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#5980

Utah Division of Oil, Gas & Mining
Utah Coal Program
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

August 21, 2019

Attn: Steve Christensen
Permit Supervisor
Re: Genwal Resources, Inc. C/015/032
C19-003 NOV #21216 Response: Drainage Revision, Task ID#5938

Dear Mr. Christensen,

Attached you will find the clean copies for the Crandll Drainage Revision Task ID #5980 in duplicate.

If you have any questions regarding these clean copies, please don't hesitate to ask.

A handwritten signature in black ink, appearing to read "K. Madsen", is written over a horizontal line.

Karin Madsen
Environmental Engineering Technician
Genwal Resources, Inc.

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Existing culverts C-2, C-8 and C-10 will be removed during the pad extension, and therefore are not included in this Appendix. These culverts are shown on Plate 7-5C, dated 03/21/91.

All culverts will be inspected regularly, and cleaned as necessary to provide for passage of design flows. Inlets and outlets shall also be maintained to prevent plugging, undue restriction of water flow and erosion. Culvert outlets will be rip-rapped where necessary to protect from erosion.

One culvert, UD-1, is considered a permanent diversion, and will remain in place after reclamation. This culvert is sized to carry runoff in-excess of a 100 year - 6 hour storm. Justification for leaving it in place is provided in the Reclamation Hydrology Section 4.1, of this Appendix.

Historical Note Concerning UD-1

As a result of the Trail Mountain Fire that moved through Crandall Canyon in the summer of 2018, the existing vegetation on the North slopes of Crandall Canyon were completely burned. This caused a major runoff problem in the undisturbed drainage behind the shop building. In the Fall of 2018, a rain storm caused the ash and debris from the fire to quickly move down the undisturbed drainage and overwhelm the culvert in UD-1, diverting the massive debris-flow down the undisturbed hillside which washed out a wall of the shop resulting in filling the bottom of the building with mud and debris over 2 feet deep. This was not a result of the existing drainage and culvert being under-designed, but a result of the fire damage eliminating all of the vegetation within the drainage and de-stabilizing the slope. As this was an emergency situation needed to further protect the structures and to protect the culvert from clogging, a small emergency overflow was constructed in case the culvert inlet becomes overwhelmed by runoff from the burn area again. This way, if or when the culvert becomes overwhelmed due to lack of vegetation in the burn scar, the water will flow west down the hill and into the parking area, instead of directly into our building, causing more damage and cost to the company. This emergency overflow plan is shown on Plate 7-5. The small berm near the UD-1 inlet will be removed as soon as vegetation on the burn scar has been re-established.

All other culverts are considered temporary, and will be removed upon final reclamation, with the exception of the lower 300' of the Main Canyon Culvert. This portion of the culvert will be left in place until the sediment pond is removed during Phase II Reclamation. The remaining portion of the culvert will be removed at that time.

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TABLE 6
 RUNOFF CONTROL STRUCTURE
 FLOW SUMMARY

hour		10 year/6 hour	10 year/24 hour	25 year/6 hour	100 year/6
Structure	Type	Peak Flow-cfs	Peak Flow-cfs	Peak Flow-cfs	Peak Flow-cfs
Main Culvert	Culvert	-	-	-	222.79
UD-1	Culvert	1.91	-	3.68	6.81
UD-2	Ditch	0.04	-	0.08	0.21
UD-3	Culvert	0.23	-	0.43	0.89
DD-1	Ditch	0.06	0.20	0.10	-
DD-3	Ditch	0.32	0.78	0.47	-
DD-4	Ditch	2.39	5.96	3.49	-
DD-5	Ditch	2.85	7.88	4.24	-
DD-7	Ditch	0.21	0.85	0.34	-
DD-8	Ditch	0.64	2.80	1.05	-
DD-10A	Ditch	0.10	0.21	0.14	-
DD-10	Ditch	2.62	3.06	2.76	-
DD-11	Ditch	0.10	0.57	0.18	-
DD-12	Ditch	1.55	3.58	2.26	-
DD-13	Ditch	2.62	6.08	3.83	-
DD-14	Sht Flw	0.39	0.88	0.56	-
C-1	Culvert	0.96	3.58	1.52	-
C-3	Culvert	0.21	0.85	0.34	-
C-4	Culvert	2.62	3.06	2.76	-
C-5	Culvert	0.10	0.57	0.18	-
C-6	Culvert	0.04	-	0.08	-
C-7	Culvert	0.32	0.78	0.47	-
C-9	Culvert	0.11	0.20	0.14	-
C-11	Culvert	1.55	3.58	2.26	-
C-11A	Culvert	1.55	3.58	2.26	-
C-12	Culvert	2.85	7.36	3.92	-
C-13	Culvert	2.62	6.08	3.83	-
C-14	Slot Cul.	0.11	0.20	0.14	-
Swale	Swale	0.06	0.11	0.08	-
C-16	Culvert	2.62	6.08	3.83	-
C-17	Culvert	2.62	6.08	3.83	-
Sediment Pond	Pond	6.46	16.53	9.50	-

