway elevations.

This impoundment is designed as a total containment pond without a spillway. The pond can contain the total design sediment volume plus the runoff from the 100-yr, 6-hr storm and still have a freeboard of 3.4 feet. The invert elevation on the dewatering pipe is set at 5910.0 ft.

2. Field Information

Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/ instrumentation information, inlet/ outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/ repairs, monitoring information, vegetation on outslopes of embankments, etc.

The pond inlets appear to be adequate. No water was in the pond at the time of the inspection. No substantial amount of sediment has accumulated in the pond. Erosion on the exterior slope of the embankment adjacent to Quitchupah Creek has been properly repaired. It appears that this piping is at least partially due to the erosive forces of the adjacent creek (Quitchupah Creek).

3. Field Evaluation.

Describe any changes in the geometry of the impounding structure, average and maximum depths and elevation of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period

The pond outslope adjacent to Quitchupah Creek is well vegetated and protected with boulders. No stability or operational concerns were noted. Riprap at the point of inflow from the mine yard appears to be adequately protective of erosion.

QUALIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous condition of the structure affecting stability.

Signature: Richard B Wolf Date: 30 Nov 2009

CERTIFIED REPORT

IMPOUNDMENT EVALUATION

If you answer NO to these questions, please explain under comments

		YES	NO
1.	Is impoundment designed and constructed in accordance with the approved plan?	☒	☐
2.	Is impoundment free of instability, structural weakness, or any other hazardous conditions?	☒	☐
3.	Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	☒	☐

COMMENTS/ OTHER INFORMATION

The pond appears to be functioning as designed.

CERTIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

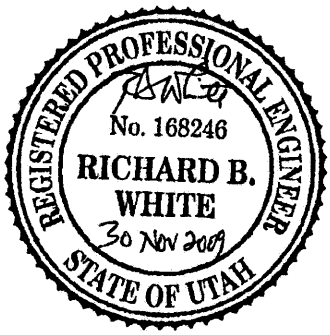
By: Richard B. White, P.E. - President, EarthFax Engineering, Inc.

Full Name and Title

Signature: Richard B White Date 30 Nov 2009

P.E. Number & State 168246, UT

[P.E. Cert. Stamp]



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GENERAL INFORMATION

Report Date	30 Nov 2009
Permit Number	ACT 015/015
Mine Name	Emery Mine
Company Name	Consolidated Coal Company

IMPOUNDMENT IDENTIFICATION

Impoundment Name	Pond 9
Impoundment Number	UPDES Outfall 009
UPDES Permit Number	UT0022616
MSHA ID Number	NA

IMPOUNDMENT INSPECTION

Inspection Date	18 Nov 2009
Inspected by	R.B. White
Reason for Inspection	Annual

(Annual, quarterly or other periodic inspections, critical installation , or completion of construction.)

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

None

Questions a and b are required for an impoundment, which functions as a Sedimentation pond.

a. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and estimated average elevation of existing sediment.

Design sediment storage volume = 0.32 AF
Design sediment storage elevation = 6052.5 ft
60% sediment cleanout volume = 0.18 AF
60% sediment cleanout elevation = 6051.7 ft
Approximate average current sediment storage elevation = 6050 ft

b. Principle and emergency spillway elevations.

Spillway elevation = 6054.6 ft

2. Field Information

Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/ instrumentation information, inlet/ outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/ repairs, monitoring information, vegetation on outslopes of embankments, etc.

There was no water or substantial sediment in the pond at the time of the inspection. No signs of erosion were noted at the pond outlet or the spillway. No signs of instability were observed. Sediment had been removed from the pond since the past annual inspection.

3. Field Evaluation.

Describe any changes in the geometry of the impounding structure, average and maximum depths and elevation of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period

No stability or operational concerns were noted.

QUALIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous condition of the structure affecting stability.

Signature: Richard Bowlby Date: 30 Nov 2009

CERTIFIED REPORT

IMPOUNDMENT EVALUATION

If you answer NO to these questions, please explain under comments

		YES	NO
1.	Is impoundment designed and constructed in accordance with the approved plan?	☒	☐
2.	Is impoundment free of instability, structural weakness, or any other hazardous conditions?	☒	☐
3.	Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	☒	☐

COMMENTS/ OTHER INFORMATION

The pond appears to be functioning as designed.

CERTIFICATION STATEMENT:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved designs and meets or exceeds the minimum design requirements under all applicable federal, state and local regulations; and that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

By: Richard B. White, P.E. - President, EarthFax Engineering, Inc.

Full Name and Title

Signature: Richard B White Date 30 Nov 2009

P.E. Number & State 168246, UT

[P.E. Cert. Stamp]

INSPECTION FORM

COAL REFUSE PILES AND COAL WASTE IMPOUNDMENTS

Name Quinn Healy Title PE - UT LIC #275564-2202

Date 2/29/09 Date last inspected 11/16/08

Site Name Emery Temp. Coal Stockpile Mine Name Emery

Refuse Facility ID # 1211-UT-09-00079-01

Refuse piles---Part A only
Impoundments---Part A and Part B

Part A

1.	Foundation preparation (vegetation, topsoil removal?)	X Yes	No
2.	Lift Thickness (inches)		
3.	Compaction (4 to 6 complete passes)	X Yes	No
4.	Burning* (specify extent and location)	Yes	X No
5.	Angle of Slope (degrees)	2:1	
6.	Seepage* (specify location, color, & appr. volume	Yes	X No
7.	Cracks or scarps* (location, size)	Yes	X No
8.	Major erosion problems* (location and extent)	Yes	X No
9.	Water impounding against toe*	Yes	X No

Part B

10.	Embankment freeboard (feet)		
11.	____Increase____Decrease in water level (feet)	Yes	No
12.	Sumps or sinkholes in slurry surface	Yes	No
13.	Clogging* (pipes, ditches, spillway)	Yes	No
14.	Trash racks clear and in place	Yes	No

* Adverse conditions noted in these items should be described (extent, location, volume, etc.) in the space provided. Major adverse changes could cause instability.

Inspection Category

Comments

I inspected the refuse pile on 2/28/09.

The refuse pile slopes are stable. The site drainage impoundment ditches are intact. There are no visible instabilities or other hazardous conditions.

LICENSED PROFESSIONAL ENGINEER
No. 275564
J. QUINN
HEALY
3/2/09
STATE OF UTAH

FORM 1

INSPECTION FORM

COAL REFUSE PILES AND COAL WASTE IMPOUNDMENTS

Name Quinn Healy Title PE

Date 5/20/09 Date last inspected 2/28/09

Site Name Emery Temp. Coal Stockpile Mine Name Emery

Refuse Facility ID # 1211-UT-09-00079-01

Refuse piles---Part A only
Impoundments---Part A and Part B

Part A

1.	Foundation preparation (vegetation, topsoil removal?)	X Yes	No
2.	Lift Thickness (inches)		
3.	Compaction (4 to 6 complete passes)	X Yes	No
4.	Burning* (specify extent and location)	Yes	X No
5.	Angle of Slope (degrees)	3:1	
6.	Seepage* (specify location, color, & appr. volume	Yes	X No
7.	Cracks or scarps* (location, size)	Yes	X No
8.	Major erosion problems* (location and extent)	Yes	X No
9.	Water impounding against toe*	Yes	X No

Part B

10.	Embankment freeboard (feet)		
11.	Increase Decrease in water level (feet)	Yes	No
12.	Sumps or sinkholes in slurry surface	Yes	No
13.	Clogging* (pipes, ditches, spillway)	Yes	No
14.	Trash racks clear and in place	Yes	No

* Adverse conditions noted in these items should be described (extent, location, volume, etc.) in the space provided. Major adverse changes could cause instability.

Inspection Category

Comments

I inspected the refuse pile on 5/20/09.

The refuse pile slope angles have been reduced. The slopes are compacted and stable. The site drainage impoundment ditches are intact. There are no visible instabilities or other hazardous conditions.

LICENSED PROFESSIONAL ENGINEER
No. 275564
J. QUINN
HEALY
STATE OF UTAH

FORM 1

INSPECTION FORM

COAL REFUSE PILES AND COAL WASTE IMPOUNDMENTS

Name Quinn Healy Title PE

Date 8/19/09 Date last inspected 5/20/09

Site Name Emery Temp. Coal Stockpile Mine Name Emery

Refuse Facility ID # 1211-UT-09-00079-01

Refuse piles---Part A only
Impoundments---Part A and Part B

Part A

1.	Foundation preparation (vegetation, topsoil removal?)	X Yes	No
2.	Lift Thickness (inches)		
3.	Compaction (4 to 6 complete passes)	X Yes	No
4.	Burning* (specify extent and location)	Yes	X No
5.	Angle of Slope (degrees)	3:1	
6.	Seepage* (specify location, color, & appr. volume	Yes	X No
7.	Cracks or scarps* (location, size)	Yes	X No
8.	Major erosion problems* (location and extent)	Yes	X No
9.	Water impounding against toe*	Yes	X No

Part B

10.	Embankment freeboard (feet)		
11.	Increase Decrease in water level (feet)	Yes	No
12.	Sumps or sinkholes in slurry surface	Yes	No
13.	Clogging* (pipes, ditches, spillway)	Yes	No
14.	Trash racks clear and in place	Yes	No

* Adverse conditions noted in these items should be described (extent, location, volume, etc.) in the space provided. Major adverse changes could cause instability.

Inspection Category

Comments

I inspected the refuse pile on 8/19/09.

The slopes are compacted and stable. The site drainage impoundment ditches are intact. There are no visible instabilities or other hazardous conditions.

LICENSED PROFESSIONAL ENGINEER
No. 175564
J. QUINN
HEALY
8/24/09
STATE OF UTAH

FORM 1

INSPECTION FORM

COAL REFUSE PILES AND COAL WASTE IMPOUNDMENTS

Name Quinn Healy Title PE

Date 11/21/09 Date last inspected 8/19/09

Site Name Emery Temp. Coal Stockpile Mine Name Emery

Refuse Facility ID # 1211-UT-09-00079-01

Refuse piles---Part A only
Impoundments---Part A and Part B

Part A

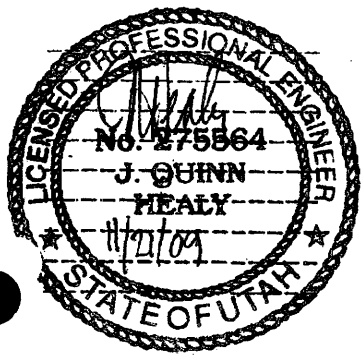
1.	Foundation preparation (vegetation, topsoil removal?)	X Yes	___ No
2.	Lift Thickness (inches)		
3.	Compaction (4 to 6 complete passes)	X Yes	___ No
4.	Burning* (specify extent and location)	___ Yes	X No
5.	Angle of Slope (degrees)	3:1	
6.	Seepage* (specify location, color, & appr. volume	___ Yes	X No
7.	Cracks or scarps* (location, size)	___ Yes	X No
8.	Major erosion problems* (location and extent)	___ Yes	X No
9.	Water impounding against toe*	___ Yes	X No

Part B

10.	Embankment freeboard (feet)		
11.	____Increase____Decrease in water level (feet)	___ Yes	___ No
12.	Sumps or sinkholes in slurry surface	___ Yes	___ No
13.	Clogging* (pipes, ditches, spillway)	___ Yes	___ No
14.	Trash racks clear and in place	___ Yes	___ No

* Adverse conditions noted in these items should be described (extent, location, volume, etc.) in the space provided. Major adverse changes could cause instability.

Inspection Category



Comments

I inspected the refuse pile on 11/21/09.

The slopes are compacted and stable. The site drainage impoundment ditches are intact. There are no visible instabilities or other hazardous conditions.

APPENDIX B

Reporting of Technical Data

Including monitoring data, reports, maps, and other information
As required under the approved plan or as required by the Division

In accordance with the requirement of R645-310-130 and R645-301-140

CONTENTS

Consolidation Coal Co.

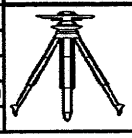
November 2009 - Annual Subsidence Survey

NAD 1983, Utah Central, US Survey feet
NAVD 1988

MEASURED POINTS

POINT NAME	NORTHING	EASTING	PREVIOUS ELEVATION	Nov. 2007 ELEVATION	Nov. 2008 ELEVATION	Nov. 2009 ELEVATION
			ADJUSTED			
			OCT. 06 ELEV.			
H-1	6758256.55	1713035.05	6082.81	6082.74	6082.88	6082.87
36	6756805.63	1713716.02	6041.05	6040.79	6041.00	6040.89
SMH	6755882.85	1712049.12	6057.67	6057.32	6057.61	6057.52
90-1	6755171.22	1712000.26	6037.91	6037.45	6037.70	6037.63
90-2	6755593.14	1712304.86	6053.83	6053.39	6053.64	6053.58
35	6761558.54	1711229.20	6106.36	6106.67	6106.80	
83-1	6759093.54	1713116.69	6065.51	6065.46	6065.64	6065.58
86-1	6757857.39	1706660.25	6003.40	6003.59	6003.84	6003.86
86-2	6758652.96	1705551.95	6040.48	6040.76	6040.91	6040.93
86-4	6760837.61	1702889.91	6078.44	6079.20	6079.40	6079.40
86-5	6760155.85	1704278.88	6163.45	6163.97	6164.22	6164.21
86-13	6759176.02	1704251.23	6036.06	6036.50	6036.65	6036.63
88-2	6759134.95	1703887.62	6016.57	6017.01	6017.17	6017.18
88-3	6758692.06	1704300.65	6014.34	6014.83	DESTROYED	DESTROYED
88-4	6758006.11	1704828.28	5988.26	5988.56	5988.71	5988.73
88-5	6757972.48	1705259.42	5994.61	5994.92	DESTROYED	DESTROYED
88-6	6757177.64	1705879.38	5975.05	5975.24	5975.39	5975.42
89-2	6762836.20	1705604.61	6200.08	6200.84	6200.98	6200.95
89-3	6761091.78	1704846.48	6170.31	6170.90	6171.13	6171.11
89-4	6762473.44	1706321.62	6184.86	6185.60	6185.69	6185.77
90-03	6756435.50	1712926.84	6037.17	6036.93	6037.13	6037.04
90-04	6757182.04	1713517.48	6031.02	6030.74	6030.89	6030.76
90-05	6757982.75	1714123.43	6048.00	6047.81	6047.92	
90-4	6756652.76	1713321.91	6043.29	6043.02	6043.27	6043.16
90-5	6757394.42	1713688.58	6036.66	6036.41	6036.56	6036.50
90-6	6758779.41	1714726.46	6050.72	6050.62	6050.82	6050.78
SM-C	6758743.87	1714106.30	6051.44	6051.38	6051.64	6051.53
91-01	6756669.94	1712000.00	6052.23	6052.01	6052.25	6052.67
91-02	6757585.42	1713036.14	6051.46	6051.28	6051.41	6051.38
91-03	6758030.88	1713361.38	6055.63	6055.45	6055.56	6055.61
91-04	6758791.86	1713935.17	6051.81	6051.72	6051.91	6051.82
87-1	6757159.14	1706351.37	5990.51	5990.59	5990.78	5990.81
97-1	6759589.84	1709488.21	6117.57	6117.83	6117.94	6117.97
97-2	6758894.76	1709132.54	6116.53	6116.66	6116.84	6116.87
E	6759462.66	1712234.87	6082.64	6082.75	6082.89	6082.95
E1/4 28	6758451.40	1713666.32	6054.53	6054.45	6054.56	6054.52
H-6	6758064.50	1711094.12	6095.91	6095.93	6096.06	6096.02
W	6756275.89	1705674.96	5958.82	5958.80	5958.94	DESTROYED
L	6754880.54	1705574.55	5950.19	5950.06	5950.29	5950.28
N	6755536.21	1706165.54	5950.23	5950.16	5950.36	5950.39
SMK-2	6758755.59	1710054.13	6102.92	6102.95	6103.12	6103.13
SMK-3	6758965.95	1711660.45	6082.15	6082.18	6082.28	6082.27

