

**BEAVER SWAMP BROOK  
HYDROLOGIC AND HYDRAULIC  
ANALYSIS**

**FOR**

**TOWN OF HARRISON  
WESTCHESTER COUNTY, NY**

DATE: 7/18/07

LJA # 07026



# Leonard Jackson Associates Consulting Engineers

26 Firemens Memorial Drive . Pomona, New York 10970 . (845) 354-4382 . FAX (845) 354-4401

July 20, 2007

Town of Harrison  
Alfred F. Sulla, Jr. Municipal Building  
One Heineman Place  
Harrison, New York 10528

Att: Robert G. Wasp, P.E.  
Commissioner of Pubic Works

Re: **Beaver Swamp Brook/Brownfield Remediation & Project Home Run**  
LJA #07026

Dear Mr. Wasp:

We have completed an analysis of the affects of the subject projects on flood elevations on the Beaver Swamp Brook. Attached is a table summarizing those effects in the vicinity and downstream of the project site. Also attached is a supporting appendix.

Our analysis finds that the affects on flood elevations resulting from the projects' construction are minimal. Our hydraulic and hydrologic models predict floodplain elevation rises of approximately 5/8" to 1" above existing 100-year flood depths which range from 4 to 8 feet along this waterway.

The input parameters and the theories upon which our hydrologic and hydraulic models are based, are not of the precision of the calculated 5/8" to 1" flood elevation rises. In short, the effects of the projects' construction on Beaver Swamp 100-year flood elevations are too small to precisely be measured.

In performing our analysis we evaluated the hydrologic effects of flood storage displacement resulting from the projects' construction based on multiple cross-sections within the stream and thereby defined an increase in discharge rate on the Brook using an HEC-1 Hydrologic Model. We then evaluated the rise on the waterway resulting from this increase in discharge rate and the change in floodplain conveyance utilizing an HEC-RAS hydraulic model.

The bases of this modeling was the analyses that Leonard Jackson Associates (LJA) prepared for the Federal Emergency Management Agency (FEMA) for the preparation of the current FEMA flood maps due for adoption this September. The FEMA Hydrologic and Hydraulic Models of the Beaver Swamp Brook for existing conditions were modified to reflect the Brownfield Remediation and Park development (Project Home Run) to determine their effects. A summary table reflecting flood elevation rises for each of these projects is attached. Summary tables were prepared for the 10-year, 50-year and 100-year return intervals.

## Leonard Jackson Associates

I am advised that residents who were flooded during the intense rainfalls this past March and April are concerned that the Brownfield Redevelopment Project was the cause of their flooding and that the future project Home Run will further exacerbate this flooding. Our analysis concludes that the flooding was caused by record rainfalls and sustained elevated groundwater levels, not Brownfield Remediation, and that the future Project Home Run will have a similar minimal effect.

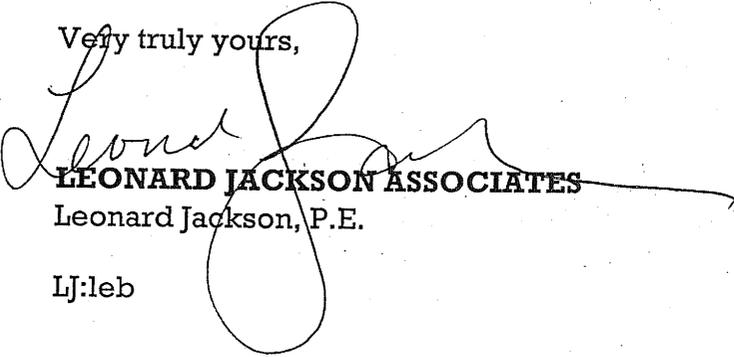
The Floodplain maps prepared by LJA for FEMA define flood hazard areas and elevations based upon detailed survey that was obtained in October 2004, prior to the Brownfield Remediation project.

The Brownfield Remediation and the proposed project Home Run do not measurably alter these flood hazard area delineations.

The solution to flooding along the Beaver Swamp Brook will likely involve physical changes to the waterway's restrictive bridges, culverts and channels. Flood storage (detention) is a significant factor in the waterways' hydrology, therefore additional flood storage should also be considered.

Leonard Jackson Associates has been retained to evaluate the above and other flood control alternatives.

Very truly yours,



**LEONARD JACKSON ASSOCIATES**

Leonard Jackson, P.E.

LJ:leb

# LJA # 07026 Beaver Swamp Brook

## Discharges Comparison Table

Return Year	Conditions			Change (2)-(1) (cfs)	Change (3)-(1) (cfs)
	Existing (1) (cfs)	As-built Brownfield (2) (cfs)	Proposed Project Home Run (3) (cfs)		
100	445	461	471	16	26
50	360	376	383	16	23
10	173	182	182	9	9

# LJA # 07026 Beaver Swamp Brook

## Flood Elevation Comparison Tables

### 100-Year Return Interval

Station	Conditions			Change (2)-(1) (ft)	Change (3)-(1) (ft)
	Existing (1) (ft)	As-built Brownfield (2) (ft)	Proposed Project Home Run (3) (ft)		
9738	33.68	33.72	33.74	0.04	0.06
9670	33.69	33.74	33.76	0.05	0.07
9560	33.67	33.72	33.75	0.05	0.08
9460	33.66	33.71	33.73	0.05	0.07
9310	33.65	33.7	33.73	0.05	0.08
9160	33.65	33.7	33.72	0.05	0.07
9040	33.64	33.69	33.72	0.05	0.08
8940	33.64	33.69	33.71	0.05	0.07
8825	33.64	33.68	33.71	0.04	0.07
8703	33.64	33.68	33.71	0.04	0.07
8441	33.63	33.68	33.71	0.05	0.08
8053	33.63	33.68	33.7	0.05	0.07
7968	33.63	33.67	33.7	0.04	0.07

### 50-Year Return Interval

Station	Conditions			Change (2)-(1) (ft)	Change (3)-(1) (ft)
	Existing (1) (ft)	As-built Brownfield (2) (ft)	Proposed Project Home Run (3) (ft)		
9738	33.37	33.42	33.44	0.05	0.07
9670	33.34	33.4	33.42	0.06	0.08
9560	33.32	33.38	33.4	0.06	0.08
9460	33.3	33.36	33.38	0.06	0.08
9310	33.3	33.35	33.38	0.05	0.08
9160	33.3	33.35	33.37	0.05	0.07
9040	33.29	33.35	33.37	0.06	0.08
8940	33.29	33.34	33.36	0.05	0.07
8825	33.29	33.34	33.36	0.05	0.07
8703	33.29	33.34	33.36	0.05	0.07
8441	33.28	33.34	33.36	0.06	0.08
8053	33.28	33.33	33.36	0.05	0.08
7968	33.28	33.33	33.35	0.05	0.07

### 10-Year Return Interval

Station	Conditions			Change (2)-(1) (ft)	Change (3)-(1) (ft)
	Existing (1) (ft)	As-built Brownfield (2) (ft)	Proposed Project Home Run (3) (ft)		
9738	32.78	32.83	32.84	0.05	0.06
9670	32.72	32.78	32.78	0.06	0.06
9560	32.71	32.77	32.77	0.06	0.06
9460	32.7	32.76	32.76	0.06	0.06
9310	32.69	32.76	32.76	0.07	0.07
9160	32.69	32.75	32.76	0.06	0.07
9040	32.69	32.75	32.75	0.06	0.06
8940	32.69	32.75	32.75	0.06	0.06
8825	32.69	32.75	32.75	0.06	0.06
8703	32.69	32.75	32.75	0.06	0.06
8441	32.69	32.75	32.75	0.06	0.06
8053	32.68	32.74	32.75	0.06	0.07
7968	32.68	32.74	32.75	0.06	0.07

## Beaver Swamp Brook

### Storage vs Discharge Relationship between Station 9738 and 7968

(Existing Condition)

	B	C	B-C
Q (cfs)	Cumulative Storage Volume @ 9738	Cumulative Storage Volume @ 7968	Storage Volume (ac-ft) between 9738 & 7968
1	26.03	23.52	2.51
50	40.12	28.52	11.6
100	96.39	71.57	24.82
150	127.72	89.96	37.76
200	153.3	105.65	47.65
250	179.6	120.07	59.53
300	199.57	133.17	66.4
350	220.78	147.62	73.16
400	242.28	161.72	80.56
450	262.99	174.91	88.08
500	286.84	190.95	95.89
550	309.83	206.5	103.33
600	333.91	222.83	111.08
650	358.03	239.25	118.78
700	378.69	253.25	125.44
750	398.53	266.83	131.7
800	414.46	277.73	136.73
850	429.47	288.69	140.78
900	444.89	299.19	145.7
950	477.76	324.46	153.3

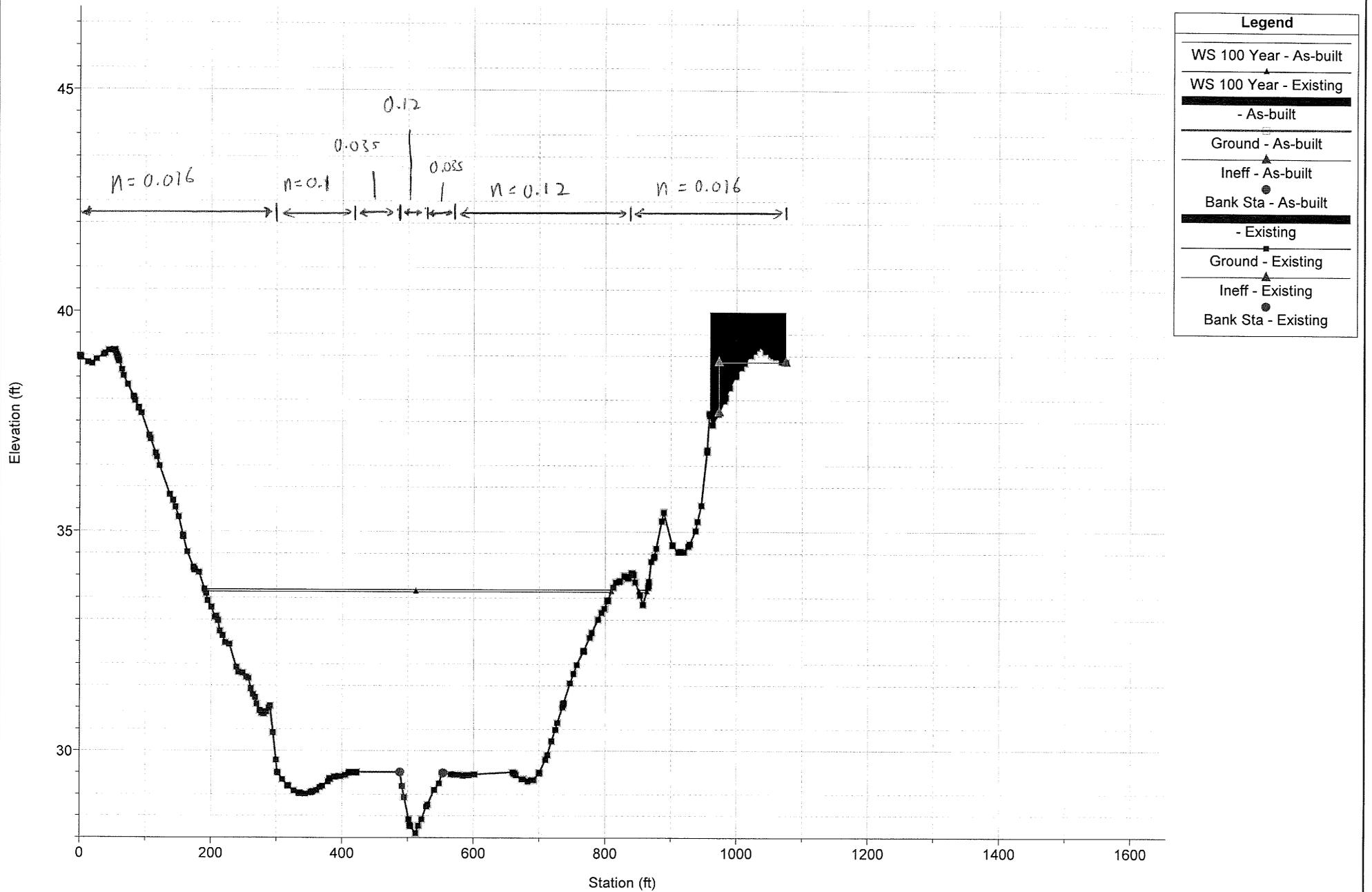
**Storage vs Discharge Relationship between Station 9738 and 7968  
(As-built Brownfield Condition)**

	B	C	B-C
Q (cfs)	Cumulative Storage Volume @ 9738	Cumulative Storage Volume @ 7968	Storage Volume (ac-ft) between 9738 & 7968
1	25.96	23.52	2.44
50	39.65	28.52	11.13
100	94.49	71.57	22.92
150	124.05	89.96	34.09
200	148.39	105.65	42.74
250	173.25	120.07	53.18
300	192.53	133.17	59.36
350	213.17	147.62	65.55
400	234.23	161.72	72.51
450	254.62	174.91	79.71
500	278.24	190.95	87.29
550	301.06	206.5	94.56
600	324.98	222.83	102.15
650	348.97	239.25	109.72
700	369.53	253.25	116.28
750	389.31	266.83	122.48
800	405.19	277.73	127.46
850	420.16	288.69	131.47
900	435.55	299.19	136.36
950	468.39	324.46	143.93

