

PICKETT RAY & SILVER

333 Mid Rivers Mall Dr
St. Peters, MO 63376

Civil Engineers
Planners
Land Surveyors

441-1211
278-1211

PROJECT NAME LOVE STAR PHASE II
PROJECT #/JOB ORDER # 86-155F
DATE 9-18-89
DESIGNER D.W.B. REV. BY JES 9/22/89
PAGE 1 OF 4

DETENTION BASIN CALCS:

AREA BEING DEVELOPED:

105.76 ACRES COMMERCIAL @ 4.75 = 502.36 cfs

83.26 ACRES RESIDENTIAL @ 3.26 = 271.43 cfs

TOTAL = 189.02 ACRES

773.79 cfs

(DEVELOPED 25 YEAR STORM)

UNDEVELOPED "Q" = 189.02 AC @ 2.31 cfs = 436.64 cfs

DIFFERENTIAL:

773.79 cfs DEVELOPED (25 YEAR STORM)

- 436.64 cfs UNDEVELOPED (25 YEAR STORM)

337.15 cfs TO BE STORED

DETENTION:

337.15 cfs x 30 MIN. x 60 SEC/MIN = 606,870 CU. FT. STORAGE
(25 YEAR)

STORAGE OF LAKE:

ELEV.	AREA SQ. FT.	AVG. SQ. FT.	CU. FT.	CUMMULATIVE CU. FT.
467.75	0	0	0	0
469.00	186,500	93,894	117,368	117,368
470.00	193,788	190,144	190,144	307,512
471.00	203,314	198,551	198,551	506,063
472.00	212,840	208,077	208,077	714,140
474.00	231,761	222,301	444,602	1,158,742
476.00	257,864	244,813	489,626	1,648,368

(STORAGE)
ELEV. 471.50
608,911 CU. FT. VOLUME Q25

STORAGE: 25 YEAR/30 MIN STORM ELEV. 471.50 = 608,911 CU. FT.

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DRAINAGE AREAS TO BASIN : (15 YEAR STORM)

DA#1 28.7 Ac. @ 3.85 cfs = 110.50 cfs
DA#3 55.3 Ac. @ 2.64 cfs = 145.99 cfs
DA#4 52.7 Ac. @ 2.64 cfs = 139.13 cfs

TOTAL "Q" TO BASIN = 395.62 cfs (15 YEAR STORM)

DEVELOPED AREAS BY PASSING BASIN : (15 YEAR STORM)

DA#2 65.5 Ac. @ 3.85 = 252.18 cfs
DA#5 22.0 Ac. @ 2.64 = 58.08 cfs

TOTAL "Q" BY-PASSING BASIN = 310.26 cfs

ALLOWABLE OUTFLOW :

353.47 cfs UNDEVELOPED "Q'S"
310.26 cfs BY-PASS

43.21 cfs (MAXIMUM ALLOWABLE
OUTFALL FROM SLOTS)

LOW FLOW CALCULATIONS :

ORIFICE FORMULA - $Q = C_d \sqrt{2gh}$

$$Q = 0.61 \times 2.76 \times \sqrt{(2 \times 32.2)(2.50)}$$

$$Q = 1.68 \times 12.69$$

$$Q = 21.32 \text{ cfs (PER SLOT RELEASE)}$$

$$2 \text{ SLOTS @ } 21.32 \text{ cfs} = 42.64 \text{ cfs @ ELEV. 475.50}$$

OVERFLOW STRUCTURE : (15 YEAR STORM)

WEIR FORMULA - $Q = CLH^{3/2}$

$$395.62 \text{ cfs} = 3.0 \times 46 \times H^{3/2}$$

$$2.87 = H^{3/2}$$

$$2.02 = H$$

$$471.50 + 2.02 = 473.52 - \text{ELEV. TO PASS 15 YEAR STORM}$$

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DRAINAGE 25 YEAR STORM TO BASIN:

DA#1 28.7 Ac @ 4.75 = 136.33 cfs
DA#3 55.3 Ac @ 3.26 = 180.28 cfs
DA#4 52.7 Ac @ 3.26 = 171.80 cfs

TOTAL "Q₂₅" TO BASIN = 488.41 cfs (25 YEAR STORM)

OVERFLOW STRUCTURE :

$$Q_{25} = CLH^{3/2}$$
$$488.41 \text{ cfs} = 30 \times 46 \times H^{3/2}$$
$$3.54 = H^{3/2}$$
$$2.32 = H$$

471.50 + 2.32 = 473.82 - ELEV. TO PASS 25 YEAR STORM

DRAINAGE 100 YEAR STORM TO BASIN:

DA#1 28.7 Ac @ 6.08 cfs = 174.50 cfs
DA#3 55.3 Ac @ 4.17 cfs = 230.60 cfs
DA#4 52.7 Ac @ 4.17 cfs = 219.76 cfs

TOTAL "Q₁₀₀" TO BASIN = 624.86 cfs (100 YEAR STORM)

OVERFLOW STRUCTURE :

$$Q = CLH^{3/2}$$
$$624.86 \text{ cfs} = 30 \times 46 \times H^{3/2}$$
$$4.52 = H^{3/2}$$
$$2.73 = H$$