	A	B	C	D	E	F	G
52				**11-2006 ELEVATION**			
53	6-01	6761645.96	1710904.27	6110.04	6110.09	6110.27	6110.27
54	6-02	6761002.37	1710059.15	6116.61	6116.60	6116.79	6116.88
55	6-03	6760565.27	1709554.45	6117.32	6117.33	6117.55	6117.69
56	6-04	6758380.42	1707028.80	6023.68	6023.77	6019.63	6019.51
57	6-05	6758719.90	1706656.21	6030.59	6030.68	6027.85	6027.67
58	6-06	6759875.49	1705933.25	6143.18	6142.91	6142.85	6142.71
59	6-07	6760863.83	1706266.65	6170.20	6169.65	DESTROYED	DESTROYED
60	6-08	6759343.46	1706993.37	6065.73	6065.23	6064.69	6064.36
61	6-09	6760017.86	1706164.92	6141.75	6139.26	6139.27	6139.11
62	6-10	6760383.96	1705795.14	6150.80	6148.22	6148.25	6148.13
63	6-11	6759493.36	1715652.26	6056.86	6056.87	6057.03	6057.01
64	6-12	6760098.03	1714699.42	6076.19	6076.15	6076.39	6076.35
65	6-13	6760891.31	1713698.10	6090.16	6090.17	6090.36	6090.35
66	6-14	6761793.53	1712734.97	6097.29	6097.30	6097.48	6097.43
67	6-15	6762265.78	1712329.15	6107.03	6107.08	6107.19	DESTROYED
68	6-16	6759657.74	1716089.80	6059.39	6059.44	6059.57	6059.56
69	6-17	6761139.50	1717065.30	6071.56	6071.66	6069.61	6069.11
70	6-18	6761947.48	1717858.85	6081.27	6081.34	6081.87	6081.54
71	6-19	6762448.91	1718246.74	6085.90	6085.96	6086.59	6086.17
72	6-20	6762741.05	1718538.73	6090.48	6090.52	6091.33	6090.73
73	6-21	6760438.20	1716180.06	6070.28	6070.30	6070.97	6070.38
74	6-22	6761333.56	1714916.16	6090.69	6090.68	6090.93	6090.92
75	6-23	6762101.13	1714019.00	6111.33	6111.31	6111.58	6111.52
76	6-24	6761067.04	1716301.20	6080.76	6080.80	6081.42	6079.91
77	6-25	6762329.01	1714637.51	6106.02	6106.01	6106.23	6106.28
78	6-27	6764041.79	1715533.49	6114.65	6114.65	6114.79	6114.81
79	6-29	6762703.00	1712897.66	6141.81	6141.85	6142.02	6142.00
80	6-30	6763349.98	1713654.71	6131.17	6131.20	6131.41	6131.32
81	6-34	6760357.41	1706945.65	6148.20	6148.07	6148.20	6147.88
82	86-11	6760330.48	1707019.83	6153.72	6153.62	6153.73	6153.39
83	86-8	6762484.75	1713660.38	6125.27	6125.27	6125.43	6125.43
84	R BOLT	6759584.85	1705565.44	6151.78	6151.79	6151.25	6151.17
85				**9-14-07 ELEVATION**			
86	07-01	6759689.65	1717605.56	6077.19	6077.17	6077.36	6077.32
87	07-02	6761395.09	1718892.63	6080.35	6080.35	6080.54	6080.60
88	07-03	6759677.37	1716935.01	6059.25	6059.28	6059.49	6059.43
89	07-04	6760461.70	1717523.64	6067.06	6067.06	6067.20	6067.12
90	07-05	6761257.03	1718095.27	6075.77	6075.80	6075.76	6075.70
91	07-06	6760573.27	1718252.26	6078.10	6078.13	6078.32	6078.32
92	07-07	6759021.04	1716449.85	6065.37	6065.43	6065.58	6065.63
93	07-08	6762043.96	1718677.76	6082.46	6082.48	6083.35	6082.68
94				**8-21-09 ELEVATION**			
95	09-01	6761952.49	1716938.13	6080.76			6080.40
96							
97							
98							
99							
100							
101							



WARE SURVEYING & ENGINEERING

G.P.S. & CONVENTIONAL SURVEYING - AUTOCAD MAPPING - CIVIL ENGINEERING

Consol Emery Mine
Panel 14th West
Bryant No. 1
Flow Measurements made at dam breach

Date	Flow (gpm)
6/13/2007	77
7/24/2007	52
8/28/2007	75
9/20/2007	69
10/19/2007	59
11/15/2007	54
12/17/2007	frozen
1/15/2008	Flowing under, over & through ice/snow; can't measure, but flow appears to be similar to the November flow rate.
2/26/2008	67
3/21/2008	90
4/24/2008	35
5/22/2008	255
6/25/2008	230
7/16/2008	355
8/14/2008	275
9/10/2008	190
10/21/2008	117
11/19/2008	48
12/11/2008	56
1/21/2009	34
2/26/2008	23
3/10/2009	29
4/20/2009	12
5/13/2009	10
6/16/2009	235
7/27/2009	345
8/19/2009	265
9/18/2009	300
10/12/2009	60
11/5/2009	80
12/23/2009	58

Coal Dust Plots – May 13, 2009

Site	Free Coal Surface Cover (%)	Mixed Soil/Coal Cover (%)*	Bare Soil and/or Rock Cover (%)	Live Vegetative Cover (%)
1A	2-3	90 -- d	<5	<5
1B	1-2	90 -- m	0-1	10
1C	0-1	15 -- l	80	3-5
2A	2-3	90 -- m	<5	7-10
2B	1-2	70 -- l	10	20-25
2C	0-1	40 -- l	45	15
3A	5	85 -- d	0-1	10-15
3B	2-3	85 -- l	3-4	10
3C	4-5	65 -- l	<5	20-25

*color of mixture: d = dark gray dominant, m = moderately gray, l = light

Note: Coal cover has gotten very difficult to estimate. There was only a very small quantity of coal on the ground surface that was distinguishable as a surface deposit consisting of distinct particles. Instead, continued mixing with the native soil is occurring, and rather than a observing distinct coal deposits, we observed mixtures that range in color from a light grayish brown to a darker brownish gray, depending upon the amount of coal entrained in the soil. We altered measurement categories to try to reflect these observations, but results are still very subjective. Within the mixed soil/coal column, there was a range of the amount of coal mixed in with the soil, as observed by color, but percentages within the mixture could not be estimated. For example, 90 percent of the area at both 1A and 1B was covered by the soil/coal mixture, but at 1A, the mixture contained more coal, as observed by the darker color of the mixture. We recommend using a Munsell soil color-based method, or other similar method, if this survey is to continue.

Emery Mine

Macroinvertebrate Study

October 2009

Prepared for:

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April 14, 2010

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Emery Mine

Macroinvertebrate Study

October 2009

1.0 Introduction

On October 13, 2009, JBR Environmental Consultants, Inc. (JBR) collected benthic macroinvertebrate samples from two streams located near Emery, Utah (Figure 1). The samples were collected upstream and downstream of a coal mine that is operated by Consolidation Coal Company (Consol) and permitted by the Utah Division of Oil, Gas and Mining (DOGM.) Known as the Emery Mine, the underground mine obtains coal at depths extending up to several hundred feet below ground surface. Associated surface facilities are located along lower Christiansen Wash and along Quitchupah Creek immediately upstream of its confluence with Christiansen Wash. In addition, the underground mine discharges intercepted groundwater to Quitchupah Creek. The discharge is primarily regulated by the Utah Division of Water Quality (DWQ) through the Utah Pollutant Discharge Elimination System (UPDES) permit program. Surface disturbances associated with the underground mine are regulated by DOGM.

DOGM requires Consol to routinely sample benthic macroinvertebrates and assess whether or not the Emery Mine is affecting the aquatic community. On behalf of Consol, JBR has conducted these macroinvertebrate studies since 2002, when the requirement began. This report is the fourth such report generated by JBR; previous reports were prepared following macroinvertebrate sampling in 2002, 2003, and 2006. After giving some relevant background information, this report describes the data collection and analysis methodology, provides the laboratory data, and discusses the results of the October 2009 macroinvertebrate study. Results are discussed from both spatial and temporal perspectives.

2.0 Background

To ensure safe operating conditions at the Emery Mine, groundwater that is intercepted during underground mining is collected and pumped to the surface. Once at the surface, the water is stored temporarily in detention ponds, where it undergoes settling prior to its discharge to Quitchupah Creek. The majority of the intercepted groundwater is pumped to Pond 6 (UPDES Outfall 003), and the remainder is pumped to Pond 1 (UPDES Outfall 001). Both ponds are adjacent to Quitchupah Creek, and discharge from the ponds is regulated by the elevation of

outlet flumes. Water from Pond 6 discharges to Quitchupah Creek about 0.5 miles downstream of the Highway 10 stream crossing and water from Pond 1 discharges about 1.5 miles further downstream.

There are seven other ponds at the Emery Mine that contain precipitation runoff from surface disturbances. These sediment ponds were designed to store (without discharge) runoff up to the amount generated by a 10-year, 24-hour storm. In reality, these ponds have significantly more capacity than the design volume and have not discharged for many years, if ever. They, along with ditches and berms, effectively prevent runoff that contacts the mine's surface facilities from entering either Quitchupah Creek or Christiansen Wash.

Quitchupah Creek flows generally southeast out of the Wasatch Plateau where it is fed by springs, snowmelt, and thunderstorm runoff, as well as by groundwater intercepted from another operator's coal mine (Canyon Fuels' SUFCO Mine). On the Wasatch Plateau, the creek flows through Quitchupah Canyon. Once out of the canyon, the creek continues southeast across flatter Quaternary deposits, where irrigation diversions and return flows can either decrease or increase stream flows, respectively. Shortly after picking up discharge from Outfall 001, Quitchupah Creek receives stream flow from one of its primary tributaries – Christiansen Wash. The smaller Christiansen Wash drains the lower slopes of the Wasatch Plateau and is also affected by agricultural waters; it does not receive any groundwater intercepted by and discharged from coal mines.

These streams, as they pass through the Emery Mine and continue downstream, are classed as 3C in the Utah Water Quality Standards. As defined at U.A.C. R317-2-6, Class 3C streams are *"Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain."* During a September 2002 fish survey for the Emery Mine, Quitchupah Creek immediately below the confluence with Christiansen Wash was supporting mountain suckers (*Catostomus platyrhynchus)*, leatherside chub (*Gila copei*), and speckled dace (*Rhinichthys osculus*) (JBR 2002). Speckled dace were also found in lower Christiansen Wash, but no fish were found in Quitchupah Creek in the immediate vicinity of the Emery Mine during the 2002 survey (JBR 2002).

Aquatic organisms such as benthic macroinvertebrates provide food for fish and are also important indicators of stream health. Because they are sensitive to water quality and respond quickly to stressors including water pollutants, and also because they are fairly stationary within a given stream feature, macroinvertebrates integrate variations in water quality or other habitat components (Davis et al 2001). Numerous indices and metrics such as diversity, taxa ratios, richness, and the like can be calculated and used to assess the macroinvertebrate community at a given site in regard to its ability to tolerate environmental pollution and/or poor physical habitat. The presence or absence of certain macroinvertebrates can indicate a

perturbation that may not have been captured by grab samples analyzed for specific water chemistry.

2.1 Previous Macroinvertebrate Study Results

As noted above, JBR sampled macroinvertebrates at the Emery Mine three times prior to the October 2009 sampling event. Results from these earlier studies are briefly summarized below.

All of the previous sampling events took place at three sites that were initially selected in 2002 with input from DOGM and the Utah Division of Wildlife Resources. The sites are shown on Figure 1 and are located as follows: Station CW-1 was located on Christiansen Wash approximately 0.30 miles upstream from the confluence with Quitchupah Creek; QC-2 was located on Quitchupah Creek approximately 0.30 miles upstream from the confluence with Christiansen Wash; and Station QC-1 was located 0.15 miles downstream of the confluence of the two drainages. The two latter sites are located downstream of the Emery Mine's discharge pond outfalls 001 and 003. More descriptive information on site characteristics is given below in Section 3.0, as these sample sites were also used in the most recent sampling. Methodologies and equipment have also been essentially the same since the studies were initiated, and are outlined in Section 4.0.

The first macroinvertebrate study for Consol's DOGM permit compliance was conducted in September 2002 at the same time as the fish survey mentioned in Section 1.1 above. Of the three sample sites, Quitchupah Creek at QC-1 was in the best condition biologically (JBR 2003). Quitchupah Creek at QC-2 was essentially devoid of macroinvertebrates, and conditions in Christiansen Wash at CW-1 were in between the other two sites, by most of the biologic measures of stream health. Both the best conditions (QC-1) and the worst conditions (QC-2) were observed downstream of the pond outfalls, with the worst observed immediately downstream. Surface disturbances associated with the Emery Mine's 4th East portal, which is located upstream of CW-1, had not yet been constructed, so the somewhat impaired habitat at that location could not be attributed to mine-related conditions. The QC-1, QC-2, and CW-1 sites were rated as good-fair, fair-poor, and fair, respectively, based upon a tolerance index. Tolerance relates to the ability of a given species to withstand stressors such as poor water quality, high sediment levels, and extremes in water temperature. Healthier stream reaches can support the more sensitive (less tolerant) organisms. In addition, QC-1 had the most diverse macroinvertebrate population in 2002, which can also be an indicator of better habitat. Although even that site reflected habitat conditions that were less than optimum by many measures, it still showed some improvements within a very short distance downstream of QC-2.