**Storage vs Discharge Relationship between Station 9738 and 7968  
(Proposed Home Run Project Condition)**

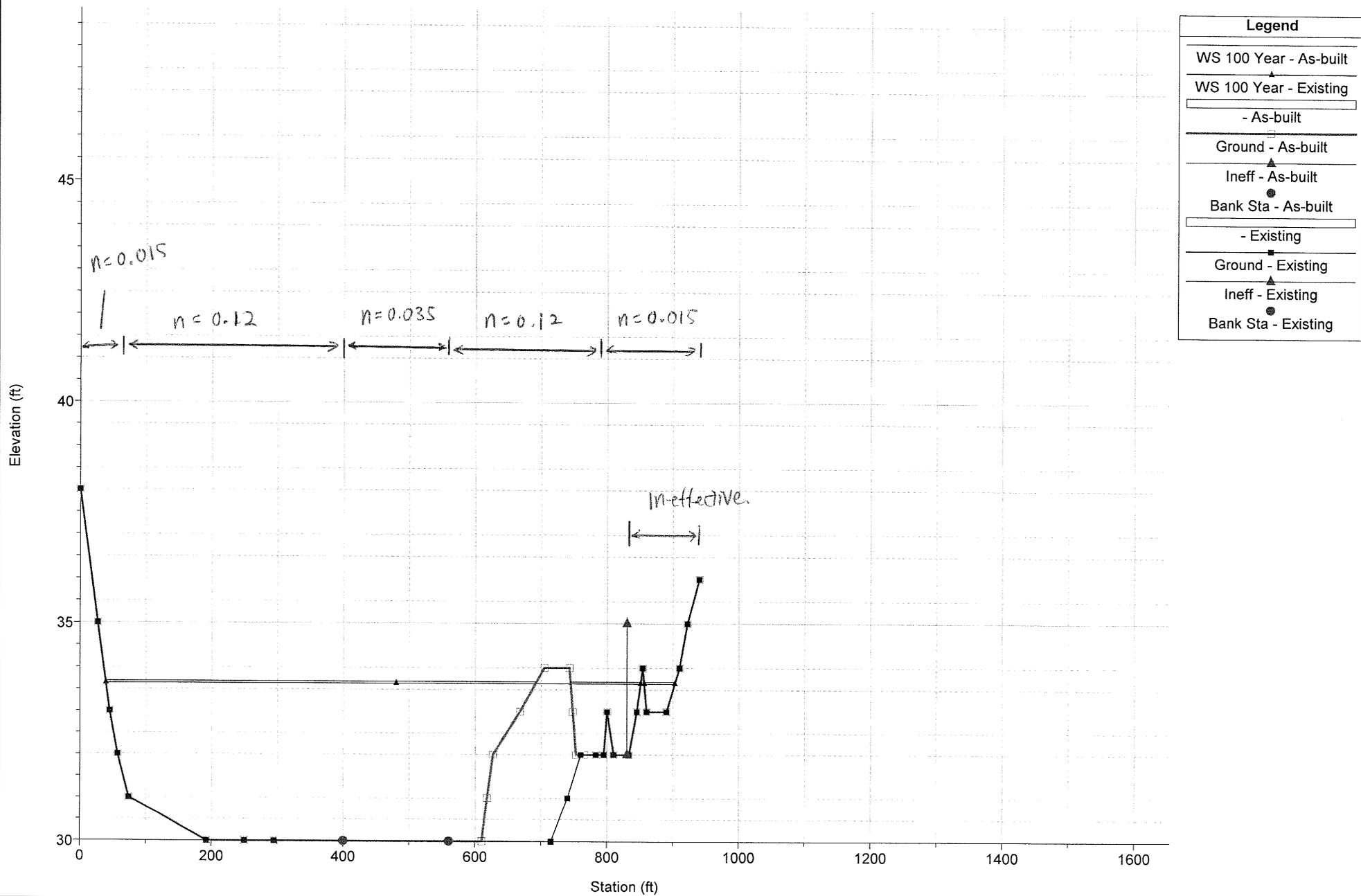
	B	C	B-C
Q (cfs)	Cumulative Storage Volume @ 9738	Cumulative Storage Volume @ 7968	Storage Volume (ac-ft) between 9738 & 7968
1	24.82	23.52	1.3
50	38.55	28.52	10.03
100	94.12	71.57	22.55
150	123.48	89.96	33.52
200	147.54	105.65	41.89
250	171.85	120.07	51.78
300	190.68	133.17	57.51
350	210.81	147.62	63.19
400	231.3	161.72	69.58
450	251.1	174.91	76.19
500	274.12	190.95	83.17
550	296.46	206.5	89.96
600	319.99	222.83	97.16
650	343.68	239.25	104.43
700	364.06	253.25	110.81
750	383.75	266.83	116.92
800	399.6	277.73	121.87
850	414.55	288.69	125.86
900	429.93	299.19	130.74
950	462.74	324.46	138.28

Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 8703 Comparison Between Existing and As-built Conditions



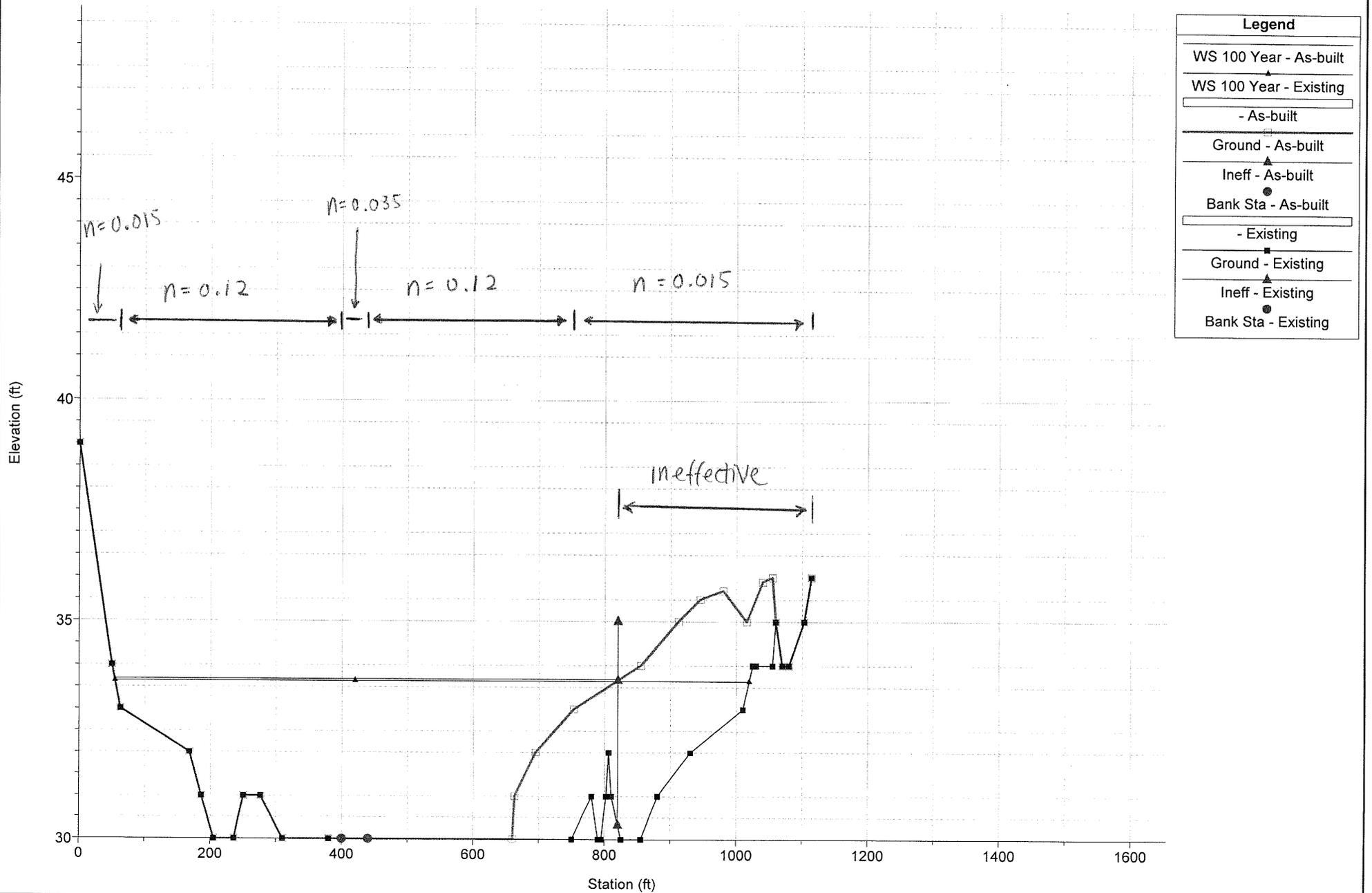
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Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 8825 Comparison Between Existing and As-built Conditions



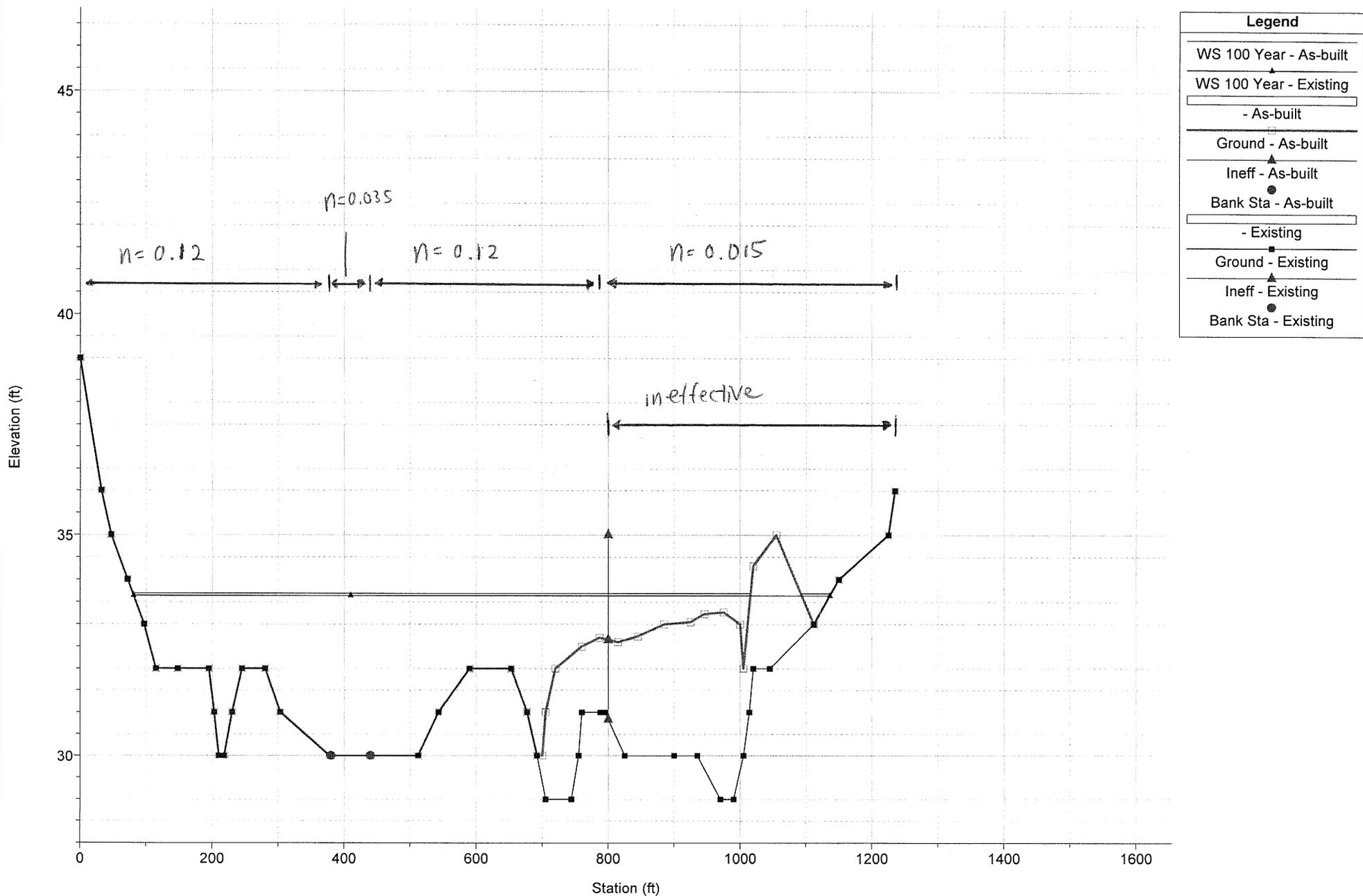
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Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 8940 Comparison Between Existing and As-built Conditions