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TABLE 7
 DISTURBED DITCH DESIGN SUMMARY

Ditch	DD-1	DD-3	DD-4	DD-5	DD-7	DD-8	DD-10A
Slope (%)	30.77	3.00	11.91	4.50	3.33	3.59	5.00
Length (ft.)	130	75	168	628	142	557	50
Manning's No.	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Side Slope (H:V)	1:1	1:1	1:1	1:1	1:1	1:1	1:1
*Bottom Width (ft.)	0	0	0	0	0	0	0
Peak Flow 10/6 (cfs)	0.06	0.32	2.39	2.85	0.21	0.64	0.10
Peak Flow 10/24 (cfs) 0.21		0.20	0.78	5.96	7.88	0.85	2.80
Flow Depth (ft.) 10/6	0.14	0.40	0.66	0.84	0.33	0.50	0.23
Flow Depth (ft.) 10/24 0.31		0.22	0.56	0.92	1.23	0.57	0.87
Flow Area (ft ²)10/6	0.02	0.16	0.43	0.71	0.11	0.25	0.06
Flow Area (ft ²)10/24	0.05	0.31	0.85	1.52	0.32	0.76	0.10
Velocity (fps)10/6	3.15	2.00	5.55	4.02	1.87	2.55	1.81
Velocity (fps) 10/24	4.26	2.50	6.97	5.19	2.66	3.68	2.18
Rip-Rap Req'd (Y/N)	N	N	Y	N	N	N	N
Rip-Rap D ₅₀	-	-	6"	-	-	-	-

* All ditches are triangular.

** Flows include 1000 gpm (2.23 cfs) Mine Water Flow.

Note: Slope/Lengths from Plate 7-5.

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TABLE 10
 UNDISTURBED CULVERT DESIGN SUMMARY

Culvert	*Main Canyon	UD-1	UD-3
Slope (%)	8.00	23.33	30.00
Length (ft.)	1500	270	50'
Manning's No.	0.02	0.02	0.02
Peak Flow 100/6 (cfs)	222.79	-	-
Peak Flow 10/6 (cfs)	-	1.91	0.23
Min. Diam. Req'd (ft.)	3.75	0.52	0.22
Diam. Installed (ft.)	6.00	3.50	1.00
Velocity (fps)	20.14	9.16	5.93