Reports on the repeat studies conducted in September 2003 and September 2006 presented similar conclusions regarding the generally fair or poor aquatic habitat at these three stream sites (Baumann 2003, 2006). However, by 2006, there appeared to be small improvements in

certain measures at QC-2 and small declines at QC-1, which (if not simply a reflection of the random sampling variability) minimized the differences between the three sites minor (JBR 2006). Macroinvertebrate communities at all three sites during all three sampling events were made up of organisms that are quite pollution tolerant, with a noted absence of most or all of the more sensitive taxa.

3.0 2009 Site Descriptions

During the October 2009 macroinvertebrate study, QC-1, QC-2, and CW-1 were re-sampled. In addition, a fourth site was sampled in order to provide some information on upstream conditions. As shown on Figure 1, this site is located on Quitchupah Creek at the Highway 10 crossing, upstream of the Emery Mine and associated UPDES outfalls. This upstream reach is not included in the required aquatic habitat monitoring program because it only flows intermittently, in part due to irrigation withdrawals. In October, Consol elected to collect samples from the upstream reach (designated as QC-3) because flows were occurring and it was a good opportunity to assess "background" aquatic habitat.

All four study sites are described briefly below. The three Quitchupah Creek sites were subject to an exceedingly high flood event several weeks prior to the sample. This event did not appear to affect Christiansen Wash. The thunderstorm that caused the flash flood occurred in the upper Quitchupah Creek watershed; little or no rain fell in the area around the Emery Mine itself.

3.1 Quitchupah Creek below Confluence with Christiansen Wash (QC-1)

This station is on lower Quitchupah Creek, downstream of the confluence with Christiansen Wash. As in past years, macroinvertebrate sampling conditions are not ideal within the reach. The reach consists of a long deep run, with a steep rocky riffle that empties into a large pool. The substrate throughout the reach is composed of large cobbles that are cemented into clay particles, with no interstitial spaces or smaller particles between the cobbles. The vegetation in the area is mostly shrubby riparian with tamarisk (*Tamarix* spp), willow (*Salix* spp.), and rabbitbrush (*Chrysothamnus* spp.). Some grasses, rushes, greasewood *(Sarcobatus* spp.), and russian olive (*Elaeagnus angustifolia*) are also present. There was little evidence of the large flood in this reach at sampling; however, the riffle area seemed a bit more defined than in the past and may have been scoured by the flood. Figure 2 shows the reach looking upstream with the individual locations sampled (n = 3; labeled A – C). Figure 3 shows the reach looking downstream.

Figure 2. View Upstream at QC-1 with Individual Sample Locations Marked

Figure 3. View Downstream at QC-1

3.2 Quitchupah Creek below Mine Discharge (QC-2)

This station is located on Quitchupah Creek upstream of its confluence with Christiansen Wash, upstream of QC-1, and downstream of the UPDES groundwater discharges from the mine. This reach is characterized by long, relatively deep runs, with infrequent drops. Conditions in the reach appeared similar to past sampling. However, the reach showed extensive scouring from the large flood event and the channel was very deeply incised. As with QC-1, macroinvertebrate sampling conditions are less than ideal due to the substrate composition and deep, silty water. The substrate is noncohesive, and is composed almost entirely of very fine particles of sand and coarse sands mixed with clay. Minimal cobbles and woody debris are present, associated with the few drops. The riparian vegetation includes tall grasses, tamarisk, and abundant willow; the streamside area grades into a terrace of greasewood, rabbitbrush, and clematis (*Clematis* spp.). Individual samples were located in areas where the water was as shallow as possible, so that there was minimal water flowing over the surber sampler. Figure 4 shows the reach looking upstream with the individual sample locations shown (n = 3; labeled A – C). Figure 5 shows the reach looking downstream.

Figure 4. View Upstream at QC-2 with Individual Sample Locations Marked

Figure 5. View Downstream at QC-2

3.3 Quitchupah Creek at Highway 10 above Mine Discharge (QC-3)

This station is located on Quitchupah Creek upstream of the crossing with US Highway 10. The reach is upstream of all other sample locations, and upstream of the UPDES groundwater discharges from the mine. The reach has more suitable macroinvertebrate habitat than the other three stations. The reach is composed of long runs and shallow riffles. Substrate is composed of gravel and sand mixed with clay. Similar to QC-2, this site showed extensive scouring from the recent large flood event, with a more deeply entrenched channel than was observed at the same site prior to the flood. The riparian vegetation includes Fremont cottonwood (*Populus fremontii*), willow, tamarisk, and grasses. Individual samples were located in a long riffle located approximately 100 feet upstream of Highway 10. Figure 6 shows the reach looking upstream with the individual sample locations shown (n = 3; labeled A – C). Figure 7 shows the reach looking downstream.

Figure 6. View Upstream at QC-3 with Individual Sample Locations Marked

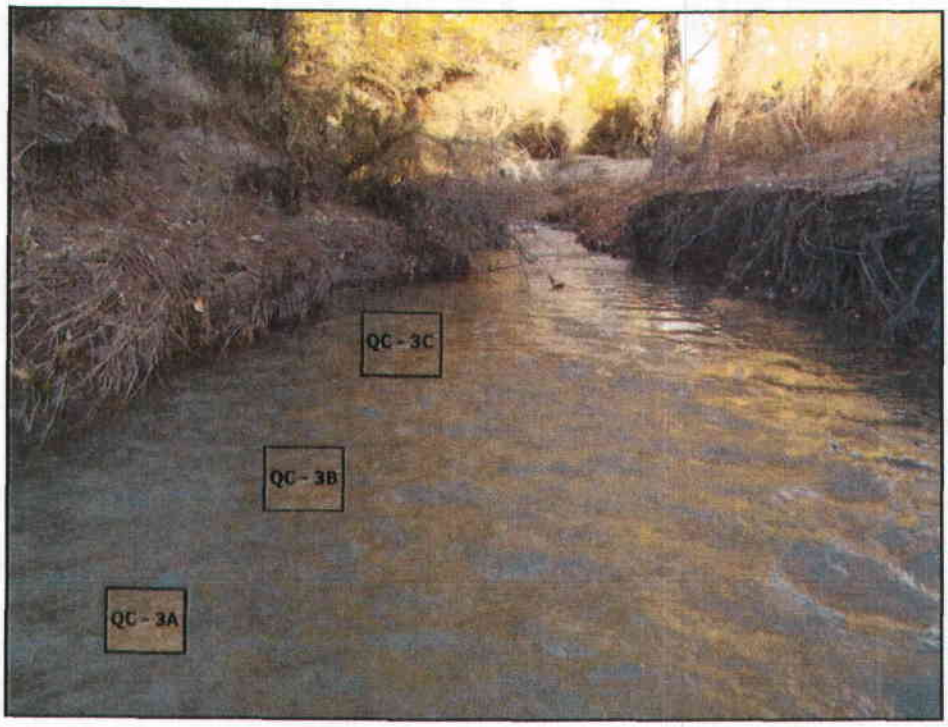


Figure 7. View Downstream at QC-3

3.4 Christiansen Wash near Mouth (CW-1)

This station is located on Christiansen Wash above the confluence with Quitchupah Creek. Christiansen Wash usually maintains perennial flow due to springs, and seasonally includes irrigation return flows; it is not influenced by UPDES mine water discharges. The channel is narrow and rocky in this area, flowing through exposed bedrock with little alluvial material present. The substrate is similar to QC-1, in that it is cemented with larger rock. Although the substrate is not ideal for macroinvertebrates (due to the lack of interstitial spaces) or macroinvertebrates sampling, the channel form is more conducive to sampling, with several small riffles. The riparian area is similar to QC-1 with larger banks of rush and grasses. The terrace habitat is narrower; few large trees are present. Individual samples were taken from the tail of a small riffle and are shown (n = 3; labeled A – C) in Figure 8. Figure 9 shows the reach looking upstream.

Figure 8. View Downstream at CW-1 with Individual Sample Locations Marked

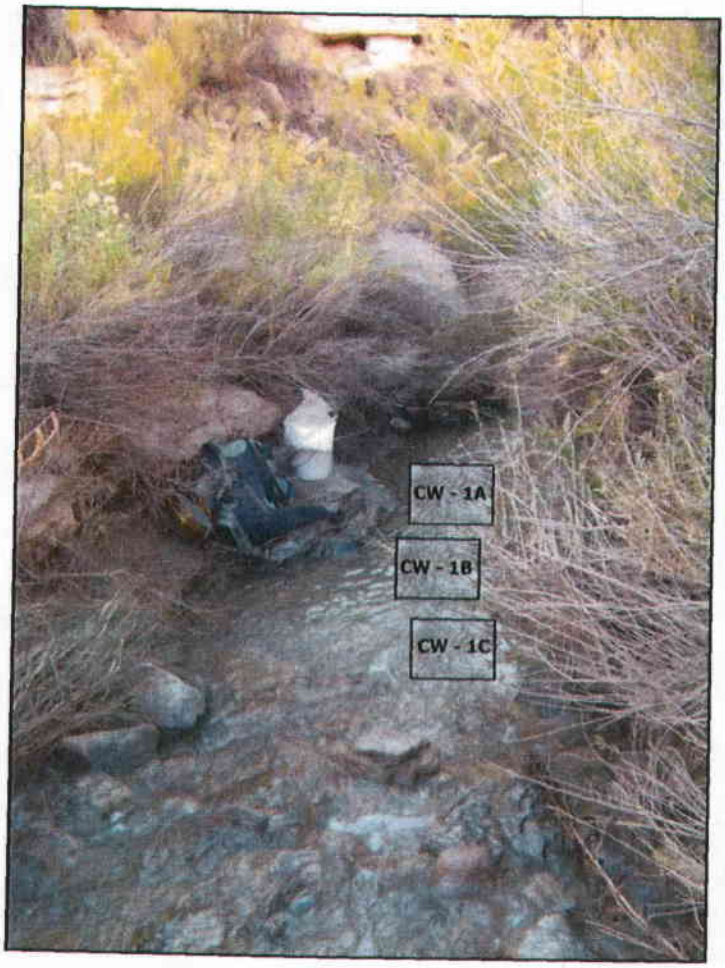
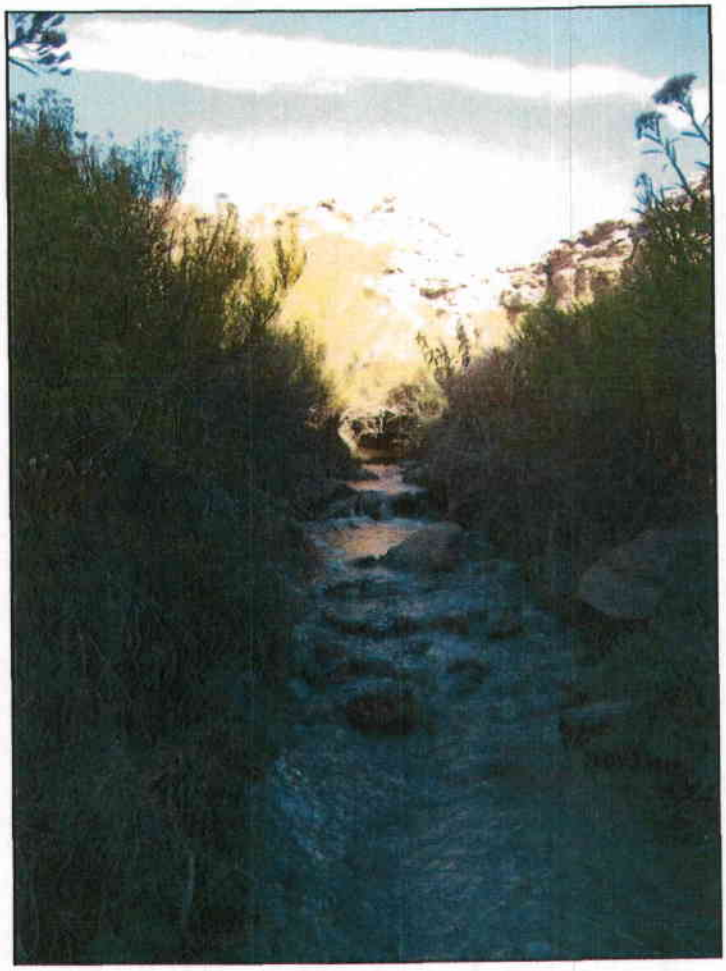


Figure 9. View Upstream at CW-1



4.0 Methods

The October 2009 macroinvertebrate study used equivalent sampling and analysis methods to those in prior years. Details are given in Sections 4.1 and 4.2 below.

4.1 Sample Collection Methods

The same field equipment and field procedures have been used for all sampling events since 2002, including the most recent samples collected in October 2009. A Surber net with a 1000 micron mesh net was used to collect three subsamples at each site. The Surber sampling methodology is described on EPA's website titled *Biological Indicators of Watershed Health* (http://www.epa.gov/bioindicators/html/box_2.html). For each subsample, a modified Surber sampler was placed on the creek bottom with its opening facing upstream so that the current

fills the collecting bag. Only the substrate that is within the $0.1m^2$ frame is sampled. Organisms are dislodged and carried into the collecting bag by the current. This process was continued until only small substrate material remained within the sampler frame. The small substrate was gently agitated by hand or a metal stake to a depth of three to four inches. The sampler was then removed and the contents of the net transferred to a pan. Debris was removed and the samples were washed by decanting and sieving. The washing was repeated until the sample was free of sediment and organic algae. The samples were rinsed from the sieve and placed in glass sample jars. The sample jars were completely filled with 95 percent ethanol so that the final concentration was between 75 and 90 percent. The container was slowly tipped horizontally and rotated to allow complete mixing of the ethanol and sample.

For the 2009 study, the collected and preserved samples were delivered to the National Aquatic Monitoring Center (the BugLab) in Logan, Utah for processing, taxonomic identification, and calculation of various statistics and metrics. The BugLab is a cooperative venture between the U.S. Bureau of Land Management (BLM) and Utah State University. Its focuses on processing macroinvertebrate samples, and processes a large percentage of the samples collected on federal land in the western U.S. The DWQ Monitoring Manual (DWQ 2006) specifies that macroinvertebrate samples be processed by the BugLab. The BugLab's methodology is described in Section 4.2.

4.2 Analysis Methods

As noted above, the National Aquatic Monitoring Center's BugLab identified the taxa found in the macroinvertebrate samples that JBR collected. In past years, a different processing/identification lab was used; however, any differences in methodology between the two labs would be inconsequential to the results. The BugLab processed the samples using methods similar to those recommended by the United States Geological Survey (Cuffney et al 1993, as referenced in Miller 2010). Subsamples at each site were composited at the lab, with identification and analysis conducted on the composite sample. Because each sample contained fewer than 600 individual organisms, 100 percent of the sample material was processed (if more than 600 organisms had been present per sample, a sub-sampling procedure would have been used). Generally, organisms were removed under a dissecting microscope at 10-30 power and separated into taxonomic orders. Organisms were then identified to a lower taxonomic level (family, genus, and/or species, as feasible). Once identified and counted, samples were placed in 20-ml glass scintillation vials with polypropylene lids in 70% ethanol, given a catalog number, and retained. The results report (Miller 2010), which is included as Appendix A, includes a complete list of taxa and the number of organisms by taxa.