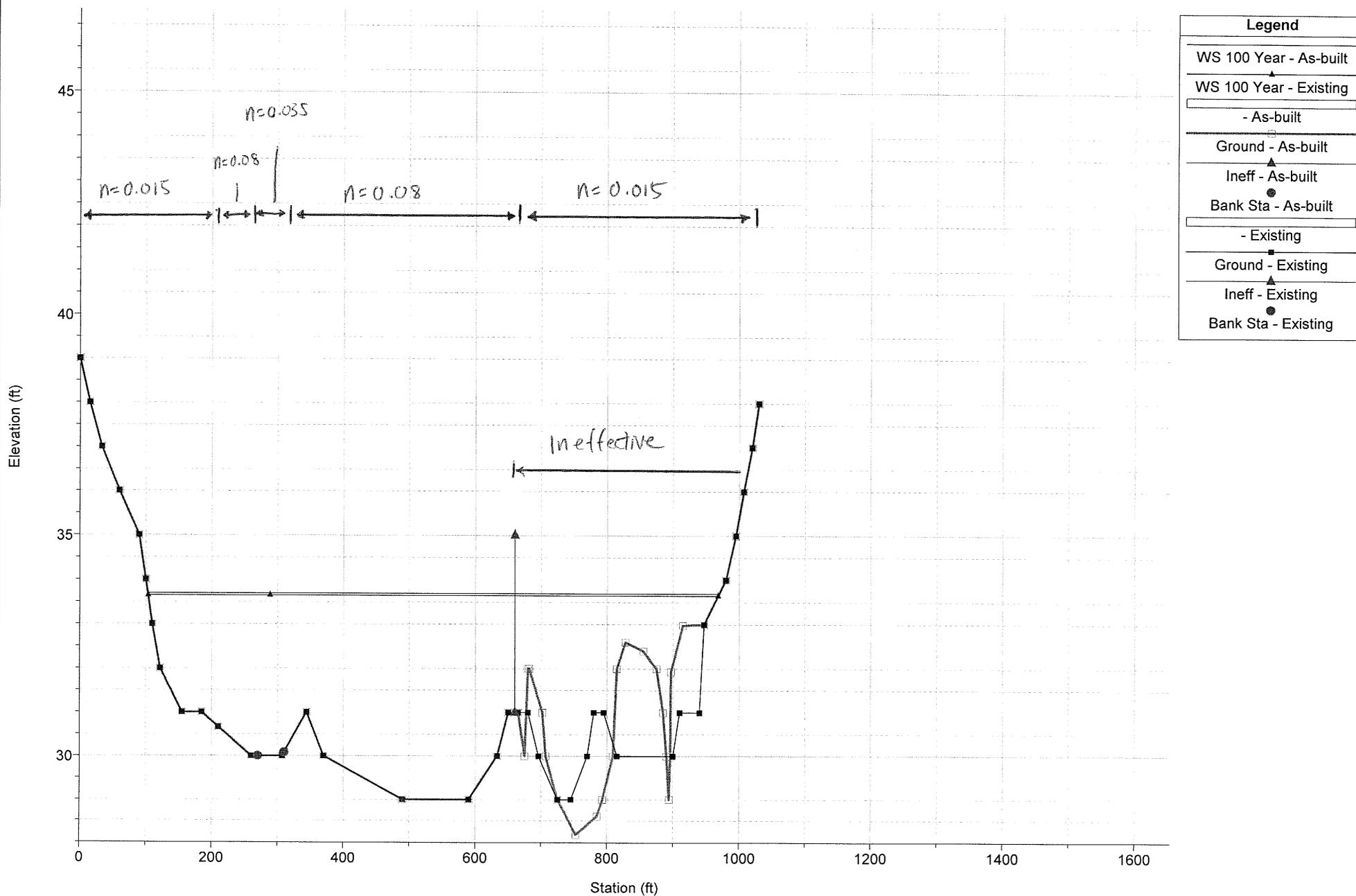
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 9040 Comparison Between Existing and As-built Conditions



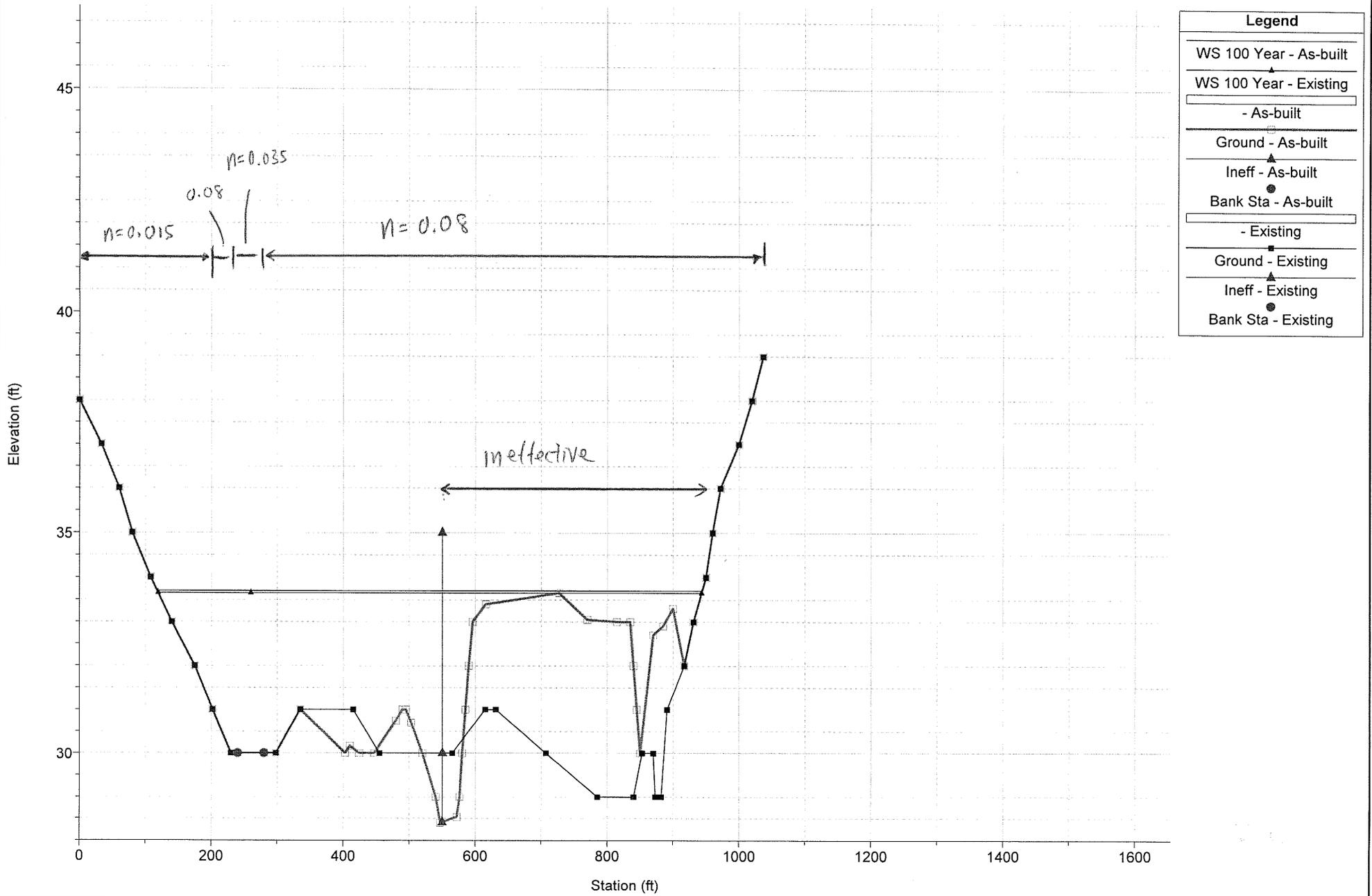
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 9160 Comparison Between Existing and As-built Conditions



1 in Horiz. = 200 ft 1 in Vert. = 3 ft

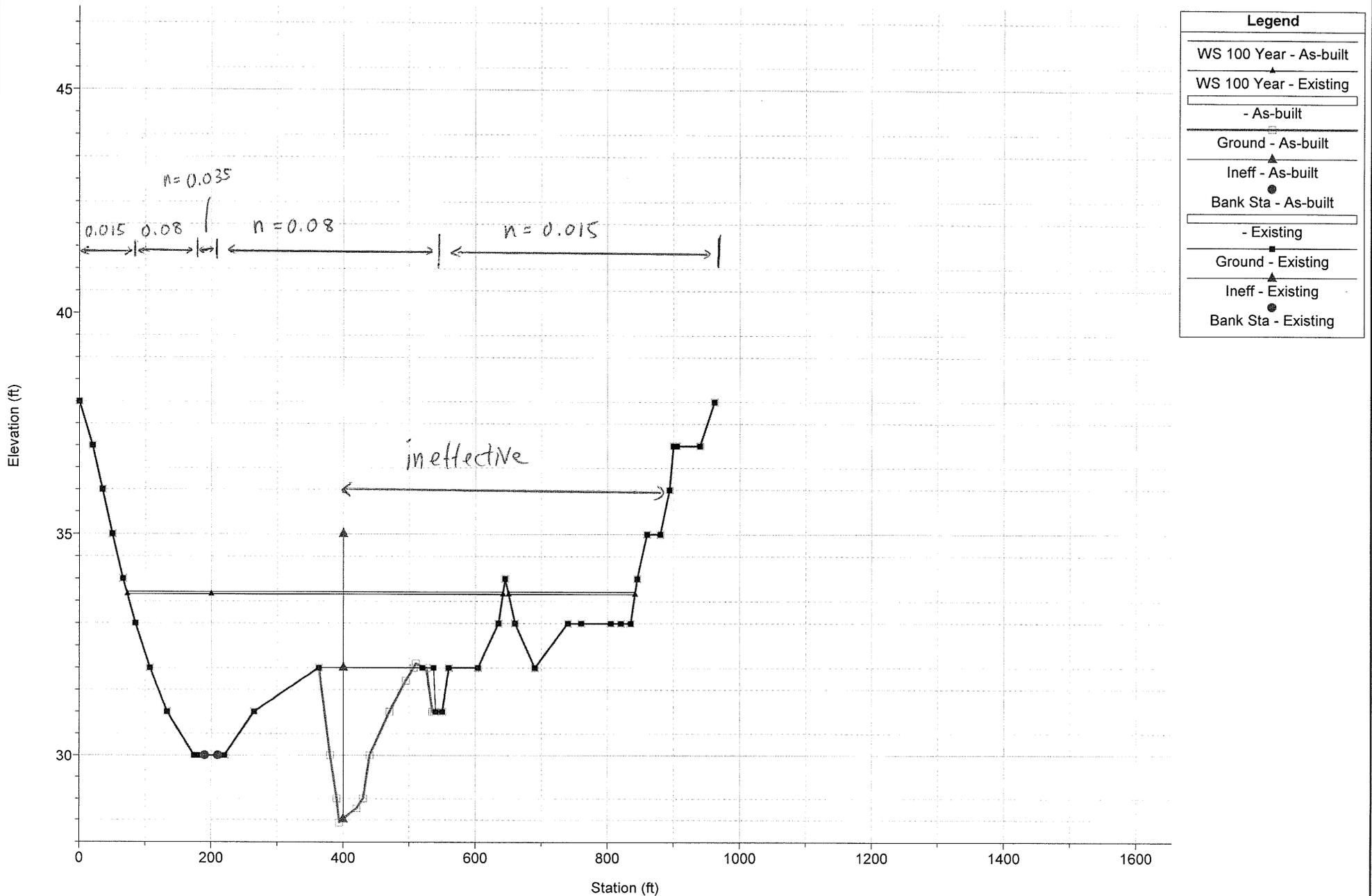
Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 9310 Comparison Between Existing and As-built Conditions



Legend	
WS 100 Year - As-built	▲
WS 100 Year - Existing	▲
- As-built	□
Ground - As-built	□
Ineff - As-built	▲
Bank Sta - As-built	●
- Existing	□
Ground - Existing	□
Ineff - Existing	▲
Bank Sta - Existing	●

