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26 May 1993

TO: **Pam Grubaugh-Littig, Permit Supervisor**

FROM: **Hugh Klein, Geologist/Hydrologist** HK

RE: **Plans For NOV 93-40-3-3 Part 2, Sunnyside Coal Company, Sunnyside Mine, ACT/007/007, Folder #5, Carbon County, Utah**

SUMMARY

Plans required under remedial action for NOV 93-40-3-3 part 3 were submitted to the Price Field Office on 20 May 1993 (the due date for plans). A review of the proposal for the Clearwater Pond inlet diversions has found the methodology and design to be reasonable. This finding is based on the attached calculations. As such, the following recommendations are made:

1) The amendment be approved given the reasons stated above.
2) The design should be implemented in accordance with the violation, and under the same timeframe. In doing so, this will allow the operator extra time for construction and reduce the likelihood of a request for an extension on this NOV.
3) All pages submitted with this proposal should be numbered for appropriate inclusion in the approved plan.

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 2 Pond Into Ditch 25/6

Solve For Depth

Given Input Data:

Bottom Width.....	1.50 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.045
Channel Slope....	0.5000 ft/ft
Discharge.....	0.31 cfs

Computed Results:

Depth.....	0.06 ft
Velocity.....	3.31 fps
Flow Area.....	0.09 sf
Flow Top Width...	1.73 ft
Wetted Perimeter.	1.76 ft
Critical Depth...	0.10 ft
Critical Slope...	0.0674 ft/ft
Froude Number....	2.50 (flow is Supercritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 2 Pond Into Ditch 10/24

Solve For Depth

Given Input Data:

Bottom Width.....	1.50 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.045
Channel Slope....	0.5000 ft/ft
Discharge.....	0.48 cfs

Computed Results:

Depth.....	0.08 ft
Velocity.....	3.87 fps
Flow Area.....	0.12 sf
Flow Top Width...	1.80 ft
Wetted Perimeter.	1.84 ft
Critical Depth...	0.14 ft
Critical Slope...	0.0625 ft/ft
Froude Number....	2.60 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 2 Pond Into Ditch 10/6

Solve For Depth

Given Input Data:

Bottom Width.....	1.50 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.045
Channel Slope....	0.5000 ft/ft
Discharge.....	0.17 cfs

Computed Results:

Depth.....	0.04 ft
Velocity.....	2.65 fps
Flow Area.....	0.06 sf
Flow Top Width...	1.66 ft
Wetted Perimeter.	1.68 ft
Critical Depth...	0.07 ft
Critical Slope...	0.0751 ft/ft
Froude Number....	2.37 (flow is Supercritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 2 Ditch Along Road 25/6

Solve For Depth

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.025
Channel Slope....	0.0375 ft/ft
Discharge.....	0.31 cfs

Computed Results:

Depth.....	0.24 ft
Velocity.....	2.62 fps
Flow Area.....	0.12 sf
Flow Top Width...	0.97 ft
Wetted Perimeter.	1.09 ft
Critical Depth...	0.27 ft
Critical Slope...	0.0206 ft/ft
Froude Number....	1.33 (flow is Supercritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 2 Ditch Along Road 10/24

Solve For Depth

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.025
Channel Slope....	0.0375 ft/ft
Discharge.....	0.48 cfs

Computed Results:

Depth.....	0.29 ft
Velocity.....	2.93 fps
Flow Area.....	0.16 sf
Flow Top Width...	1.15 ft
Wetted Perimeter.	1.28 ft
Critical Depth...	0.32 ft
Critical Slope...	0.0194 ft/ft
Froude Number....	1.36 (flow is Supercritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 2 Ditch Along Road 10/6

Solve For Depth

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.025
Channel Slope....	0.0375 ft/ft
Discharge.....	0.17 cfs

Computed Results:

Depth.....	0.19 ft
Velocity.....	2.26 fps
Flow Area.....	0.08 sf
Flow Top Width...	0.78 ft
Wetted Perimeter.	0.87 ft
Critical Depth...	0.21 ft
Critical Slope...	0.0223 ft/ft
Froude Number....	1.28 (flow is Supercritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 1 Pond Into Ditch 25/6

Solve For Depth

Given Input Data:

Bottom Width.....	1.50 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.045
Channel Slope....	0.5000 ft/ft
Discharge.....	0.29 cfs

Computed Results:

Depth.....	0.06 ft
Velocity.....	3.23 fps
Flow Area.....	0.09 sf
Flow Top Width...	1.72 ft
Wetted Perimeter.	1.75 ft
Critical Depth...	0.10 ft
Critical Slope...	0.0682 ft/ft
Froude Number....	2.49 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 1 Pond Into Ditch 10/24

Solve For Depth

Given Input Data:

Bottom Width.....	1.50 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.045
Channel Slope....	0.5000 ft/ft
Discharge.....	0.45 cfs

Computed Results:

Depth.....	0.07 ft
Velocity.....	3.78 fps
Flow Area.....	0.12 sf
Flow Top Width...	1.79 ft
Wetted Perimeter.	1.82 ft
Critical Depth...	0.13 ft
Critical Slope...	0.0632 ft/ft
Froude Number....	2.59 (flow is Supercritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 1 Pond Into Ditch 10/6

Solve For Depth

Given Input Data:

Bottom Width.....	1.50 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.045
Channel Slope....	0.5000 ft/ft
Discharge.....	0.16 cfs

Computed Results:

Depth.....	0.04 ft
Velocity.....	2.59 fps
Flow Area.....	0.06 sf
Flow Top Width...	1.66 ft
Wetted Perimeter.	1.68 ft
Critical Depth...	0.07 ft
Critical Slope...	0.0759 ft/ft
Froude Number....	2.36 (flow is Supercritical)

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 1 Ditch Along Road 25/6

Solve For Depth

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.025
Channel Slope....	0.0375 ft/ft
Discharge.....	0.29 cfs

Computed Results:

Depth.....	0.24 ft
Velocity.....	2.58 fps
Flow Area.....	0.11 sf
Flow Top Width...	0.95 ft
Wetted Perimeter.	1.06 ft
Critical Depth...	0.26 ft
Critical Slope...	0.0207 ft/ft
Froude Number....	1.32 (flow is Supercritical)

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 1 Ditch Along Road 10/24

Solve For Depth

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.025
Channel Slope....	0.0375 ft/ft
Discharge.....	0.45 cfs

Computed Results:

Depth.....	0.28 ft
Velocity.....	2.88 fps
Flow Area.....	0.16 sf
Flow Top Width...	1.12 ft
Wetted Perimeter.	1.25 ft
Critical Depth...	0.32 ft
Critical Slope...	0.0196 ft/ft
Froude Number....	1.36 (flow is Supercritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Clear Water Pond

Comment: Area 1 Ditch Along Road 10/6

Solve For Depth

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.025
Channel Slope....	0.0375 ft/ft
Discharge.....	0.16 cfs

Computed Results:

Depth.....	0.19 ft
Velocity.....	2.22 fps
Flow Area.....	0.07 sf
Flow Top Width...	0.76 ft
Wetted Perimeter.	0.85 ft
Critical Depth...	0.21 ft
Critical Slope...	0.0225 ft/ft
Froude Number....	1.27 (flow is Supercritical)

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Company Name: Office of Surface Mining - TIPS
Filename: C:\SEDCAD3\CLEAR User: HK
Date: 05-24-1993 Time: 12:14:54
Clear Water Inlets
Storm: 1.62 inches, 25 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	0.75	82	M	0.060	0.000	0.000	0.0	0.03	0.29
111	2	0.80	82	M	0.060	0.000	0.000	0.0	0.03	0.31
		Type: Null			Label: Clear Water Inlets					
111	Structure	1.55							0.05	
111	Total IN/OUT	1.55							0.05	0.61

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Company Name: Office of Surface Mining - TIPS
Filename: C:\SEDCAD3\CLEAR User: HK
Date: 05-24-1993 Time: 12:14:49
Clear Water Inlets
Storm: 1.84 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	0.75	82	M	0.060	0.000	0.000	0.0	0.03	0.45
111	2	0.80	82	M	0.060	0.000	0.000	0.0	0.04	0.48
		Type: Null			Label: Clear Water Inlets					
111	Structure	1.55							0.07	
111	Total IN/OUT	1.55							0.07	0.94

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Company Name: Office of Surface Mining - TIPS
Filename: C:\SEDCAD3\CLEAR User: HK
Date: 05-24-1993 Time: 12:14:44
Clear Water Inlets
Storm: 1.30 inches, 10 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	0.75	82	M	0.060	0.000	0.000	0.0	0.02	0.16
111	2	0.80	82	M	0.060	0.000	0.000	0.0	0.02	0.17
		Type: Null			Label: Clear Water Inlets					
111	Structure	1.55							0.03	
111	Total IN/OUT	1.55							0.03	0.33