The BugLab also provided data summaries and calculated various indices and metrics (Miller 2010), many of which will be discussed in the results discussion. These included: abundance,

total taxa richness, EPT (Ephemeroptera, Plecoptera, and Trichoptera) taxa richness, Ephemeroptera taxa richness, Plecoptera taxa richness, Trichoptera taxa richness, percent EPT abundance, percent Ephemeroptera abundance, percent Chironomidae abundance, intolerant taxa richness, percent tolerant organisms, Hilsenhoff Biotic Index, percent contribution of the dominant taxon, clinger taxa richness, percent clinger abundance, percent collector-filterer abundance, and percent scraper abundance. Descriptions of these individual metrics and their usefulness are provided below and are taken essentially verbatim from the BugLab's data report (Miller 2010). More detail and references for how calculations were made are also given in their report.

Taxa richness - Richness is a component and estimate of community structure and stream health based on the number of distinct taxa. Taxa richness normally decreases with decreasing water quality. In some situations organic enrichment can cause an increase in the number of pollution tolerant taxa. Taxa richness was calculated for operational taxonomic units and the number of unique genera, and families. The values for operational taxonomic units may be overestimates of the true taxa richness at a site if individuals were the same taxon as those identified to lower taxonomic levels or they may be underestimates of the true taxa richness if multiple taxa were present within a larger taxonomic grouping but were not identified. All individuals within all samples were generally identified similarly, so that comparisons in operational taxonomic richness among samples within this dataset are appropriate, but comparisons to other data sets may not. Comparisons to other datasets should be made at the genera or family level.

Abundance - The abundance, density, or number of aquatic macroinvertebrates per unit area is an indicator of habitat availability and fish food abundance. Abundance may be reduced or increased depending on the type of impact or pollutant. Increased organic enrichment typically causes large increases in abundance of pollution tolerant taxa. High flows, increases in fine sediment, or the presence of toxic substances normally cause a decrease in invertebrate abundance. Invertebrate abundance is presented as the number of individuals per square meter for quantitative samples and the number of individuals collected in each sample for qualitative samples.

EPT - A summary of the taxonomic richness and abundance within the insect Orders Ephemeroptera, Plecoptera, and Trichoptera (EPT). These orders are commonly considered sensitive to pollution (Karr and Chu 1998, as referenced in Miller 2010).

Percent contribution of the dominant family or taxon - An assemblage largely dominated (>50%) by a single taxon or several taxa from the same family suggests environmental stress. Habitat conditions likely limit the number of taxa that can occur at the site.

Shannon Diversity Index - Ecological diversity is a measure of community structure defined by the relationship between the number of distinct taxa and their relative abundances. The Shannon Diversity Index was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations.

Evenness - Evenness is a measure of the distribution of taxa within a community. Value ranges from 0-1 and approach zero as a single taxa becomes more dominant.

Clinger taxa - The number of clinger taxa have been found by Karr and Chu (1998, as referenced in Miller 2010) to respond negatively to human disturbance. These taxa typically cling to the tops of rocks and are thought to be reduced by sedimentation or abundant algal growths.

Long-live taxa - The number of long-lived taxa was calculated the number of taxa collected that typically have 2-3 year life cycles. Disturbances and water quality and habitat impairment typically reduces the number of long-lived taxa Karr and Chu (1998, as referenced in Miller 2010).

Biotic indices - Biotic indices use the indicator taxa concept. Taxa are assigned water quality tolerance values based on their tolerance to pollution. Scores are typically weighted by taxa relative abundance. In the U.S. the most commonly used biotic index is the Hilsenhoff Biotic Index (Hilsenhoff 1987, Hilsenhoff 1988, as referenced in Miller 2010). The USFS and BLM throughout the western U.S. have also frequently used the USFS Community Tolerance Quotient.

Hilsenhoff Biotic Index - The Hilsenhoff Biotic Index (HBI) summarizes the overall pollution tolerances of the taxa collected. This index has been used to detect nutrient enrichment, high sediment loads, low dissolved oxygen, and thermal impacts. It is best at detecting organic pollution. Families were assigned an index value from 0- taxa normally found only in high quality unpolluted water, to 10- taxa found only in severely polluted waters. Family level values were taken from Hilsenhoff (1987, 1988, as referenced in Miller 2010) and a family level HBI was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations. Sampling locations with HBI values of 0-2 are considered clean, 2-4 slightly enriched, 4-7 enriched, and 7-10 polluted. Rather than using mean HBI values for a sample, taxon HBI values can also be used to determine the number of pollution intolerant and tolerant taxa occurring at a site. In this report, taxa with HBI values ≤ 1 were considered intolerant clean water taxa and taxa with HBI values ≥ 9 were considered pollution tolerant taxa. The number of tolerant and intolerant taxa and the abundances of tolerant and intolerant taxa were calculated for each sampling location.

USFS community tolerant quotient - Taxa are assigned a tolerant quotient (TQ) from 2 - taxa found only in high quality unpolluted water, to 108 - taxa found in severely polluted waters.

The dominance weighted community tolerance quotient (CTQd) was calculated. Values can vary from about 20 to 100, in general the lower the value the better the water quality.

Functional feeding group measures - A common classification scheme for aquatic macroinvertebrates is to categorize them by feeding acquisition mechanisms. Categories are based on food particle size and food location, e.g., suspended in the water column, deposited in sediments, leaf litter, or live prey. This classification system reflects the major source of the resource, either within the stream itself or from riparian or upland areas and the primary location, either erosional or depositional habitats. The number of taxa and individuals of the following feeding groups were calculated for each sampling location.

Shredders - Shredders use both living vascular hydrophytes and decomposing vascular plant tissue - coarse particulate organic matter. Shredders are sensitive to changes in riparian vegetation. Shredders can be good indicators of toxicants that adhere to organic matter.

Scrapers - Scrapers feed on periphyton - attached algae and associated material. Scraper populations increase with increasing abundance of diatoms and can decrease as filamentous algae, mosses, and vascular plants increase, often in response to increases in nitrogen and phosphorus. Scrapers decrease in relative abundance in response to sedimentation and higher levels of organic pollution or nutrient enrichment.

Collector-filterers - Collector-filterers feed on suspended fine particulate organic matter. Collector-filterers are sensitive to toxicants in the water column and to pollutants that adhere to organic matter.

Collector-gatherers - Collector-gatherers feed on deposited fine particulate organic matter. Collector-gatherers are sensitive to deposited toxicants.

Predators - Predators feed on living animal tissue. Predators typically make up about 25% of the assemblage in stream environments and 50% of the assemblage in still-water environments.

Unknown feeding group - This category includes taxa that are highly variable, parasites, and those that for which the primary feeding mode is currently unknown.

In addition, JBR used the BugLab's data set to calculate several other metrics that various literature sources consistently indicate as being potentially useful for macroinvertebrate analysis. These are described below.

Ratio of Specialist Feeders to Generalist Feeders - Specialist feeders include shredders and scrapers and generalist feeders include filterers and gatherers. Generalists are typically more tolerant to environmental stressors, so their proportion often increases in response to

degraded water quality or stream habitat. This ratio has been used successfully to assess impacts from mining (Mize and Deacon 2002).

Ratio of EPT to Chironomidae - Ideally, communities have a near-even distribution among all four of these major groups. The Chironimid Family, in general, is more tolerant than most of the taxa in the Ephemeroptera, Plecoptera, and Trichoptera orders (Barbour et al 1999). Therefore, this ratio can indicate environmental stress when it shows disproportionate numbers of Chironomidae (Davis et al 2001).

Ratio of Baetidae to all Ephemeroptera – Although Ephmeroptera is considered to be an order that is generally sensitive to pollution, its Baetidae family is more tolerant to pollution, so when its proportion increases, water quality often decreases (EPA 2009). The same can be said for the Hydropsychidae family within the Trichoptera order (EPA 2009), so the **Ratio of Hydropsychidae to all Trichoptera** is also useful for detecting poor water quality.

Percent Heptageniidae, Chloroperlidae, and *Rhyacophila*; Ratio of Heptageniidae to all Ephemeroptera – Similarly to the above-noted tolerant taxa, Heptageniidae, Chloroperlidae, and *Rhyacophila* were considered by Mize and Deacon (2002) when assessing elevated trace metals and other mining related impacts. Heptageniidae, Chloroperlidae, and *Rhyacophila* were chosen due to their apparent sensitivity to such elements, thus their absence can indicate poor water quality.

As with analysis of any set of macroinvertebrate data, multiple metrics will be relied upon to describe site conditions and trends in regard to aquatic habitat. Whether looking at data from an individual sample, comparing data from different sites for a spatial assessment, or examining temporal changes, no one metric can ever be presumed to tell the whole story. There is generally some natural variability in community makeup, and some metrics are better at ascertaining specific conditions than others. For these reasons, most researchers use a variety of metrics and would expect to see similar indications in several of them before making a conclusion regarding impact to a given site. In contrast, there is some redundancy among metrics because they use at least some of the same data. EPA (Barbour et al 1999) and others have developed techniques for combining various metrics into a single index, and also for ranking sites based upon individual metrics in a way that a potentially impacted site can be compared to reference sites (known to be unimpacted). However, there is not a large enough data set available to make this type of analysis meaningful for this study. Further, the natural variability of any of these indices is not known, so it is difficult to determine whether a difference between sites is due to degraded conditions or simply a reflection of natural variability. While a data set conducive to statistical handling (assigning confidence limits, assessing significance, etc.) would be ideal, and may be available as sampling continues in the future, those types of data are not currently available.

5.0 Results and Discussion

The results report that was prepared by the BugLab (Miller 2010) is provided in full as Appendix A. That report includes the raw data (taxonomic lists of organisms identified, counts, etc.) as well as numerous tables of various metrics and indices that the lab calculated based upon the data. Many of these metrics and indices were described in Section 4.2 above. The report (Miller 2009) does not discuss or interpret the study results, and this section focuses on those tasks, beginning with a brief summary of the data and a general discussion of the results.

A total of 26 operational taxonomic units (OTU) were identified in the 4-sample set (OTUs are used as a measure because of the variation in taxonomic levels to which identification is made). There were members of 20 families and 13 genera present within the combined sample set, and many insect orders commonly found in macroinvertebrate communities were represented in the sample set. While representatives of the Coleoptera, Diptera, Ephemeroptera, Odonata, and Tricoptera orders were present in the sample set as a whole, it is notable that there was a complete absence of members of the Plecoptera Order. Non-insect orders were also represented. As shown on Figure 10, there were considerable differences among the four sites, reflected in part by the varying percentages that the individual orders contributed to the macroinvertebrate community at each site. These spatial differences will be discussed further in Section 5.1.

The 2009 results generally indicate that none of the four stream sites was in optimum shape at the time of sampling. While Quitchupah Creek had experienced the recent high flood flows that could have temporarily upset the macroinvertebrate community by disrupting substrate, Christiansen Wash did not appear to have been affected by the flooding. Therefore, the overall poor conditions at all sites cannot be completely explained by that recent flood event. Similarly, the upstream sites on both creeks are not affected by Consol's discharge, so overall poor conditions do not totally reflect that input. However, as will be discussed below, by most metrics, conditions at QC-2 are worse than elsewhere, but improvement is noted within a short distance downstream at QC-1.

5.1 Spatial Variation in 2009 Samples

Numerous metrics and indices have been calculated and graphed using data obtained from the October 2009 sampling in Quitchupah Creek and Christiansen Wash. Graphs provide an easy visual means to analyze the spatial variation in the macrovinvertebrate communities that were sampled. While all four sites are in relatively close proximity, they are subject to varying influences on their flow rate, water quality, and physical habitat. QC-3 is located upstream of any potential impact from Consol's Emery Mine, either due to the mine's surface facilities or to the discharge of intercepted groundwater. CW-1 is located upstream of any discharge of intercepted groundwater, but downstream of a portion of Consol's surface facilities. QC-2 is

located immediately downstream of Consol's groundwater discharge outfalls, thus its water quality can be substantially different than the water quality at the upstream Quitchupah Creek site. QC-1 is the furthest downstream site, where stream flows and water quality are essentially a mixture of those found at QC-2 and CW-1.

As shown in Figure 10, there were considerable differences in community composition among the four sites, based upon the percentage that the individual orders represented contributed to the total abundance at each site. Non-insect orders (primarily of the subclass Oligochaeta) dominated the sample at QC-2 at more than 70 percent, but were present in only very small percentages at the other Quitchupah Creek sites and made up less than 25 percent of the total in the Christiansen Wash sample. Oligochaeta include aquatic worms that are generally found in large numbers at degraded sites. Trichoptera (caddisfly) was the dominant order at CW-1, Diptera (true flies) was the dominant order at QC-3, and those orders were co-dominant at QC-1. Some members of both of these two orders can be sensitive to pollutants and others can be tolerant.

Three measures of richness are shown in Figure 11a: total OTU richness, family richness, and EPT taxa richness. As noted above in Section 4.2, richness can provide an estimate of community structure and stream health; it normally decreases with decreasing water quality. Conversely, in some situations organic enrichment can cause an increase in the number of pollution tolerant taxa, thus increasing some measures of richness. Richness measured using only EPT taxa, which are generally less tolerant to pollution, can be used to verify whether the overall richness is reflecting stream health. As indicated by Figure 11a, all three richness measures indicate that QC-1 is the richest site. CW-1's OTU and family richness is similar to those measured at QC-1, but appear to be influenced by more pollutant tolerant taxa, as indicated by the lower EPT richness at CW-1, as compared to QC-1. Based on richness measures, aquatic habitat at both QC-2 and QC-3 appears to be more degraded than the other two sites.

Evenness expresses a characteristic similar to richness. Rather than simply being a measure of the number of different taxa in a community, it shows how those taxa are distributed. Ranging between 0 and 1, a low evenness indicates a good distribution of taxa and a high evenness indicates dominance of a single taxa. As shown on Figure 11b, all four sites showed moderate evenness, though QC-3's somewhat higher evenness reflected a poorer distribution than was found at the other three sites. Specifically, QC-1, QC-2, and CW-1 all had evenness values between 0.53 and 0.55, and QC-3 had an evenness of 0.70.