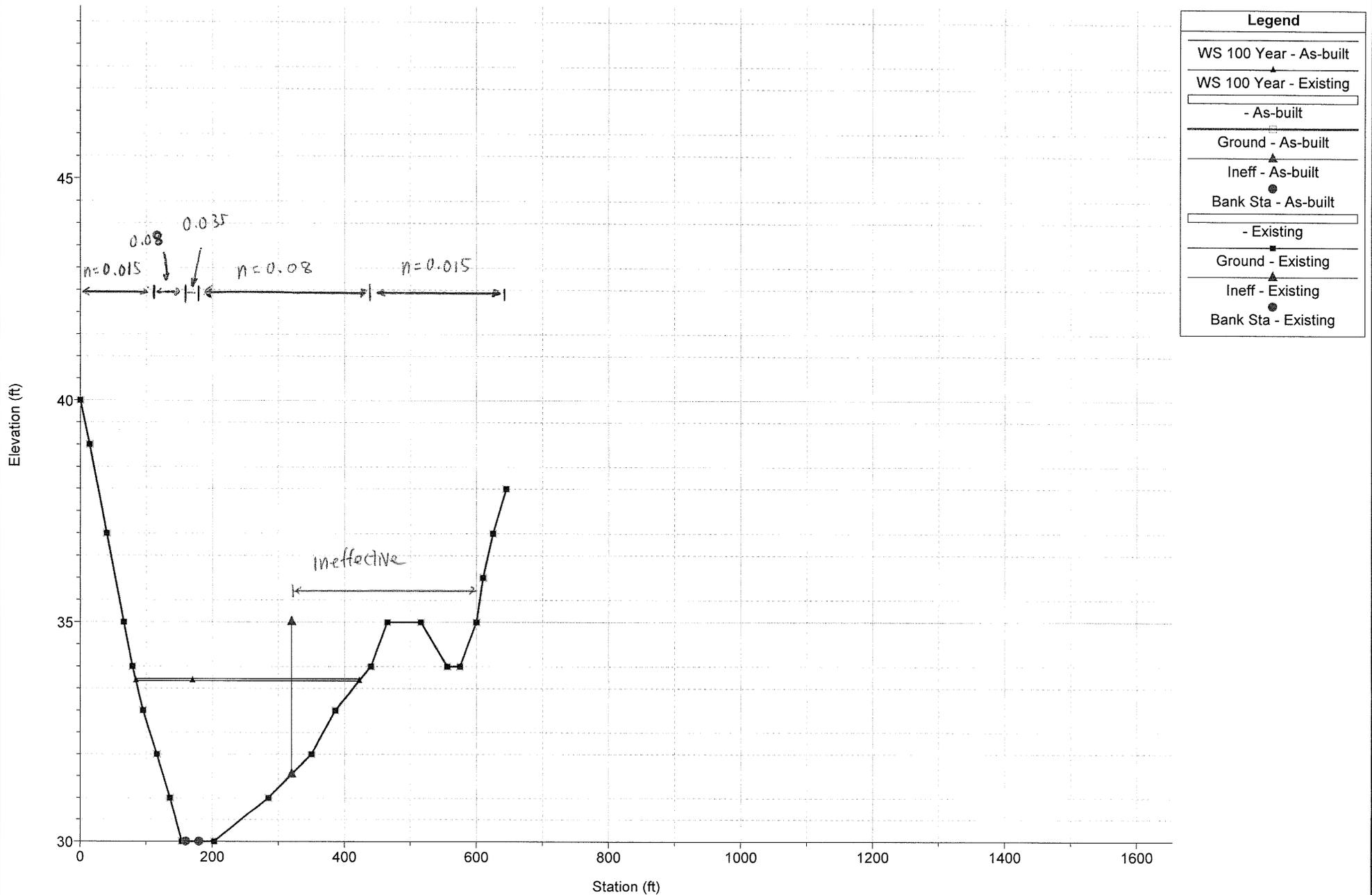
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 9460 Comparison Between Existing and As-built Conditions



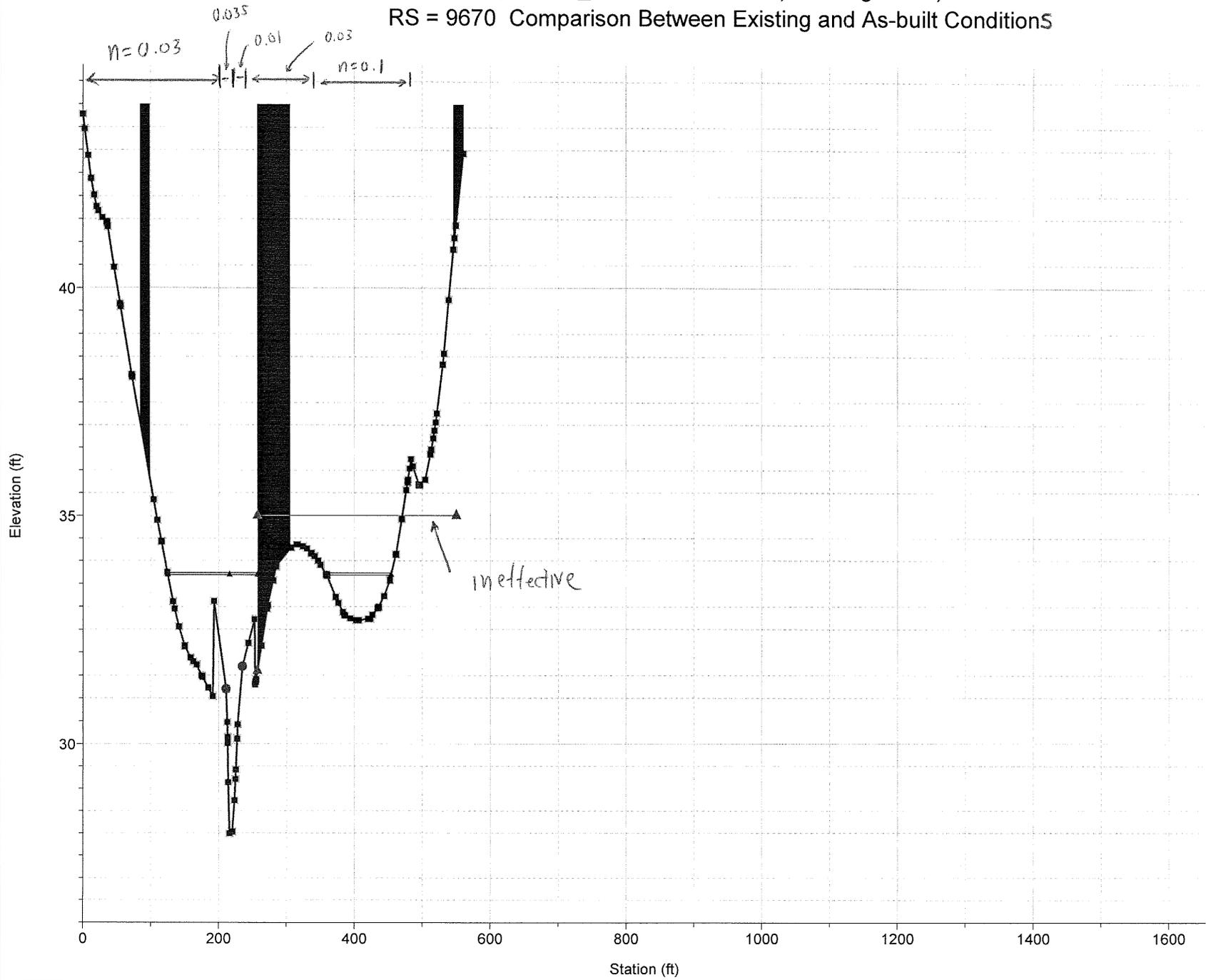
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 9560 Comparison Between Existing and As-built Conditions



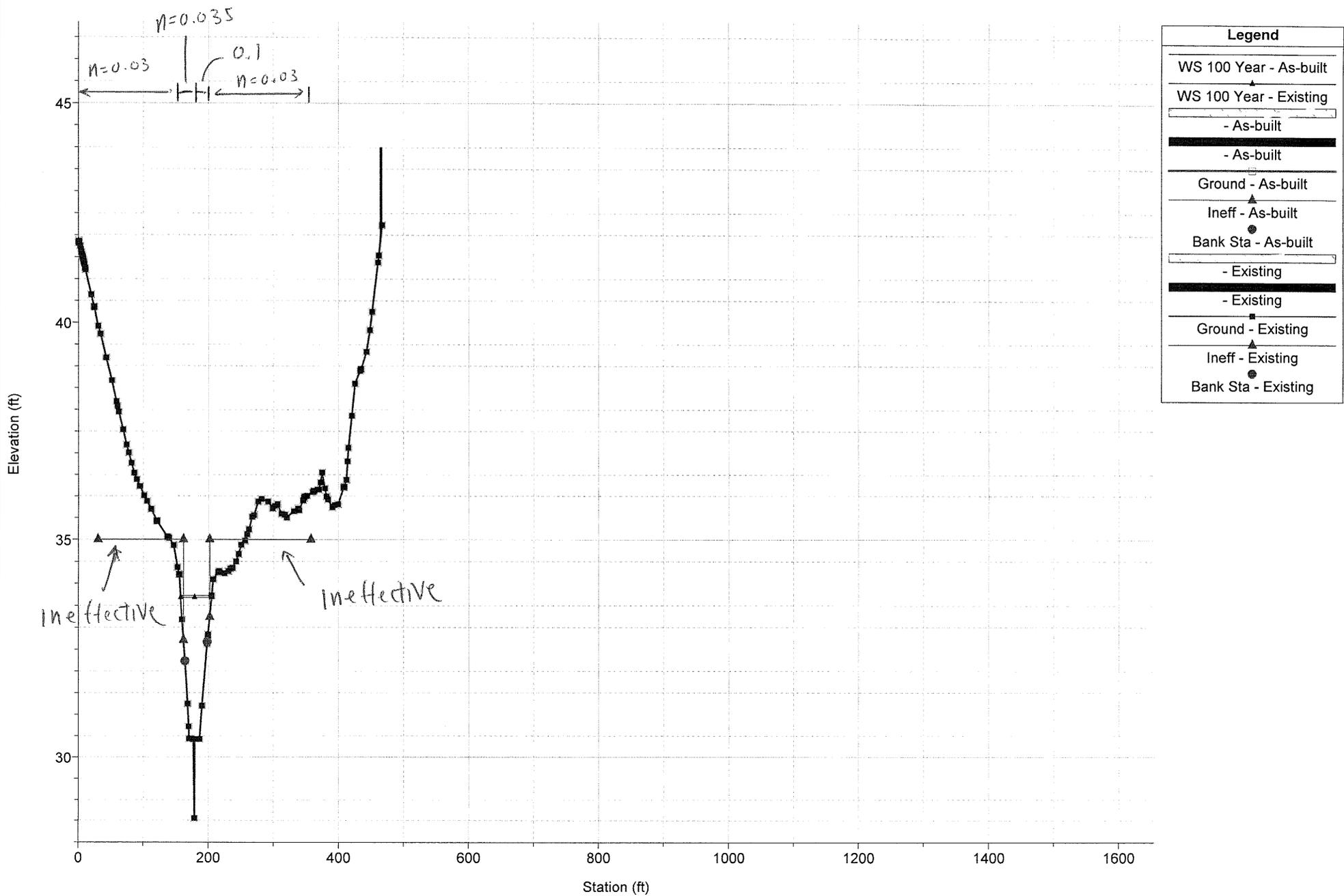
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 9670 Comparison Between Existing and As-built Conditions



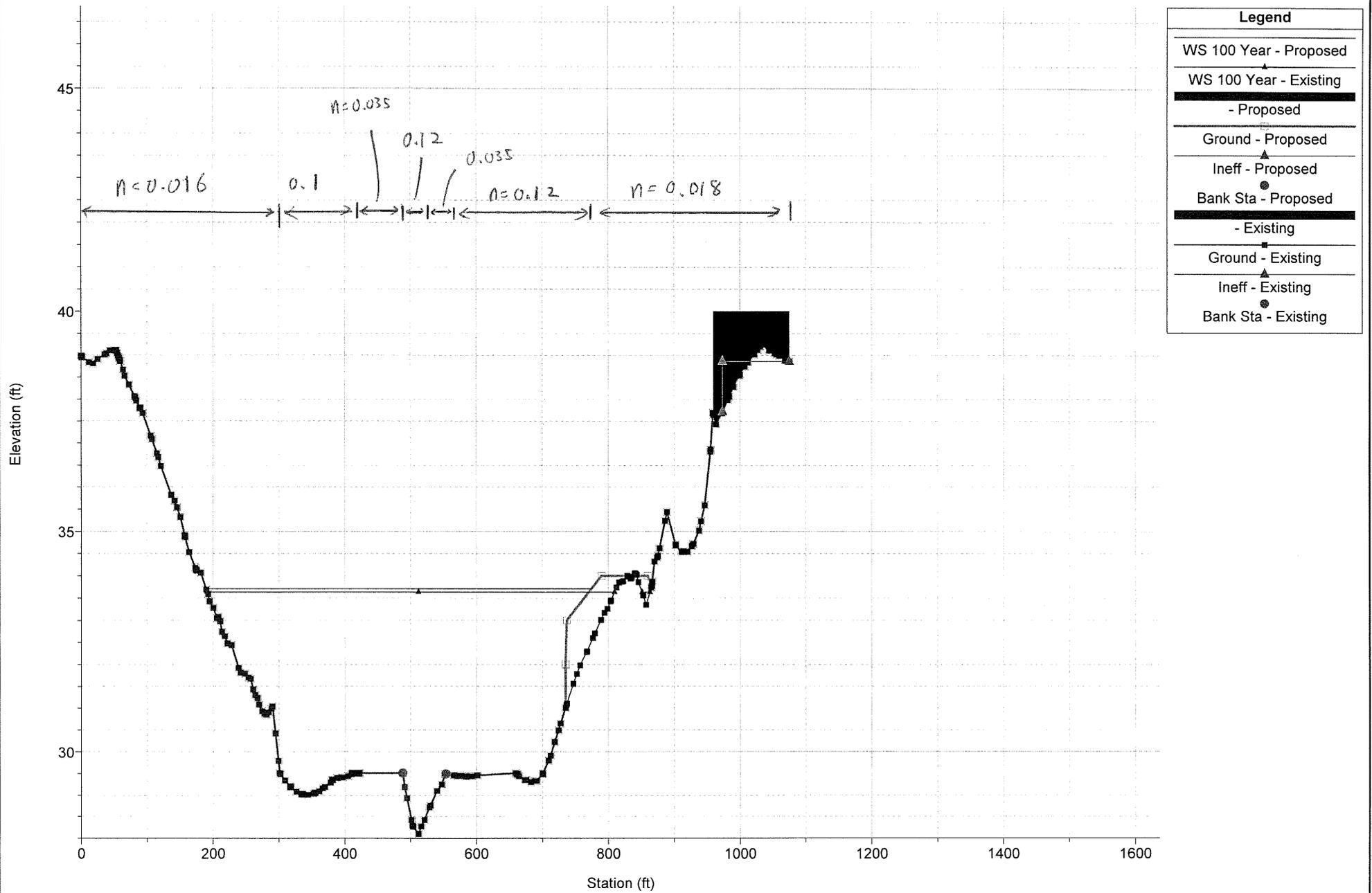
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Beaver Swamp Brook\_Final Plan: 1) Existing 2) As-built  
 RS = 9738 Comparison Between Existing and As-built Conditions



