



**PURPOSE OF STUDY**

Identify any deficiencies of Midas Creek Culvert MC-19 in handling the 100-year storm flow and then redesign culvert MC-19 to facilitate the 100 year storm flow while providing 1-foot freeboard.

**EXISTING BRIDGE CULVERT**

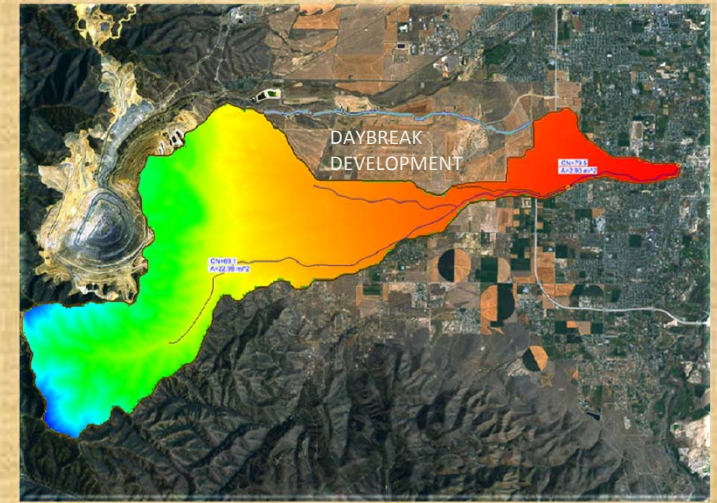


Inlet View MC-19



Outlet View MC-19

Special thanks to Jim Nelson, Ph.D., Rollin Hotchkiss, Ph.D., Jeremy Nielson, Scott Baird, PE, Brent Beardall, and Erik McCarthy

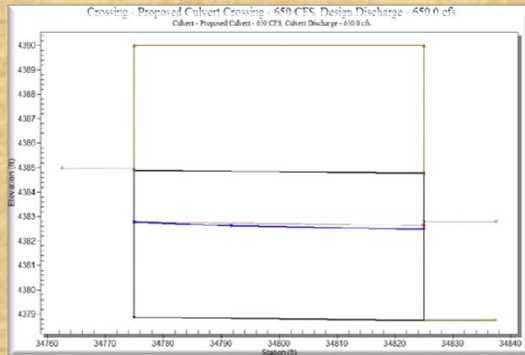


Midas Creek Drainage Basin Excluding Daybreak Development

**HYDROLOGIC MODEL AND ANALYSIS**

- Prepared by WMS and Performed by HEC-HMS
- Farmer Fletcher 3-Hour Rainfall Distribution
- Loss Rate Method- SCS Curve Number
- 100 yr. Storm Peak Discharge- 650cfs

**PROPOSED CULVERT HYDRAULIC DESIGN**



15' X 6' Culvert Analysis and Design by HY-8

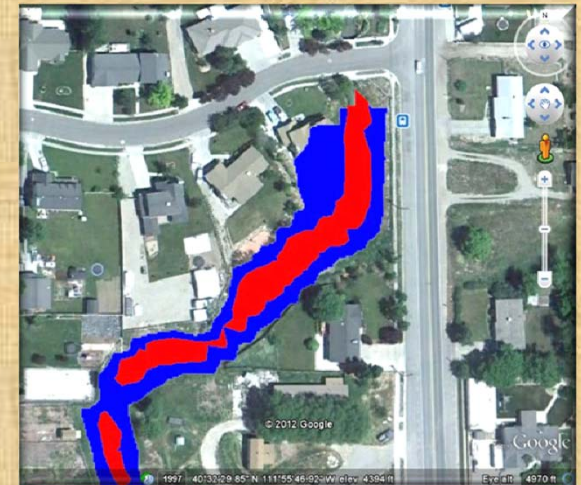
**CULVERT ANALYSIS**

EXISTING VS. PROPOSED CULVERT ANALYSIS		
	EXISTING BRIDGE CULVERT	PROPOSED BOX CULVERT
SPAN	13.5'	15'
RISE	VARIABLE 2' TO 3'	6'
CAPACITY	440 CFS	650 CFS
NEARBY HOUSE FF EL	4386'	4386'
HEADWATER EL	4391'	4385'
FREEBOARD	-5' (FLOODING)	1'

Freeboard criteria is 1-foot below top of channel bank or roadway surface. It was cost and space prohibitive to keep the upstream water surface elevation (WSE), or headwater elevation as in this case, 1-foot below the top of the bank.

The nearby residential structure's basement finish floor elevation was determined as a feasible alternative to design the culvert to provide 1-foot freeboard. The roadway is even higher and would cause flooding to the residential structure based on our 100-year storm peak discharge analysis.

**100 YEAR STORM HEADWATER ANALYSIS**



BLUE= Headwater EL 4391 based on Existing Bridge Culvert Size  
RED= Headwater EL. 4385 based on Proposed Box Culvert Design

**PROPOSED CULVERT COST ESTIMATE**

ESTIMATE OF PROBABLE CONSTRUCTION COST					
ITEM NO	DESCRIPTION OF ITEM	UNIT	QTY	UNIT COST	TOTAL COST
1	UNCLASSIFIED EXCAVATION	CY	650	\$ 15	\$ 9,750
2	DEMOLITION	SY	250	\$ 30	\$ 7,500
3	HAND RAILS	LF	84	\$ 20	\$ 1,680
4	15'X6' CULVERT	LF	50	\$ 775	\$ 38,750
5	NEW BOX CULVERT INSTALLATION	LF	50	\$ 400	\$ 20,000
6	NEW WING WALL	EA	2	\$ 5,000	\$ 10,000
7	EXIST BOX CULVERT REMOVAL	LF	50	\$ 200	\$ 10,000
8	NEW PCC PAVEMENT SECTION	SY	250	\$ 100	\$ 25,000
9	DEWATERING	LS	1	\$ 5,000	\$ 5,000
10	UTILITY CONFLICTS	LS	1	\$ 10,000	\$ 10,000
CONTINGENCY (20%)					\$ 27,536
GRAND TOTAL					\$ 165,216

**PROJECT'S ENGINEERING COST**

ENGINEERING DESIGN SERVICES				
	CIVIL DESIGN LEADER J. SNEED	CIVIL ENGINEERING G. RILEY	CIVIL ENGINEERING K. KIM	TOTAL
MEETING	6	9	7.5	22.5
SITE SURVEY	6	10.5	11	27.5
HYDROLOGICAL MODELING (WMS)	43	10	-	53
CULVERT DESIGN (HY-8)	-	28.5	24	52.5
REPORTS AND POSTER	19.5	20.5	21	61
TOTAL LABOR HOURS	74.5	78.5	63.5	216.5
HOURLY RATE	\$ 45.00	\$ 35.00	\$ 25.00	
3.0 MULTIPLIER	\$ 135.00	\$ 105.00	\$ 75.00	
TOTAL	\$ 10,057.50	\$ 8,242.50	\$ 4,762.50	\$ 23,062.50