Looking more closely at taxa dominance, as expressed on Figure 11c, QC-2 had the highest percent contribution by the dominant family, with slightly over 70 percent. In this case, however, the dominant taxa was only identified to subclass, not family, so these results could

be somewhat skewed. Nonetheless, the previously mentioned aquatic worms (Oligochaeta) dominated the sample from QC-2. At slightly less than 60 percent, the Chironimidae family dominated QC-3. Hydropsychidae was the dominant family at both QC-1 and CW-1, comprising 48 and 55 percent, respectively. As noted above, when a community has greater than 50 percent of its members within a single family, environmental stress is suggested. This is the case at three of the four sites sampled here, with the fourth only minimally less than 50 percent. Notably, all three of these taxa (Oligochaeta, Chironimidae, and Hydropsychidae) are generally considered to be tolerant to pollution, which further supports a conclusion that all four sites are under environmental stress. This stress is at least in part due to factors unrelated to mining, which could include the recent flooding, generally poor substrate habitat, and/or other physical or water quality characteristics.

Shannon's Diversity Index, which is a measure of variety in the macroinvertebrate community, was fairly low at all four sites, as shown by Figure 11d. Healthier stream sites usually support a more diverse macroinvertebrate community than stressed sites. QC-2 had the lowest Shannon's value at 1.03, followed closely by QC-3 with 1.26, and then by QC-1 and CW-1 (1.54 and 1.53, respectively). For comparison, the average Shannon's Diversity Index in reference site streams in Wyoming ranged from 2.45 to 3.14 (Gregg and Stednick 2000).

All of the measures described above, which in some way or the other reflect variety in the macroinvertebrate community, suggest that Quitchupah Creek and Christiansen Wash are in less than ideal condition. Further, they generally indicate that QC-2 and QC-3 are in poorer shape than either QC-1 or CW-1. Other metrics, discussed below will help to refine this analysis.

HBI, as noted in Section 4.2, is a tolerance index that has been used to detect numerous types of water quality problems. But, it was developed - and is best used - for detecting organic pollution and enriched waters. With a possible range of between 0 and 10, an HBI of 0 to 2 represents clean water, 7-10 represents polluted waters, and in between represents intermediate levels of pollution. Figure 12a shows HBIs for all four stream sites. Of particular interest is that QC-2, which is immediately downstream of the large influx of discharged mine water, is the cleanest (with an HBI of 1.28) of the four sites, as measured by HBI. The other two Quitchupah Creek sites (with HBIs of around 5) are classed as being enriched and CW-1 fell into the "slightly enriched" category, with an HBI of 3.44. The HBI-designated clean water at QC-2 is in large part due to the presence of a couple of members of the Gomphidae family (in the Odonata or dragonfly order). The HBI method ranks this family as very sensitive to organic enrichment. It may be that the mine discharge water is actually improving water quality by dilution in regard to nutrients or other organics caused by agricultural land uses in the upstream waters. Or, it may simply be due to the inherent variability in sampling. As stated

before, no single metric should be used in isolation to develop conclusions regarding stream health.

The other tolerance index that was calculated by the BugLab (Miller 2010) is the CTQd, which uses a different means of establishing tolerance. This index is a U.S. Forest Service-developed index and is more commonly used in Utah and throughout the west than the HBI. By this measure (see Figure 12b), all four sites were found to be quite polluted, with CTQds ranging from 100 at QC-3 to 105 at QC-2. While tolerance quotients used in this index can range from 2 (most sensitive organisms) to 108 (most tolerant organisms), the CTQd index itself rarely exceeds 100. These values are in direct contrast to those derived using the HBI.

In addition to tolerance indices such as the HBI and CTQd discussed above, the presence or absence of specific taxa also provide evidence regarding stream health. As noted in Section 4.2, members of the Ephemeroptera, Plecoptera, and Trichoptera Orders are generally sensitive to pollution (though there are exceptions within those orders, as will be discuss below). Figure 12c shows the percent of EPT represented in the samples. By this measure, QC-2 is in much poorer health than the other sites, with EPT taxa making up less than 8 percent of the total number of organisms. CW-1 had the highest percentage, with EPT taxa of 57 percent, and QC-1 was close at 51 percent. About 38 percent of the taxa at QC-3 were EPT organisms.

Chironomids, a family in the Diptera Order, are generally tolerant of pollutants or other poor conditions. Figure 12c also shows the percentage of Chironomids (including Chironominae and Orthocladiinae) represented in each sample. Conversely to the EPT percentages, a higher percentage of Chironomids indicates poorer stream health. By this measure, alone, the sites would be ranked from worst to best as follows: QC-3, QC-1, QC-2, and CW-1.

Another way to look at EPT taxa and Chrionomids is by ratio. As noted above in Section 4.2, the ratio of EPT to Chironomidae can indicate environmental stress when it shows disproportionate numbers of Chironomidae (Davis et al 2001). Figure 12d clearly shows that Christiansen Wash appears much less stressed than any of the Quitchupah Creek sites, by this measure.

The ratios of Baetidae to all Ephemeroptera, and of Hydropsychidae to all Trichoptera, are shown in Figure 13a. All four sites had very high ratios, which can indicate poor water quality as discussed in Section 4.2, with the exception of Baetidae:Ephemeroptera at QC-1. At this site, *Tricorythodes*, in the Leptohyphidae family were present in significant numbers, which greatly reduced the ratio of Baetidae. There were no Ephemeroptera (and thus no Baetidae) at CW-1.

The metrics of percent Heptageniidae, Chloroperlidae, and *Rhyacophila* were also indicative of poor water quality at all four sites. There were no members of these indicator taxa at any of the sites. Because these taxa are generally sensitive to pollutants, their absence can indicate poor water quality (Mize and Deacon 2002; Kiffney and Clements 1994). However, it could also

be that the stream types/general macroinvertebrate habitat available in Quitchupah Creek and Christiansen Wash are simply not conducive to these taxa.

Last, feeding group measures can be used to assess the overall habitat quality of the sampled sites, as well as any spatial differences among them. These data also support the previously stated conclusion that none of the sites are in optimum condition. The proportion of shredders at all sites was quite low, ranging from less than 3 percent at CW-1 to 0 percent at QC-2. There were no scrapers sampled at any of the sites. The ratio of specialist feeders (shredders and scrapers) to generalist feeders (filterers and gatherers) was similarly extremely low, though again CW-1 was in slightly better shape than the Quitchupah Creek sites. Because generalists are typically more tolerant to environmental stressors, the ratios for this measure also reflect poor habitat or water quality.

Overall, these measures indicate that QC-2 is in the worst condition of the four study sites. This site is the site most likely to be affected by Consol's UPDES discharge points, but it is also the site that has the poorest physical habit (slow moving water, very fine substrate, etc.). There is a marked improvement downstream at QC-1, but whether that is attributable to an improvement in habitat or water quality (or simply sampling variation) is not known. None of the four sites, including the one completely unaffected by Consol's Emery Mine (QC-3) is in optimum, or even good, condition, based upon the observed macroinvertebrate communities that were sampled in 2009.

5.2 Temporal Variations

As previously mentioned, macroinvertebrate studies were conducted in 2002, 2003, and 2006, when samples were collected at QC1, QC-2, and CW-1 (QC-3 was sampled for the first time in 2009). Results from those studies can be compared with results from the 2009 study.

Data from all four study years (Baumann 2002, 2003, 2006; Miller 2010) reflect generally unfavorable habitat for macroinvertebrates in both Quitchupah Creek and Christiansen Wash. Further, there is little concrete evidence to indicate either degrading or improving conditions between 2002 and 2009. As with the 2009 data set, no members of the order Plectoptera were previously collected at any of the sampled sites. The sensitive taxa mentioned in section 5.2 as lacking in 2009 (Heptageniidae, Chloroperlidae, and *Rhyacophila*), were also lacking in previous years. And, within the generally sensitive Ephemeroptera and Tricoptera orders, the more tolerant Baetidae and Hydroppsychidae families have been dominant in all three sampling events prior to 2009. Further, feeding group measures consistently reflect poor habitat conditions over the years, with 2002 and 2003 completely lacking in either shredders or scrapers, and 2006 sampling reflecting only a few shredders organisms (members of the *Tipula* genus within the order Diptera) collected at CW-1. Figures 13a and 13b provide additional indications of unfavorable water quality and/or poor habitat. The CTQd measure, shown in

Figure 13a, reflects a macroinvertebrate community dominated by tolerant organisms at all sites and in all four years of sampling. Though variable, Shannon's Diversity was quite low at all sites and during all four years, with differences most likely due to natural fluctuations or inherent sampling variability.

However, in general, the data collected over four different sampling episodes have consistently reflected somewhat poorer conditions at QC-2 than at the other two sites.

6.0 Conclusions

Results of four episodes of macroinvertebrate sampling in both Quitchupah Creek and Christiansen Wash since 2002 reflect less than ideal water quality and/or habitat conditions. While in general, the data have consistently reflected poorer conditions at QC-2 than at the other sites, this cannot be definitively attributed to discharge from the Emery Mine. By many of the same measures, conditions in 2009 at QC-3, upstream from the Emery Mine, were similarly poor. However, at QC-1, which is downstream of QC-2 and the Christiansen Wash site (CW-1), the macroinvertebrate community generally appears to have recovered from whatever perturbations drove the conditions at QC-2 (though the term recovery is relative, since overall conditions at CW-1 and QC-3 were still less than ideal.

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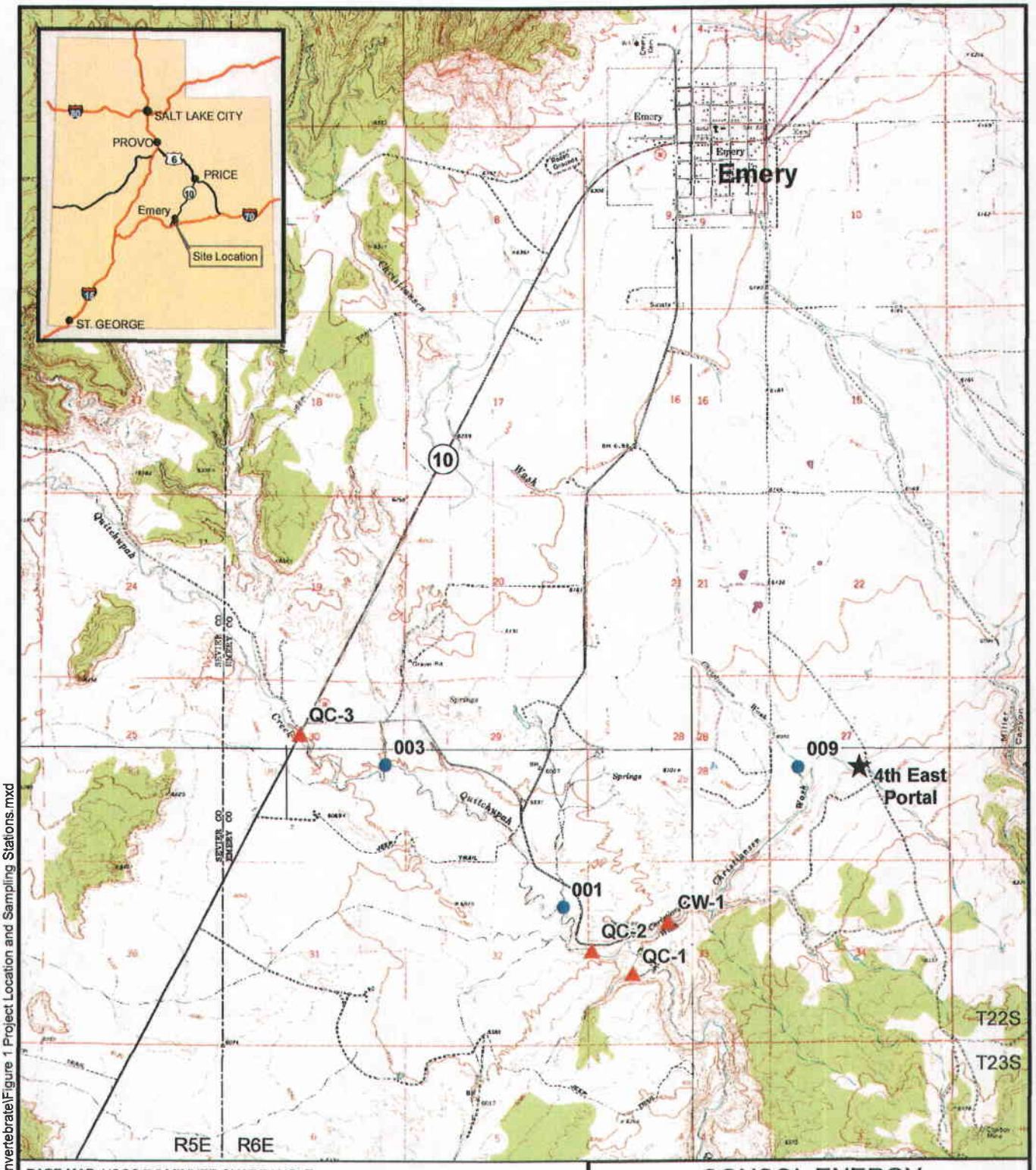
FIGURES



BASE MAP: USGS 7.5 MINUTE QUADRANGLE

Legend

- Macroinvertebrate Stations
- UPDES Discharge Locations

4,000 2,000 0 4,000 Feet

N

CONSOL ENERGY
Emery Mine

FIGURE 1
PROJECT LOCATION AND SAMPLING STATIONS

JBR

DRAWN BY	DATE DRAWN
KK/cp	04/08/10
SCALE	1:48,000 1 in = 4,000 ft

drawings\Consol Emery Mine\Macroinvertebrate\Figure 1 Project Location and Sampling Stations.mxd