471.50 + 2.73 = 474.24 - ELEV. TO PASS 100 YEAR STORM

NOTE: SET TOP OF DAM @ 474.24 + 1.76 = 476.00 MIN.
↑ FREEBOARD

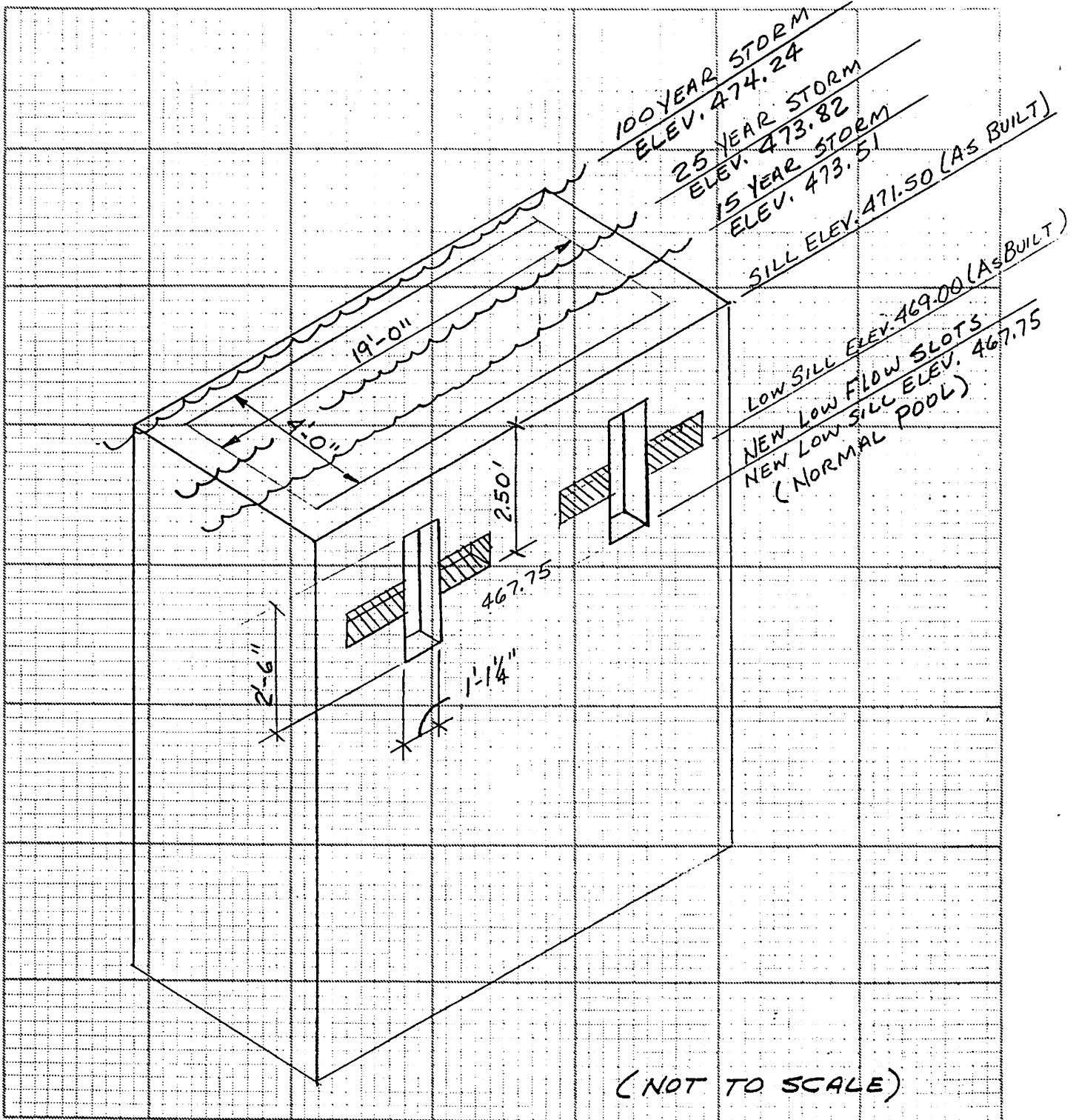
PICKETT RAY & SILVER

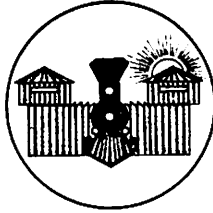
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DESIGNER DWB REV. BY M.G.G. REV. J.E.S.
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CITY OF O'FALLON
State of Missouri

September 29, 1989

James E. Strauss
Pickett, Ray & Silver
333 Mid Rivers Mall Drive
St. Peters, Mo. 63376

RE: Lone Star, Phase II - Revised Outfall Structure and
Detention Calculations

Dear Mr. Strauss

The revised outfall structure will provide the detention required and not exceed the allowable outflow. The revised design is approved for construction. Please send two (2) more sets of revised sheets 7A & 7B for our files.

Thank you for your cooperation in this matter. If you have any additional questions, please contact this office.

Sincerely yours

Frank Godwin
Technical Engineer/Inspector

FG/pl

cc. E. Brookshier
T. Price
J. Hurlbert

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PAGE 1 of 3

LONE STAR PHASE II
DETENTION BASIN CALCS

AREA BEING DEVELOPED:

105.76 Acres Commercial @ 4.75 cfs ✓ = 502.36 cfs
83.26 Acres Residential @ 3.26 cfs ✓ = 271.43 cfs

Total: 189.02 Acres ✓ 773.79 cfs ✓
(Developed 25 Year Storm)

Undeveloped "Q" = 189.02 Acres @ 2.31 cfs ✓ = 436.64 cfs ✓

DIFFERENTIAL :

773.79 cfs Developed (25 Year Storm)
- 436.64 cfs Undeveloped (25 Year Storm)
337.15 cfs To Be Stored

DETENTION:

337.15 cfs x 30 Min. x 60 Sec/Min. = 606,870 Cu. Ft. - Storage 25 Year ✓

DRAINAGE AREAS TO BASIN: (15 YEAR STORM)

DA #1 28.7 Acres @ 3.85 cfs = 110.50 cfs
DA #3 55.3 Acres @ 2.64 cfs = 145.99 cfs
DA #4 32.7 Acres @ 2.64 cfs = 139.13 cfs

Total "Q" To Basin = 395.62 cfs
(15 Year Storm)

DEVELOPED AREAS BY-PASSING BASIN: (15 YEAR STORM)

DA #2 65.5 Acres @ 3.85 cfs = 252.18 cfs
DA #5 22.0 Acres @ 2.64 cfs = 58.08 cfs

Total "Q" By-Passing Basin = 310.26 cfs

ALLOWABLE OUTFLOW:

353.47 cfs Undeveloped "Q" = 189.02 ACRES x 1.87
- 310.26 cfs By-Pass

43.26 cfs ✓ (Maximum Allowable Outflow From Slots)

STORAGE: 15 Year/30 Min. Storm Elev. 472.75 = 670,995 Cu. Ft.

