

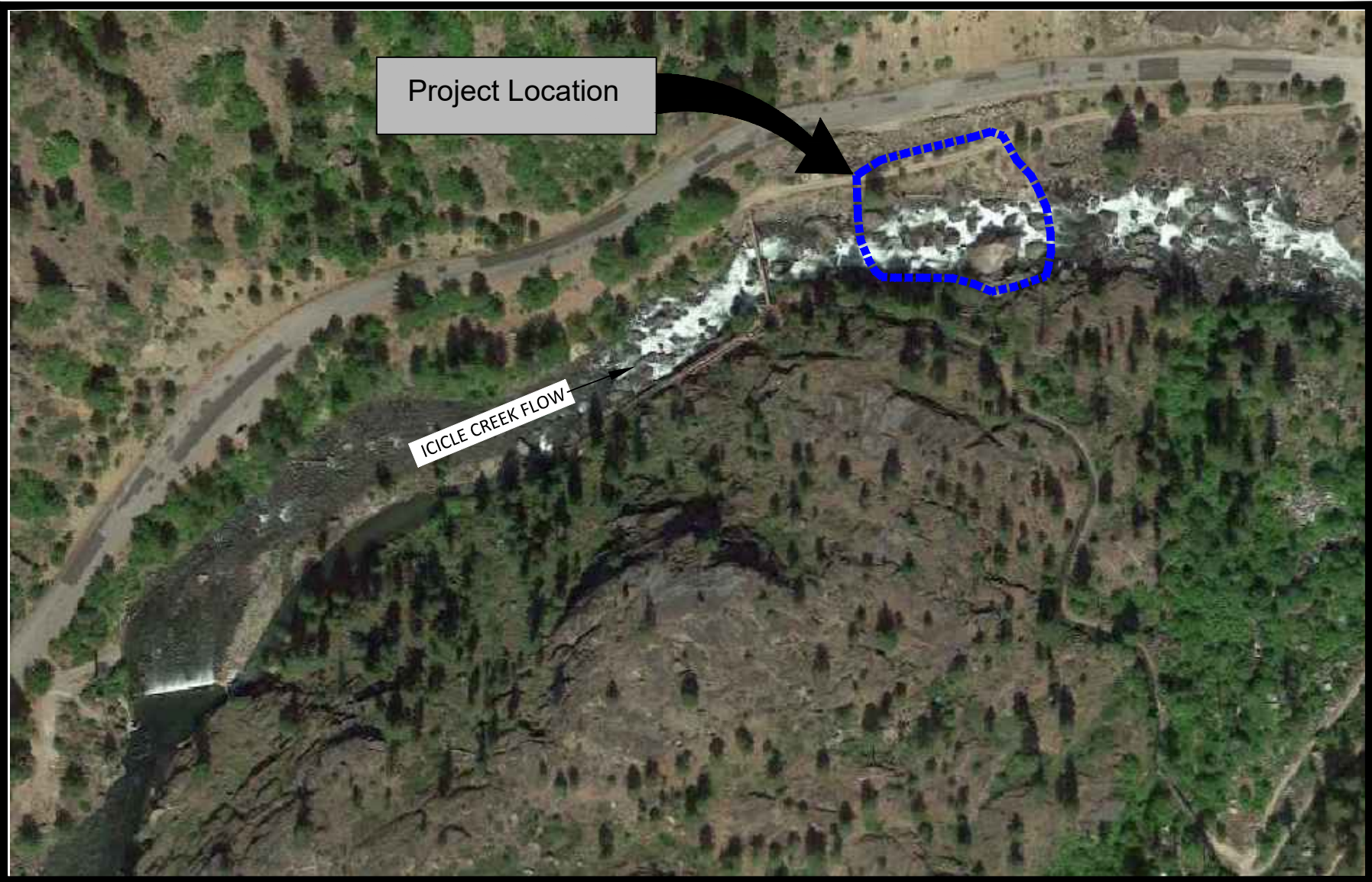
Preliminary Design - Option 5 - Step Pool Fishway

Icicle Boulder Field Passage Design

Project Number 13-1342

DRAWING INDEX:

- 1. Cover Sheet
- 2. Site Plan – Survey Control
- 3. Location of Control Points
- 4. Existing Site Plan
- 5. Construction Access Dewatering Plan
- 6. Site Plan – Overall
- 7. Site Plan – Enlarged
- 8. Channel Profile
- 9. Sections B and C
- 10. Sections D and E
- 11. Sections F and G
- 12. Sections H and I
- 13. Sections J and K
- 14. Sections L and M
- 15. Sections N and O
- 16. Fishway Step/Pool Details
- 17. Rock Slope Details



VICINITY MAP
Scale 1" = 200'



Icicle Boulder Field Passage Design

REV	DATE	BY	APP'D	DESCRIPTION
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DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
10/02/16

Cover Sheet

1 17
SHEET OF

CONTROL POINTS

POINT NAME	NORTHING	EASTING	ELEVATION
M2C PT # 107	198347.48	1669549.18	1417.42
M2C PT # 108	197875.34	1669099.02	1443.39
M2C PT # 109	197900.32	1669172.93	1429.72
M2C PT # 110	198679.36	1670636.90	1387.53

M2C PT # 110
NAIL IN PAVEMENT

USFS Road

IID Gravel Road

Boulder Field

M2C PT # 107
REBAR AND CONTROL CAP

IID Diversion Dam

M2C PT # 109
HUB AND TACK

M2C PT # 108
ALUMINUM CAP WITH AERIAL TARGET



Icicle Boulder Field Passage
Design

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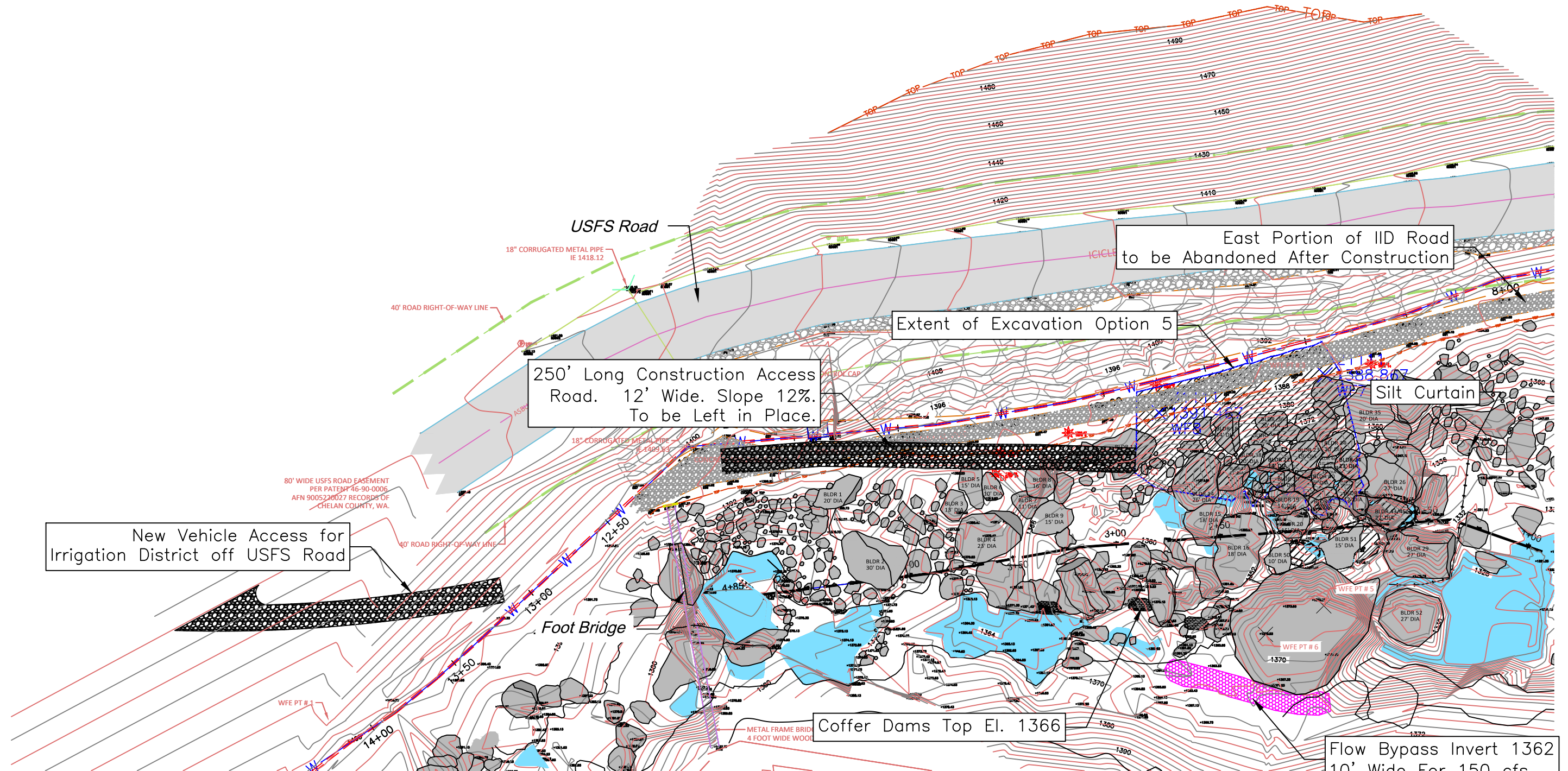
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Location of Control Points

3 17
SHEET OF



Site Plan
SCALE: 1" = 50'