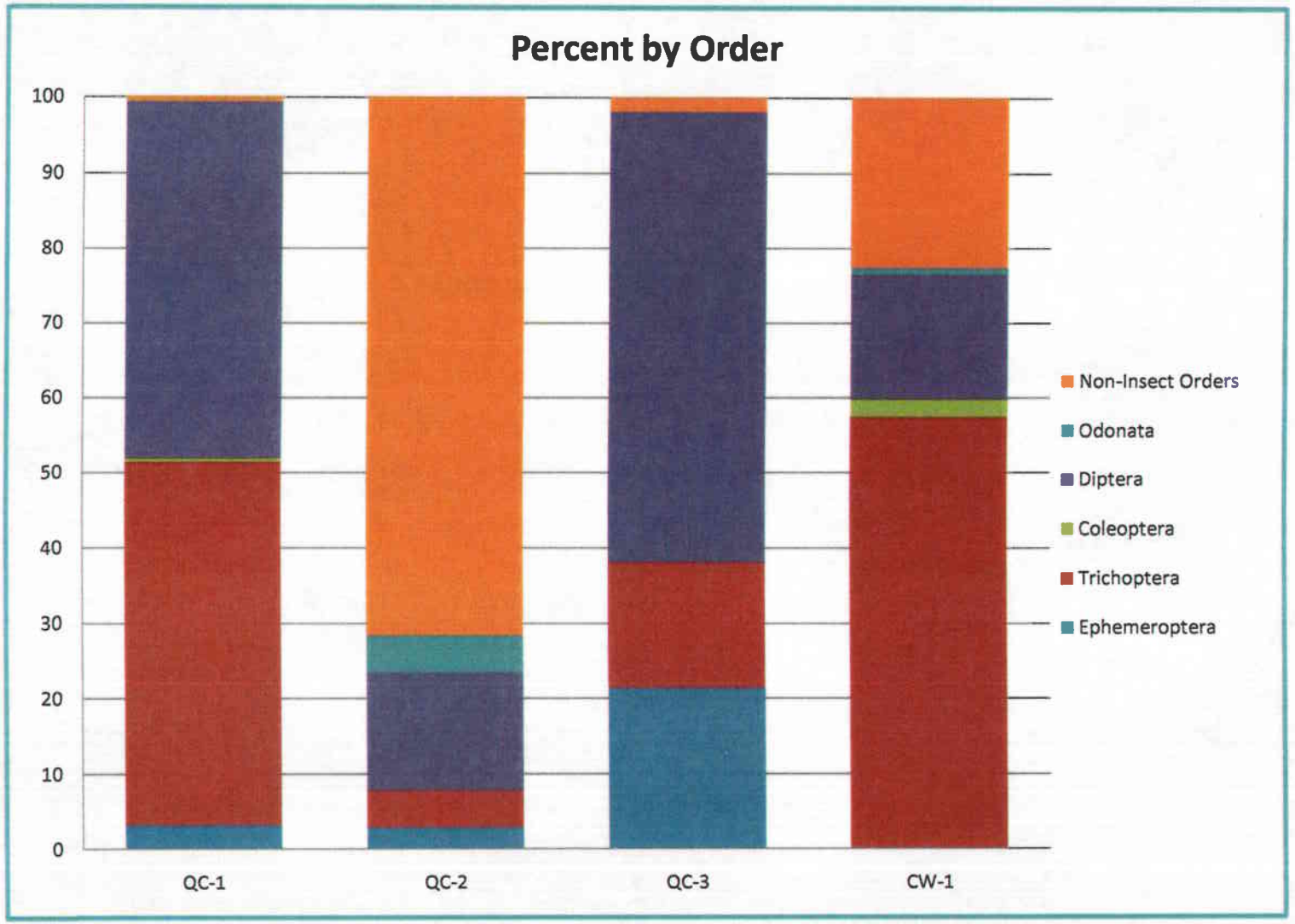
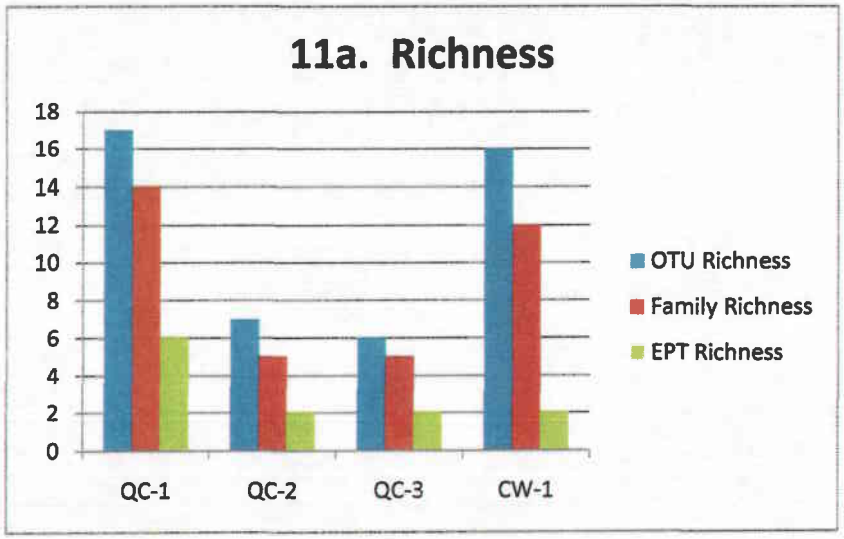
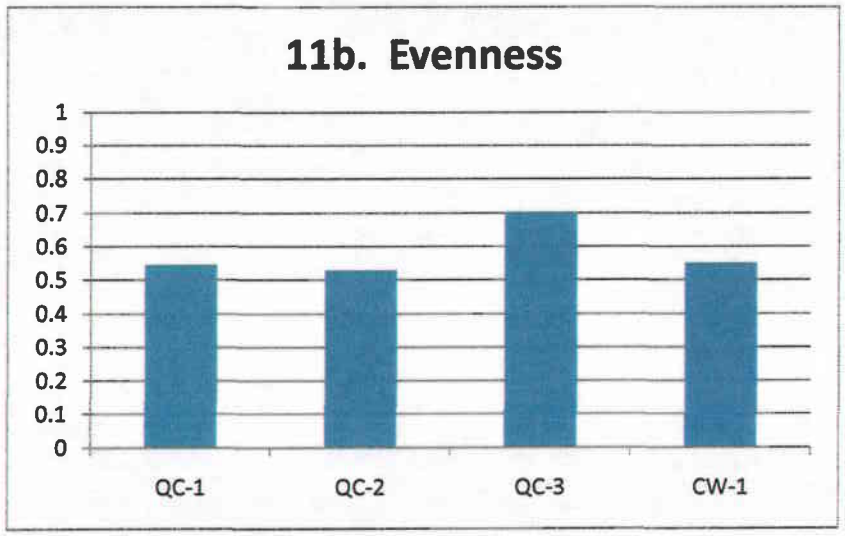
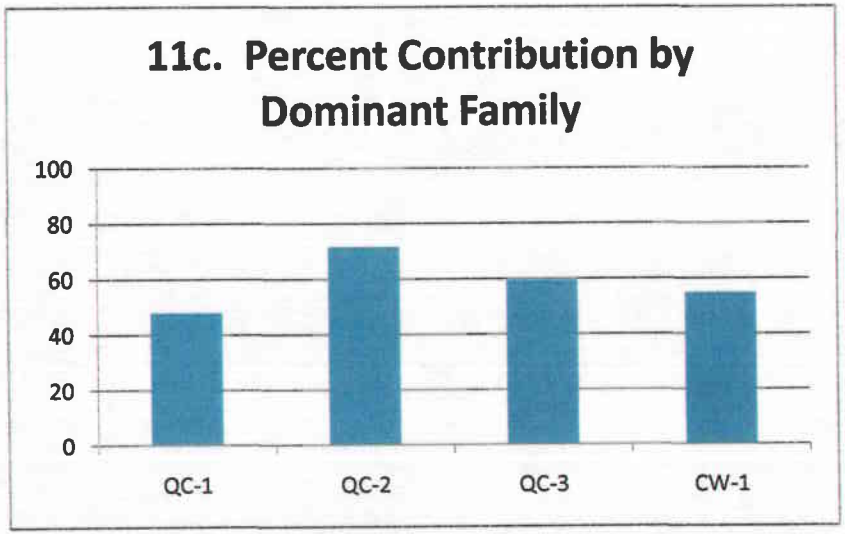


FIGURE 10 Aquatic Community Composition in Quitchupah Creek and Christiansen Wash







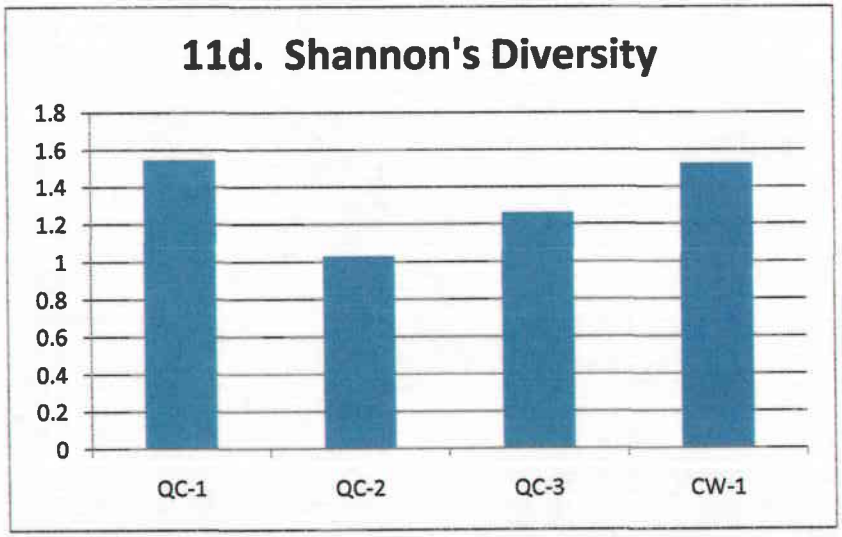
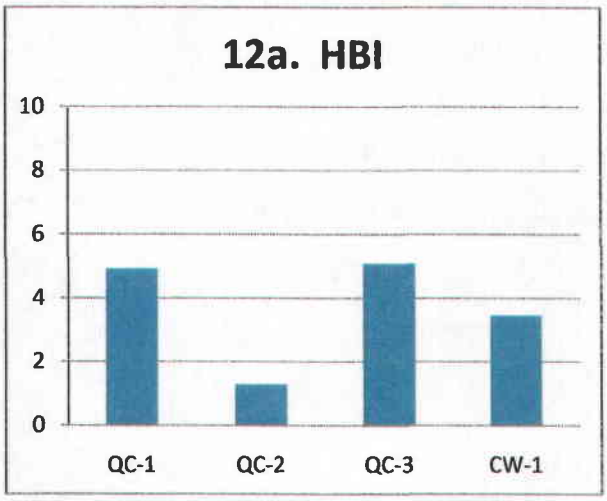
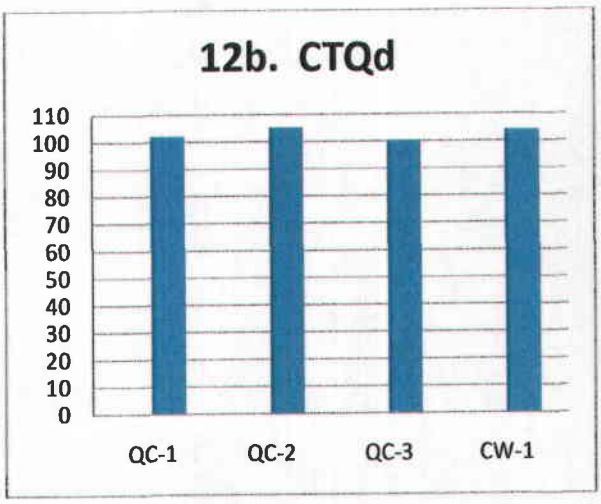
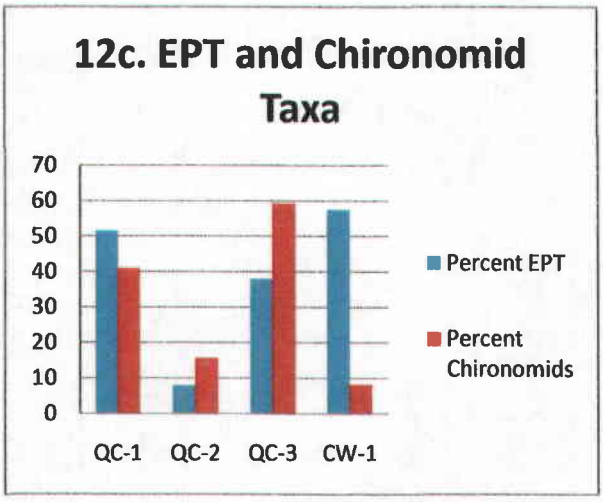
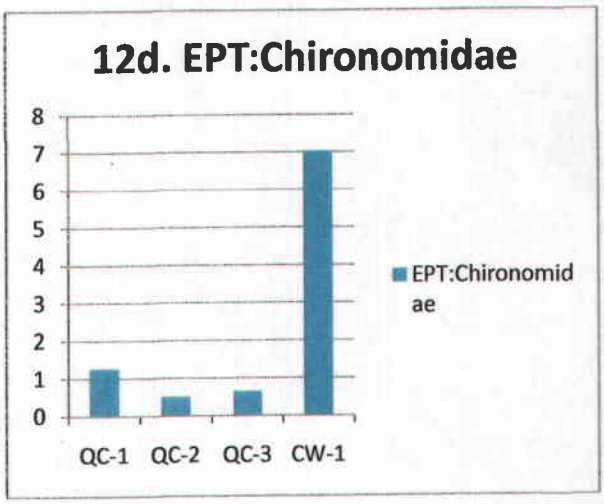


FIGURE 11 Measures of Diversity and Dominance









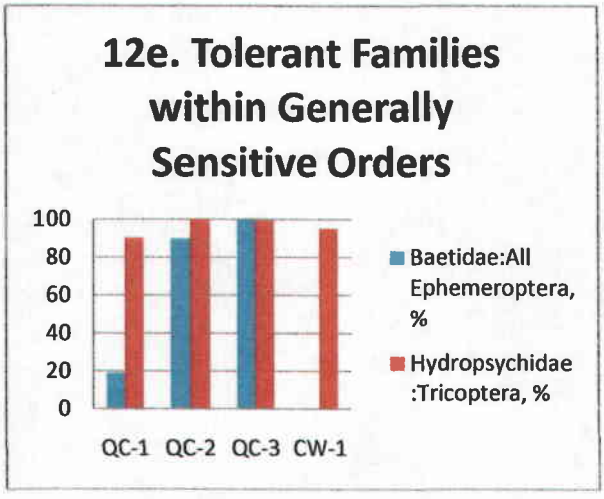
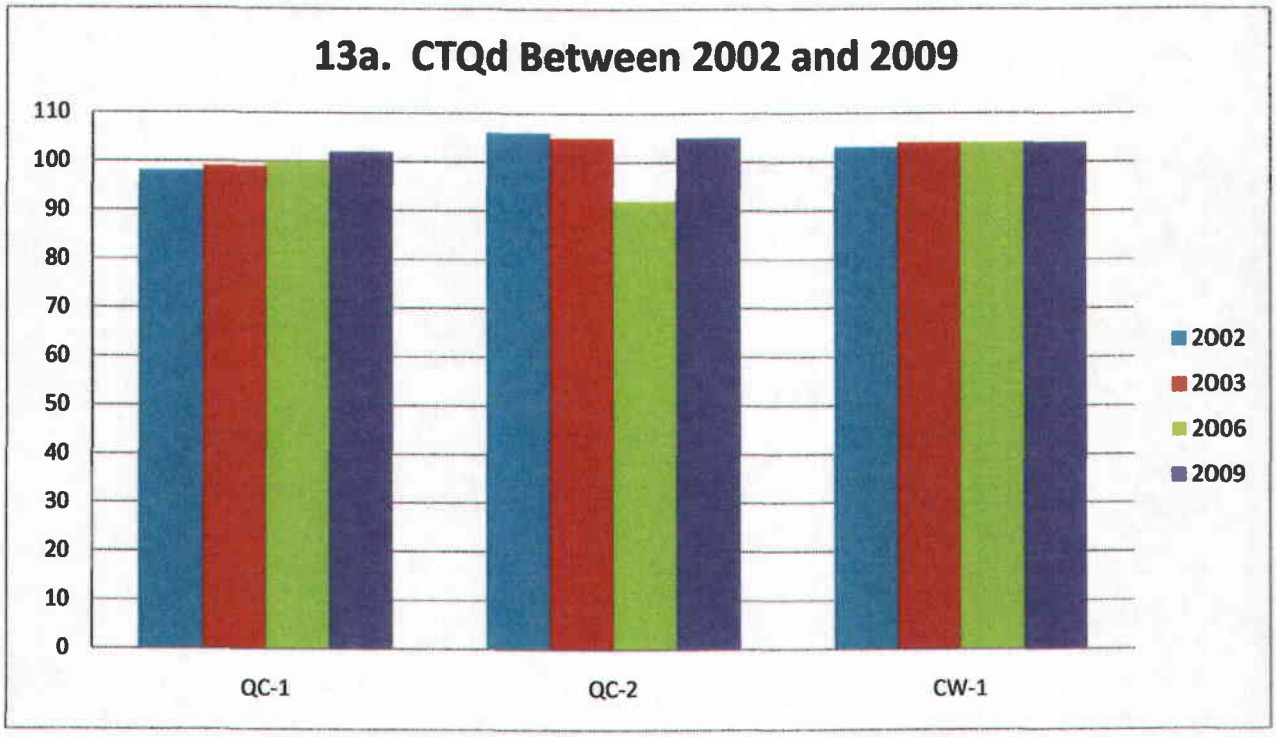