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**LOW FLOW CALCULATIONS
ORIFICE FORMULA**

= Q= $Ca\sqrt{2gh}$
Q= $0.61 \times 3.0 \times \sqrt{32.2 \times 2 \times 2.17'}$
Q= 1.83×11.82
Q= 21.63 cfs (Per Slot Release)

2 Slots @ 21.63 cfs = 43.26 cfs @ Elev. 472.75

STORAGE OF LAKE:

<u>ELEV.</u>	<u>AREA</u> <u>SQ. FT.</u>	<u>AVG.</u> <u>SQ. FT.</u>	<u>CU. FT.</u>	<u>CUMMULATIVE</u> <u>CU. FT.</u>
469.0	0	0	0	0
470.0	193,788	96,894	96,895	96,894
472.0	212,840	203,314	406,628	503,522
	(Storage) Elev. 472.75 =	670,995	Cu. Ft. Volume	Q15
474.0	231,761	222,301	444,602	948,124
475.0	244,813	238,287	238,278	1,186,411
476.0	257,864	251,339	251,339	1,437,750

OVERFLOW STRUCTURE @ DEPTH OF 1.81' 15 YEAR STORM

WEIR FORMULA = $3.0 \times 46 \times 1.81^{3/2} = 336.04$ cfs - Overflow Structure
2 SLOTS = $0.61 \times 3.0 \times \sqrt{32.2 \times 2 \times 3.98} = 29.30 \times 2 = 58.60$ cfs Low Flow Slots

336.04 cfs + 58.60 cfs = 394.64 cfs - Total Outflow At Pond Elev. 572.75+ 1.81' = 574.56

DRAINAGE 100 YEAR STORM TO BASIN

DA #1 28.7 Acres @ 6.08 cfs = 174.50 cfs
DA #3 55.3 Acres @ 4.17 cfs = 230.60 cfs
DA #4 52.7 Acres @ 4.17 cfs = 219.76 cfs