Icicle Boulder Field Passage Design

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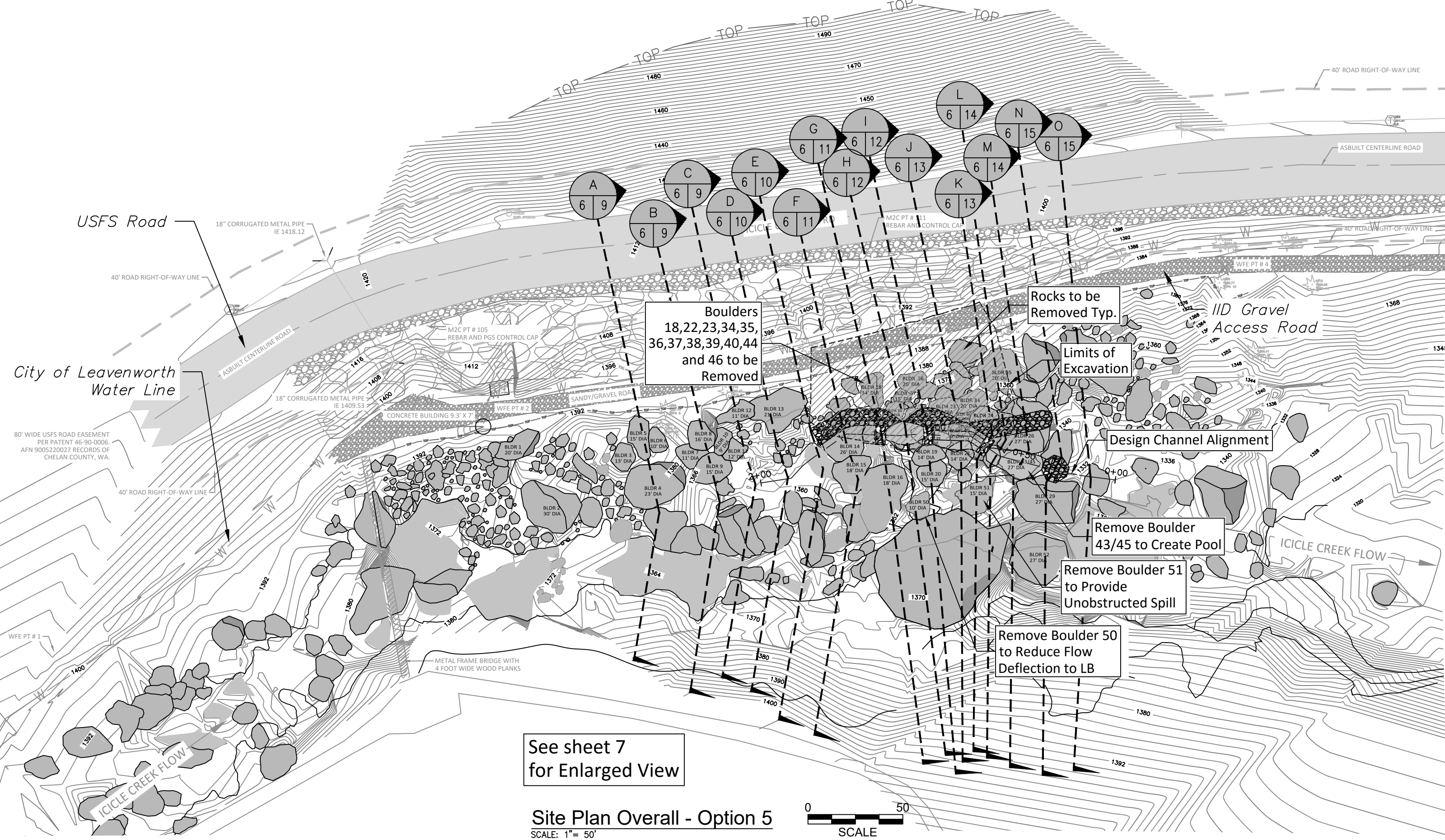
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Construction Access Dewatering Plan

5 **17**
SHEET OF



See sheet 7
for Enlarged View

Site Plan Overall - Option 5
SCALE: 1" = 50'



Icicle Boulder Field Passage Design - Option 5

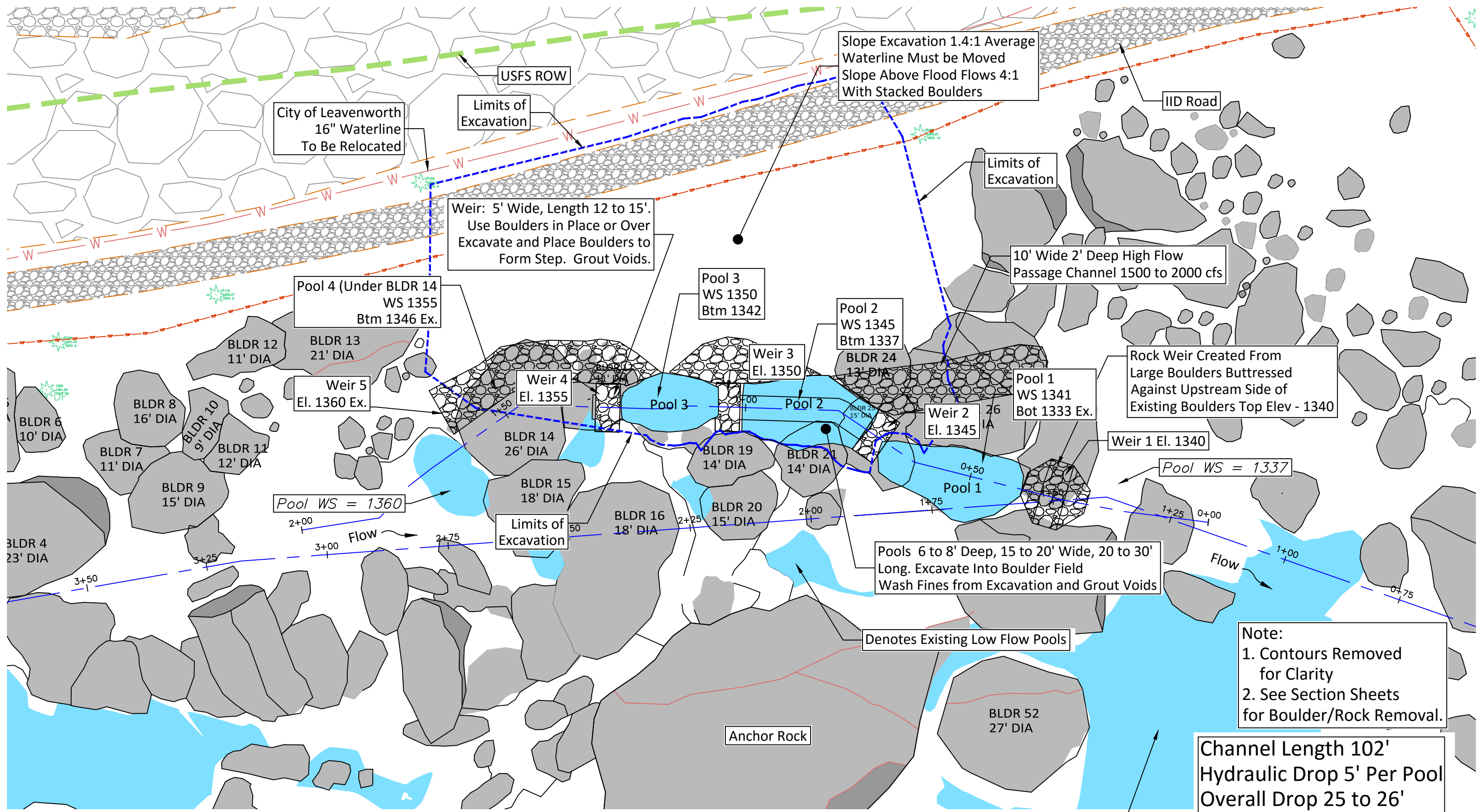
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Site Plan
Overall - Option 5



Site Plan - Option 5

SCALE: 1" = 20'



Pool WS = 1337

Note:
1. Contours Removed for Clarity
2. See Section Sheets for Boulder/Rock Removal.

Channel Length 102'
Hydraulic Drop 5' Per Pool
Overall Drop 25 to 26'
Channel Slope 15%



Icicle Boulder Field Passage Design - Option 5

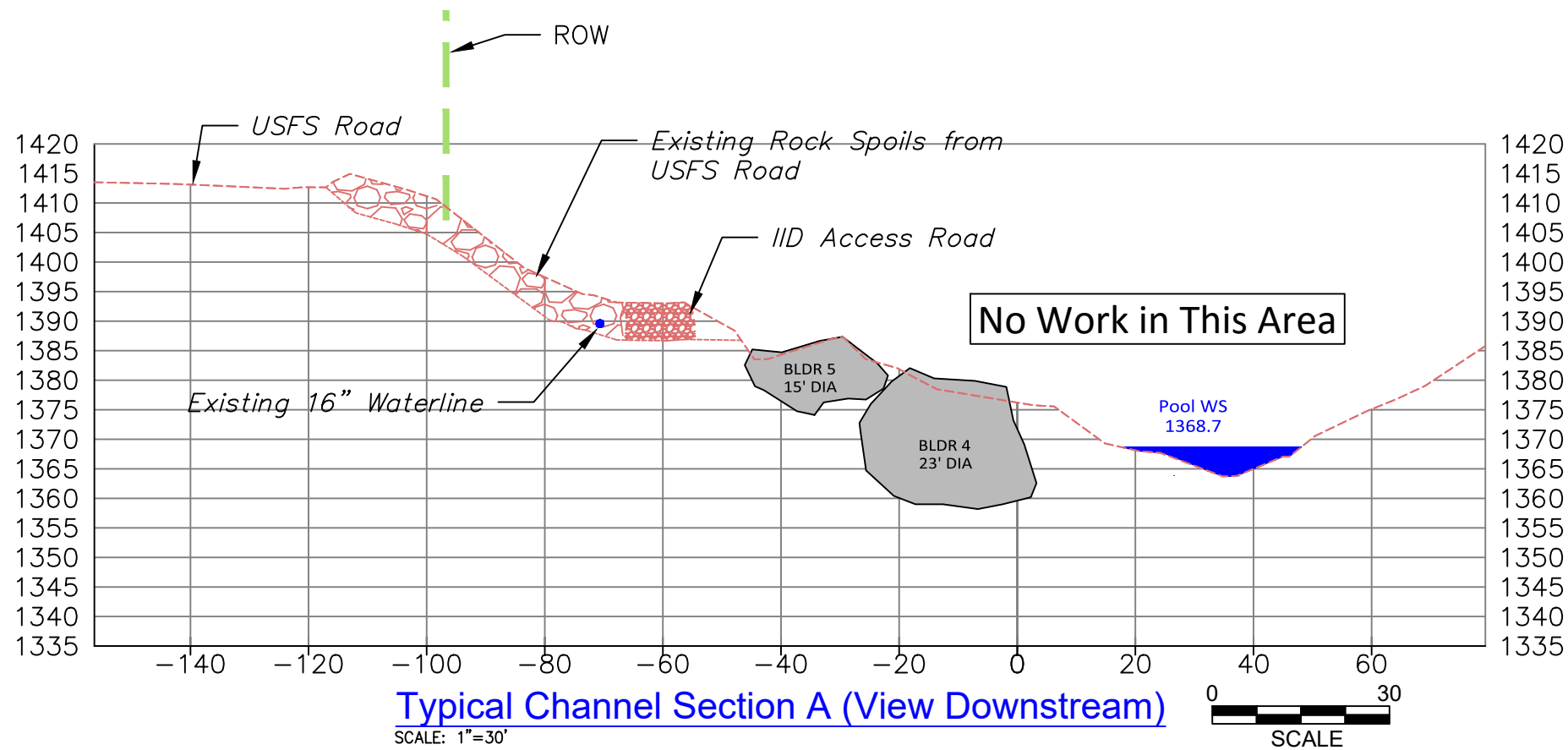
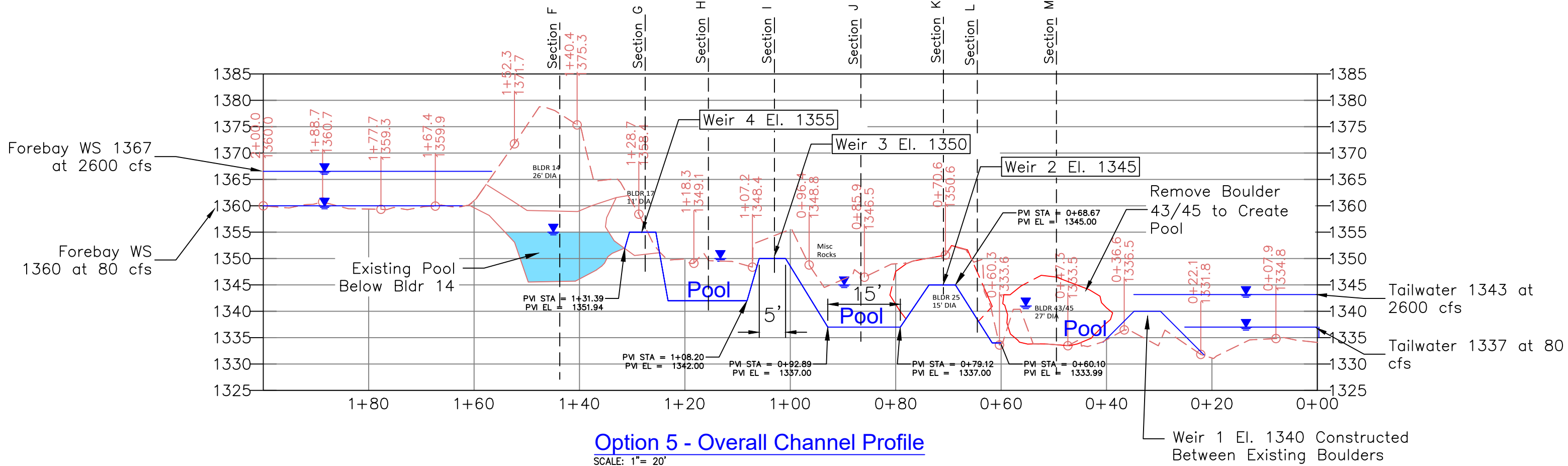
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0				1"