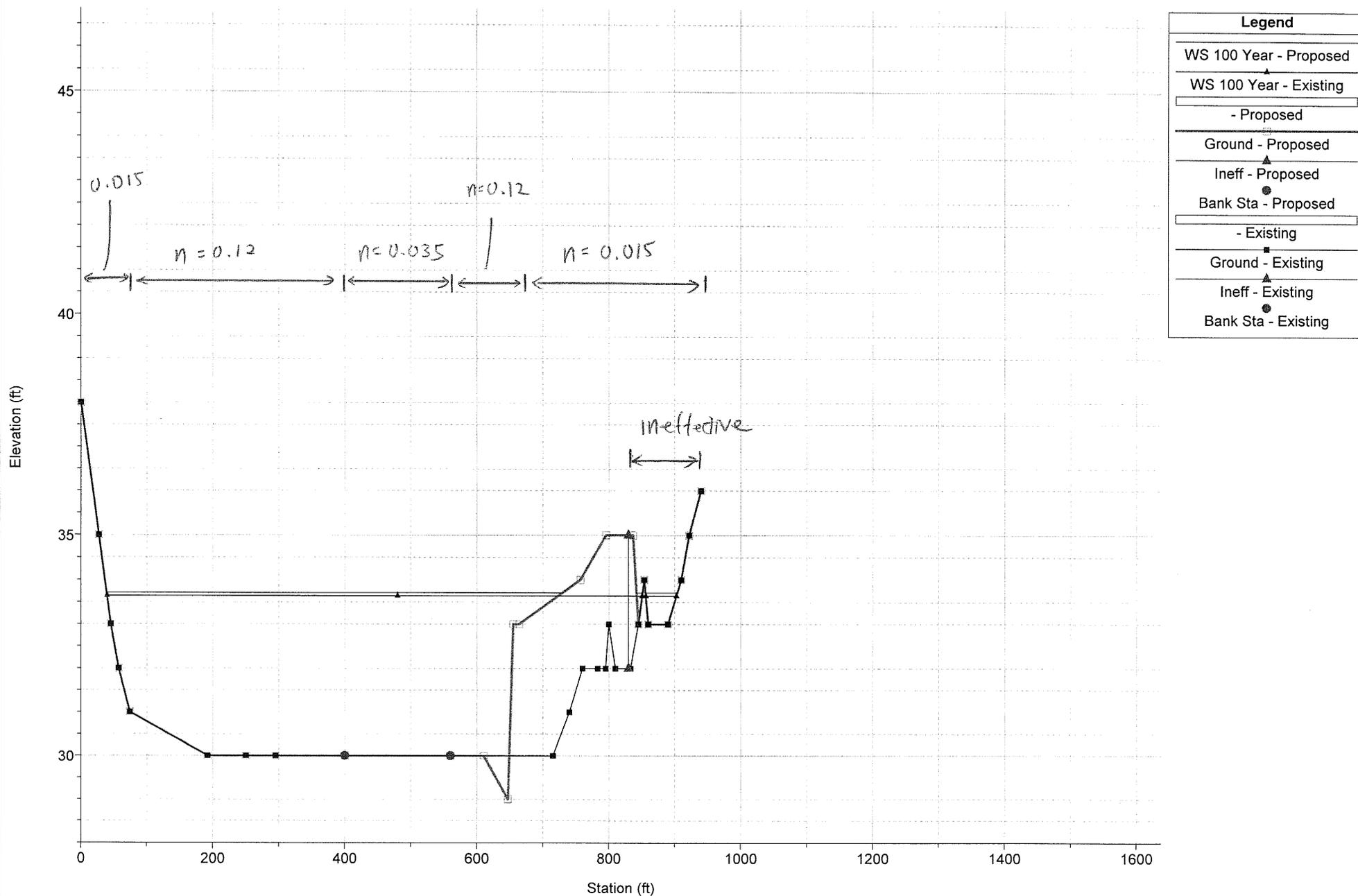
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 8703 Comparison Between Existing and Proposed Conditions



1 in Horiz. = 200 ft 1 in Vert. = 3 ft

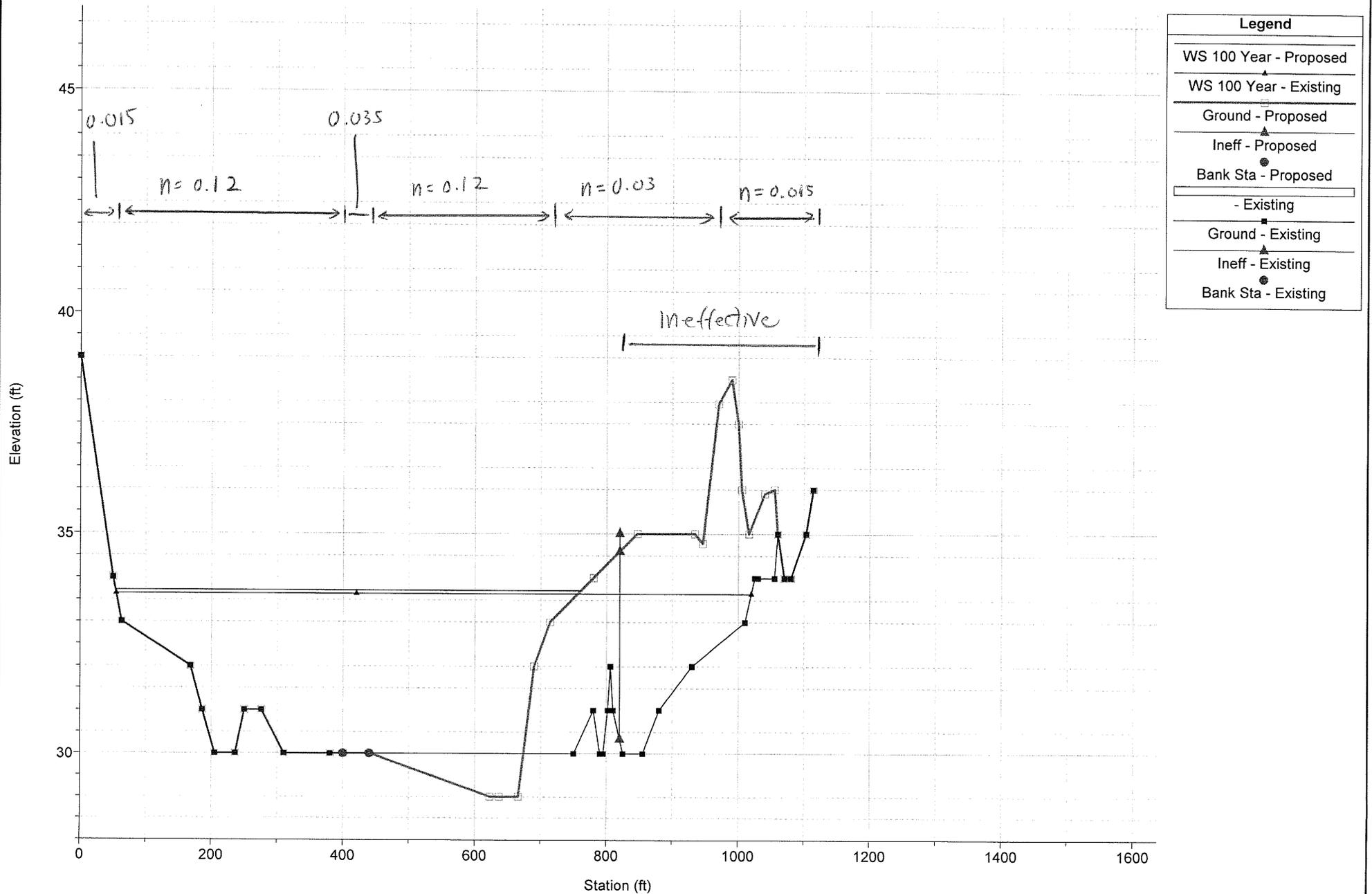
Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 8825 Comparison Between Existing and Proposed Conditions



Legend	
WS 100 Year - Proposed	▲
WS 100 Year - Existing	▲
- Proposed	□
Ground - Proposed	—
Ineff - Proposed	●
Bank Sta - Proposed	●
- Existing	□
Ground - Existing	—
Ineff - Existing	●
Bank Sta - Existing	●

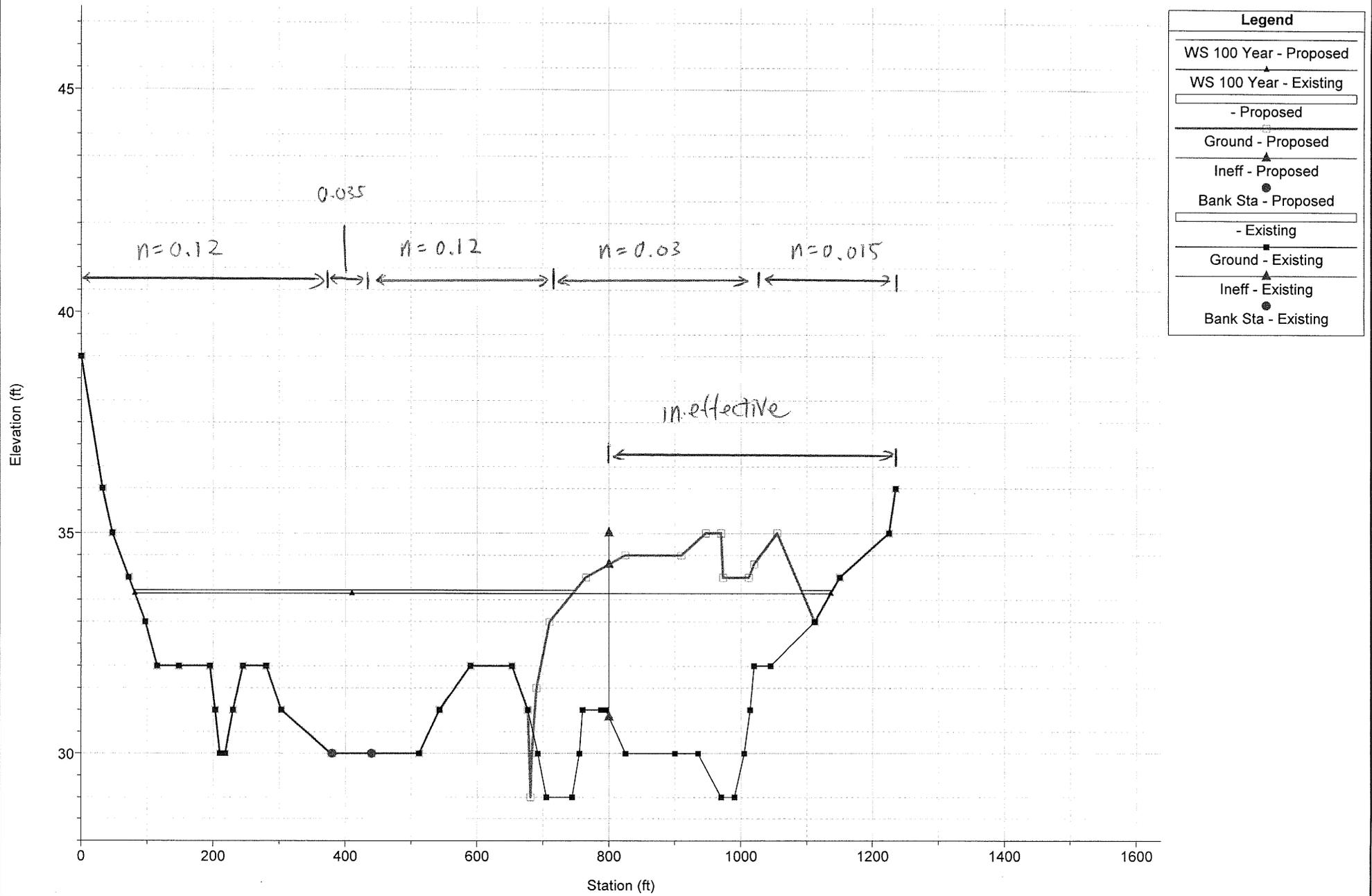
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 8940 Comparison Between Existing and Proposed Conditions



