



Date 2.13.89 Page 2 of 6
Project Reflection Ridge 3rd
Item Drainage (@ 21st st.)

Determine D :

| D | d | A | p | R | $R^{2/3}$ | $AR^{2/3}$ |
|-------|-------|------|-------|-------|-----------|------------|
| 0.27' | 0.00' | 0.87 | 6.75 | 0.129 | 0.255 | 0.22 |
| 0.42' | 0.15' | 2.64 | 17.47 | 0.151 | 0.284 | 0.75 |
| 0.50' | 0.23' | 4.32 | 25.16 | 0.172 | 0.309 | 1.33 |
| 0.60' | 0.33' | 7.92 | 34.75 | 0.228 | 0.373 | 2.96 |

$$\text{USE } D = 0.55' \pm \quad d = 0.23'$$

$$\begin{aligned} W &= 10' + 48(d - 0.15) \\ &= 10 + 48(0.13) \\ &= 16.24' \end{aligned}$$

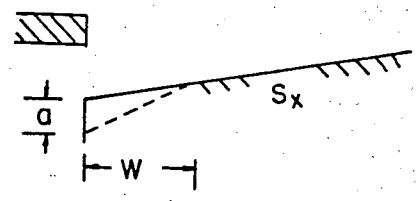
$$\begin{aligned} \text{Lane Width Open} &= \text{Total width} - \text{Wet Width} \\ &= 34' - 16.24' = 17.76' \quad \underline{\underline{\text{OK}}} \end{aligned}$$

Check interception @ existing gutter inlet:

see pages 3, 4

$$Q_i = 1.8$$

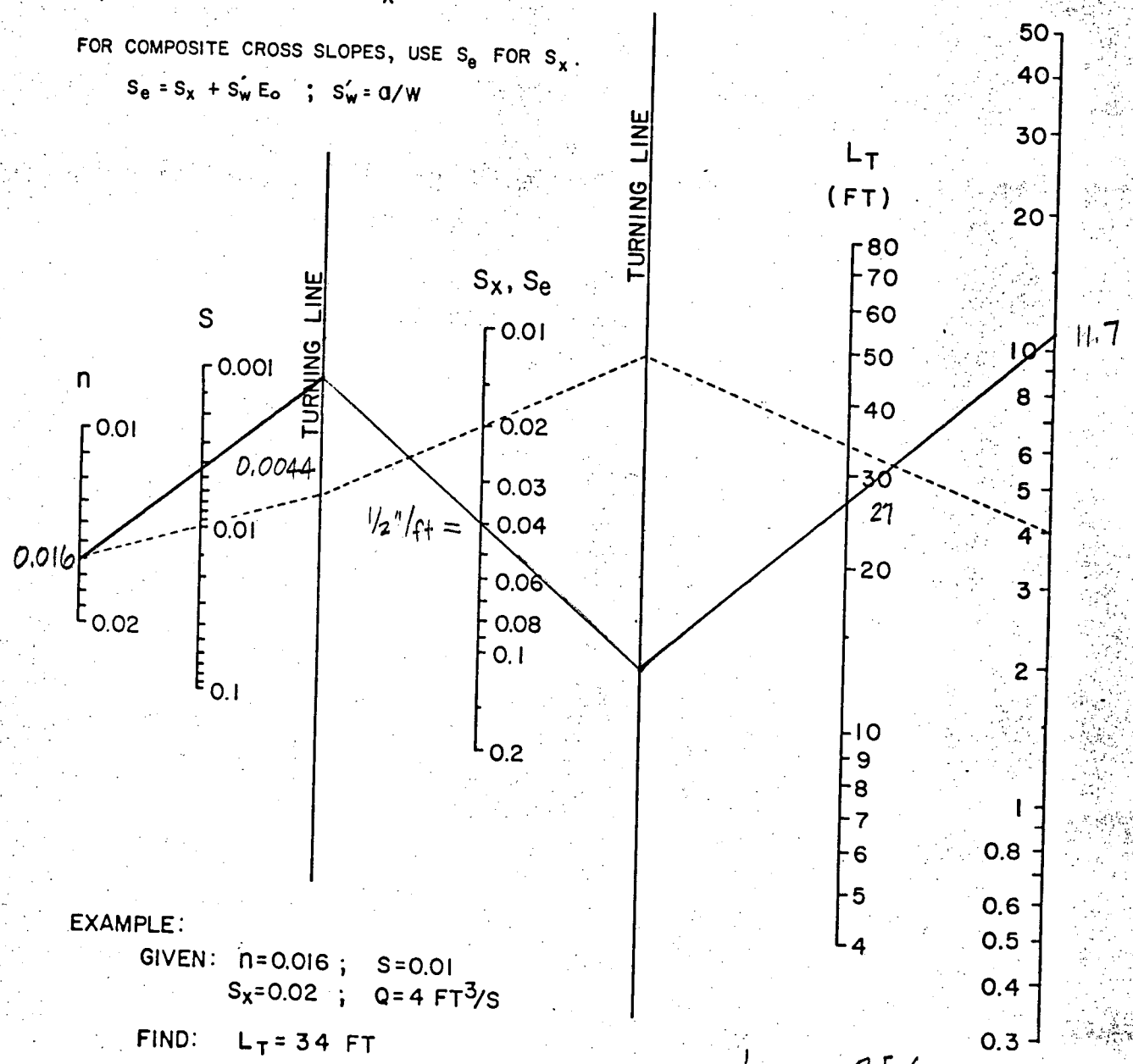
$$Q_b = 11.7 - 1.8 = 9.9 \text{ cfs}$$



$$L_T = 0.6Q^{0.42} S^{0.3} (1/nS_x)^{0.6}$$

FOR COMPOSITE CROSS SLOPES, USE S_e FOR S_x .

$$S_e = S_x + S_w E_o ; S_w = a/W$$



EXAMPLE:

GIVEN: $n=0.016$; $S=0.01$
 $S_x=0.02$; $Q=4 \text{ FT}^3/\text{S}$

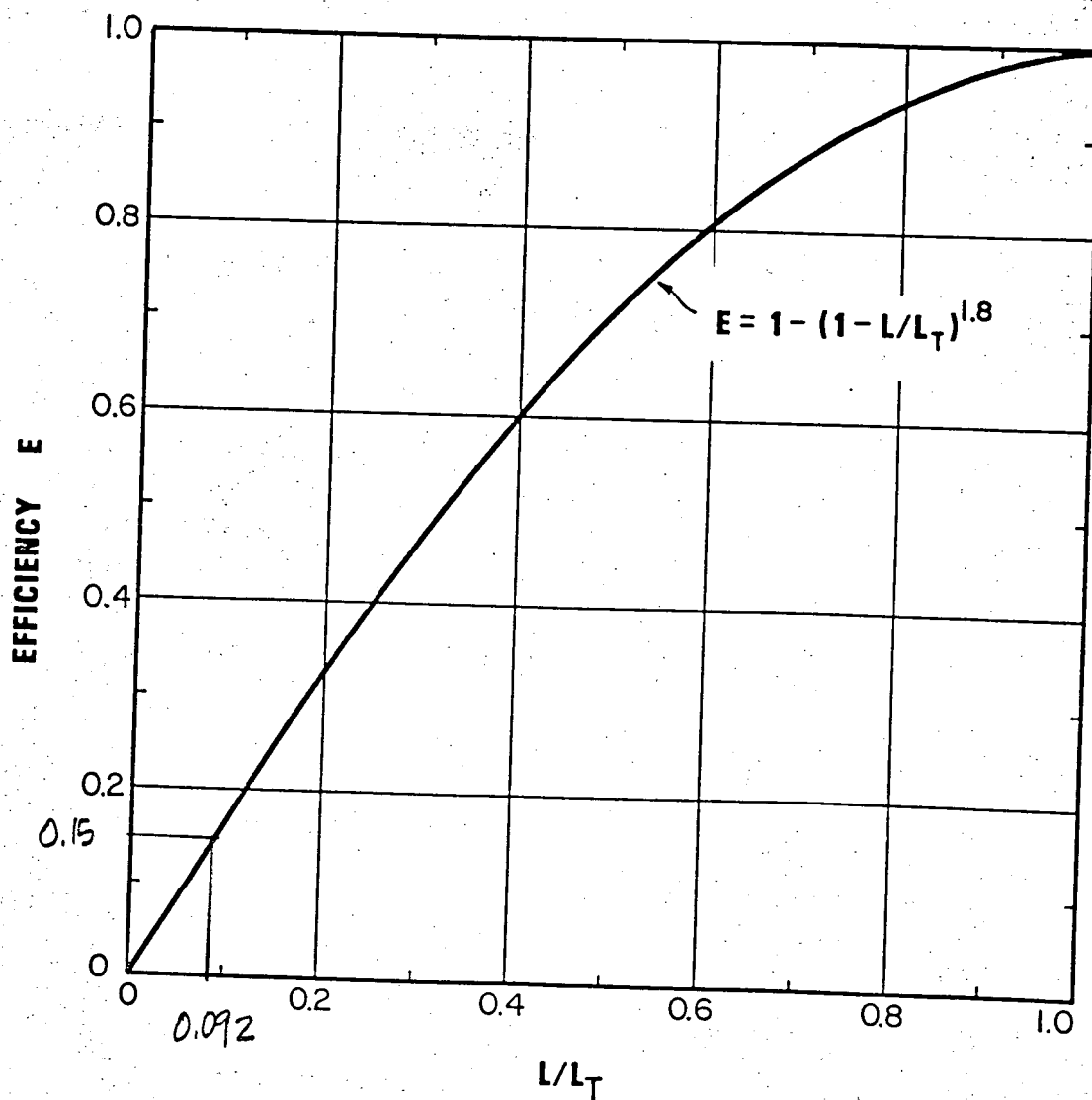
FIND: $L_T = 34 \text{ FT}$

$$\frac{L}{L_T} = \frac{2.5}{27} = 0.092$$

CHART 9. Curb-opening and slotted drain inlet length for total interception.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR. 1964.

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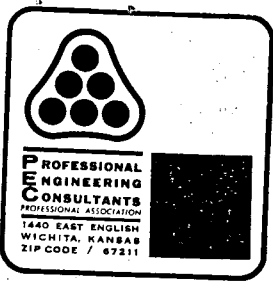
$E = 0.15$

Interception = $11.7 \times 0.15 = 1.8$

CHART 10. Curb-opening and slotted drain inlet interception efficiency.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., Mar. 1954

B



Date 2.13.89 Page 5 of 6
Project Reflection Ridge 3rd
Item Drainage (@ 21st st.)

SUB-BASIN B

Determine $Q_B = C_B I_B A$

$C_B = 0.51$ (same as school)

$t_c = 15$ minutes (assumed)

$I_B = 4.56$

$A = 7.35$ Ac.

$Q_B = 0.51 \times 4.56 \times 7.35$
 $= 17.1$

Check flow in 21st st. assuming 17.1 + bypass gutter from sub-basin A (9.9) is approaching inlet approx. 400' east of Reflection Rd.

$Q = 17.1 + 9.9 = 27.0$

$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ where $Q = 27.0$
 $n = 0.016$
 $S = 0.44\%$

$A R^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}} = \frac{27.0 \times 0.016}{1.486 \times 0.0663} = \frac{0.432}{0.09852} = 4.38$

USE same section as shown for Sub-Basin A



Date 2.13.89 Page 6 of 6
Project Reflection Ridge 3rd
Item Drainage (@ 21st st.)

| <u>D</u> | <u>d</u> | <u>A</u> | <u>p</u> | <u>R</u> | <u>R^{2/3}</u> | <u>AR^{2/3}</u> |
|----------|----------|----------|----------|----------|------------------------|-------------------------|
| 0.60 | 0.33 | 7.92 | 34.75 | 0.228 | 0.373 | 2.96 |
| 0.65 | 0.38 | 9.14 | 39.28 | 0.233 | 0.378 | 3.46 |
| 0.70 | 0.43 | 11.22 | 44.39 | 0.253 | 0.400 | 4.48 |

