

Appendix J
Fairfield County Sewer Report

May 7, 1999

Mr. Kerry S. Hogan, P.E.
Directory of Utilities/Sanitary Engineer
Fairfield County Utilities
210 E. Main Street, Room 302
Lancaster, Ohio 43130-3854

Re: Fairfield County Utilities
Lancaster Service Area
Wastewater Collection Evaluation

Dear Mr. Hogan:

The purpose of this letter report is to summarize the findings of the Fairfield County Utilities Wastewater Collection Evaluation for the Lancaster Service Area. The purpose of this study was to evaluate the ability of the City of Lancaster wastewater collection system to accept sanitary flow from six areas within Fairfield County, two of which are served by package plants. The other areas are served by individual on-site systems. This letter report includes information pertaining to the project background, computer model development, estimated wastewater flow rates, impacts from future development, and a report summary.

Project Background

Fairfield County hired Malcolm Pirnie to determine the impact of connecting customers from six County developments to the existing Lancaster wastewater collection system. In order to aid in this evaluation, Malcolm Pirnie utilized the City of Lancaster's Stormwater Management Model (SWMM) of their collection system. The model was used to determine potential sewer system impacts such as sewer surcharging or increased combined sewer overflow (CSO) volume that would result during dry weather or wet weather as a result of the additional wastewater flow.

Computer Model Development

As part of the City's 1996 Sewer System Characterization, a wastewater collection system model was developed and calibrated using software from CAICE Software, Inc. (formally XP-SWMM Software Inc.). During the system characterization, the flows at many sewer system locations and at all CSOs were monitored during both dry and wet weather situations. In addition, rainfall was measured throughout the City to aid in model calibration.

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As part of the system characterization, four typical annual storms were developed from historical rainfall records. These storms were then modeled and the results were used to determine the sewer system response to rainfall and to estimate the impact on the annual CSO volume. For each typical storm, the model was used to determine the impact of the additional flow from the Fairfield County service areas on the Lancaster wastewater collection system.

Wastewater Flow Rates

The County is investigating connection of six service areas, all of which are located outside of the City of Lancaster corporation limits, to the City of Lancaster wastewater collection system. The general location of the proposed connections to the Lancaster wastewater collection system are shown on Figure 1. The specific location of each connection to the existing Lancaster collection system is shown on Figures 2, 3, 4, and 5. The following is a brief description of each of the proposed areas:

Knox Acres Subdivision - Knox Acres Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster. This subdivision is fully developed at 29 connections and is currently served by on-site systems.

Carpico Drive Subdivision - Carpico Drive Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster. This subdivision is currently developed with 26 connections served by on-site systems. Of the three remaining undeveloped lots, it is assumed that only one is developed due to the size and location of the lots.

Peters Subdivision - Peters Subdivision is an existing residential development located in Fairfield County outside the City of Lancaster, but which is currently served by the City of Lancaster. A proposed expansion would increase the subdivision from 122 connections to 139 total connections.

Lakeside Subdivision - Lakeside Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster and is currently served by a package plant. This subdivision is fully developed at 30 connections. In order to connect to the Lancaster system, a sewer line would be extended through an unincorporated area adjacent to homes currently served by individual on-site systems. Wastewater from the adjacent homes is not specifically included with the Fairfield County projected flows, but is included in the overall Lancaster service area flows for the year 2020.

Pleasant Lea Subdivision - Pleasant Lea Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster and is currently served by a package plant. This subdivision is fully developed at 84 connections. In order to connect to the Lancaster system, a sewer line would be extended through an unincorporated area adjacent to homes currently served by on-site systems. Wastewater from the adjacent homes is not specifically included with the Fairfield County projected flows, but is included in the overall Lancaster service area flows for the year 2020.

Keister Manor Subdivision - Keister Manor Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster. This subdivision is fully developed at 54 connections and is currently served by on-site systems.