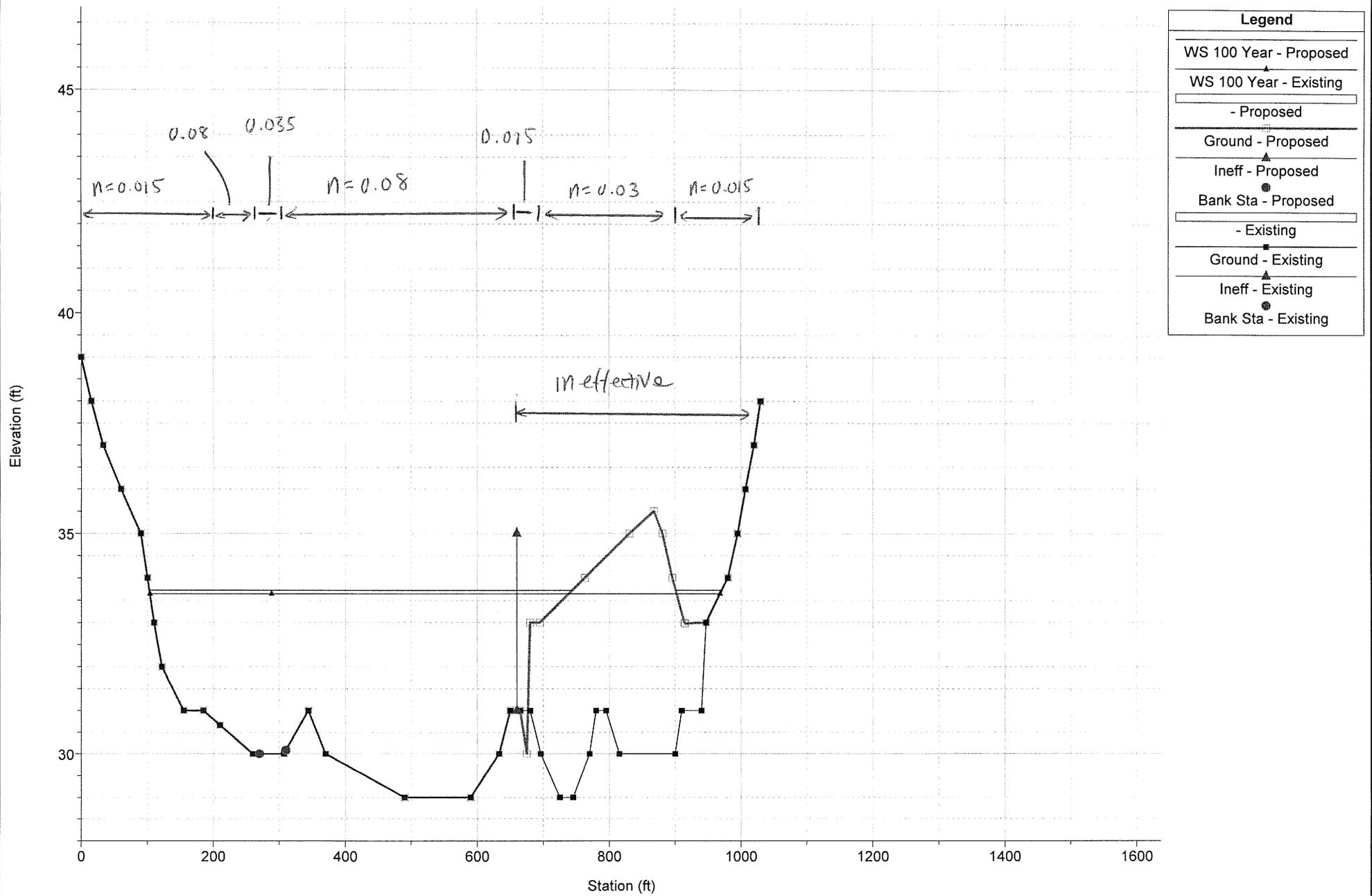
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 9040 Comparison Between Existing and Proposed Conditions



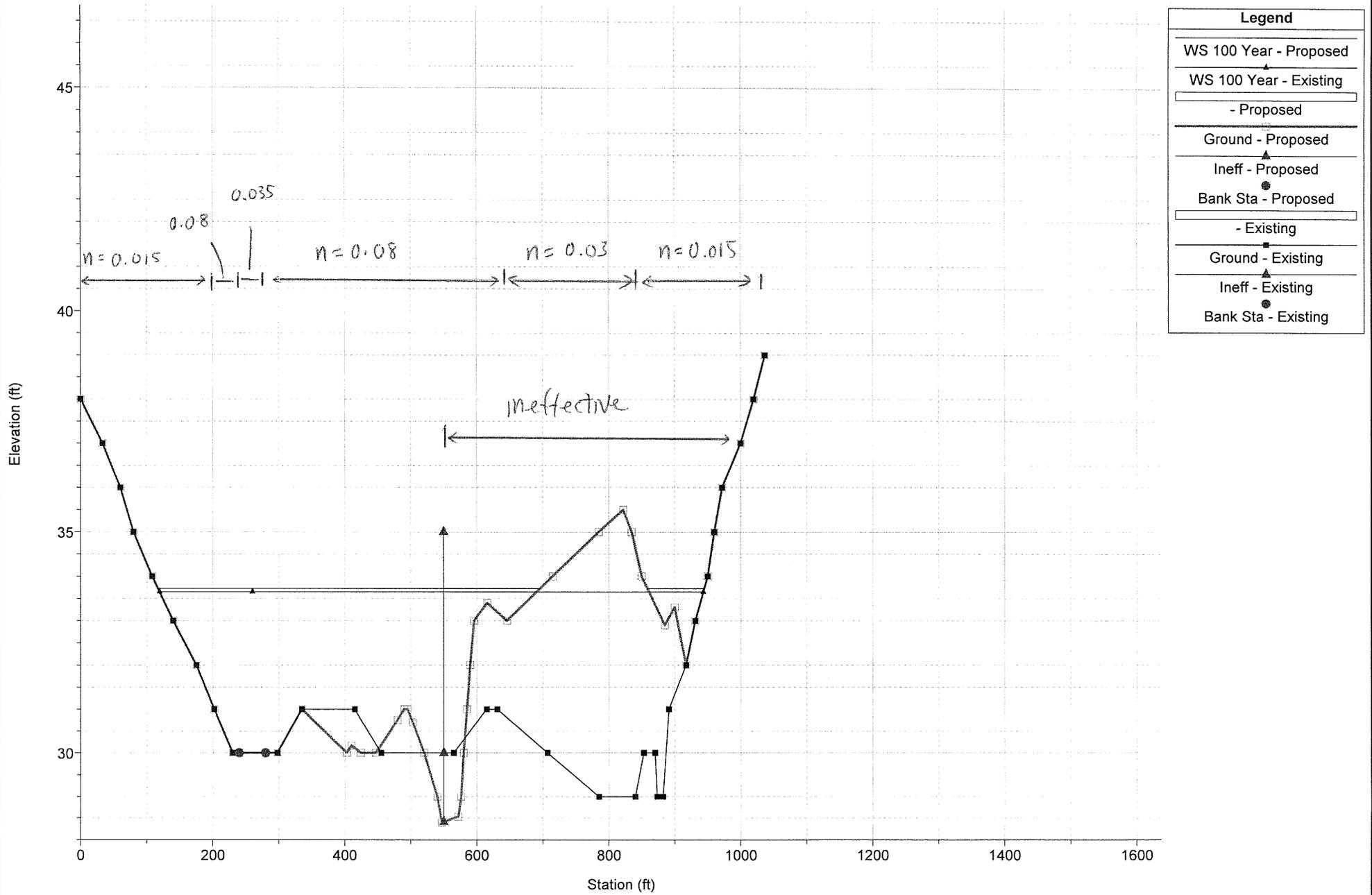
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Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 9160 Comparison Between Existing and Proposed Conditions



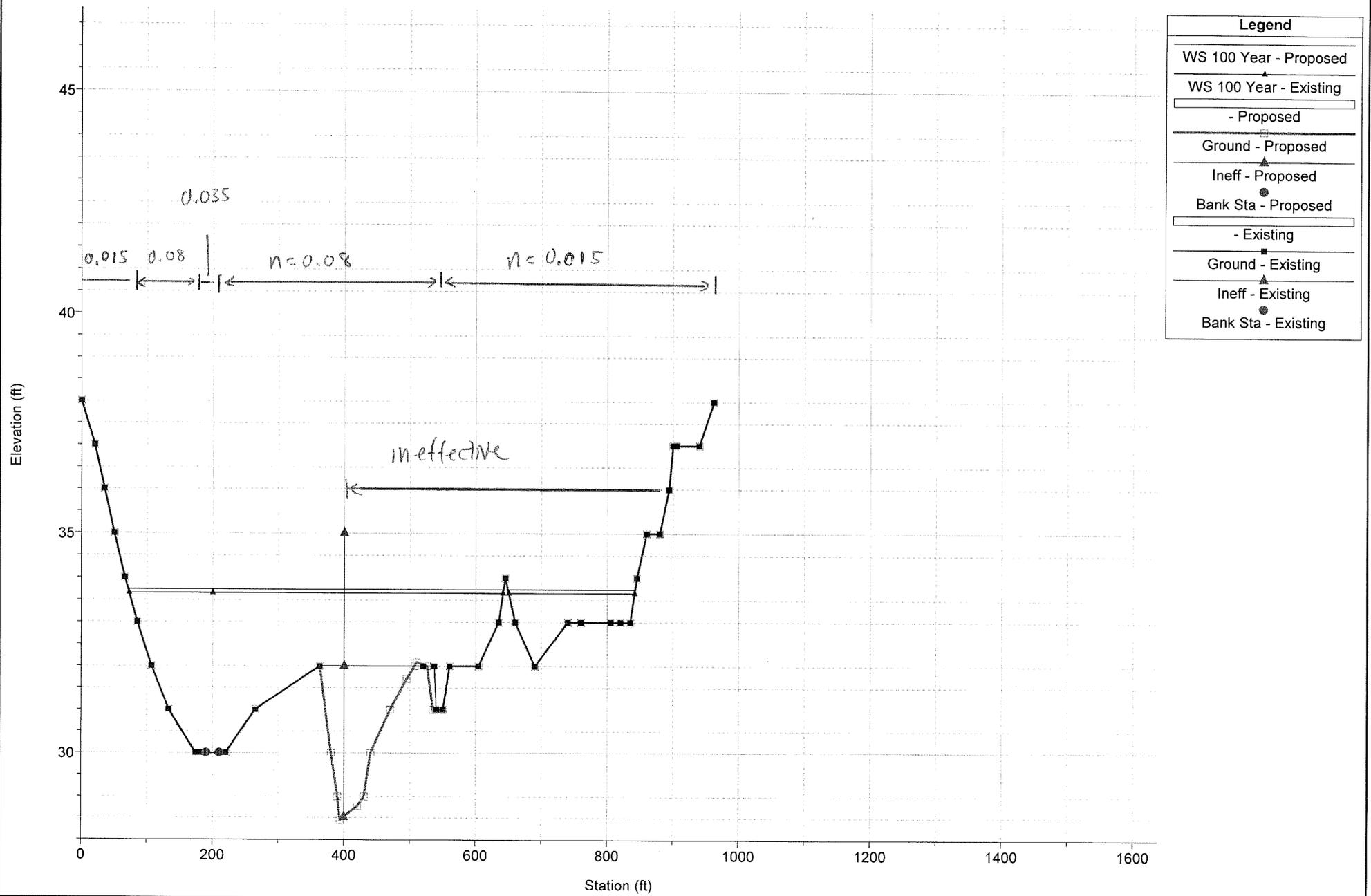
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 9310 Comparison Between Existing and Proposed Conditions