USE $D = 0.70$ $d = 0.43$

$$\begin{aligned} W = \text{Width} &= 10' + 48(d - 0.15) \\ &= 10' + (48)(0.43 - 0.15) \\ &= 10' + 48(0.28) \\ &= 10' + 13.44' \\ &= 23.44' \end{aligned}$$

$$\begin{aligned} \text{Lane Width open} &= \text{Total Width} - \text{Wet Width} \\ &= 34 - 23.44 \\ &= 10.56' \end{aligned}$$

OK



Date Feb. 13, 1989 Page 1 of 6

Project Reflection Ridge 3rd.

Item Drainage (@ 21st Street)

SUB-BASIN A

Determine: $Q_s = C_s I_s A$

C_s w/ Neighborhood Commercial = 0.69

$t_c = 15$ minutes (assumed)

$I_s = 4.56$

$A = 3.71$ Ac.

$$Q_s = 0.69 \times 4.56 \times 3.71$$

$$= 11.7 \text{ cfs}$$

Check flow in 21st street assuming 100% of 11.7 cfs is approaching existing gutter inlet west of Reflection Road.

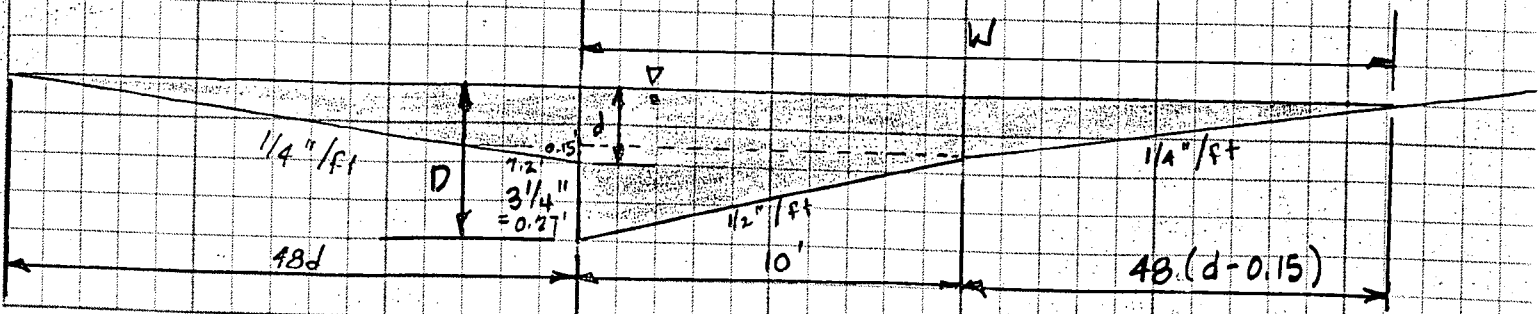
Use Manning's Eq'n: $Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$

where $Q = 11.7$ $n = 0.018$ $S = 0.44\%$

$$AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}} = \frac{11.7 \times 0.018}{1.486 \times 0.0663} = \frac{0.1872}{0.098}$$

$$AR^{2/3} = 1.90$$

Use following section: (per 21st st. plans)





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Project Reflection Ridge 3rd
Item Drainage (@ 21st st.)

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USE $D = 0.55' \pm$ $d = 0.23'$

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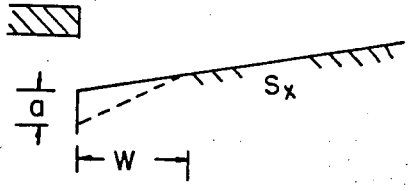
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Check interception @ existing gutter inlet!