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Site Plan
Option 5 - Enlarged View



Icicle Boulder Field Passage Design - Option 5

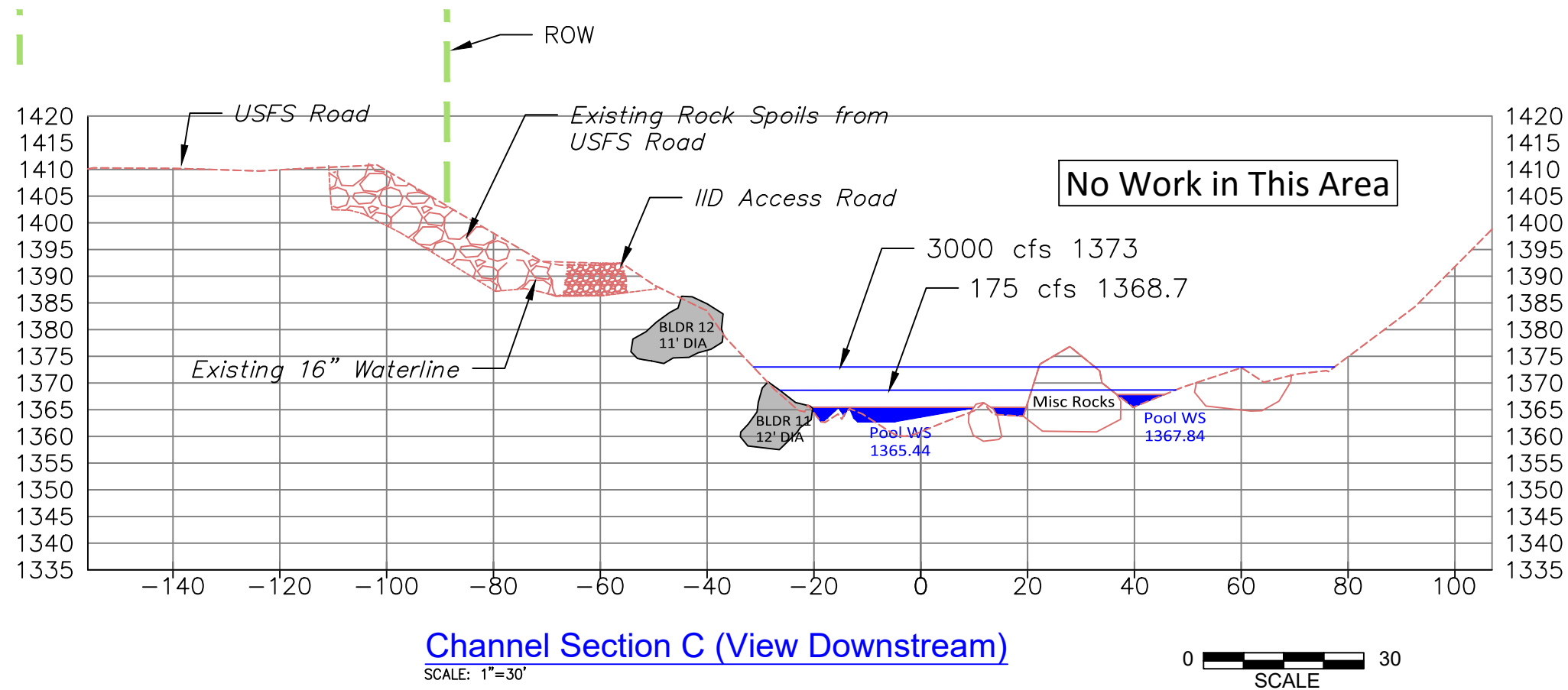
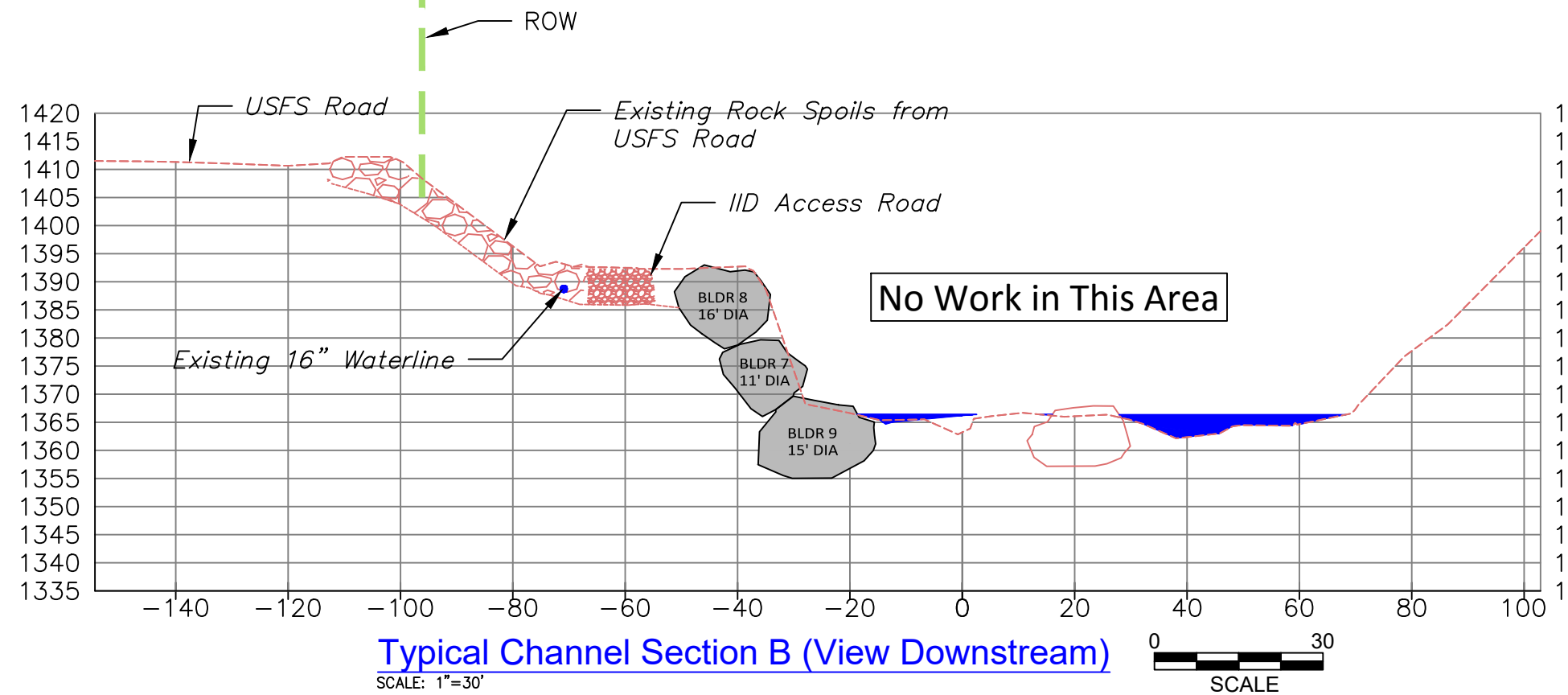
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0 1"				

