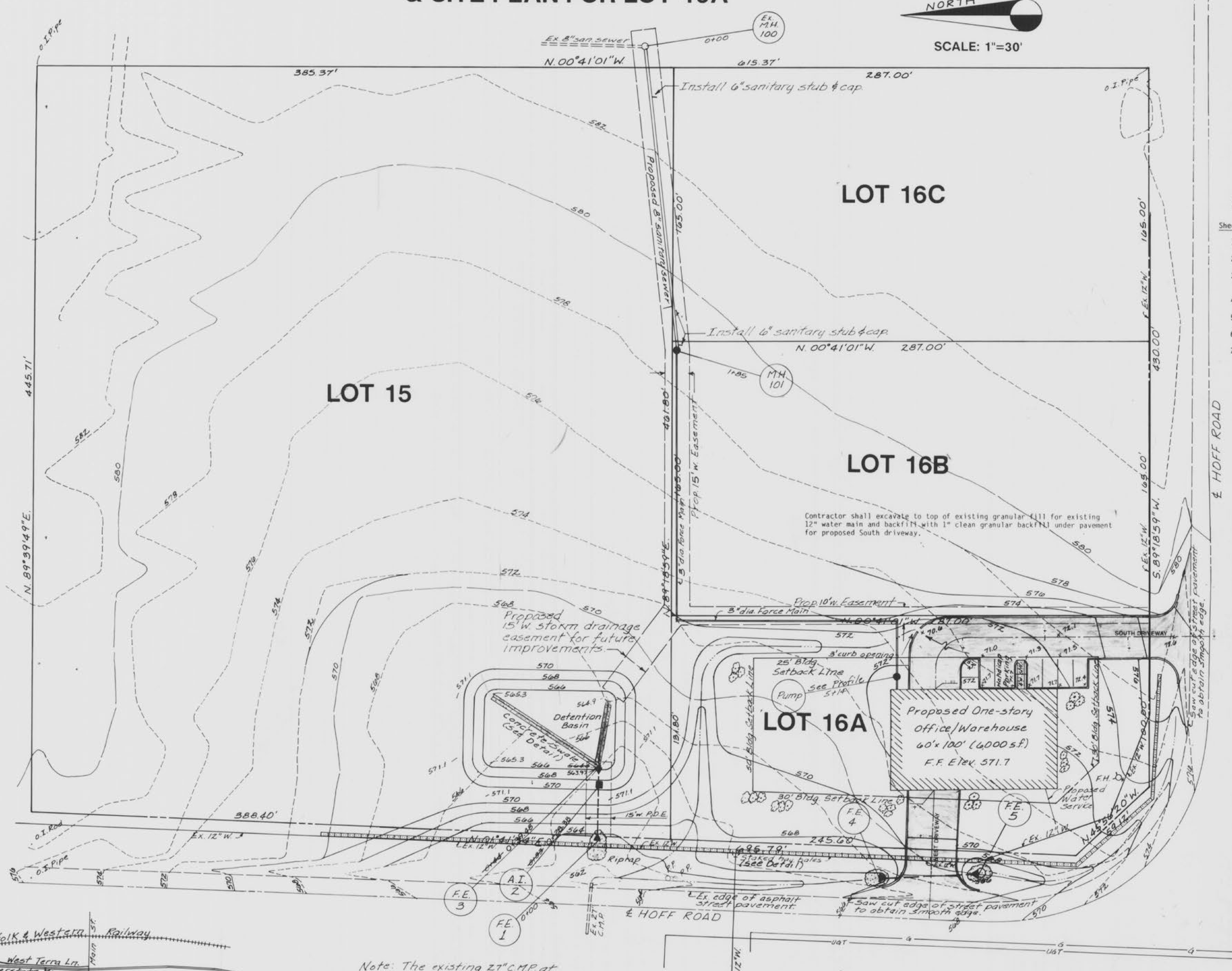
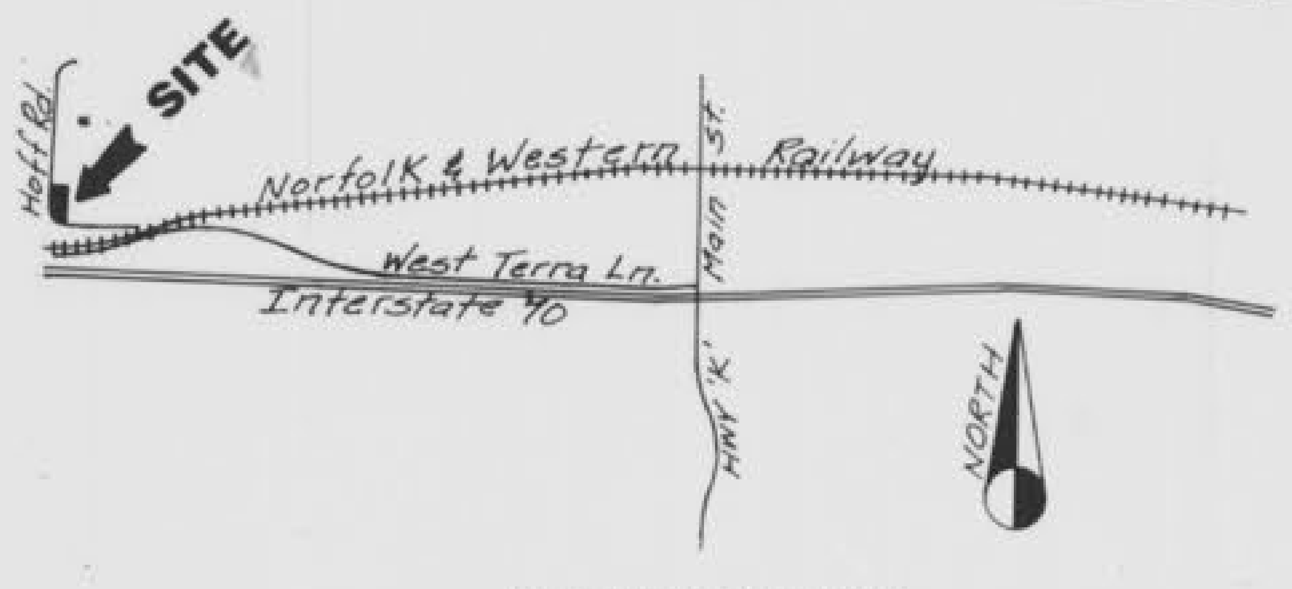
DETENTION FOR LOTS 15 & 16 OF LONE STAR INDUSTRIAL PARK
& SITE PLAN FOR LOT 16A