1 in Horiz. = 200 ft 1 in Vert. = 3 ft

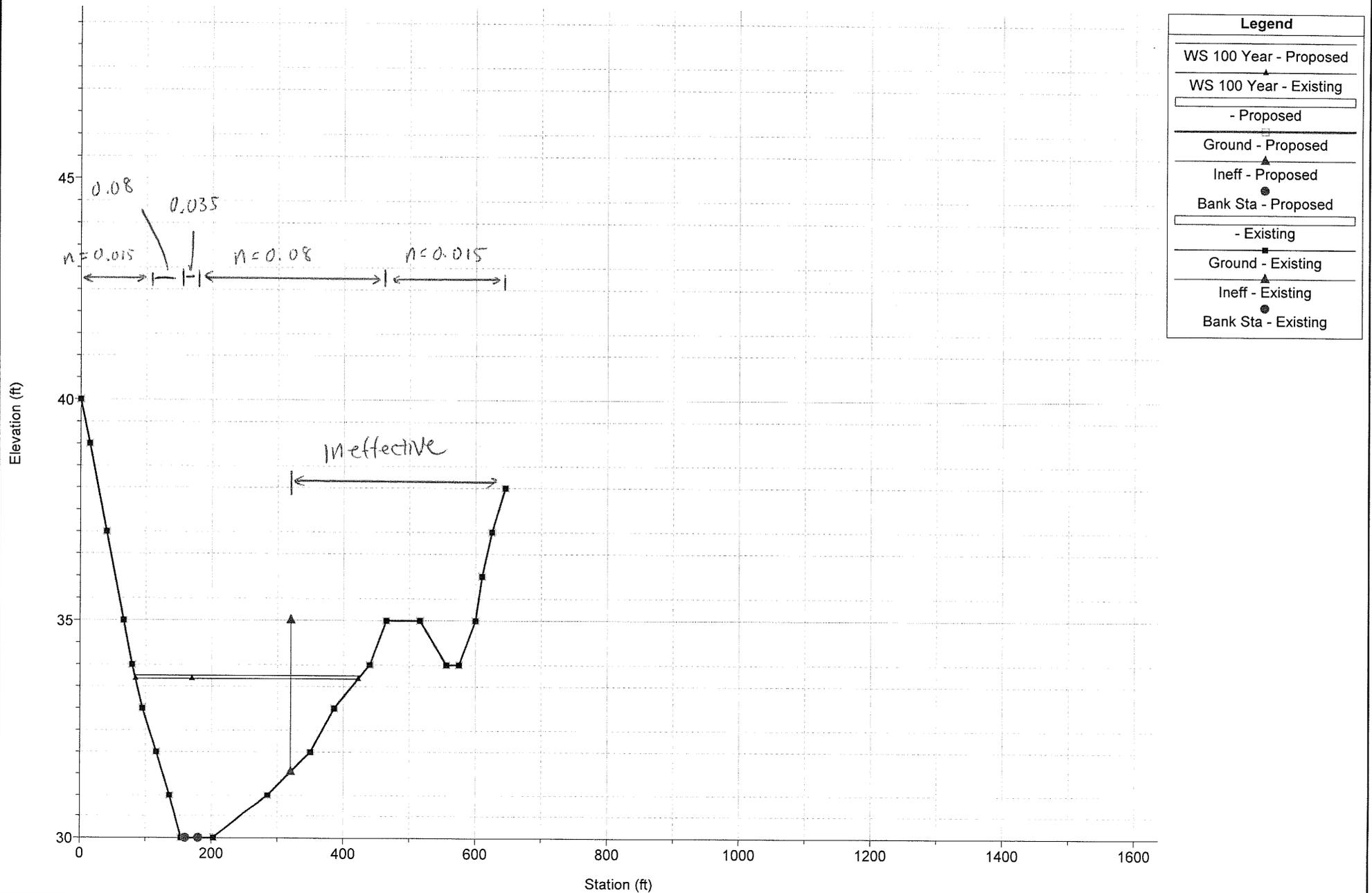
Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 9460 Comparison Between Existing and Proposed Conditions



Legend	
WS 100 Year - Proposed	▲
WS 100 Year - Existing	■
- Proposed	— (dashed line)
Ground - Proposed	— (solid line)
Ineff - Proposed	▲
Bank Sta - Proposed	●
- Existing	— (solid line)
Ground - Existing	— (solid line)
Ineff - Existing	▲
Bank Sta - Existing	●

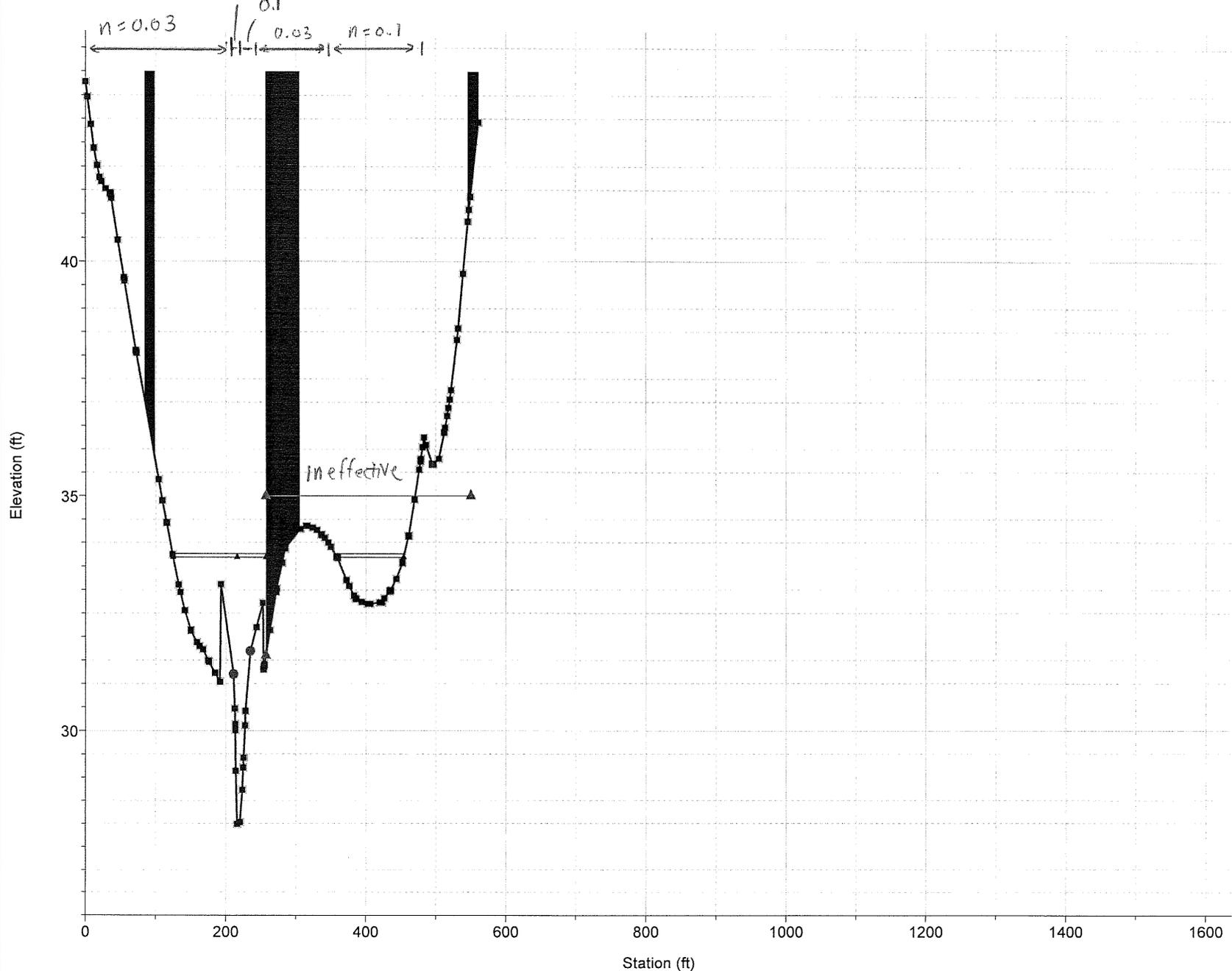
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 9560 Comparison Between Existing and Proposed Conditions



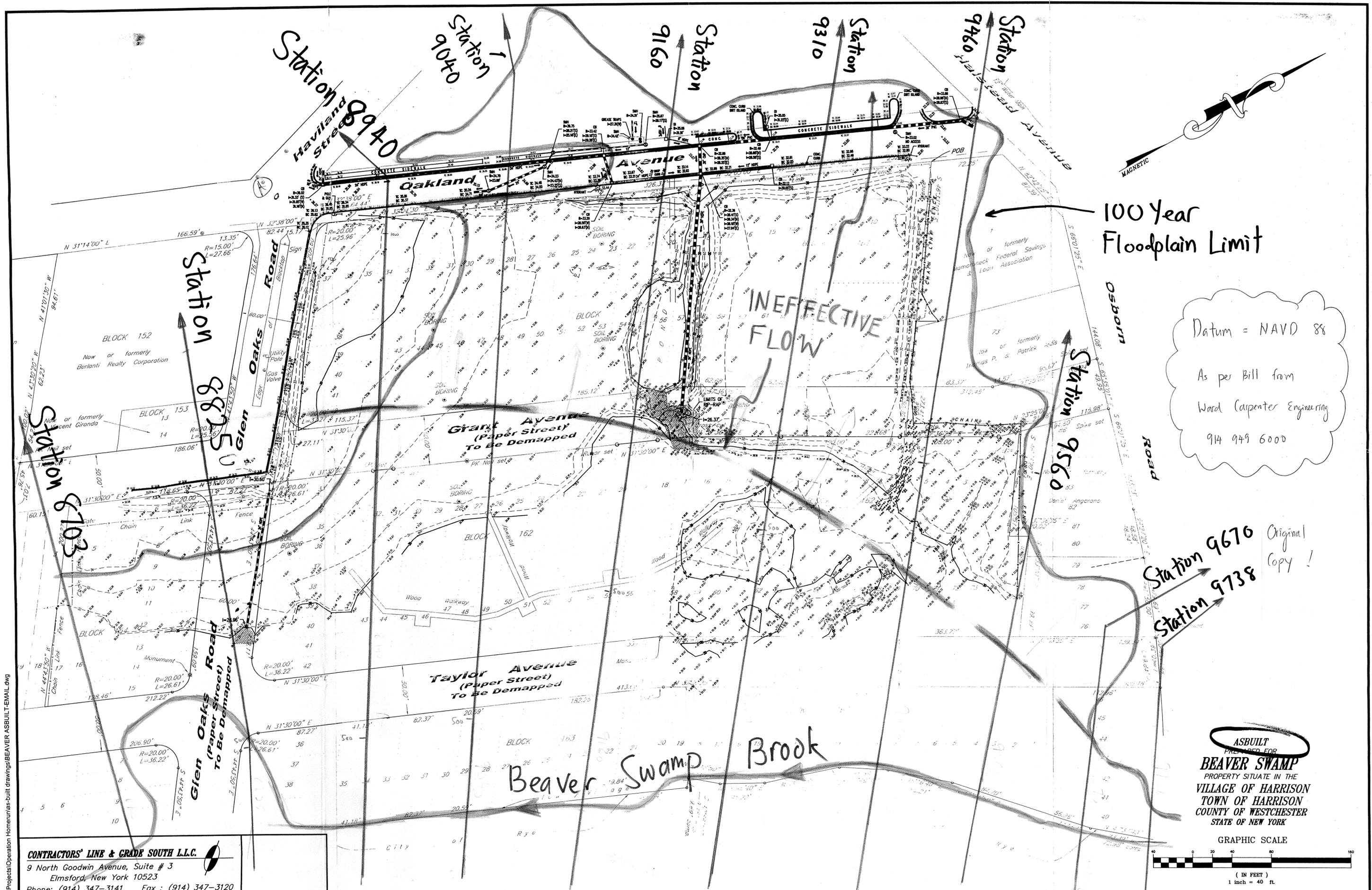
1 in Horiz. = 200 ft 1 in Vert. = 3 ft

Beaver Swamp Brook\_Final Plan: 1) Existing 2) Proposed  
 RS = 9670 Comparison Between Existing and Proposed Conditions



Legend	
WS 100 Year - Proposed	▲
WS 100 Year - Existing	■
- Proposed	□
- Proposed	▬
Ground - Proposed	□
Ineff - Proposed	●
Bank Sta - Proposed	○
- Existing	□
- Existing	▬
Ground - Existing	■
Ineff - Existing	▲
Bank Sta - Existing	●

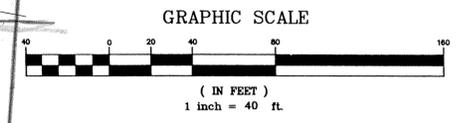
1 in Horiz. = 200 ft 1 in Vert. = 3 ft



Datum = NAVD 88  
 As per Bill from  
 Ward Carpenter Engineering  
 914 949 6000

Station 9670 Original Copy!  
 Station 9738

ASBUILT  
 PREPARED FOR  
**BEAVER SWAMP**  
 PROPERTY SITUATE IN THE  
 VILLAGE OF HARRISON  
 TOWN OF HARRISON  
 COUNTY OF WESTCHESTER  
 STATE OF NEW YORK