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Channel Profile
and Section



Icicle Boulder Field Passage Design - Option 5

REV	DATE	BY	APP'D	DESCRIPTION
SCALE VERIFICATION				IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
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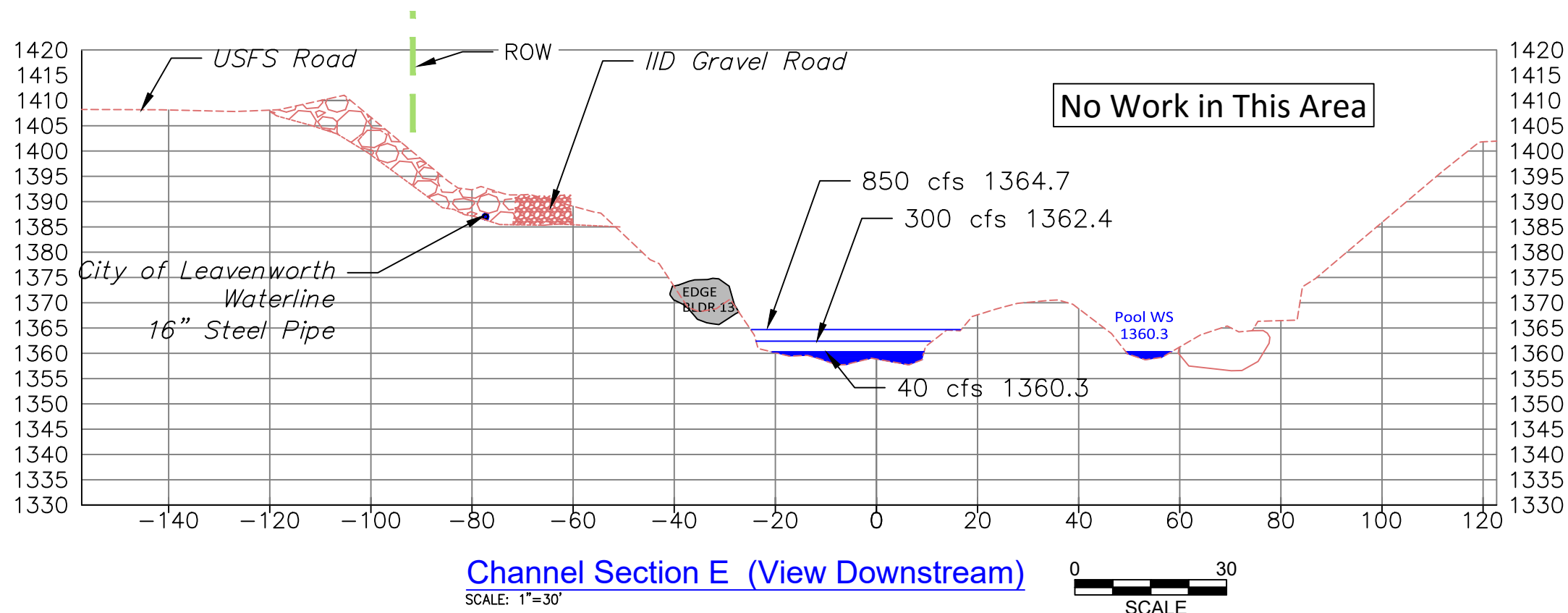
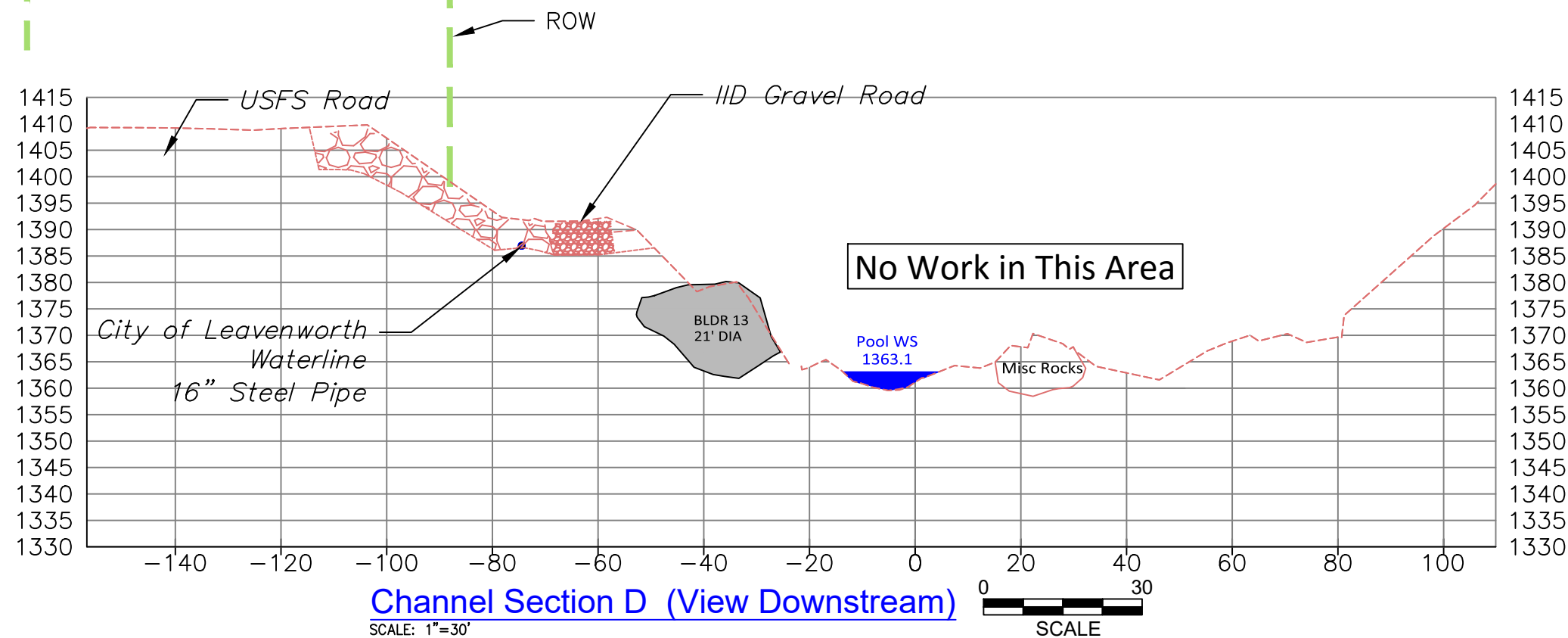
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Sections

9 17
SHEET OF



Icicle Boulder Field Passage Design - Option 5

REV	DATE	BY	APP'D	DESCRIPTION
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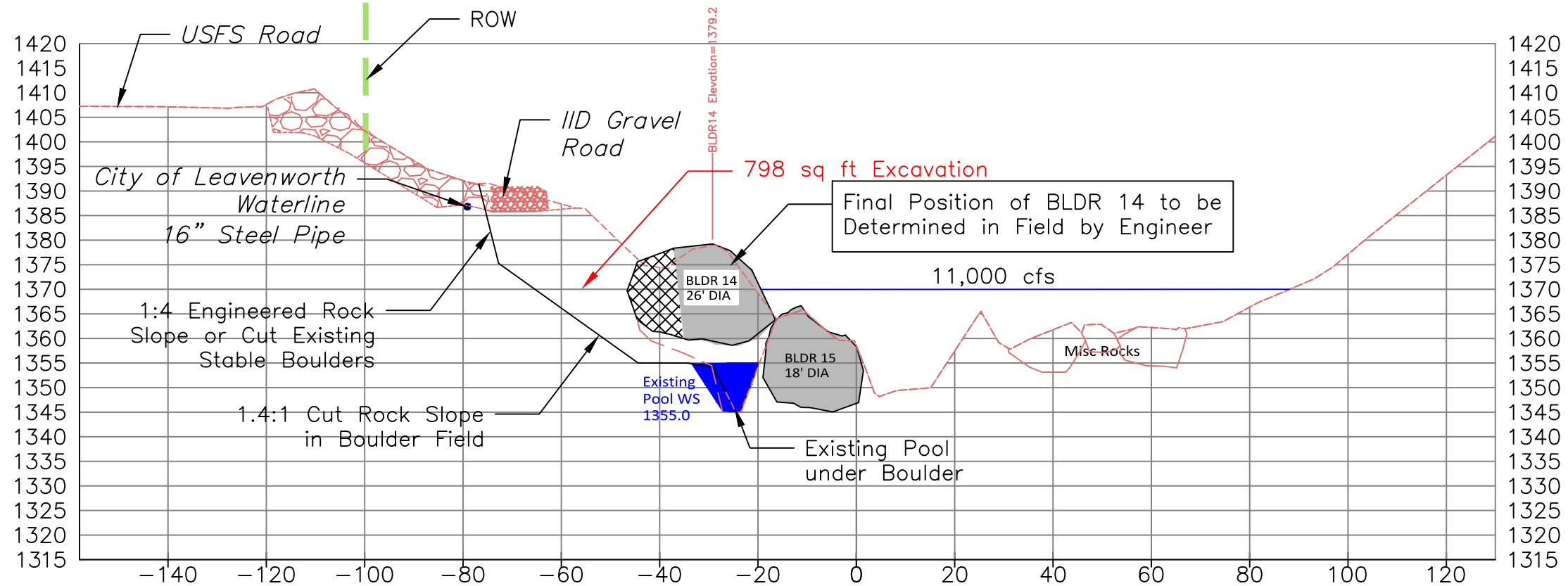
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RiverSide Drafting

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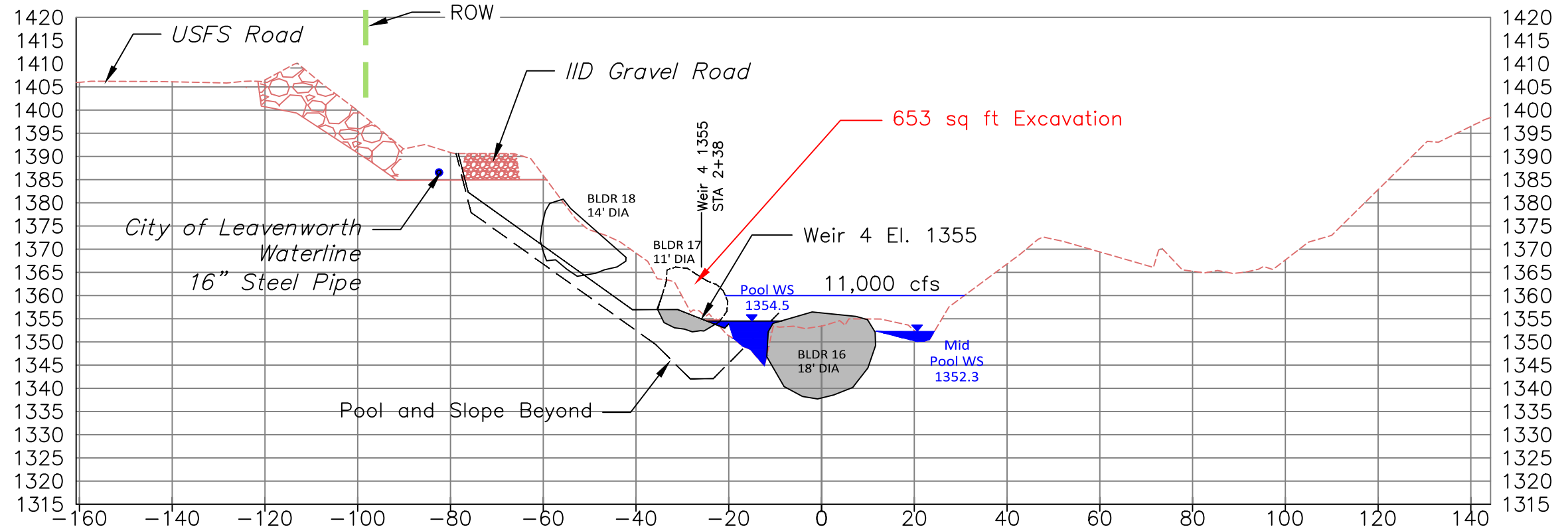
Sections