Dry and wet weather flow projections for each area were made to represent the impact of the additional flow on the collection system during dry weather and typical annual rainfall events. Dry and wet weather flowrates were developed for each of the areas using the number of developed lots, sanitary flows per lot, infiltration allowances, and previous flow monitoring data. The calculation of the estimated average dry weather flowrates (DWF) and peak wet weather flowrates (WWF) from each of the six areas are provided in Table 1 and are summarized below.

<u>Subdivision</u>	<u>Projected Ave. DWF</u>	<u>Projected Peak WWF</u>	<u>Connection Point</u>
Knox Acres	11,600 gpd	12,539 gpd	Barr Dr. & Wittenburg
Carpico	10,800 gpd	11,861 gpd	Granville Pike & Creekside Drive
Peters	6,800 gpd	7,467 gpd	Hillbrook Dr. & Midway Blvd.
Lakeside	12,000 gpd	29,700 gpd	Last Manhole on Rainbow Dr. East
Pleasant Lea	16,800 gpd	67,700 gpd	Last Manhole on Rainbow Dr. East
<u>Keister Manor</u>	<u>21,600 gpd</u>	<u>24,509 gpd</u>	Ewing Trunk sewer at Rainbow Dr.
Total	79,600 gpd	153,776 gpd	

Using the number of developed lots for each subdivision in Table 1, the projected average dry weather flows appear to be reasonable and slightly conservative.

Impacts From Future Development

As part of the City of Lancaster's 1997 National Pollutant Discharge Elimination System (NPDES) Permit, the City is required to complete a sewer system extension evaluation. Through this evaluation, the impact of future development on the collection system during both dry and wet weather will be determined and addressed in Lancaster's CSO Long Term

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Control Plan. Although Lancaster's Long Term Control Plan is not yet completed, it is anticipated that there will be no allowable increase in CSO volume as a result of the increase in flow from new development or connections. Therefore, the City is obligated to prevent any increase in CSO volume as a result of new development or connections through implementation of sewer system and treatment system modifications or improvements.

Impacts From Projected Development Throughout The Entire Lancaster Service Area - The Lancaster collection system is being modeled and evaluated for the development and connections projected for the year 2020. In order to estimate future flowrates, areas of future industrial and residential/commercial development were projected. Based on the projected development areas, industrial and residential/commercial flows were estimated. These projected development areas include the above referenced Fairfield County service areas. The diurnal flow pattern from similarly developed areas of the City was used to develop the diurnal flow pattern for each new area of development. These diurnal flows were then input into SWMM at the appropriate locations in order to model the projected flow increases.

Model simulations were performed in order to determine the impact of the projected year 2020 wastewater flow rates on the collection system during dry weather. Based on the model output, the projected increase in flows should not cause any surcharging or flooding problems. However, as a result of the dry weather flow increase for the year 2020, modification to CSOs in the lower portion of the collection system are required in order to prevent dry weather overflows.

The model was also used to estimate the impact of the increase in system connections on the collection system during wet weather. Using data from the existing separated sewer areas of the collection system, wet weather infiltration allowances were made for all future development or connection areas.

The results from model simulations for an average annual year of precipitation were compared for the existing and projected future 2020 conditions. Based on the model output, there should not be any significant hydraulic changes associated with the additional flow during typical yearly storms. However, as a result of the projected increase in flow, the annual CSO volume will increase. Therefore, the City is planning collection system modifications in order to prevent increased CSO discharges.

Impacts From New Fairfield County Connections - Model simulations were performed to determine the impact of the increase in dry weather flow from the County subdivisions on the Lancaster collection system prior to 2020. Based on the

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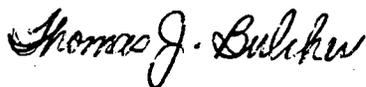
results of these simulations, the Fairfield County wastewater flows can be added to the City of Lancaster collection system . However, it is recommended that the City of Lancaster complete CSO modifications associated with raising weir levels at CSO 1019 and CSO 1031 prior to accepting the additional flow in order to prevent increases in annual CSO discharge volumes.