FIGURE 12 Measures of Tolerance



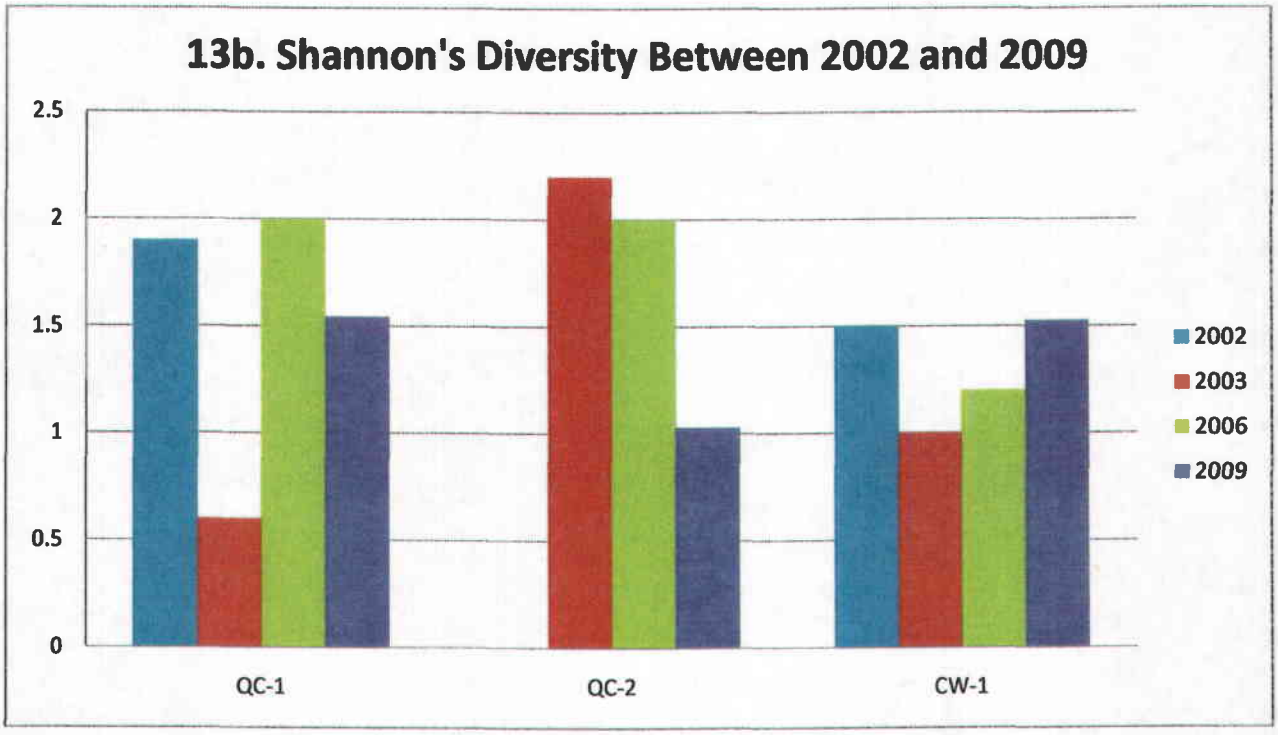


FIGURE 13 Tolerance & Diversity -- Temporal Changes

APPENDIX A BUGLAB REPORT

Aquatic invertebrate report for samples collected by JBR Environmental Consultants

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13 January 2010

Sampling Locations

Table 1. Sampling site locations

Station	Location	Latitude	Longitude	Elevation (meters)
CW-1	Christansen Creek, Emery County, Utah	38.860	-111.251	1815
QC-1	Quitchupah Creek, Emery County, Utah	38.855	-111.256	1788
QC-2	Quitchupah Creek, Emery County, Utah	38.857	-111.260	1799
QC-3	Quitchupah Creek, Emery County, Utah	38.874	-111.290	1832

Methods

Field sampling

Samples were collected on October 13, 2009 (Table 2). Aquatic invertebrates were collected quantitatively from riffle or run habitats with a Surber net with a 500 micron mesh net.

Laboratory methods

General procedures for processing invertebrate samples were similar to those recommended by the United States Geological Survey (Cuffney et al. 1993) and are described in greater detail and rationalized in Vinson and Hawkins (1996). Samples were sub-sampled if the sample appeared to contain more than 600 organisms. Sub-samples were obtained by pouring the sample into an appropriate diameter 500 micron sieve, floating this material by placing the sieve within an enamel pan partially filled with water and leveling the material within the sieve. The sieve was then removed from the water pan and the material within the sieve was divided into two equal parts. One half of the sieve was then randomly chosen to be processed and the other half set aside. The sieve was then placed back in the enamel pan and the material in the sieve again leveled and split in half. This process was repeated until approximately 600 organisms remained in one-half of the sieve. This material was placed into a Petri dish and all organisms were removed under a dissecting microscope at 10-30 power. Additional sub-samples were taken until at least 600 organisms were removed, All organisms within a sub-sample were removed, and separated into taxonomic Orders. When the sorting of the sub-samples was completed, the entire sample was spread throughout a large white enamel pan and searched for 10 minutes to remove any taxa that might not have been picked up during the initial sample sorting process. The objective of this "big/rare" search was to provide a more complete taxa list by finding rarer taxa that may have been excluded during the sub-sampling process. These rarer bugs were placed into a separate vial and the data entered separately from the bugs removed during the sub-sampling process. All the organisms removed during the sorting process were then identified using appropriate identification keys (see literature cited list for list of taxonomic resources used). Once the data had been entered into a computer and checked, the unsorted portion of the sample was discarded. The identified portion of the sample was placed in a 20 ml glass scintillation vial with polypropylene lids in 70% ethanol, given a catalog number, and retained. In this report, metrics were calculated using data from the sub-sampled and big/rare portions of the sample. Abundance data are presented as the estimated number of individuals per square meter for quantitative samples and the estimated number per sample for qualitative samples.

Table 2. Field comments and laboratory processing information.

Sample	Station	Sampling Date	Habitat Sampled	Sampling Method	Sampling Area Sqmts	% of sample processed	Number of individuals identified	Field Comments
141702	QC-1	10/13/2009	Riffle	Surber net	0.28	100	507	
141703	QC-2	10/13/2009	Riffle	Surber net	0.28	100	39	
141704	QC-3	10/13/2009	Riffle	Surber net	0.28	100	108	
141705	CW-1	10/13/2009	Riffle	Surber net	0.28	100	221	

Data summarization

A number of metrics or ecological summaries can be calculated from an aquatic invertebrate sample. A summary and description of commonly used metrics is available in Barbour et al. (1999, http://www.epa.gov/owow/monitoring/rbp/index.html#Table%20of%20Contents) and Karr and Chu (1998). Both of these publications suggest use of the following metrics for assessing the health of aquatic invertebrate assemblages: Total taxa richness, EPT taxa richness, Ephemeroptera taxa richness, Plecoptera taxa richness, Trichoptera taxa richness, % EPT abundance, % Ephemeroptera abundance, % Chironomidae abundance, Intolerant taxa richness, % tolerant organisms, Hilsenhoff Biotic Index, % contribution of the dominant taxon, clinger taxa richness, % clinger abundance, % collector-filterer abundance, and the % scraper abundance. Assessments are best made by comparing samples to samples collected similarly at reference sites or from samples collected prior to impacts or management actions at a location. In this report, the following metrics were calculated for each sample.

Taxa richness - Richness is a component and estimate of community structure and stream health based on the number of distinct taxa. Taxa richness normally decreases with decreasing water quality. In some situations organic enrichment can cause an increase in the number of pollution tolerant taxa. Taxa richness was calculated for operational taxonomic units (OTUs) and the number of unique genera, and families. The values for operational taxonomic units may be overestimates of the true taxa richness at a site if individuals were the same taxon as those identified to lower taxonomic levels or they may be underestimates of the true taxa richness if multiple taxa were present within a larger taxonomic grouping but were not identified. All individuals within all samples were generally identified similarly, so that comparisons in operational taxonomic richness among samples within this dataset are appropriate, but comparisons to other data sets may not. Comparisons to other datasets should be made at the genera or family level.

Abundance - The abundance, density, or number of aquatic macroinvertebrates per unit area is an indicator of habitat availability and fish food abundance. Abundance may be reduced or increased depending on the type of impact or pollutant. Increased organic enrichment typically causes large increases in abundance of pollution tolerant taxa. High flows, increases in fine sediment, or the presence of toxic substances normally cause a decrease in invertebrate abundance. Invertebrate abundance is presented as the number of individuals per square meter for quantitative samples and the number of individuals collected in each sample for qualitative samples.

EPT - A summary of the taxonomic richness and abundance within the insect Orders Ephemeroptera, Plecoptera, and Trichoptera (EPT). These orders are commonly considered sensitive to pollution (Karr and Chu 1998).

Percent contribution of the dominant family or taxon - An assemblage largely dominated (>50%) by a single taxon or several taxa from the same family suggests environmental stress. Habitat conditions likely limit the number of taxa that can occur at the site.

Shannon diversity index - Ecological diversity is a measure of community structure defined by the relationship between the number of distinct taxa and their relative abundances. The Shannon diversity index was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations. The calculations were made following Ludwig and Reynolds (1988, equation 8.9, page 92).

Evenness - Evenness is a measure of the distribution of taxa within a community. The evenness index used in this report was calculated following Ludwig and Reynolds (1988, equation 8.15, page 94). Value ranges from 0-1 and approach zero as a single taxa becomes more dominant.

Clinger taxa - The number of clinger taxa have been found by Karr and Chu (1998) to respond negatively to human disturbance. Clinger taxa were determined using information in Merritt et al. (2008). These taxa typically cling to the tops of rocks and are thought to be reduced by sedimentation or abundant algal growths.

Long-live taxa - The number of long-lived taxa was calculated the number of taxa collected that typically have 2-3 year life cycles. Disturbances and water quality and habitat impairment typically reduces the number of long-lived taxa Karr and Chu (1998). Life-cycle length determinations were based on information in Merritt et al. (2008).

Biotic indices - Biotic indices use the indicator taxa concept. Taxa are assigned water quality tolerance values based on their tolerance to pollution. Scores are typically weighted by taxa relative abundance. In the United States the most commonly used biotic index is the Hilsenhoff Biotic Index (Hilsenhoff 1987, Hilsenhoff 1988). The USFS and BLM

throughout the western United States have also frequently used the USFS Community Tolerance Quotient.

Hilsenhoff biotic index - The Hilsenhoff Biotic Index (HBI) summarizes the overall pollution tolerances of the taxa collected. This index has been used to detect nutrient enrichment, high sediment loads, low dissolved oxygen, and thermal impacts. It is best at detecting organic pollution. Families were assigned an index value from 0- taxa normally found only in high quality unpolluted water, to 10- taxa found only in severely polluted waters. Family level values were taken from Hilsenhoff (1987, 1988) and a family level HBI was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations. Sampling locations with HBI values of 0-2 are considered clean, 2-4 slightly enriched, 4-7 enriched, and 7-10 polluted. Rather than using mean HBI values for a sample, taxon HBI values can also be used to determine the number of pollution intolerant and tolerant taxa occurring at a site. In this report, taxa with HBI values ≤ 2 were considered intolerant clean water taxa and taxa with HBI values ≥ 8 were considered pollution tolerant taxa. The number of tolerant and intolerant taxa and the abundances of tolerant and intolerant taxa were calculated for each sampling location.

USFS community tolerant quotient - Taxa are assigned a tolerant quotient (TQ) from 2 - taxa found only in high quality unpolluted water, to 108 - taxa found in severely polluted waters. TQ values were developed by Winget and Mangum (1979). The dominance weighted community tolerance quotient (CTQd) was calculated. Values can vary from about 20 to 100, in general the lower the value the better the water quality.

Functional feeding group measures - A common classification scheme for aquatic macroinvertebrates is to categorize them by feeding acquisition mechanisms. Categories are based on food particle size and food location, e.g., suspended in the water column, deposited in sediments, leaf litter, or live prey. This classification system reflects the major source of the resource, either within the stream itself or from riparian or upland areas and the primary location, either erosional or depositional habitats. The number of taxa and individuals of the following feeding groups were calculated for each sampling location. Functional feeding group designations were from Merritt et al. (2008).

Shredders - Shredders use both living vascular hydrophytes and decomposing vascular plant tissue - coarse particulate organic matter. Shredders are sensitive to changes in riparian vegetation. Shredders can be good indicators of toxicants that adhere to organic matter.

Scrapers - Scrapers feed on periphyton - attached algae and associated material. Scraper populations increase with increasing abundance of diatoms and can decrease as filamentous algae, mosses, and vascular plants increase, often in response to increases in nitrogen and phosphorus. Scrapers decrease in relative abundance in response to sedimentation and higher levels of organic pollution or nutrient enrichment.

Collector-filterers - Collector-filterers feed on suspended fine particulate organic matter. Collector-filterers are sensitive to toxicants in the water column and to pollutants that adhere to organic matter.

Collector-gatherers - Collector-gatherers feed on deposited fine particulate organic matter. Collector-gatherers are sensitive to deposited toxicants.