10 17
SHEET OF



Channel Section F - Pool 4 BLDR 14 (View Downstream)

SCALE: 1"=30'



Channel Section G - Weir 4 (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage Design - Option 5

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SCALE VERIFICATION				IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
0				1"

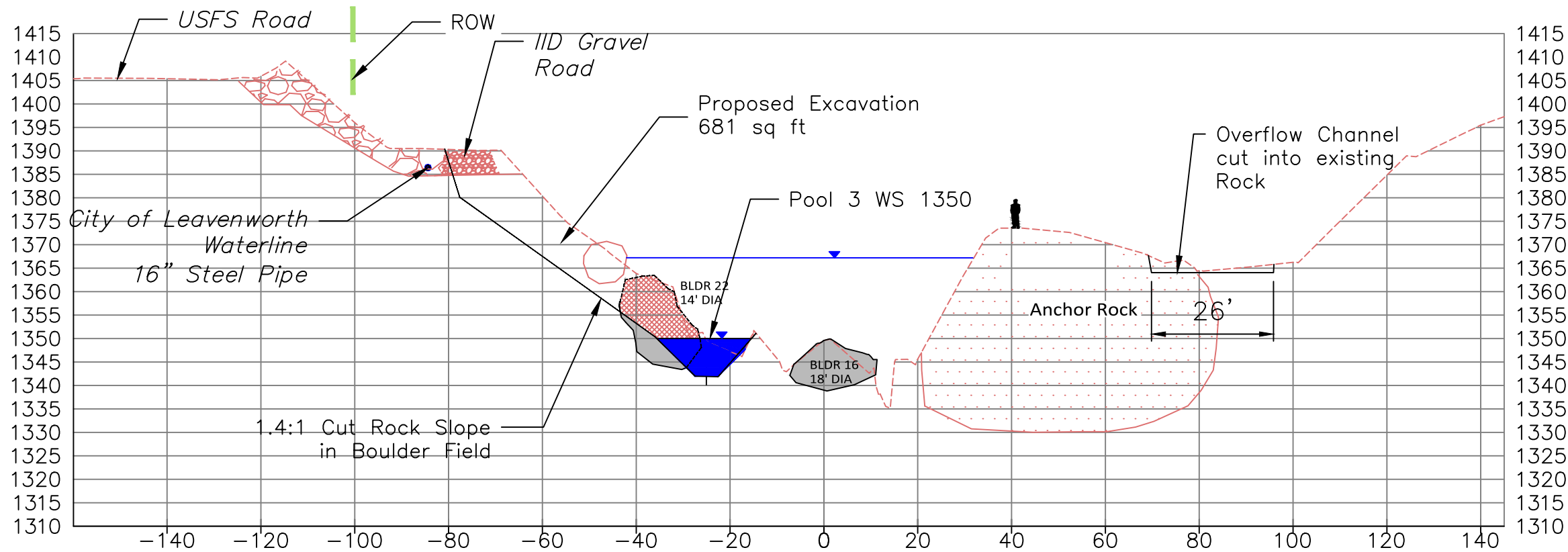
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RiverSide Drafting

DATE:
10/02/16

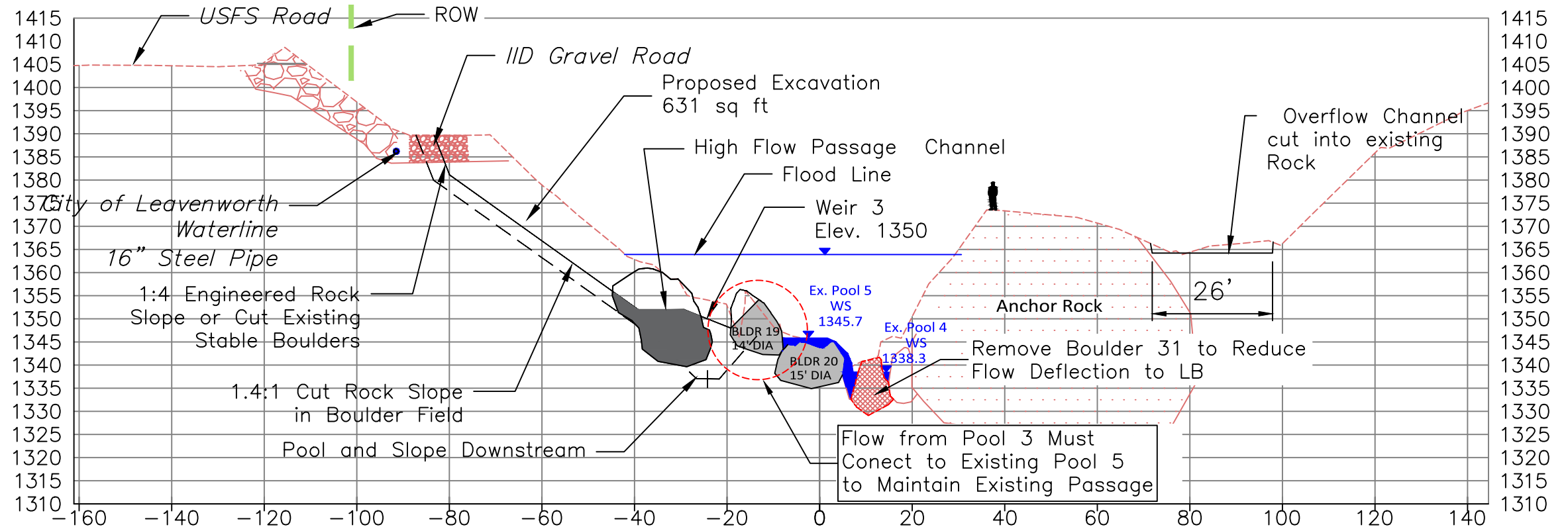
Sections

11 **17**
SHEET OF



Channel Section H - Pool 3 (View Downstream)

SCALE: 1"=30'



Channel Section I - Weir 3 (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage Design - Option 5

REV	DATE	BY	APP'D	DESCRIPTION
SCALE VERIFICATION				IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
0				1"

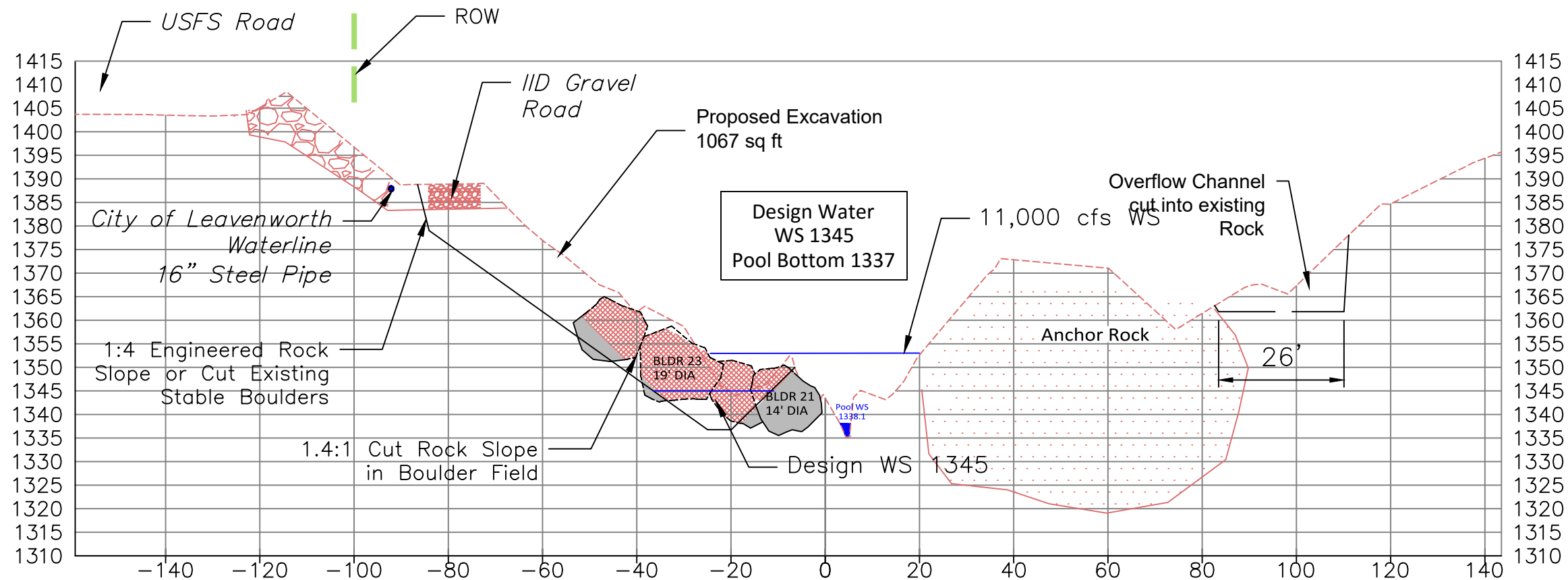
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RiverSide Drafting