Report Summary

The City of Lancaster has projected future industrial and residential/commercial development areas and wastewater flow rates through the year 2020. The estimated 2020 flows have been modeled to determine the impact of these flows during dry and wet weather. Based on model results, modifications to the collection system by the City of Lancaster will enable all of the projected flow to be added to the collection system without increasing CSO discharge volume or surcharging sewers. Specifically, the additional flow from the six Fairfield County service areas will not impact the City of Lancaster collection system during dry or wet weather after the modifications at CSO 1019 and 1031 are completed. It is recommended that these modifications be made by the City of Lancaster prior to connection of the Fairfield County service areas with the exception of Knox Acres. Knox Acres could be added at any time. It is anticipated that the CSO modifications will be completed by mid 2000.

Very truly yours,

MALCOLM PIRNIE, INC.



Thomas J. Bulcher, P.E.
Associate

sewer2.wpd/mdw

c: Mike Nixon, City of Lancaster, WPCD Superintendent
L. Kent Huston P.E., City of Lancaster, City Engineer
Mitch Altier, Sieco, Inc.

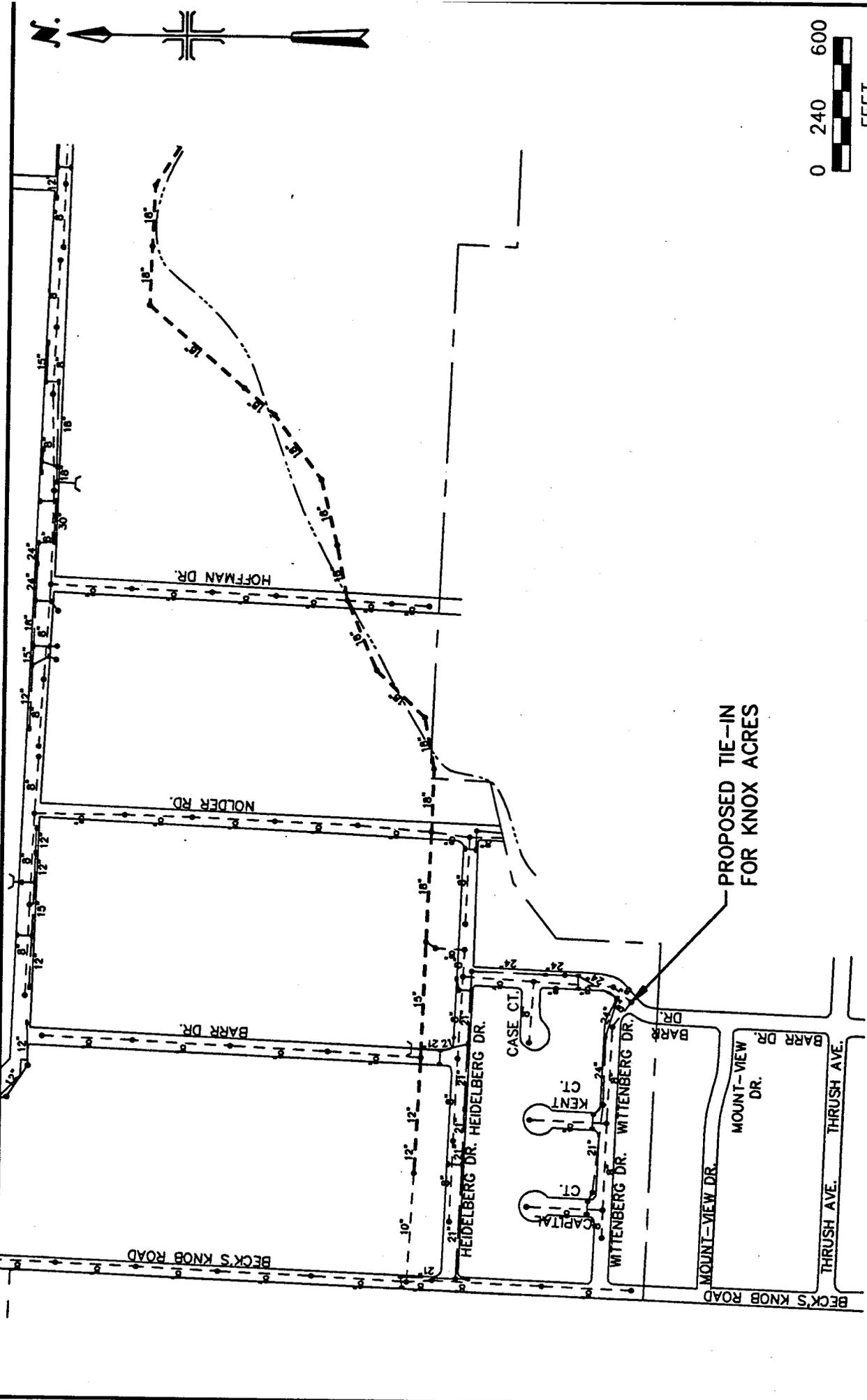
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Table 1
Fairfield County
Subdivision Flows