DATE: SEPTEMBER 25, 2006

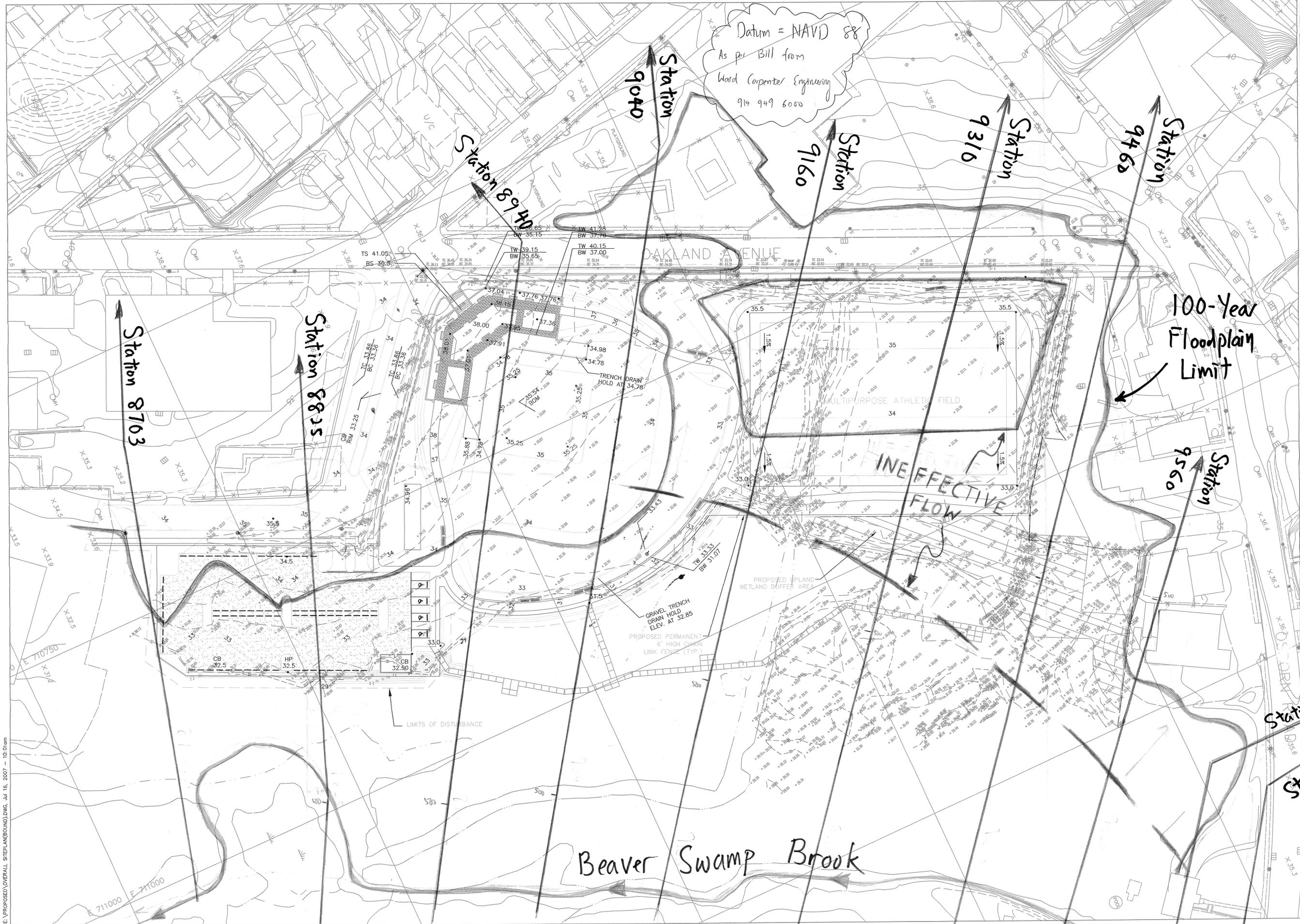
Land Projects 2004\04-666\_Reaffle BEAVER.dwg\BEAVER ASBUILT.dwg

**CONTRACTORS' LINE & GRADE SOUTH L.L.C.**  
 9 North Goodwin Avenue, Suite # 3  
 Elmsford, New York 10523  
 Phone: (914) 347-3141 Fax: (914) 347-3120

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C:\Capital Projects\Operation Homerunas-built drawings\BEAVER ASBUILT-EMAIL.dwg

E:\PROPOSED\OVERALL SITE\PLAN\BOUND.DWG, Jul 16, 2007 - 10:01am



Datum = NAVD 88  
 As per Bill from  
 Ward Carpenter Engineering  
 914 949 6000

100-Year  
 Floodplain  
 Limit

INEFFECTIVE  
 FLOW

Beaver Swamp Brook

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 Engineering · Science · Operations

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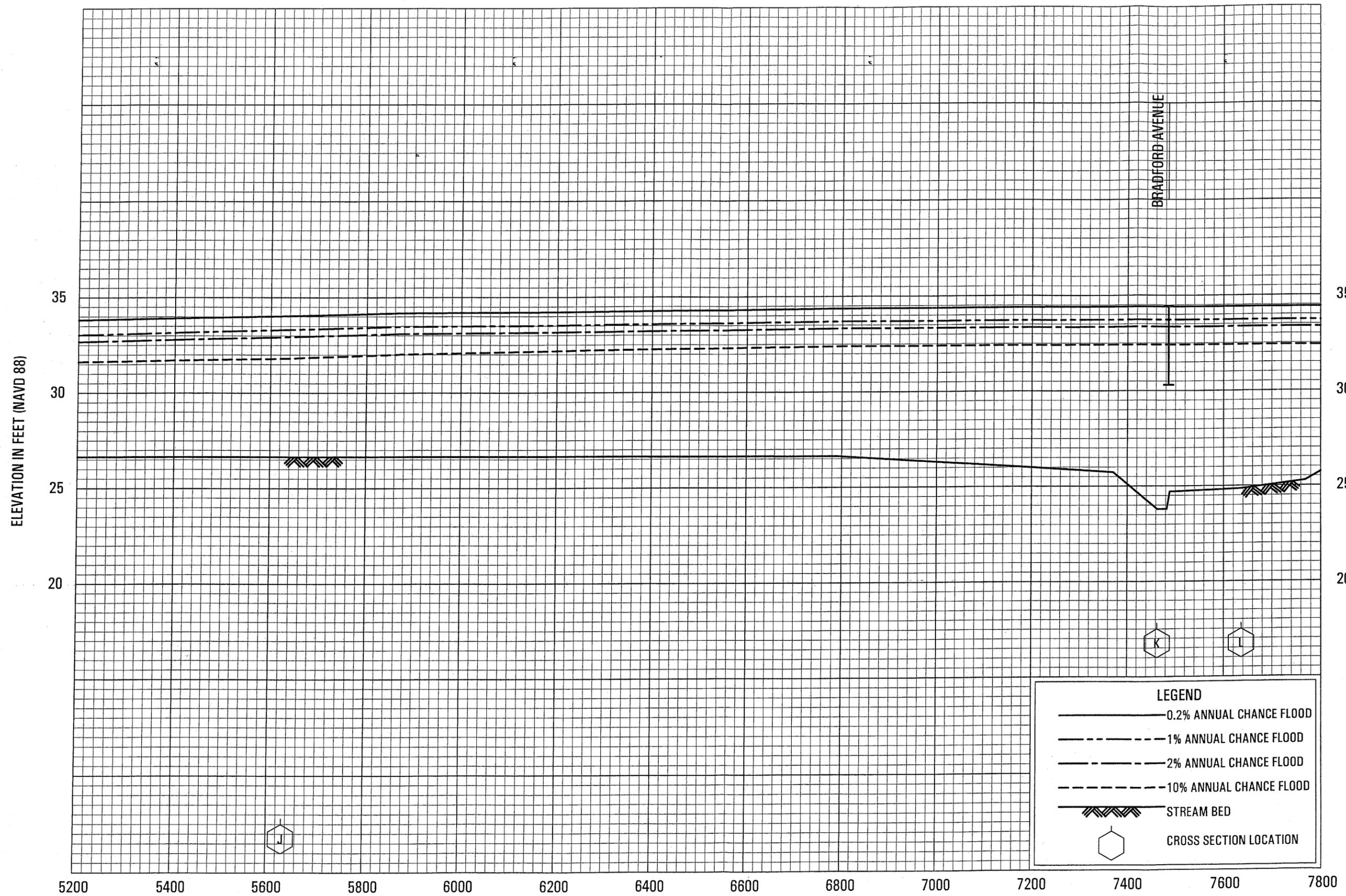
REV	DATE	BY	VD/DMP

PROPOSED CONDITIONS AND  
 GRADING PLAN

Station 9676  
 Station 9738  
 BEAVER SWAMP BROOK PARK

JOB NO.: 213544  
 DATE: November, 2006  
 SCALE: 1"=40'  
 SHEET: 1 OF 1

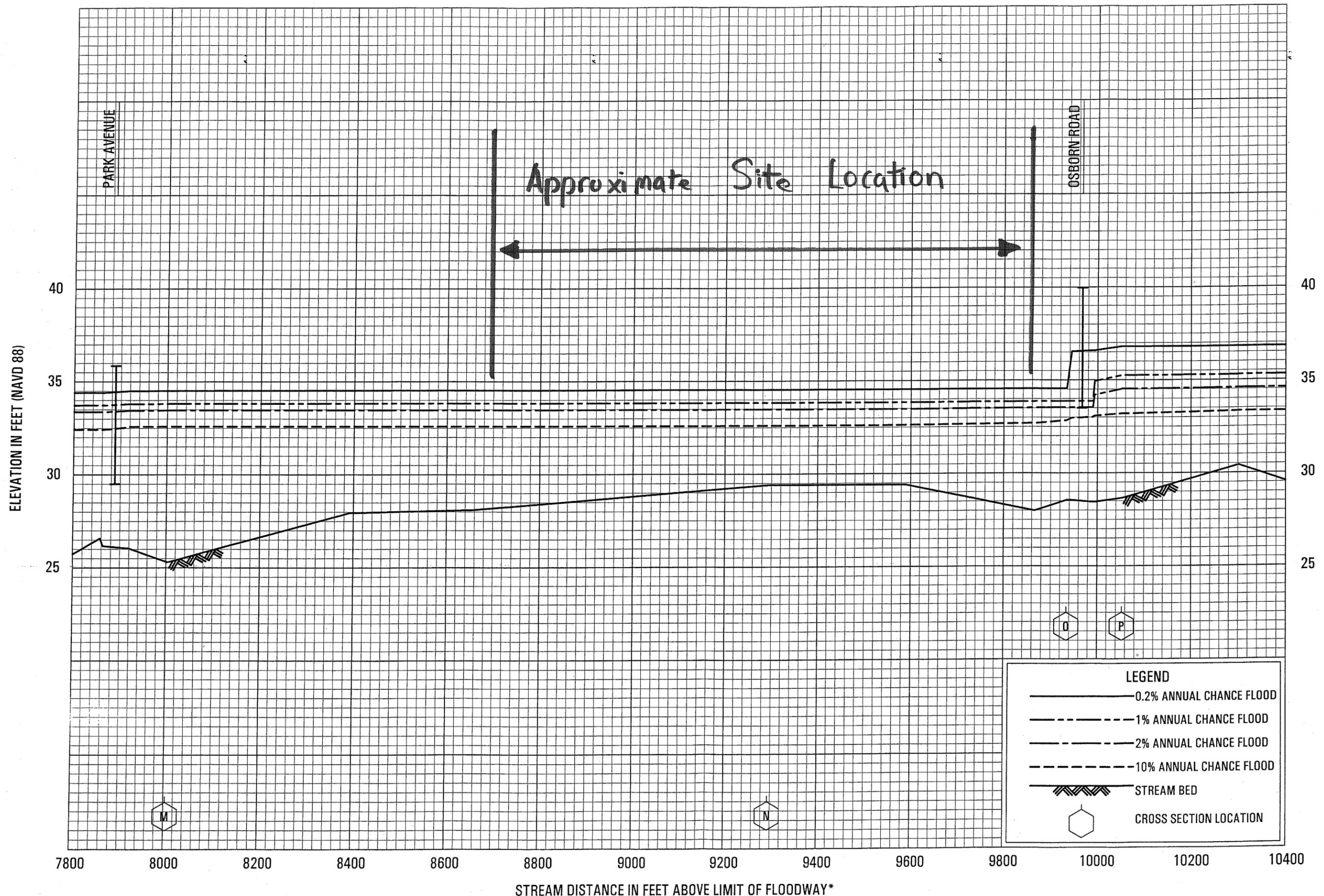
Original Copy!



STREAM DISTANCE IN FEET ABOVE LIMIT OF FLOODWAY\*  
 \*LIMIT OF FLOODWAY IS LOCATED APPROXIMATELY 170 FEET DOWNSTREAM OF SOUTH BARRY AVENUE

FLOOD PROFILES  
 BEAVER SWAMP BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 WESTCHESTER COUNTY, NY  
 (ALL JURISDICTIONS)



STREAM DISTANCE IN FEET ABOVE LIMIT OF FLOODWAY\*  
 \*LIMIT OF FLOODWAY IS LOCATED APPROXIMATELY 170 FEET DOWNSTREAM OF SOUTH BARRY AVENUE

FLOOD PROFILES

BEAVER SWAMP BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 WESTCHESTER COUNTY, NY  
 (ALL JURISDICTIONS)