DATE:
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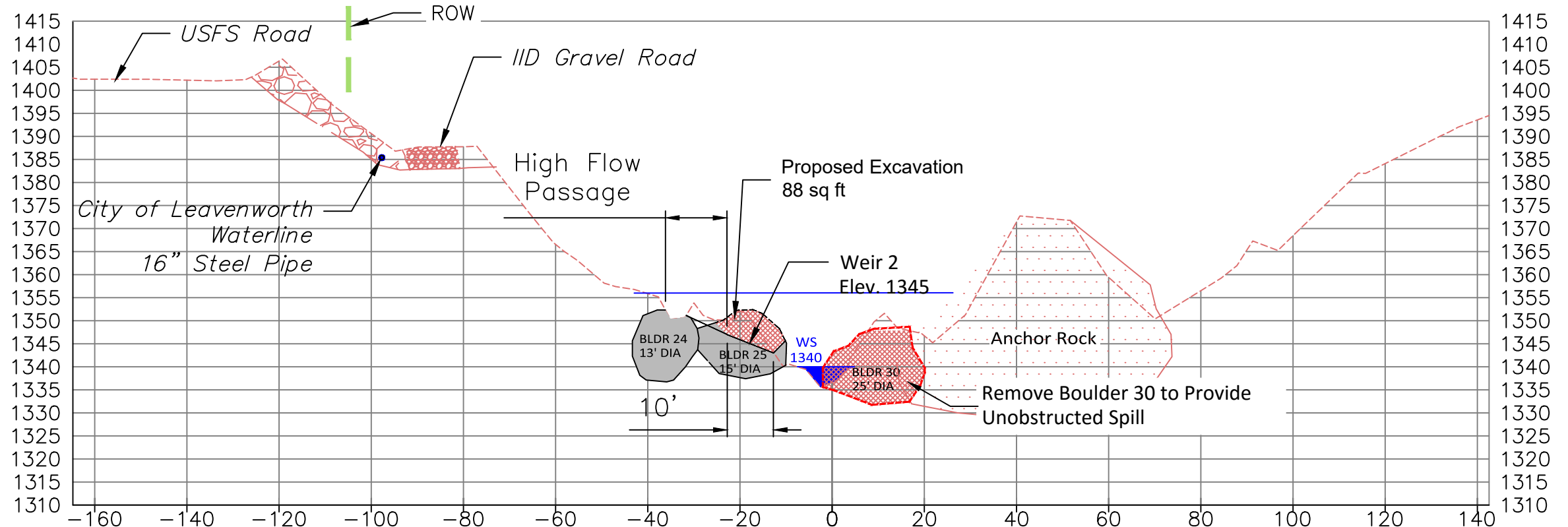
Sections

12 17
SHEET OF



Channel Section J - Pool 2 (View Downstream)

SCALE: 1"=30'



Channel Section K - Weir 2 (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage Design - Option 5

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0				1"

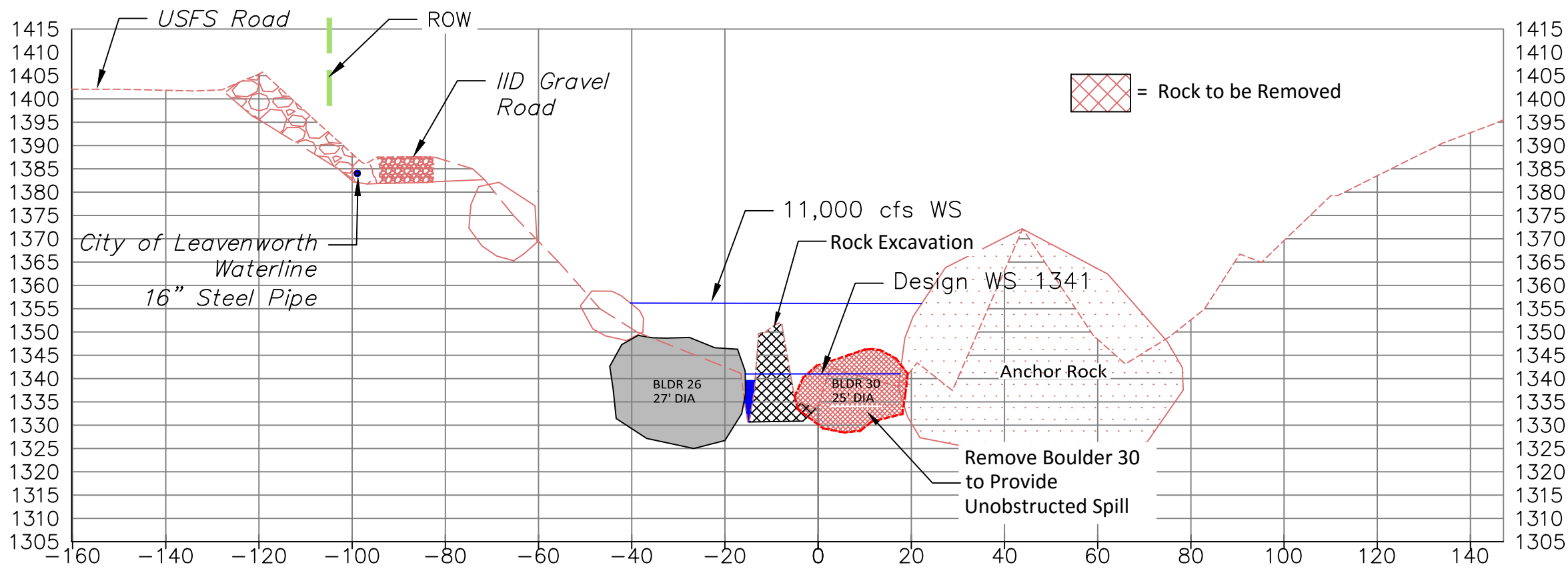
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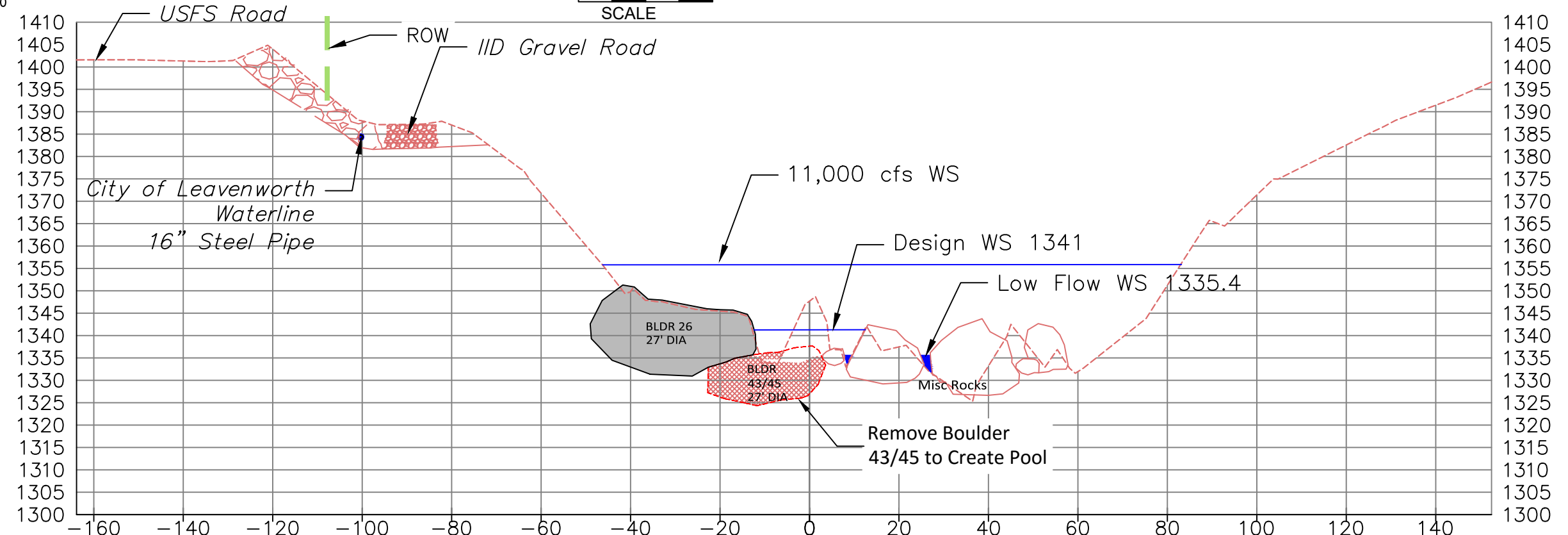
Sections

13 **17**
SHEET OF



Channel Section L - Pool 1 (View Downstream)

SCALE: 1"=30'



Channel Section M (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage Design - Option 5