	Knox Acres	Carpico Drive	Peters	Lakeside	Pleasant Lea	Keister Mannor
No. of homes projected	29	27	17	30	84	54
Dry Weather Baseflow/home (gpd)(1)	NM	NM	377 (12)	353	150	NM
Wet Weather I/I/home (gpd) (1)	NM	NM	85 (12)	84	35	NM
Peak WWF (2)	NM	NM	7,854	13,110	15,540	NM
Maximum Flow (3)	NM	NM	NA	29,700	67,700	NM
Adj. Baseflow/home (gpd) (4)	400	400	400	400	200	400
Infil./Inflow (gpd/in-mi) (5)	200	200	200	NA	NA	200
8" Sewer Length (ft) (6)	3,100	3,500	2,200	NA	NA	9,600
Ave. DWF (gpd) (7)	11,600	10,800	6,800	12,000	16,800	21,600
Peak WWF (gpd) (8)	12,539	11,861	7,467	29,700 (9)	67,700 (9)	24,509
Peak Diurnal DWF (gpd) (10)	15,080	14,040	8,840	15,600	21,840	28,080
Peak Diurnal WWF (gpd) (11)	39,208	36,504	22,984	40,560	67,700 (13)	73,008

1. Flows from Fairfield County package plants October 1, 1998 through December 31, 1998. Flow/home calculations by Sieco Inc.
2. Peak Wet Weather Flow (WWF) calculated using No. of homes times the total of the baseflow/home plus infil/inflow per home.
3. Maximum flow from Infiltration/Inflow Study Report by Sieco Inc., September 1980, revised January 1981.
4. Actual dry weather baseflow rates adjusted up for conservative flow projection.
5. Infiltration allowed by 10 State Standards.
6. Length of sewer from Seico Inc.
7. Average Dry Weather Flow (DWF) = # of homes times adjusted dry weather baseflow/home.
8. Peak WWF = average DWF plus infiltration/inflow.
9. Actual peak Wet Weather Flow measured as part of Infiltration/Inflow Study Report, Rev. January 1981.
10. Diurnal peaking factor is 1.3 times the average DWF based on existing City of Lancaster flow monitoring. The flow monitoring area was a 15-inch line near Union & SR33.
11. Peak diurnal WWF is 2.6 times the peak diurnal DWF based on existing flow monitoring data of existing City of Lancaster separated sewer areas.
12. Based on existing Peters Subdivision of 122 homes.
13. Actual flow monitoring data was used since the calculated peak wet weather flow was less than the actual measurement.
14. N/A - Not Applicable; N/M - Not Measured; I/I - Infiltration/Inflow

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PROPOSED TIE-IN
FOR KNOX ACRES