Total "Q" To Basin = 624.86 cfs - 100 Year Storm

OVERFLOW STRUCTURE @ DEPTH OF 2.55'- 100 YEAR STORM

Weir Formula = $3.0 \times 46 \times 2.55^{3/2} = 561.94$ cfs Overflow Structure

2 Slots = $0.61 \times 3.0 \times \sqrt{32.2 \times 2 \times 4.72} = 31.91 \times 2 = 63.82$ cfs Low Flow Slots

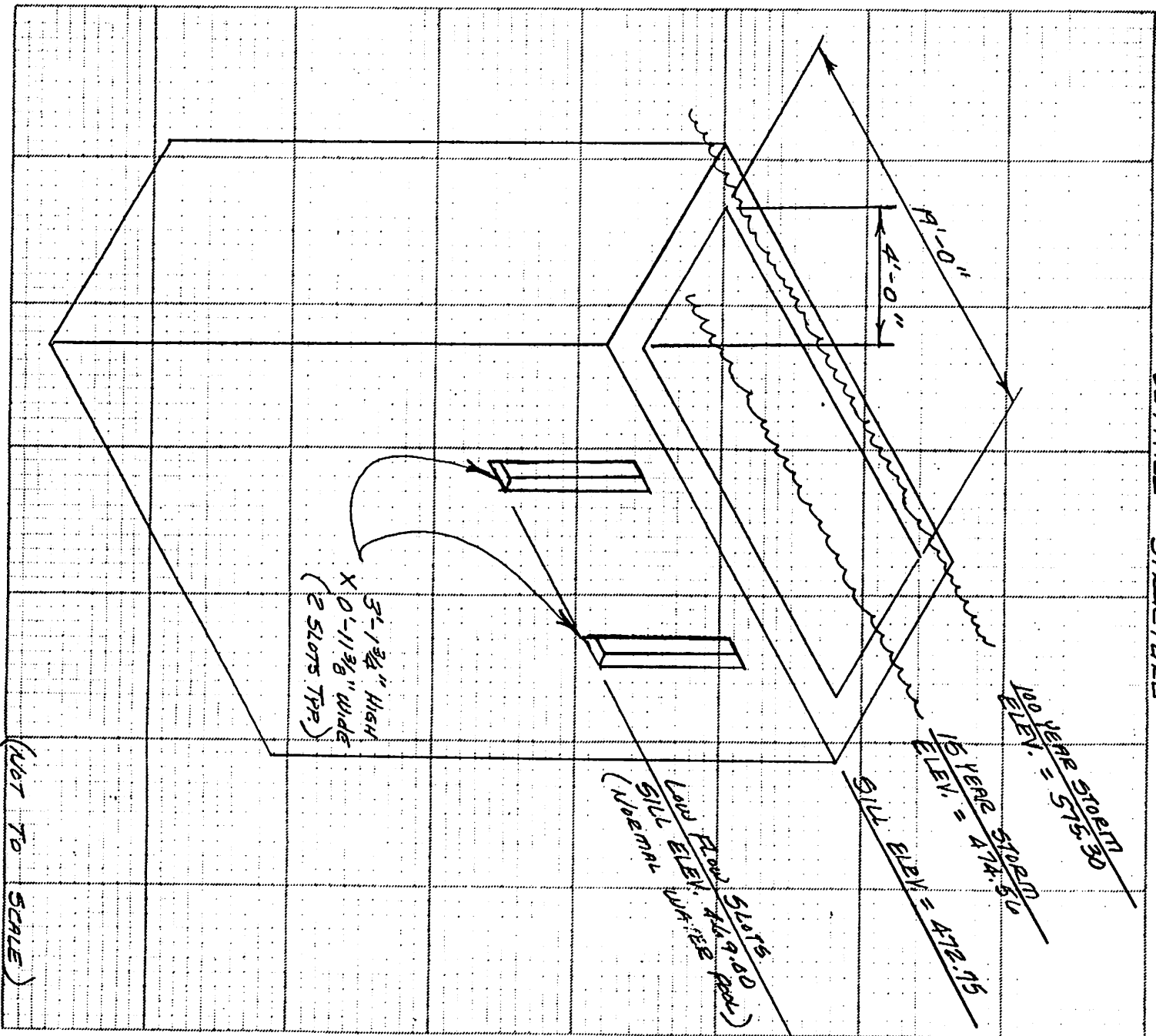
561.94 cfs + 63.82 cfs = 625.76 cfs

Total Outflow At Pond Elev. 572.75 + 2.55 = 575.30

NOTE: Set Top of Dam @ 575.30 + 1.0 Freeboard = 576.30 Minimum

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OUTFALL STRUCTURE



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STORAGE : 25 YEAR/30 MIN STORM ELEV. 471.50 = 608,911 CU. FT.

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<u>ALLOWABLE OUTFLOW : = ±208 cfs</u>	
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WEIR FORMULA - $Q = CLH^{3/2}$	
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<u>471.50 + 2.02 = 473.52 - ELEV. TO PASS 15 YEAR STORM</u>	

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$$3.54 = H^{3/2}$$
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471.50 + 2.32 = 473.82 - ELEV. TO PASS 25 YEAR STORM ✓

CONSERVATIVE

DRAINAGE 100 YEAR STORM TO BASIN:

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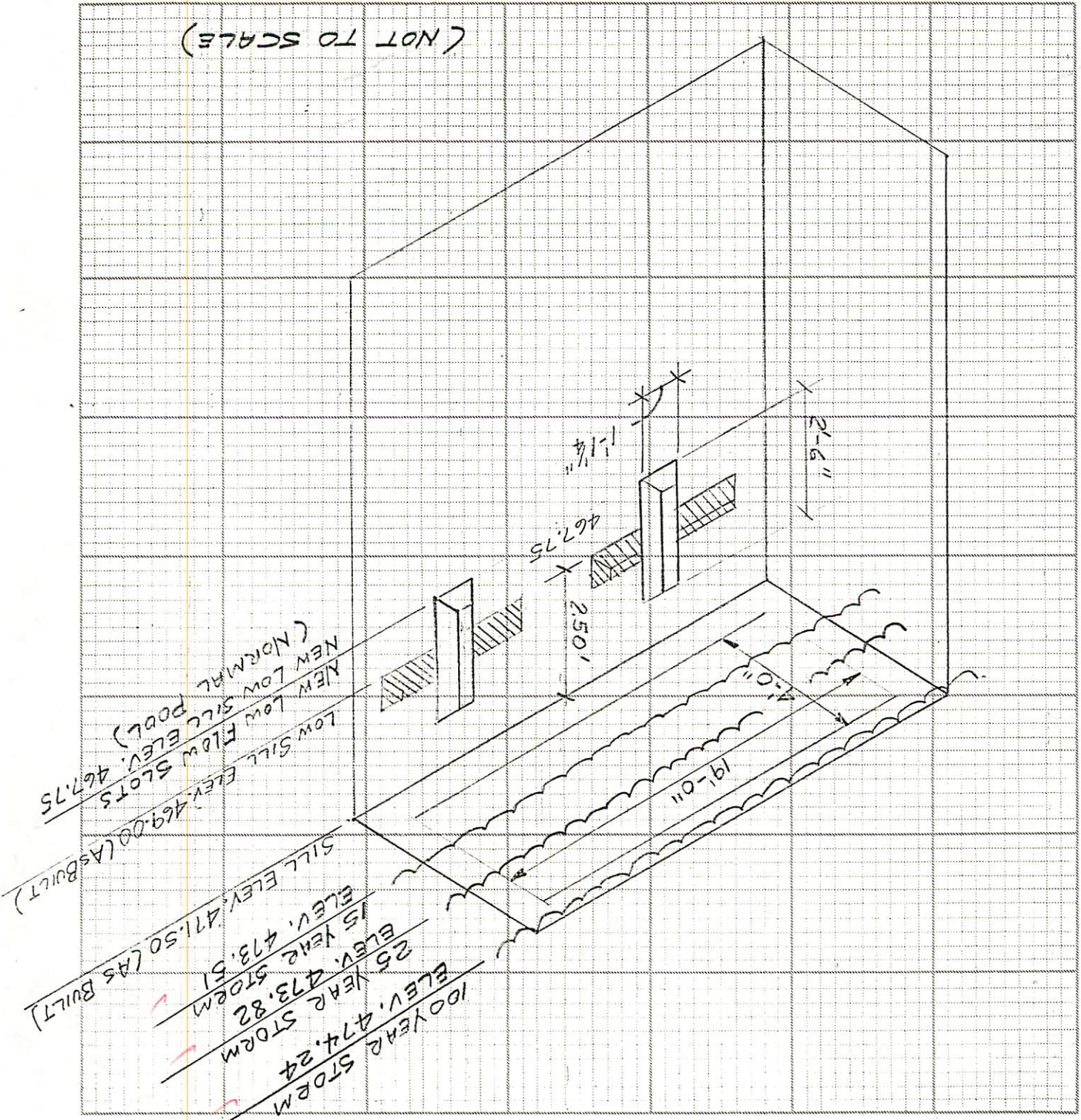
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$$2.73 = H$$

471.50 + 2.73 = 474.24 - ELEV TO PASS 100 YEAR STORM

NOTE: SET TOP OF DAM @ 474.24 + 1.76 = 476.00 MIN. ✓

FREEBOARD

OK



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