Note: The existing 27" C.M.P. at Hoff Road drains from West to East.

T.B.M. – Railroad spike in West Face of Power Pole East of Hoff Road, south of Force Main. Elev. 575.47



LOCATION MAP NOT TO SCALE

NOTE:

Existing underground (U/G), overhead (O.H.) utilities and drainage structures have been plotted from available information and therefore, their locations must be considered approximate only. It is the responsibility of the individual Contractors to notify the utility companies before actual construction.

Bid Yardage
Cut - 3300 c.y.
Fill - 4,000 c.y.
(Assumes 15% shrinkage).

As-Constructed, May 4, 1989, J.M.G.

TABLE OF CONTENTS

GBA
GEORGE BUTLER ASSOCIATES, INC.
CONSULTING ENGINEERS/ARCHITECTS
LANDSCAPE ARCHITECTS/PLANNERS

OFFICES:
8207 MELROSE DRIVE, P.O. BOX 14548, LENEXA / KANSAS / 66215
1100 CITY CENTER SQUARE, 1100 MAIN, KANSAS CITY / MISSOURI / 64105
208 FIFTH STREET, P.O. BOX 346, AMES / IOWA / 50010
6200 CONNECTICUT, SUITE 100, KANSAS CITY / MISSOURI / 64120
225 SOUTH MAIN STREET, SUITE #200, O'FALLON / MISSOURI / 63366
4508 CLASSEN BOULEVARD, OKLAHOMA CITY / OKLAHOMA / 73118

DETENTION FOR LOTS 15 & 16 OF LONE STAR INDUSTRIAL PARK
& SITE PLAN FOR LOT 16A
PREPARED FOR MR. TOM GLOSIER

JOB NO	5272
DATE	
DESIGNED BY	J.L.B.
DRAWN BY	J.L.B.
CHECKED BY	G.R.H.
SHEET NO	1 of 7

DETENTION FOR LOTS 15 & 16 OF LONE STAR INDUSTRIAL PARK & FLAT PLAN FOR LOT 16A

SCALE: 1"=30'

GENERAL CONSTRUCTION NOTES

1. Total area of property: 0.89 Acres
2. Present Zoning: I-2, Heavy Industrial
3. Sewage Disposal: City of O'Fallon 281-2866