see pages 3, 4

$$Q_i = 1.8$$

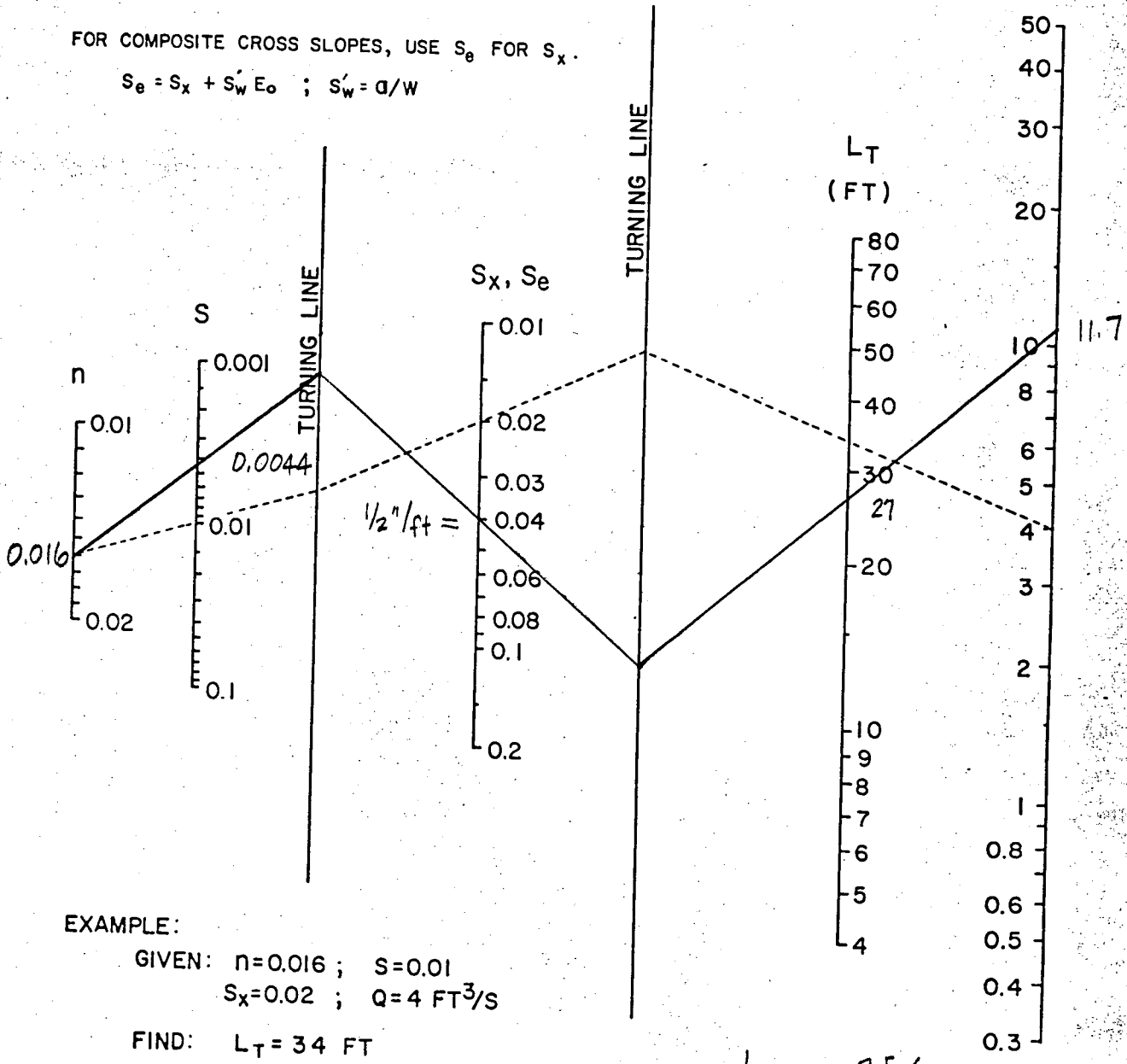
$$Q_b = 11.7 - 1.8 = 9.9 \text{ cfs}$$



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FOR COMPOSITE CROSS SLOPES, USE S_e FOR S_x .

$$S_e = S_x + S_w E_o ; S_w = d/w$$



EXAMPLE:

GIVEN: $n=0.016 ; S=0.01$
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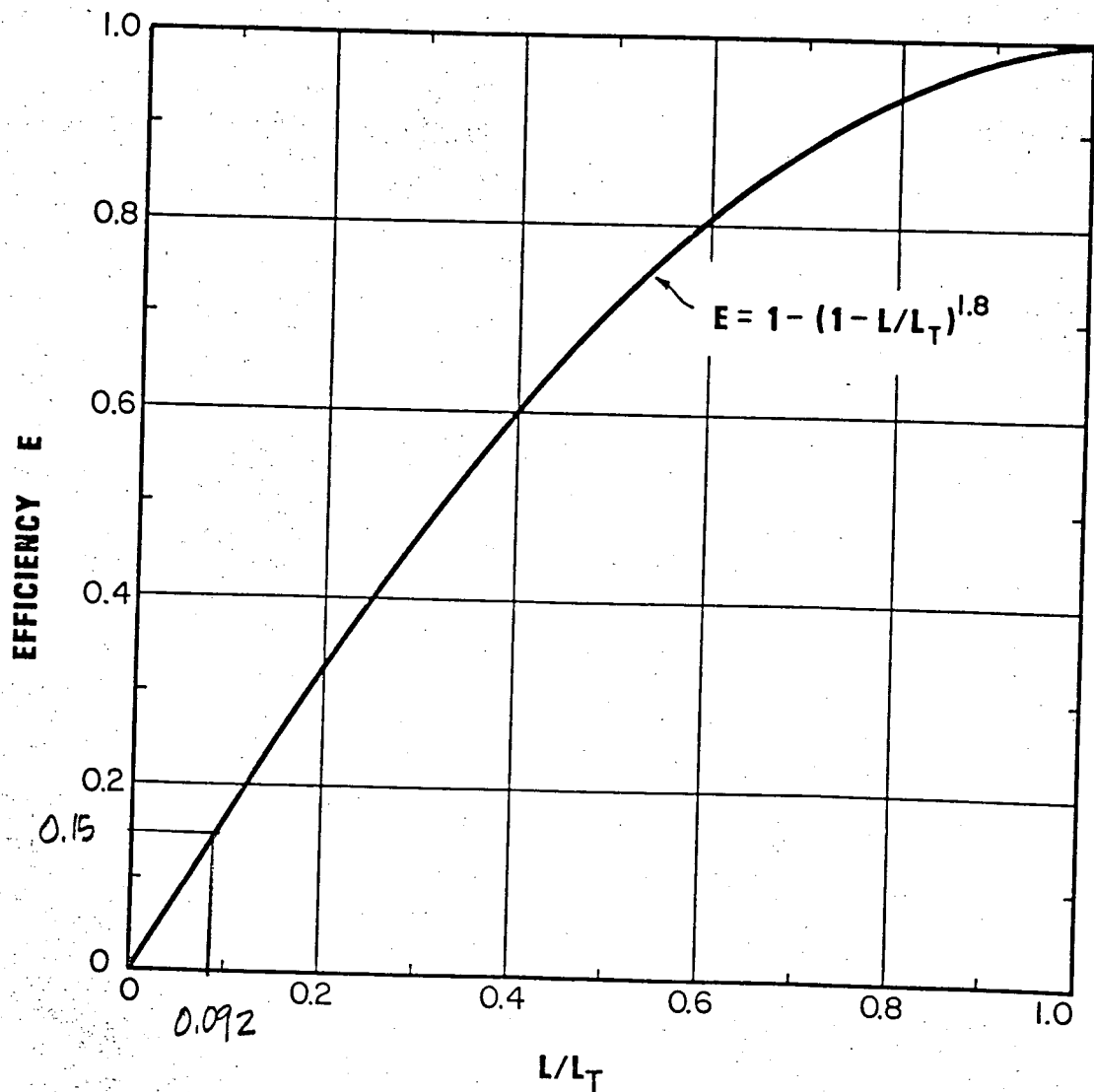
FIND: $L_T = 34 \text{ FT}$

$$\frac{L}{L_T} = \frac{2.5}{27} = 0.092$$

CHART 9. Curb-opening and slotted drain inlet length for total interception.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR. 1984.