Predators - Predators feed on living animal tissue. Predators typically make up about 25% of the assemblage in stream environments and 50% of the assemblage in still-water environments.

Unknown feeding group - This category includes taxa that are highly variable, parasites, and those that for which the primary feeding mode is currently unknown.

Results

Abundance data and taxa richness are reported as the estimated number of individuals per square meter for quantitative samples and the number per sample for qualitative samples. NC = Not calculated. * = unable to calculate. EPT = totals for the insect orders, Ephemeroptera, Plecoptera, Trichoptera. QL = qualitative sample.

Sample	Sampling date	Station	Total abundance	EPT abundance	Dominant family	% contribution dominant family
141702	10/13/2009	QC-1	1819	936	Hydropsychidae	47.94
141703	10/13/2009	QC-2	140	11		71.46
141704	10/13/2009	QC-3	388	147	Chironomidae	59.35
141705	10/13/2009	CW-1	793	456	Hydropsychidae	54.73
Mean			784.9	387.5		58.37

Diversity indices

Sample	Sampling Date	Station	Total taxa richness	Total genera richness	Total family richness	EPT taxa richness	Shannon diversity index	Evenness
141702	10/13/2009	QC-1	17	9	14	6	1.540	0.540
141703	10/13/2009	QC-2	7	3	5	2	1.030	0.530
141704	10/13/2009	QC-3	6	2	5	2	1.260	0.700
141705	10/13/2009	CW-1	16	8	12	2	1.530	0.550
Mean			11.5	5.5	9.0	3.0	1.340	0.580

Genera richness by major taxonomic group.

Sample	Sampling Date	Station	Coleoptera	Diptera	Ephemerotpera	Heteroptera	Megaloptera	Odonata	Plecoptera	Trichoptera	Annelida	Custacea	Mollusca
141702	10/13/2009	QC-1	2	7	2	0	0	0	0	4	1	0	0
141703	10/13/2009	QC-2	0	2	1	0	0	2	0	1	1	0	0
141704	10/13/2009	QC-3	0	3	1	0	0	0	0	1	1	0	0
141705	10/13/2009	CW-1	4	7	0	0	0	1	0	2	1	0	0
Mean			1.5	4.8	1.0	0.0	0.0	0.8	0.0	2.0	1.0	0.0	0.0

Total abundance by major taxonomic group.

Sample	Sampling Date	Station	Coleoptera	Diptera	Ephemerotpera	Heteroptera	Megaloptera	Odonata	Plecoptera	Trichoptera	Annelida	Custacea	Mollusca
141702	10/13/2009	QC-1	7	865	57	0	0	0	0	879	7	0	0
141703	10/13/2009	QC-2	0	22	4	0	0	7	0	7	100	0	0
141704	10/13/2009	QC-3	0	233	83	0	0	0	0	65	7	0	0
141705	10/13/2009	CW-1	18	133	0	0	0	7	0	456	176	0	0
Mean			6.3	313.3	36.0	0.0	0.0	3.5	0.0	351.8	72.5	0.0	0.0

Biotic Indices

Sample	Sampling date	Station	Hilsenhoff Biotic Index		USFS Community CTQd
			Index	Indication	
141702	10/13/2009	QC-1	4.91	Some organic pollution	102
141703	10/13/2009	QC-2	1.28	No apparent organic pollution	105
141704	10/13/2009	QC-3	5.07	Some organic pollution	100
141705	10/13/2009	CW-1	3.44	No apparent organic pollution	104
Mean			3.68		102.8

Taxa richness and relative abundance values with respect to tolerance or intolerance to pollution were based on the Hilsenhoff Biotic Index (HBI). Intolerant taxa have HBI score <= 1. Tolerant taxa have a HBI score >= 9. Data are presented as estimated count per square meter for quantitative samples and total number per sample for qualitative samples.

Sample	Sampling date	Station	Intolerant taxa				Tolerant Taxa			
			Richness		Abundance		Richness		Abundance	
141702	10/13/2009	QC-1	0	(0)	0	(0)	0	(0)	0	(0)
141703	10/13/2009	QC-2	2	(29)	7	(5)	0	(0)	0	(0)
141704	10/13/2009	QC-3	0	(0)	0	(0)	0	(0)	0	(0)
141705	10/13/2009	CW-1	0	(0)	0	(0)	1	(6)	7	(1)
Mean			0.5	(7)	1.8	(1)	0.3	(2)	1.8	(0)

Functional feeding groups

Taxa richness by functional feeding group. The percent of the total is shown in parentheses.

Sample	Sampling date	Station	Shredders		Scrapers		Collector-filterers		Collector-gatherers		Predators		Unknown	
141702	10/13/2009	QC-1	2	(12)	0	(0)	3	(18)	8	(47)	3	(18)	1	(6)
141703	10/13/2009	QC-2	0	(0)	0	(0)	1	(14)	4	(57)	2	(29)	0	(0)
141704	10/13/2009	QC-3	1	(17)	0	(0)	1	(17)	4	(67)	0	(0)	0	(0)
141705	10/13/2009	CW-1	1	(6)	0	(0)	1	(6)	4	(25)	7	(44)	2	(13)
Mean			1.0	(9)	0.0	(0)	1.5	(14)	5.0	(49)	3.0	(22)	0.8	(5)

Invertebrate abundance by functional feed group. The percent of the total is shown in parentheses.

Sample	Sampling date	Station	Shredders		Scrapers		Collector-filterers		Collector-gatherers		Predators		Unknown	
141702	10/13/2009	QC-1	7	(0)	0	(0)	879	(48)	818	(45)	111	(6)	4	(0)
141703	10/13/2009	QC-2	0	(0)	0	(0)	7	(5)	126	(90)	7	(5)	0	(0)
141704	10/13/2009	QC-3	4	(1)	0	(0)	65	(17)	319	(82)	0	(0)	0	(0)
141705	10/13/2009	CW-1	22	(3)	0	(0)	434	(55)	233	(29)	90	(11)	11	(1)
Mean			8.3	(1)	0.0	(0)	346.3	(31)	374.0	(62)	52.0	(6)	3.8	(0)

The 10 metrics thought to be most responsive to human induced disturbance (Karr and Chu 1998).

Sample	Sampling Date	Station	Total taxa	Epheme-roptera taxa	Plecoptera taxa	Trichoptera taxa	Long-lived taxa	Intolerant taxa	Clinger taxa	% tolerant indi-viduals	% contribution dominant taxon	% predators
141702	10/13/2009	QC-1	17	2	0	1	1	0	3	0.00	43.59	6.10
141703	10/13/2009	QC-2	7	1	0	1	2	2	1	0.00	71.46	5.00
141704	10/13/2009	QC-3	6	1	0	1	0	0	1	0.00	52.90	0.00
141705	10/13/2009	CW-1	16	0	0	1	5	0	4	0.88	54.73	11.35
Mean			11.5	1.0	0.0	1.0	2.0	0.5	2.3	0.22	55.67	5.61

Taxonomic list and counts for 4 samples collected on October 13, 2009. Count is the total number of individuals identified and retained. Samples heading refers to the number of samples contain that taxon.

Order	Family	Subfamily/Genus/Species	Samples	Count
Phylum: Annelida				
Class: Clitellata	SubClass: Oligochaeta			
			4	81
Phylum: Arthropoda				
Class: Arachnida	SubClass: Acari			
Trombidiformes	Sperchonidae	Sperchon	2	2
Class: Insecta	SubClass: Pterygota			
Coleoptera	Dryopidae	Postelichus	1	1
Coleoptera	Dytiscidae		1	1
Coleoptera	Elmidae	Microcylloepus pusillus	2	3
Coleoptera	Helophoridae	Helophorus	1	1
Coleoptera	Hydraenidae	Hydraena	1	1
Diptera	Ceratopogonidae	Ceratopogoninae Sphaeromiini Probezzia	2	18
Diptera	Chironomidae		2	39
Diptera	Chironomidae	Chironominae	4	20
Diptera	Chironomidae	Orthocladiinae	4	235
Diptera	Chironomidae	Tanypodinae	1	2
Diptera	Empididae		1	1
Diptera	Empididae	Hemerodromiinae Hemerodromiini	2	30
Diptera	Scathophagidae		1	1
Diptera	Simuliidae		1	2
Diptera	Stratiomyidae	Stratiomys	1	1
Ephemeroptera	Baetidae	Baetis	3	27
Ephemeroptera	Leptohyphidae	Tricorythodes	1	13
Odonata	Coenagrionidae	Argia	1	2
Odonata	Gomphidae		1	1
Odonata	Gomphidae	Ophiogomphus severus	1	1
Trichoptera	Hydropsychidae		1	22
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	4	362
Trichoptera	Leptoceridae		1	1
Trichoptera	Limnephilidae		2	7

Total: OTU Taxa : **26** Genera : **13** Families : **20** Individuals : **875**

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Taxa Lists for Individual Samples

Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected October 13, 2009 at station QC-1, Quitchupah Creek, Emery county, Utah. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.279 square meters. The percentage of the sample that was identified and retained was 100% of the collected sample. A total of 507 individuals were removed, identified and retained. The sample identification number is 141702. OTU=operational taxonomic unit. Notes - identification to genus or species was not spported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistint characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Annelida					
Class: Clitellata		SubClass: Oligochaeta			
			adult	7.18	
Phylum: Arthropoda					
Class: Arachnida		SubClass: Acari			
Trombidiformes	Sperchonidae	Sperchon	adult	3.59	
Class: Insecta		SubClass: Pterygota			
Coleoptera	Elmidae	Microcylloepus pusillus	larvae	3.59	
Coleoptera	Helophoridae	Helophorus	adult	3.59	
Diptera	Ceratopogonidae	Ceratopogoninae Sphaeromiini Probezzia	larvae	46.64	
Diptera	Chironomidae		pupae	125.58	
Diptera	Chironomidae	Chironominae	larvae	17.94	
Diptera	Chironomidae	Orthocladiinae	larvae	602.78	
Diptera	Empididae	Hemerodromiinae Hemerodromiini Hemerodromia	larvae	61.00	
Diptera	Simuliidae		larvae	7.18	I
Diptera	Stratiomyidae	Stratiomys	larvae	3.59	
Ephemeroptera	Baetidae	Baetis	larvae	10.76	
Ephemeroptera	Leptohyphidae	Tricorythodes	larvae	46.64	
Trichoptera	Hydropsychidae		larvae	78.94	
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	792.94	
Trichoptera	Leptoceridae		larvae	3.59	I
Trichoptera	Limnephilidae		larvae	3.59	I
Total: OTU Taxa : 17	Genera : 9	Families : 14		1819.10	

Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected October 13, 2009 at station QC-2, Quitchupah Creek, Emery county, Utah. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.279 square meters. The percentage of the sample that was identified and retained was 100% of the collected sample. A total of 39 individuals were removed, identified and retained. The sample identification number is 141703. OTU=operational taxonomic unit. Notes - identification to genus or species was not spported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistint characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Annelida					
Class: Clitellata		SubClass: Oligochaeta			
			adult	100.46	
Phylum: Arthropoda					
Class: Insecta		SubClass: Pterygota			
Diptera	Chironomidae	Chironominae	larvae	17.94	
Diptera	Chironomidae	Orthocladiinae	larvae	3.59	
Ephemeroptera	Baetidae	Baetis	larvae	3.59	D
Odonata	Gomphidae		larvae	3.59	I
Odonata	Gomphidae	Ophiogomphus severus	larvae	3.59	
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	7.18	
Total: OTU Taxa : 7		Genera : 3	Families : 5	139.93	

Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected October 13, 2009 at station QC-3, Quitchupah Creek, Emery county, Utah. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.279 square meters. The percentage of the sample that was identified and retained was 100% of the collected sample. A total of 108 individuals were removed, identified and retained. The sample identification number is 141704. OTU=operational taxonomic unit. Notes - identification to genus or species was not spported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistint characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Annelida					
Class: Clitellata		SubClass: Oligochaeta			
			adult	7.18	
Phylum: Arthropoda					
Class: Insecta		SubClass: Pterygota			
Diptera	Chironomidae	Chironominae	larvae	25.12	
Diptera	Chironomidae	Orthocladiinae	larvae	204.51	
Diptera	Scathophagidae		larvae	3.59	
Ephemeroptera	Baetidae	Baetis	larvae	82.52	
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	64.58	
Total: OTU Taxa : **6**		Genera : **2** Families : **5**		387.50	

Taxonomic list and densities of aquatic invertebrates identified and retained from a sample collected October 13, 2009 at station CW-1, Christansen Creek, Emery county, Utah. The sample was collected from riffle habitat using a surber net. The total area sampled was 0.279 square meters. The percentage of the sample that was identified and retained was 100% of the collected sample. A total of 221 individuals were removed, identified and retained. The sample identification number is 141705. OTU=operational taxonomic unit. Notes - identification to genus or species was not spported because: I - immature organisms, D- damaged organisms, M - poor slide mount, G - gender, U - indistint characters or distribution, R - retained in our reference collection.

Order	Family	Subfamily/Genus/Species	Life Stage	Density	Notes
Phylum: Annelida					
Class: Clitellata		SubClass: Oligochaeta			
			adult	175.81	
Phylum: Arthropoda					
Class: Arachnida		SubClass: Acari			
Trombidiformes	Sperchonidae	Sperchon	adult	3.59	
Class: Insecta		SubClass: Pterygota			
Coleoptera	Dryopidae	Postelichus	adult	3.59	
Coleoptera	Dytiscidae		adult	3.59	D
Coleoptera	Elmidae	Microcylloepus pusillus	larvae	7.18	
Coleoptera	Hydraenidae	Hydraena	adult	3.59	
Diptera	Ceratopogonidae	Ceratopogoninae Sphaeromiini Probezzia	larvae	17.94	
Diptera	Chironomidae		pupae	14.35	
Diptera	Chironomidae	Chironominae	larvae	10.76	
Diptera	Chironomidae	Orthocladiinae	larvae	32.29	
Diptera	Chironomidae	Tanypodinae	larvae	7.18	
Diptera	Empididae		larvae	3.59	U
Diptera	Empididae	Hemerodromiinae Hemerodromiini Hemerodromia	larvae	46.64	
Odonata	Coenagrionidae	Argia	larvae	7.18	I,D
Trichoptera	Hydropsychidae	Hydropsychinae Hydropsyche	larvae	434.14	
Trichoptera	Limnephilidae		larvae	21.53	I
Total: OTU Taxa : 16	Genera : 8	Families : 12		792.94	

APPENDIX C

Legal Financial, Compliance and Related Information

Annual Report of Officers
As submitted to the Utah Department of Commerce

Other change in ownership and control information
As required under R645-301-110

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APPENDIX D

Mine Maps

As required under R645-302-525-270

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APPENDIX E

Other Information

In accordance with the requirements of R645-301 and R645-302

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