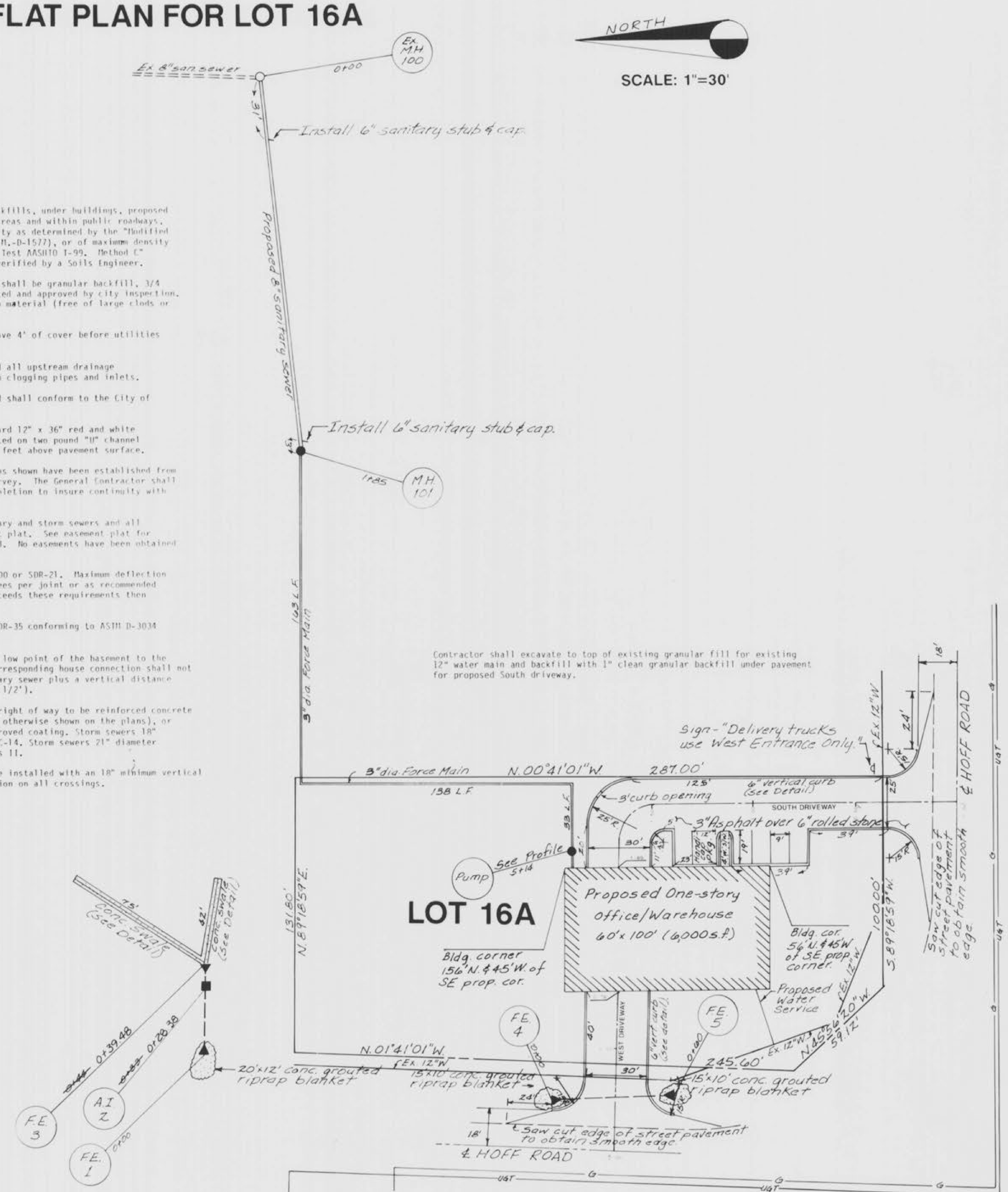
   Water: MMEI 281-2866

   Electricity: Unipn Electric 272-6203

   Gas: Laclede Gas Company 535-7700

   Phone: Contel 327-3600
4. Fire Protection: O'Fallon Fire Protection District
5. Developer/Owner: Mr. Tom Glosier, P.O. Box 1197, St. Charles, Missouri 63302

