Copper Creek Master Plan

Brigham Young University
Senior Capstone Design

BAJRS ENGINEERING
Brent McCune, Amy Holt, Jared Friedman, Robert Rycraft, Grant Christensen

This is the deliniation of the water shed area for Copper Creek. The watershed basin and sub-basins were calculated through WMS based on flow paths calculated from the LiDAR elevation data obtained from AGRC. The watershed was divided into four sub-basins based differing land use and slope.

Background Information

Copper Creek is Located in Herriman, Utah. Development of the land near Copper Creek is planned within the next 5 to 10 years. In preparation for development a master plan needed to be designed to unsure that damage to new properties would not occur during a 100 year flood event and that flow of the creek would be directed to the outlet located at Pioneer Street and Herriman Parkway. Three different alternatives were discussed:

1. No Action
2. Open Channel*
3. Piped Drainage*

* Alternative includes drainage basin.

Analysis

Development of Hydrologic Model

1. ***Data Collection*** including soil type, land use, and LiDAR elevation was obtained from Utah's Automated Geographic Resource Center (AGRC). SURGO soil data was used to geospatially define soil types.
2. ***Compiled Hydr0ogic Data For SCS Curve Number Method*** The watershed modeling software WMS was used to delineate the watershed and calculate the necessary parameters such as curve numbers run the model in HMS.
3. ***Hydraulic Analysis of Current Channel*** HEC-RAS was used to see if the current channel would handle a 100 year flood event.
4. ***Design of Alternatives*** Mannings equation was used to develop designs for both an open channel and piped system. Hydraulic toolboxwas used to design the detention basin.
5. ***Hydraulic Analysis of Designed Channel*** HEC-RAS was used to see if the designed channel would handle a 100 year flood event.

Project Alternatives & Costs

Open Channel

Open Channel Design Cost				
Description	Number	Units	Unit Price	Total Cost
Site survey	1	None	$4,800.00	$4,800.00
Site preparation	1	None	$8,000.00	$8,000.00
Excavation	5,133	Cubic Yard	$11.00	$56,466.67
Cobble Stone	8250	Square Feet	$8.00	$66,000.00
Grass	6,600	Square Yard	$1.00	$6,600.00
			Total Cost	$141,866.67

Piped Drainage

Piped Flow Design Cost				
Description	Number	Units	Unit Price	Total Cost
Site survey	1	None	$4,800.00	$4,800.00
Site preparat	1	None	$8,000.00	$8,000.00
Excavation	5,133	Cubic Yard	$11.00	$56,466.67
Landscaping	6,600	Square Feet	$1.00	$6,600.00
Pipe	3300	Feet	$123.69	$408,173.78
			Total Cost	$484,040.45

No Action

Pictured to the left is the theoretical condtion of Copper Creek if a 100 year flood event occured.

Project Constraints

Design Standards

The following design parameters were given as requirements for the development of a master plan.

- *The outflow from a detention basin is restricted 0.2 cfs per acre of development*
- *100 year design storm*
- *Material constraints HDP pipe/RCP based on size /no CMP*
- *Slope of channel*
- *Side slope*
- *Smaller, 2-year flow channel*

Physical Constraints

- *Solution needs to be built around existing property lines.*
- *Needs to be esthetically pleasing.*

Environmental Constraints

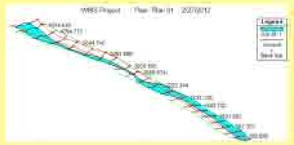
- *None exist.*

Private Stakeholders' Interests

- *Jordan School District owns much of the land around where the channel/detention basins will be built.*
- *Land owners interests.*
- *City of Herriman's development plan.*

Left: Cross sections obtained from WMS and inputted into HEC-RAS.

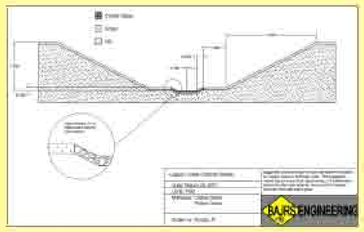
Right: Model of current channel conditions during a 100 year flood event.

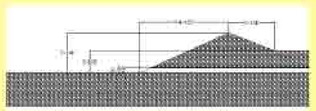


Final Design

Open Channel Design with Detention Basin

1) *Lowest cost.*
2) *Low Maintanance.*
3) *Asthetically pleasing.*
4) *Within project constraints.*





Picture above: Cross Section of Detention Basin.
Pictured Left: Cross Section of Channel Design.