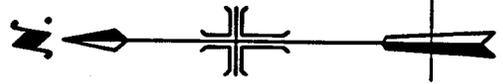
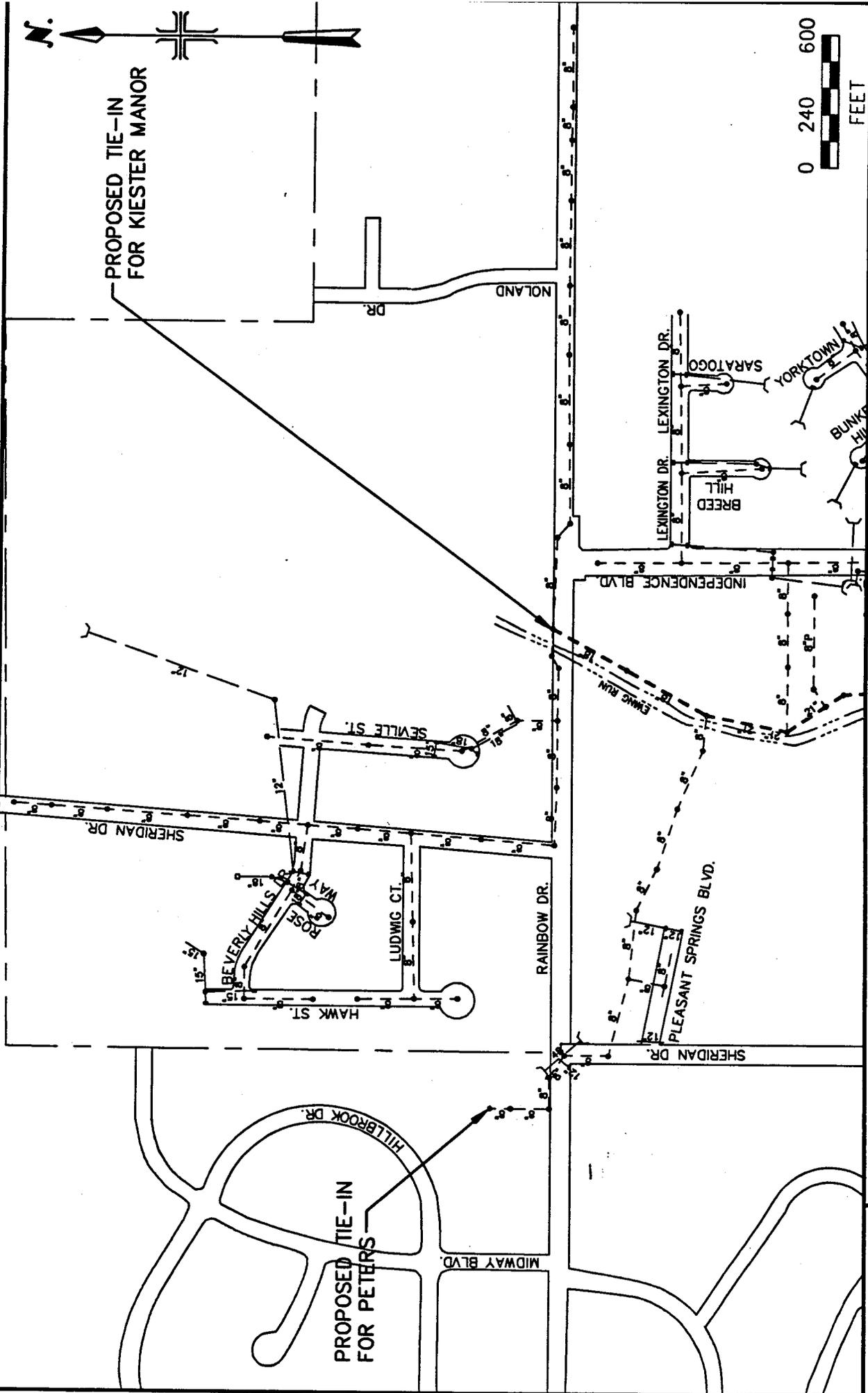
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FAIRFIELD COUNTY UTILITIES
LANCASTER SERVICE AREA
WASTEWATER COLLECTION EVALUATION