   Phone Number: 947-4515
6. Temporary Facilities: Light, Power, Water, and Toilet Facilities shall be provided by the General Contractor.
7. Protection: Each contractor shall protect his excavations: All excavations shall be kept free of water and lighted barricades maintained.
8. Clean-Up: The General Contractor shall remove all debris from site and building broom cleaned and not allow trash to blow onto adjoining properties. Tools, equipment, and scaffolding not in active use shall be removed.
9. The sediment control plan should be implemented as soon as possible. No graded area is to remain bare without being seeded and mulched. Also, care should be exercised to prevent this soil from damaging adjacent property and silting up all storm drainage systems whether on or off site.
10. All low places whether on site or off site should be graded to allow drainage. This can be accomplished with temporary ditches.
11. Topsoil, sod, and debris is to be removed from area of new construction.
12. Excavate to produce an undisturbed soil bearing surface at required levels. Remove all soft spots in subgrade and fill with compacted granular fill.
13. Remove existing foundations that interfere with new work.
14. Fill soils shall not contain organic material, vegetation, rubbish, cinders or frozen materials. Horizontal fills may be clay or granular fill. Remove all unacceptable or excess excavated material from site.
15. All existing underground utilities & services that are to remain are to be protected throughout construction.
16. Gas, water and other underground utilities shall not conflict with the open or horizontal location of existing and proposed sanitary and storm sewers including house laterals.
17. Underground utilities, have been plotted from available information and therefore their locations must be considered approximate only. The verification of the location of all underground utilities, either shown or not shown on these plans shall be the responsibility of the contractor, and shall be located prior to grading or construction of improvements.
18. All filled places, including trench backfills, under buildings, proposed storm and sanitary sewer lines, paved areas and within public roadways, shall be compacted to 90% maximum density as determined by the "Modified AASHTO T-180 Compaction Test." (A.S.T.M.-D-1577), or of maximum density as determined by the "Standard Proctor Test AASHTO T-99. Method C" (A.S.T.M. D-698). All tests shall be verified by a Soils Engineer.
19. All trench backfills under paved areas shall be granular backfill, 3/4 inch or 1 inch crushed rock, water jetted and approved by city inspection. All other trench backfills may be earth material (free of large clods or stones) and shall be water jetted.
20. Fill areas for public utilities must have 4' of cover before utilities are put in.
21. Siltation control must be put in around all upstream drainage structures to prevent soil erosion from clogging pipes and inlets.
22. All construction and materials required shall conform to the City of O'Fallon standards.
23. Barricades will consist of three standard 12" x 36" red and white striped scotchlite hazard markers mounted on two pound "U" channel sign post, with bottom of marker seven feet above pavement surface.
24. All top, flowline, and invert elevations shown have been established from the grading plan and/or topographic survey. The General Contractor shall verify all elevations upon grading completion to insure continuity with proposed and existing utilities.
25. Easements have been provided for sanitary and storm sewers and all utilities and are shown on the easement plat. See easement plat for size and location of easements provided. No easements have been obtained for sanitary sewer laterals.
26. All P.V.C. water pipe shall be Class 200 or SDR-21. Maximum deflection on water lines shall not exceed 5 degrees per joint or as recommended by the manufacturer. If deflection exceeds these requirements then fittings will be required.
27. All P.V.C. sanitary sewer pipe to be SDR-35 conforming to ASTM D-3034 with approved bedding.
28. The minimum vertical distance from the low point of the basement to the flowline of a sanitary sewer at the corresponding house connection shall not be less than the diameter of the sanitary sewer plus a vertical distance not less than two and one half feet (2 1/2').
29. All storm sewer pipes within proposed right of way to be reinforced concrete pipe (ASTM C/C Class II minimum unless otherwise shown on the plans), or 14 gage corrugated steel pipe with approved coating. Storm sewers 18" diameter or smaller shall be A.S.T.M. C-14. Storm sewers 21" diameter or larger shall be A.S.T.M. C-76, Class II.
30. Sanitary sewer and water lines shall be installed with an 18" minimum vertical clearance and a 10' horizontal separation on all crossings.



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As-Constructed, May 4, 1989
J.M.G.

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DETENTION FOR LOTS 15 & 16 OF LONE STAR INDUSTRIAL PARK & FLAT PLAN FOR LOT 16A

JOB NO	5272
DATE	
DESIGNED BY	J.L.B.
DRAWN BY	J.L.B.
CHECKED BY	G.R.H.
SHEET NO	2 OF 7

DETENTION BASIN CALCULATIONS

Area of Lots 15 and 16 7.09 Acres

Proposed Lot 16A will have 38% impervious area, but we will provide detention for Lots 15 and 16 and assume 75% impervious area.

25 Year Storm

PI Factor	% Impervious
4.75	100%
X	75%
2.31	5%

By interpolation PI=4.11 for 75% impervious area.