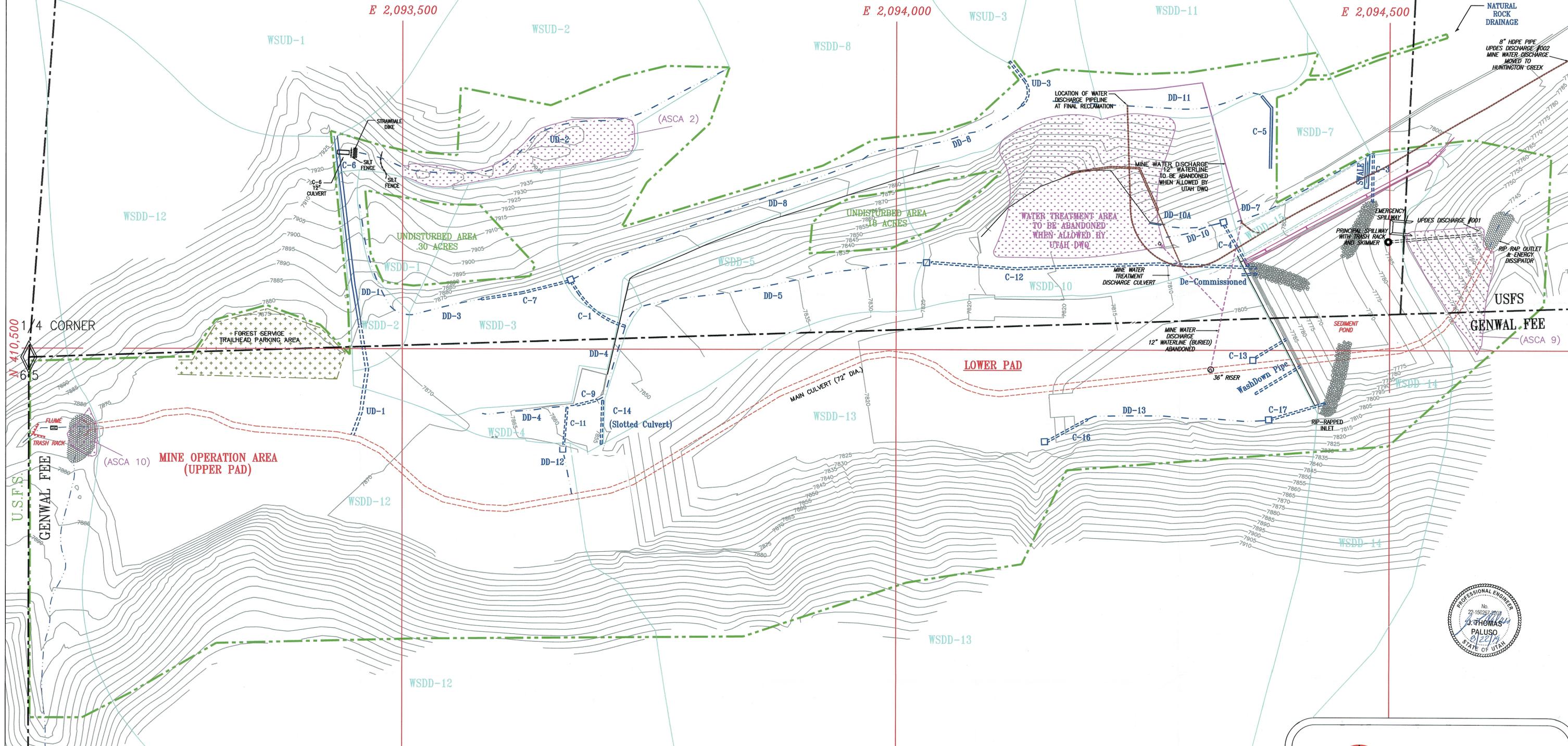
* Culvert to be installed under expansion plan.

All other undisturbed culverts are existing.

Note: Slope/Lengths from Plate 7-5.

Source: (Haestad Methods, Flowmaster I, Version 3.43)

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LEGEND:

POTENTIAL EXTENT OF DISTURBANCE	
10' CONTOUR	
JERSEY BARRIERS	
WATERSHED BOUNDARY	
UNDISTURBED/DISTURBED WATERSHED	WSUD-1 WSDD-10
DIVERSION DITCH	
CULVERT (Solid-Above Grd/Dashed-Buried)	
6' DIAMETER CULVERT	
ASCA AREA:	



CONTOUR INTERVAL = 5'



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GENWAL™
RESOURCES, INC.

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**CRANDALL CANYON MINE
DRAINAGE MAP**

REV: 22	ACAD: 7-5
DATE: 8-21-19	BY: PJJ
SCALE: 1" = 100'	PLATE #: 7-5