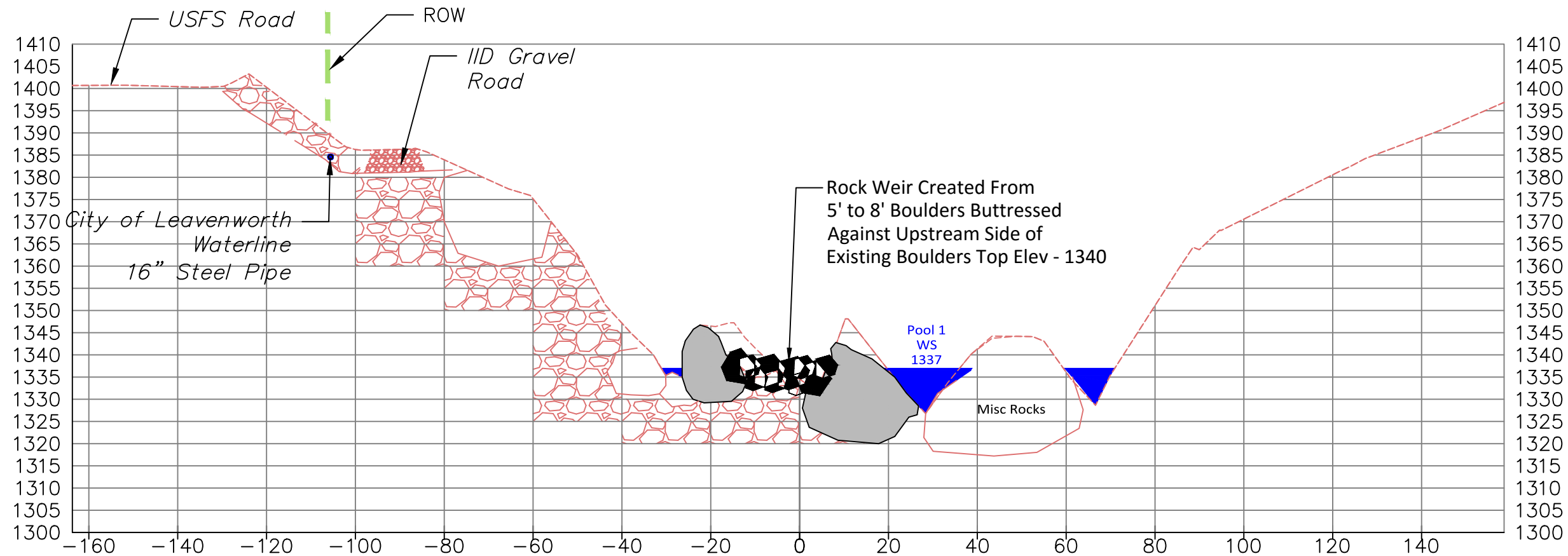
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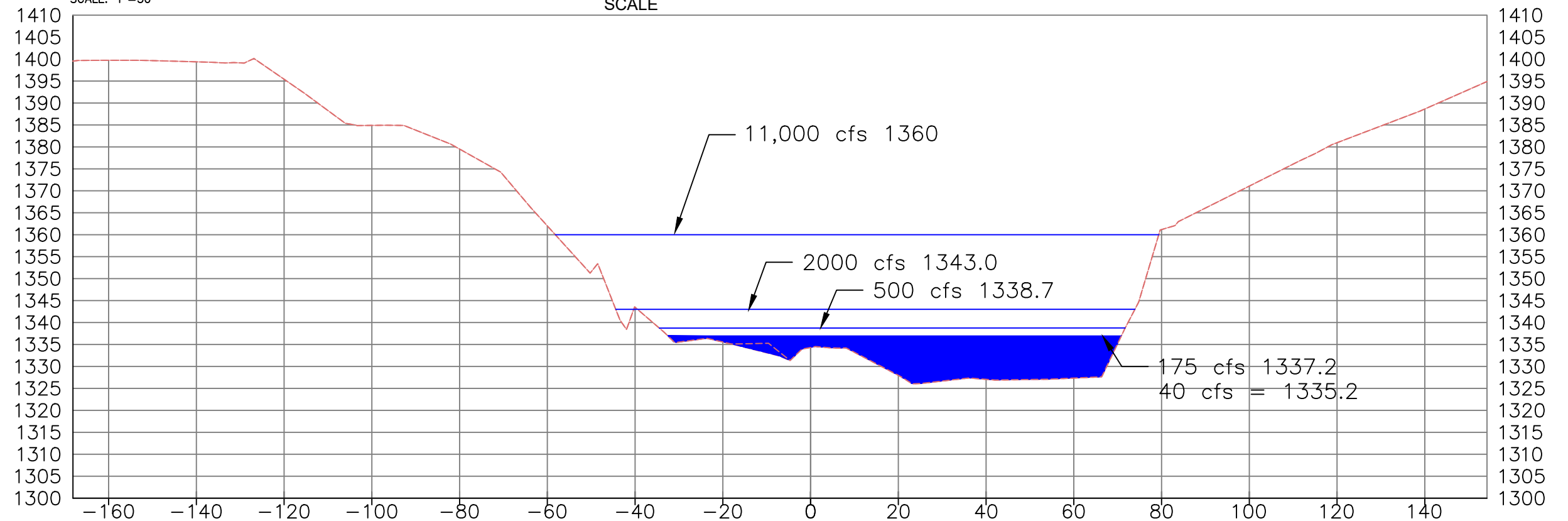
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Sections



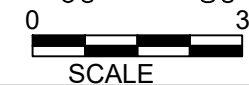
Channel Section N (View Downstream)

SCALE: 1"=30'



Channel Section O (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage Design - Option 5

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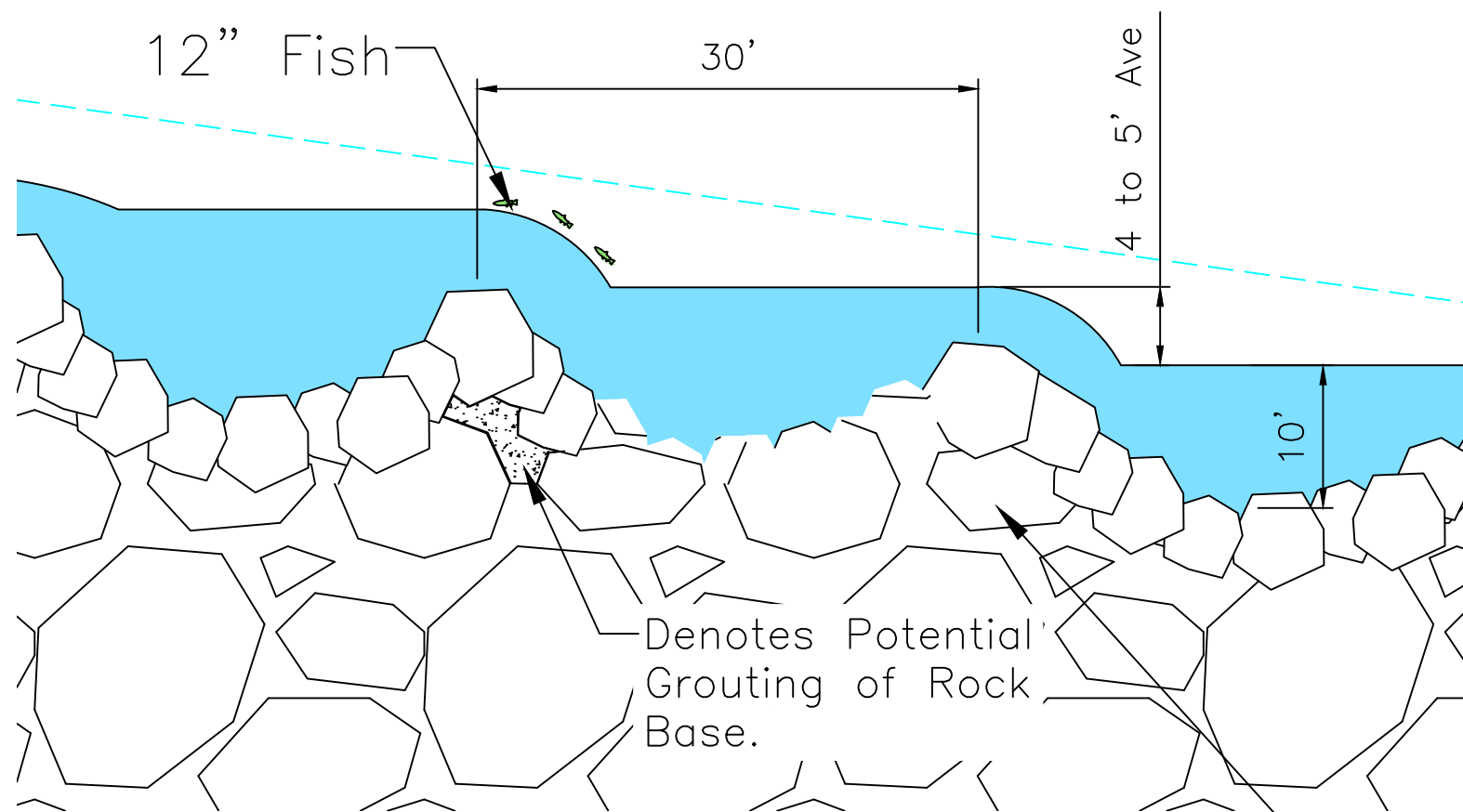
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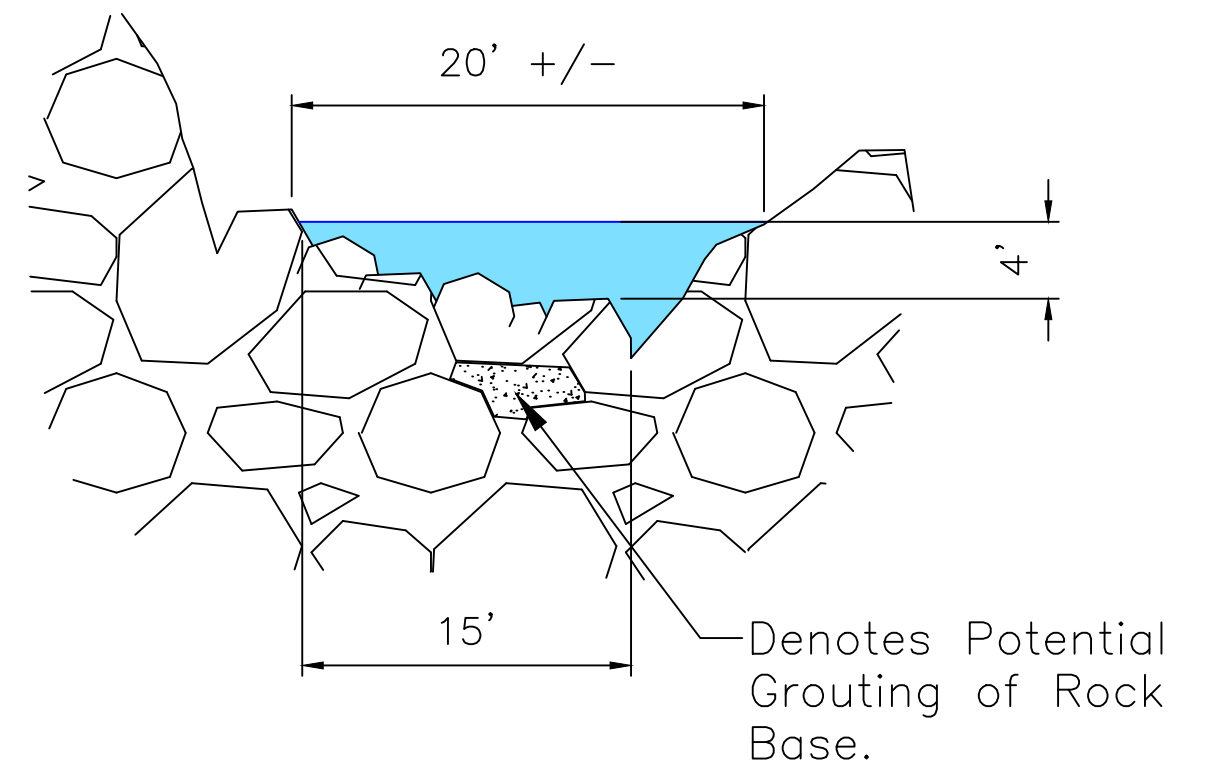
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Sections