Now find required storage volume

$V_{storage}$ = 7.09 x 1800(4.11-2.31) = 22,972 cu. ft.

say 23,000 cu. ft.

Now find the 25 year runoff tributary to detention basin: 5.39 Ac.

$V_{tributary}$ = 5.39 x 4.11 x 1800 = 39,875 c.f.s.

39,875-23,000 = 16,875 cu. ft.
or Q = $\frac{16,875}{1800}$ = 9.38 c.f.s.

Therefore, we can release 9.38 c.f.s. from the detention basin.

Now find stage in detention basin

Stage			Storage Volume (cu. ft.)
571		7987	31084
		7571	
570	7.95	7155	23513
		6739	
569		6323	16774
		5907	
568	6.10	5490	10867
		5044	
567		4599	5823
		4154	
566	4.12	3708	1669
		1669	
565.1		0	0

Elev.	Volume (Cu. Ft.)
570	23,513
WS	23,000
569	16,774

6226 = 0.92'
6739

(25 Year) W.S. Elev. = 569.92

$Q_{allowable}$ = 9.38 c.f.s.

Try 12" pipe A = $\frac{\pi}{4}(1)^2$ = .785 sq. ft.

Available Head: h=569.92 - 564.40 - 12/24 = 5.02'

Q = .62(.785) $\sqrt{64.4(5.02)}$ = 8.75 c.f.s.

Therefore we are voluntarily storing more than we need to store.

$Q_{additional}$ = 9.38 - 8.75 = 0.63 c.f.s.

$V_{additional}$ = .63 x 1800 = 1134 cu. ft.

So find revised W.S. Elevation to accomodate the additional 1134 cu. ft. of storage

V = 1134 + 23000 = 24,134 cu. ft.

Elevation	Volume (Cu. Ft.)
571	31084
WS	24134
570	23513

621 = 0.08'
7571

So the revised 25 Year W.S. Elevation = 570.08

Now design 100 Year Emergency Outfall Pipe:

25 Year Inflow = 4.11 x 5.39 = 22.15 c.f.s.

100 Year Inflow = 22.15 x 1.2771 = 28.29 c.f.s.

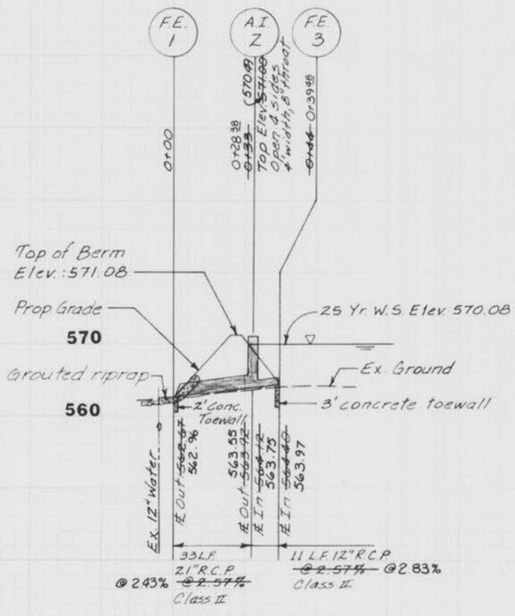
We will use a standard area inlet as the spillway and set the sill at 570.08 with the top of berm at 571.08. The top of the inlet will be at 571.00. Upstream flowline of 12" pipe is at 564.40.

Find Capacity of Inlet

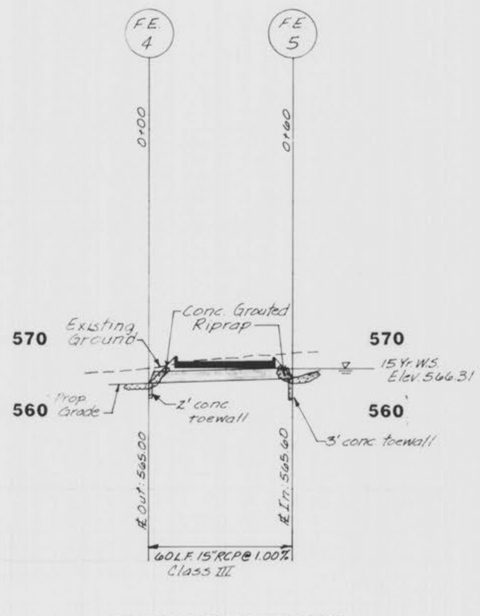
Four throat openings 8" x 4'
Area = .67 x 4 = 2.68 s.f.
Assume W.S. to top of throat
Sill Elevation = 570.08
Top of throat elevation = 570.08 + .67 = 570.75
Top of berm elevation = 571.08
100 Yr. freeboard = 571.08 - 570.75 = .33' or 4"
$Q = 4CA\sqrt{2gh} = 4(.62)\sqrt{2(32.2)(.67/2)} = 30.64$ c.f.s.
100 Year Inflow = 28.29 c.f.s.
30.64 c.f.s. > 28.29 c.f.s.
Therefore, inlet has adequate capacity for a 100 year storm.

