FAILURE AND RE-ENGINEERING OF A DRAINAGE CHANNEL

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Background

• Site located in the Rocky Mountain region of the United States

• Multiple drainage channel installation and grading activities performed for a 35-acre site closure

• **Focus:** 1,400-foot long drainage channel having a grade ranging from 30% to 47%

• IT FAILED.
What it looked like just after construction

Then... it RAINED

1.2 inches over 30 minutes
After the initial repairs:

It rained

Then it rained some more....
So, what went wrong?

• Channel was designed to handle too low of a flow rate (original ~75 CFS)
• A surge pond had been removed and not replaced
• Vegetation had not yet been established
• Construction contractor not able to meet the design specifications
• Lack of consistent third-party oversight
The final remedy

• Begin negotiations with owner associated with the final remedy and associated costs
• Recalculate channel flow capacity requirements
• Retain outside specialized technical support
• Provide full-time construction oversight
The agreement (main points)

• The **Design Firm** will pay for the redesign of a new Channel
• The **Owner** will pay for the construction of the new Channel
• The **Design Firm** will hold the construction contract AND provide construction management
• The **Design Firm** will provide credits to the Owner for:
  1.) Costs incurred associated with the original Channel construction
  2.) Removal of the existing Channel material
The design parameters

• Re-modeled flow capacity requirements. New Capacity: 145 CFS

Resiliency Factors:

• Must be able to handle “Gully Washers”
• Can’t rely on vegetative growth to provide stability nor velocity dissipation
• Must be able to handle rain events during construction

• CAN NOT FAIL
The design (belt and suspenders)

- No man-made products and no vegetative growth used
- Retain outside design firm
- Widen the channel
- Riprap lined channel to be constructed
- Grade control/check dam using 36 to 48-inch material placed at seven locations
- Owner/Client acceptance throughout the design
Typical cross section

~20 Ft. (Typ)
Check Dam

RIPRAG LINER

3.5 FT

3.5 FT

4 FT

5 FT

5.5 FT

1.5 FT

1 FT THICK FILTER ROCK
(SEE TYP SECTIONS)

ROCK CHECK DAM
DAM TOP WIDTH 4' MIN
MEASURED ALONG CENTERLINE
Construction
More construction
THE END RESULT

✓ Zero lost time injuries

✓ 1,400-foot channel was constructed

✓ 2 years later, channel is still functioning as designed
Lessons Learned/Resiliency

- Vegetative growth: Take into account growth factors.
- Man made products: Man does not trump Mother Nature.
- Adherence to specifications and construction monitoring are critical to successful implementation of a design.
THANK YOU

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