4/6



$E = 0.15$

Interception = $11.7 \times 0.15 = 1.8$

CHART 10. Curb-opening and slotted drain inlet interception efficiency.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., Mar. 1954

B



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$$t_c = 15 \text{ minutes (assumed)}$$

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$$A = 7.35 \text{ Ac.}$$

$$Q_B = 0.51 \times 4.56 \times 7.35 \\ = 17.1$$

Check flow in 21st st. assuming 17.1 +
bypass from sub-basin A (9.9) is approaching
gutter inlet approx. 400' east of Reflection Rd.

$$Q = 17.1 + 9.9 = 27.0$$

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2} \quad \text{where} \quad Q = 27.0 \\ n = 0.016 \\ S = 0.44\%$$

$$A R^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}} = \frac{27.0 \times 0.016}{1.486 \times 0.0663} = \frac{0.432}{0.09852} = 4.38$$

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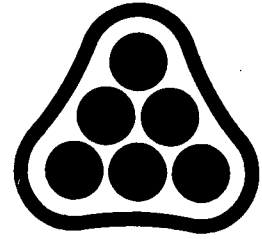
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OK

DIRECTORS

C. O. KNOR, P.E.
W. H. KELTNER, P.E.
R. D. PLETCHER, P.E.
F. D. MIDDLETON, JR., P.E.
D. E. MALTBIE, P.E.
M. D. SCHOMAKER, P.E.
G. D. SCHOCK, P.E.
J. H. BAILEY, P.E., PH.D.
D. I. NORTON, P.E.



PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

February 14, 1989

Mr. Michael E. Lindebak, P.E.
City Engineer
7th Floor - City Hall
455 North Main
Wichita, Kansas 67202

Attention: Ms. Vicky Huang, P.E.

Reference: Reflection Ridge 3rd Addition
PEC File No. 36-88594-2092

Dear Ms. Huang:

As you requested, we have investigated the drainage from Reflection Ridge 3rd Addition and the adjoining property that discharges onto 21st Street. Attached you will find 2 copies of our calculations and revised Drainage Plan.

It appears that the design storm sewer can be handled in 21st Street with an 8' driving lane open to traffic (per City criteria).

If you have any questions or need any additional information, please advise.

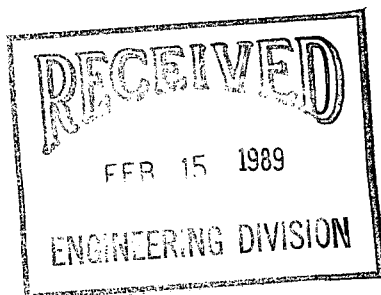
Very truly yours,

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

Charles S. Brown, P.E.
Project Engineer

cc: Reg Boothe (w/encl.)

CSB/cas



**PROFESSIONAL
ENGINEERING CONSULTANTS, PA**

1440 E. English
WICHITA, KANSAS 67211

(316) 262-2691

LETTER OF TRANSMITTAL

| | |
|------------------------------------|--------------------------|
| DATE Jan. 27, 1989 | JOB NO. 36-88594-2273 |
| ATTENTION Ms. Vicky Huang, P.E. | |
| RE: Reflection Ridge 3rd Add. | |
| | |
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TO The City of Wichita, KS
455 N. Main
Wichita, KS

WE ARE SENDING YOU Attached Under separate cover via _____ the following items:

- Shop drawings Prints Plans Samples Specifications
 Copy of letter Change order _____

| COPIES | DATE | NO. | DESCRIPTION |
|--------|---------|-----|---|
| 2 | 1-27-89 | | Drainage Plan & Supporting Calculations |
| | | | |
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THESE ARE TRANSMITTED as checked below:

- For approval Approved as submitted Resubmit _____ copies for approval
 For your use Approved as noted Submit _____ copies for distribution
 As requested Returned for corrections Return _____ corrected prints
 For review and comment _____
 FOR BIDS DUE _____ 19 _____ PRINTS RETURNED AFTER LOAN TO US

REMARKS The Final Plat will be submitted today, 1-27-89,
for hearing by the Subdivision Committee on
2-9-89.

COPY TO File
Reg. Boothe

SIGNED: Charles J. Brown