GBA
GEORGE BUTLER ASSOCIATES, INC.
Engineers / Architects / Landscape Architects / Planners

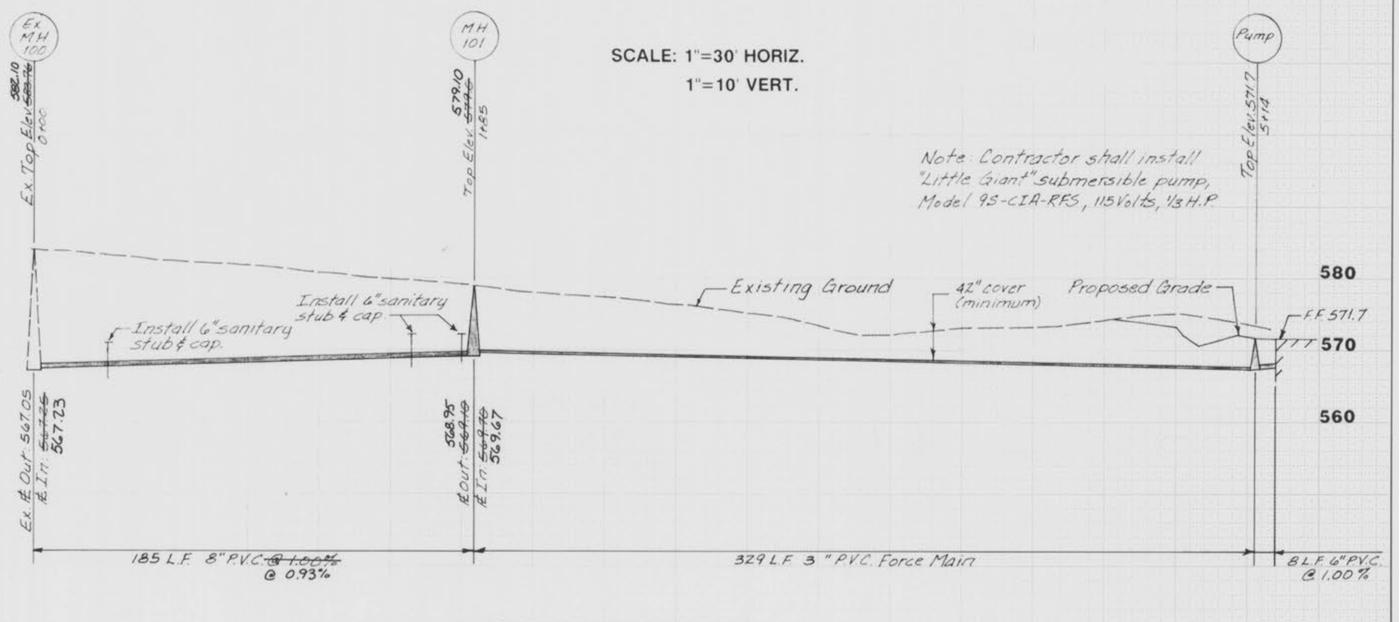
PROJECT	SHEET NO.	TOTAL SHEETS
DETENTION CALC'S. SEWER PROFILES	3	7
PROJECT NO.: 5272	DATE: June, 1988	
REVISIONS:		