15 **17**
SHEET OF

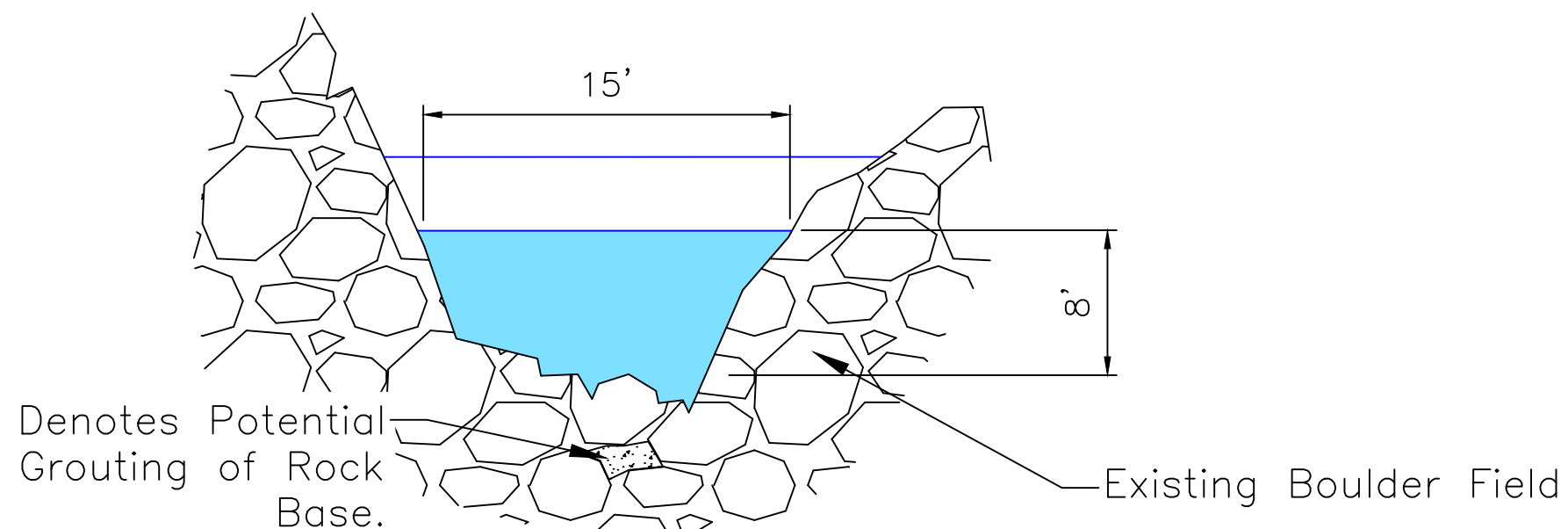


11% Slope Channel Profile
SCALE: 1" = 10'



Typical Step/Weir
SCALE: 1" = 10'

Existing Boulder Field



Typical Pool Detail
SCALE: 1" = 10'

Icicle Boulder Field Passage Design - Option 5

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Waterfall Engineering

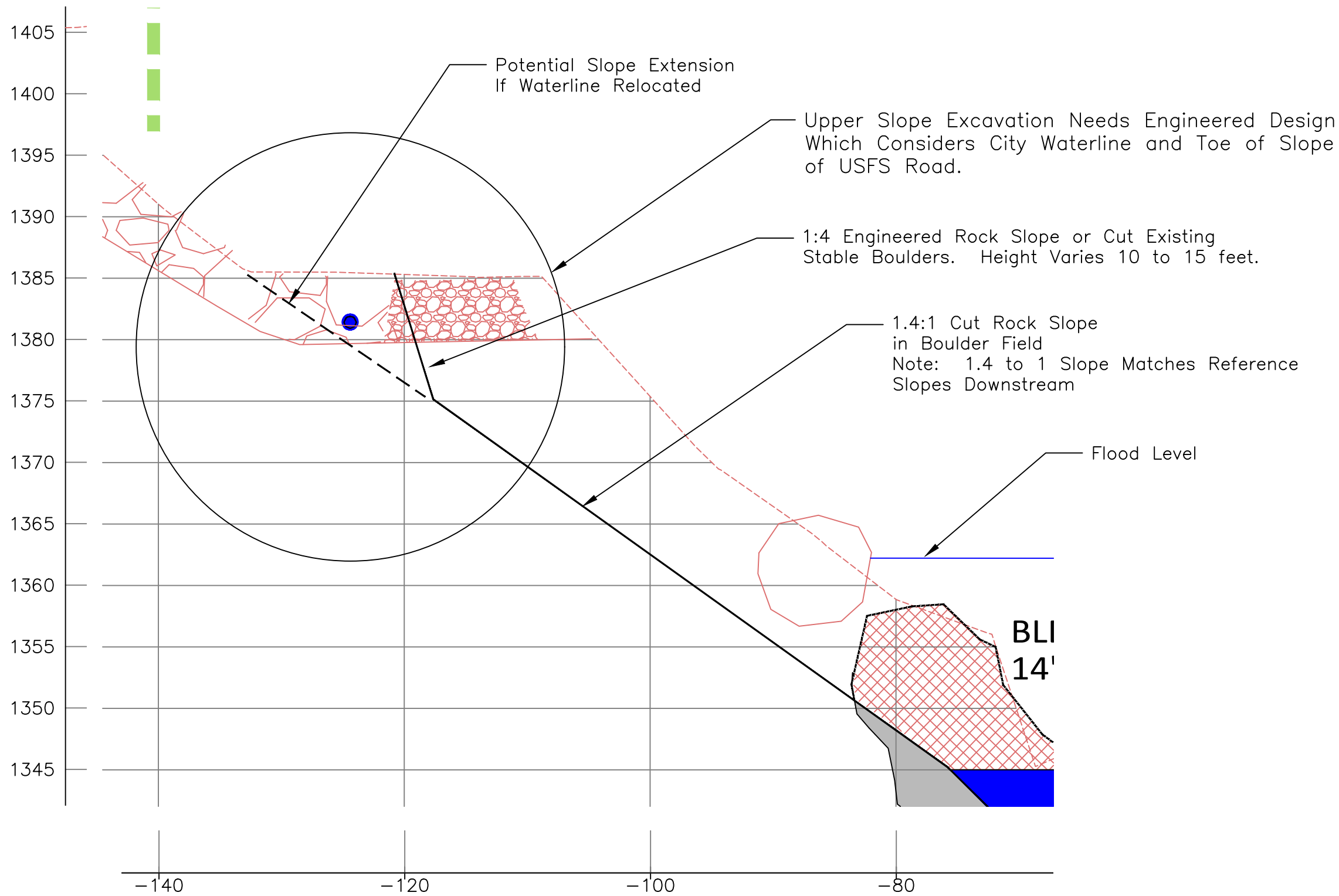
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DATE:
10/02/16

Fishway Step/Pool Details

16 17
SHEET OF





Typical Slope Section
SCALE: 1" = 10'



Icicle Boulder Field Passage Design - Option 5

REV	DATE	BY	APP'D	DESCRIPTION
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DESIGN BY:
Waterfall Engineering

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RiverSide Drafting

DATE:
10/02/16

Rock Slope Detail

Ice Creek Boulder Field Passage Design

Yellow Color Denotes Calculation

Site: Boulder Field
Date: Updated 10/26/16
Estimate By: Waterfall Engineering
Design Level: 80% Channel, 10% Waterline

Proposed Correction: Design Option 5: Remove 350' of Access Road, Relocate 300' of 16" Waterline Construct a 80' long, 20% sloped Step/Pool Rock Fishway with Four drops each 4 to 5 feet, Steps 10' Wide, Pools 20' Wide by 25' Long. Make Rock Blasting Modifications to the Main Spill Channel Adjacent to the

Description	Unit	CAD Qty	Mult	Bid Qty	Cost	Amount	Sub Total	Notes
Mobilize								
Mobilize	L.S.	1			\$140,000	\$140,000		Includes Access Road
Access	L.S.	1			\$15,000	\$15,000		Build Road Down to Site From USFS Road
Stream Bypass	C.Y.	80	1.2	96	\$200.00	\$19,200		Right of Anchor Rock
Cofferdams and Pumps	L.S.	1			\$30,000	\$30,000		Cofferdams and Pumping
Fish Removal	L.S.	1			\$5,000	\$5,000		
SUBTOTAL							\$209,200	
Channel Excavation and Form Steps								
Total Excavation		2453						Total Excavation Based on CAD Measurement of Sections is 2
Large Exposed Boulder Blasting	C.Y.	740	1.2	888	\$200.00	\$177,600		15 Boulders Larger Than 10' Diameter
Additional Buried Boulder Blasting	C.Y.	732	1.2	878.16	\$200.00	\$175,632		
General Rock Excavation	C.Y.	981	1.2	1177.4	\$80.00	\$94,195		
Loading Trucks	C.Y.	2453	1.2	2943.6	\$25.00	\$73,590		3 cu yd size, 66" Diam Approx
Disposal	C.Y.	2453	1.2	2943.6	\$15.00	\$44,154		Rock Disposed of Within 5 Miles
Step Construction (4)	C.Y.	375	1.2		\$150.00	\$67,500		Use Boulders From Excavation Includes Grout
Concrete/Grout Seal	C.Y.	40	1.2		\$1,000.00	\$48,000		Low Flow Channel Seal
Boulder 43/45, 50 and 52 Removal	C.Y.	300	1.2		\$200.00	\$72,000		Rock in Spill Area to Redirect Flow
15' High Rock Wall	L.S.	1			\$150,000	\$150,000		Needs to be Designed, 100' long
SUBTOTAL							\$902,671	
Waterline Relocation								
Option A - From IntegriTech Report	L.S.	1			\$614,000.00	\$614,000		Note: The waterline relocation plan has not been aproved by the City of Leavenworth. This estimate is conceptual only and requires further design and discussion with the USFS and the City of Leavenworth. Relocation area may be on the USFS ROW.
SUBTOTAL							\$614,000	
CONSTRUCTION SUB TOTAL							\$1,725,871	
Contingencies	25%						\$431,468	
Sales Tax	8.0%						\$172,587	
CONSTRUCTION TOTAL							\$2,329,926	

Opinions of Probable Construction Cost

In providing opinions of probable construction cost, the Client understands that the Consultant (Waterfall Engineering, L.L.C.) has no control over the cost or availability of labor, equipment or materials, or over market condition or the Contractor's method of pricing, and the consultant's opinions of probable construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, express or implied that the bids or the negotiated cost of the Work will not vary from the Consultant's opinion of probable construction cost.