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FIGURE 2

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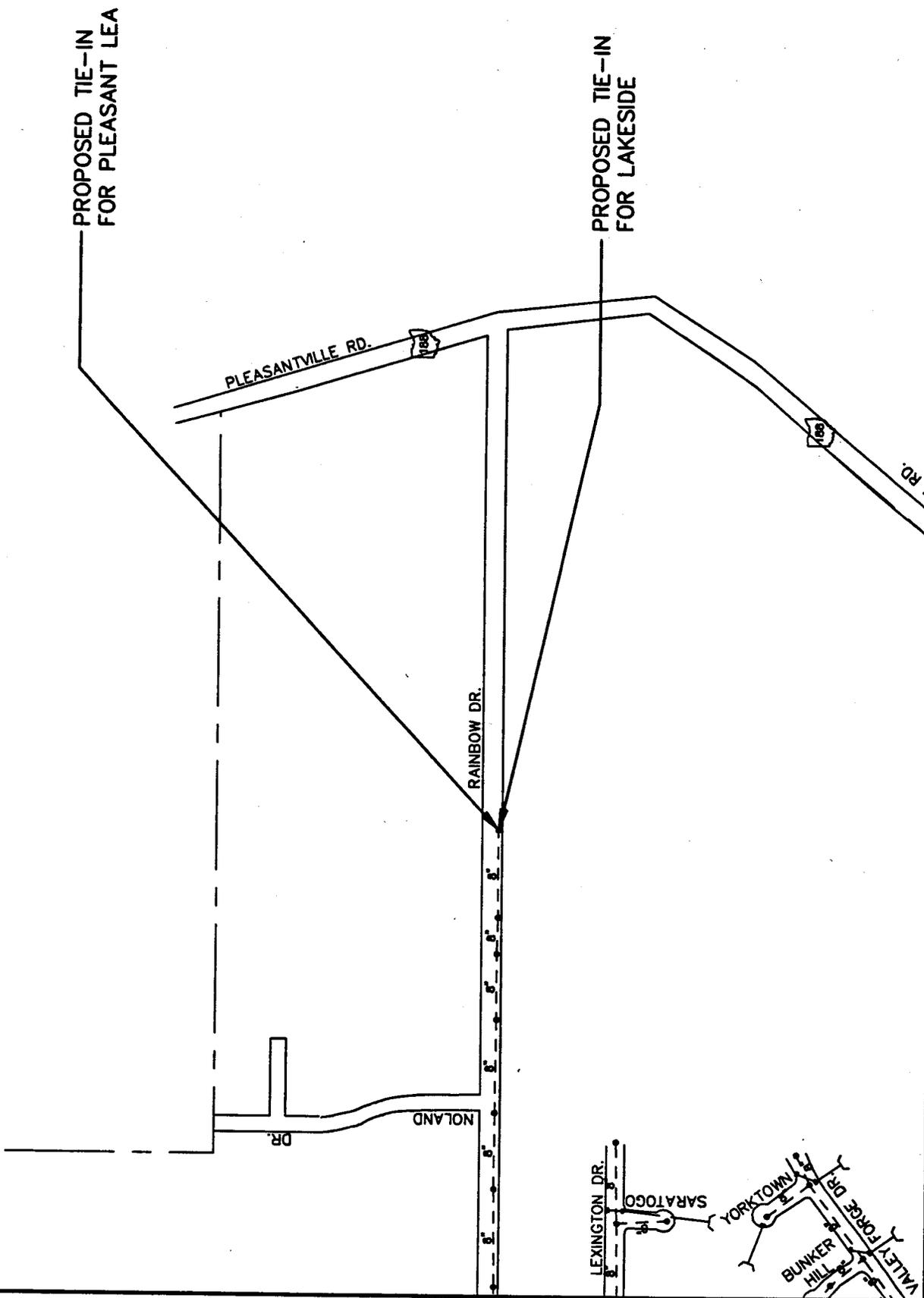
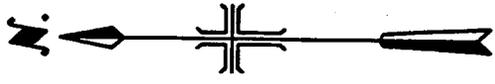


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 FIGURE 3

FAIRFIELD COUNTY UTILITIES
 LANCASTER SERVICE AREA
 WASTEWATER COLLECTION EVALUATION

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FAIRFIELD COUNTY UTILITIES
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WASTEWATER COLLECTION EVALUATION

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FIGURE 4