STORM SEWER PROFILE



STORM SEWER PROFILE



SANITARY SEWER PROFILE

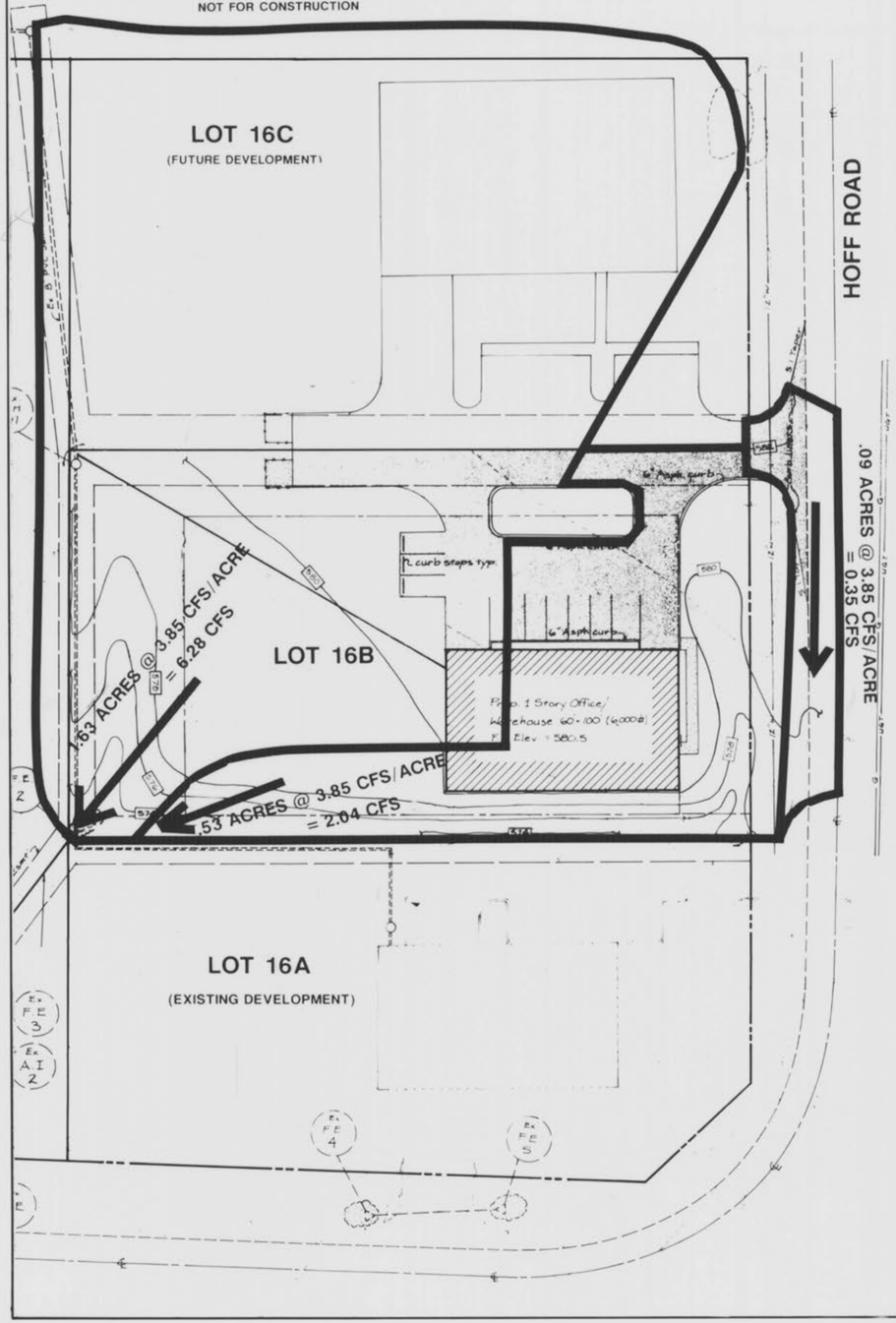
As-Constructed, May 4, 1989
-JMG

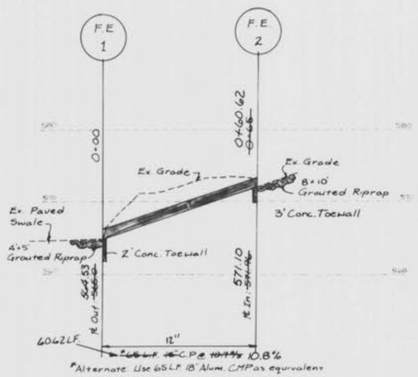
LOT 16A, B, C LONE STAR IND. AS-BUILT

DRAINAGE AREA MAP

1" = 30'

NOT FOR CONSTRUCTION





STORM SEWER PROFILE

1" = 30' HORIZ.
1" = 10' VERT

AVG. SLOPE: 5.7%

MAX. DEPTH DESIRED: 0.5'

VELOCITY: 4.67 f.p.s.

CAPACITY: Q=5.75(4.67)=26.85 c.f.s.>6.28 c.f.s.

VELOCITY (actual): 6.28=5.75(V)

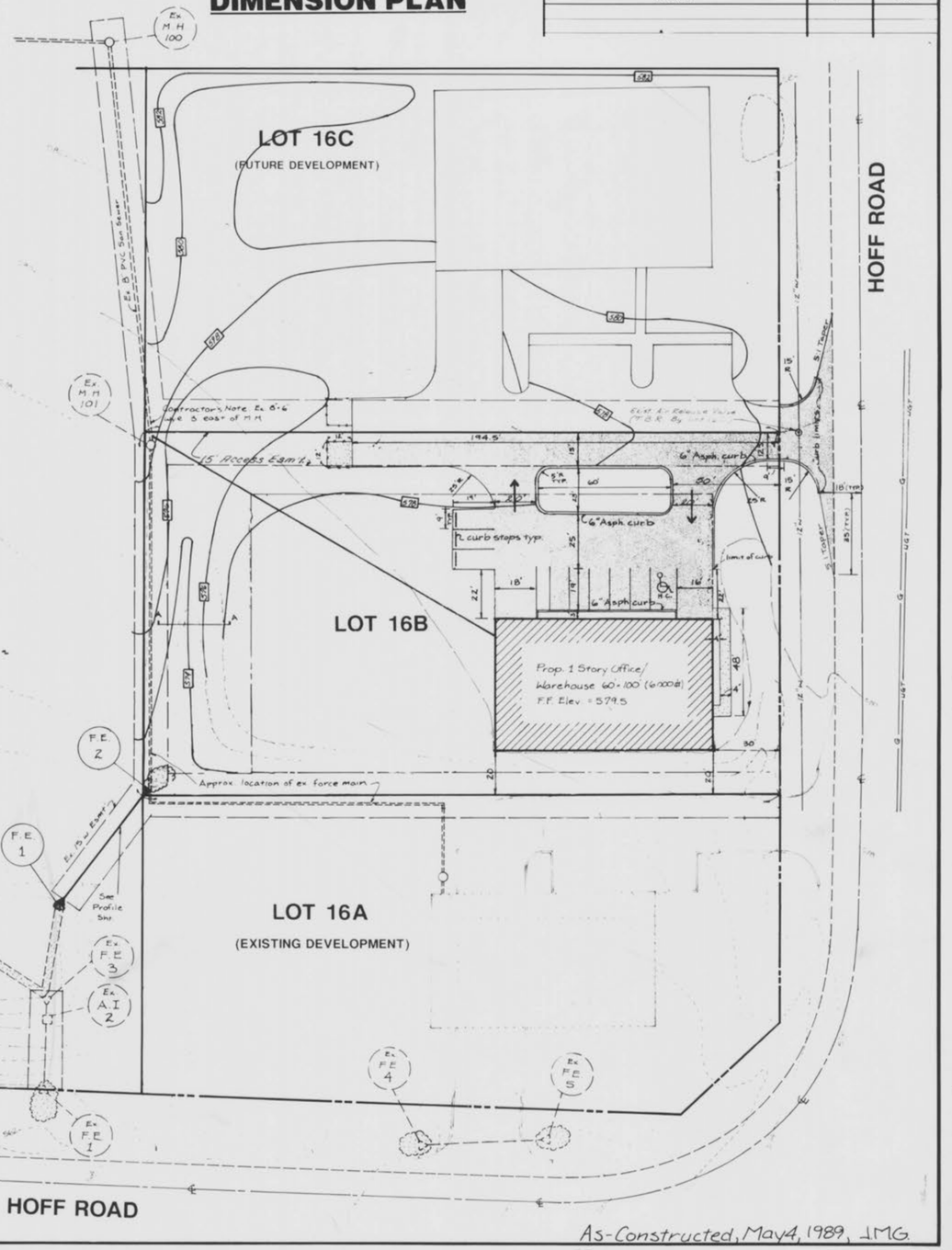
V=1.1 f.p.s. > 5.0 f.p.s. - nonerosive

DITCH SECTION AA

SYMBOLS

DIMENSION PLAN

1" = 30'



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GEORGE BUTLER ASSOCIATES, INC.
Engineers / Architects / Landscape Architects / Planners
Kansas City, Mo. / Lenexa, Ks. / O'Fallon, Mo. / Ames, Ia. / Oklahoma City, Ok.

DATE:	
DESIGN BY: MTS	
DRAWN BY: CJO	
PROJECT NO.: 5323	
SHEET NO.	TOTAL SHEETS

LONE STAR LOT 16B CONSTRUCTION PLANS

2 | 2

REVISIONS	BY	DATE

As-Constructed, May 4, 1989, JMG