1.0 INTRODUCTION

2.1 PROJECT BACKGROUND

The City of Lancaster is located in Fairfield County, approximately 30 miles southeast of downtown Columbus, Ohio. The population of Lancaster, per the 2000 census, is approximately 37,700, covering approximately 17 square miles. The city is currently experiencing considerable growth on the northwest side along the existing U.S. Route 33 Corridor. This growth to the west and northwest is expected to continue, particularly with the construction of the U.S. Route 33 Bypass. The State of Ohio is in the first phase of construction for the U.S. Route 33 Bypass. The City recognizes that with the construction of the bypass, there will be significant pressure for future development in the area.

Malcolm Pirnie, Inc. was selected by the City to provide water and wastewater master planning services for the entire incorporated area of the City and the new U.S. 33 Bypass / Rock Mill Corporate Park area located west of the City. The original scope for the master plan project identified two specific planning goals, ***"Near-Term"*** and ***"Long-Term"*** Facilities. The Near-Term Facilities would provide capital improvement projects that are necessary to serve development needs that will result when the bypass construction is completed in June of 2005. The Long-Term Facilities would provide infrastructure improvements projected for the city service area for the year 2025, and ultimately 2045. The boundaries for these planning areas are shown on Figure 1. In addition, the City is interested in the ***more immediate*** infrastructure support required for the development of Rock Mill Corporate Park Phase 2 on the east side of the bypass.

2.2 PROJECT DESCRIPTION

In order to analyze alternatives to provide service to the planning area and show the overall financial impacts on water and sewer rates to the citizens of Lancaster, the following items must be considered on a system-wide basis:

- Future growth anticipated throughout the City in addition to the bypass area.
- The condition/capacity of the YMCA Pump Station.
- The condition/capacity of the existing interceptors / CSO structures.
- The City's Long Term Control Plan including commitments to keep CSO discharge volumes to 1995 levels (antidegradation).

2.1.1 Purpose

The overall project purpose is to develop a Water and Wastewater Master Plan that will address the development of the entire City with a special early emphasis on the development of the U.S. 33 Bypass Project Area. This report reviews ***Near-Term*** water and wastewater service needs in coordination with the ***Immediate*** needs report submitted in May, 2002, which identified immediate capital improvement projects necessary to serve the Rock Mill Phase 2 Corporate Park located on the east side of the bypass. Other development along the entire U.S. 33 Bypass Corridor will begin shortly after the bypass

is completed. As plans for the utilities services for Rock Mill Corporate Park Phase 2 are developed, consideration for the future service needs for the surrounding properties is necessary in order to effectively plan for the expansion of the City's utilities.

2.1.2 Planning Improvement Phases

In order for Lancaster to serve their growing community efficiently and effectively, it is important that the planning documents are comprehensive and can be easily updated in response to changing situations and regulations. This not only will ensure that orderly development of the bypass can be achieved, but it will also help to create a smooth transition from the master plan phase to the design phase.

To effectively match level of needs, future water and wastewater capital improvement projects were identified as ***Near-Term*** and ***Long-Term*** improvement phases within the Master Plan to provide service in a phased implementation program. In addition to the ***Near-Term*** and ***Long-Term*** phases, the City identified an additional critical area in need of more ***"Immediate"*** service for the U.S. 33 Bypass development. Therefore, the planning area will be reviewed in three separate improvement phases:

Immediate Needs – Utility services associated with the completion of Rock Mill Industrial Park, Phase 2 located on the east side of the bypass.

Near-Term Needs – Utility services for initial development associated with the completion of the U.S. 33 Bypass west of the Lancaster city limits and system pressure problems.

Long-Term Needs – Utility services for all development associated with the completion of the U.S. 33 Bypass west of Lancaster and improvements within the city service area projected for the years 2025 and 2045.

The areas that were identified as the most immediate need for service include Rock Mill Corporate Park Phase 2, shown as area I-5 on the attached figures, as well as areas I-3, I-4, C-2, C-3, C-4 and SF-6. A separate recommendation for facilities and a cost estimate for these areas was requested and submitted in May, 2002. The proposed water distribution and collection systems, as recommended in the ***Immediate*** memorandum, are included in this report as the first improvement phase on Figures 2A – 2D and Figure 4. The ***Near-Term*** facilities are also shown on Figures 2A - 2D and Figure 4 as the second improvement phase.

The ***Near-Term*** phase includes service for areas within the immediate service area as well as area C-5. In addition, 25% of the projected growth for the year 2025 in areas SF-12, SF-13, SF-14 and SF-16 is also included to address current system pressure problems experienced in the system. The overall infrastructure was considered to the extent feasible in order to ensure efficient expansion for the ***Long-Term*** service needs.

The information will be verified in the ***Long-Term*** segment of the Lancaster Master Plan project.

2.0 METHODOLOGY

2.1 PLANNING AREA

The Master Plan project planning area includes the entire city limits of Lancaster and other areas to the west of the city to consider development associated with the new U.S. 33 Bypass and north of the city to consider anticipated growth trends toward Columbus. The areas west and north of the city limits were determined based on past planning reports and through workshops with Malcolm Pirnie and City staff. The approximate boundaries overall include the corporation limits to the east, the interchange of US 22 and the US 33 Bypass to the south, Hocking and Greenfield Townships to the west and Coonpath Road to the north. The planning area is outlined on Figure 1.

Areas of possible development were determined using land use information obtained from Fairfield County as well as the current zoning code for the City of Lancaster. Areas were designated on the attached Figure 1 as single family residential (SF), multi family residential (MF), estate district (ED), commercial (C), or industrial (I) properties. Meetings were later held with City staff members to further define areas of development and to estimate approximate growth percentage projections for each area.

2.2 REFERENCES AND RESOURCES

The previous report prepared by Malcolm Pirnie Inc. (*U.S. 33 / Rock Mill Corporate Park Immediate Infrastructure Needs Evaluation Memorandum, May 2002*) was used as the basis for Near-Term planning improvements in the Project Area. The Immediate Needs Memorandum was modified in the Near-Term Report to enable facilities recommendations that will coordinate with the Final Master Plan.

2.1.1 Previous Studies

Design references and planning documents were reviewed to determine the most appropriate design criteria for the area. These included the City of Lancaster Zoning Code, the Department of Engineering Sanitary Sewer Design Manual, the Fairfield County Land Use Development Plan, the Water Pollution Control Department Combined Sewer System Long-Term Control Plan, and the U.S. Route 33 Bypass Utilities Services Planning Report.

Other sources of information reviewed included SIECO, Inc.'s 1995 Lancaster Water Master Plan, costs from recent water line, sewer line, and street projects, miscellaneous mapping and drawings prepared by developers for the Rock Mill Phase 2 and Ruble Corporate Parks, and Fairfield County Soil and Water Conservation District maps. Water Pollution Control Department and Water Department operating and billing records, system maps, planning documents, and equipment information were also reviewed for historical data.

2.1.2 Utility Modeling Software

It was initially planned to analyze future demands on the water distribution system using the City's existing water distribution system model. However, there was uncertainty regarding whether the existing model was suitable for use as a planning tool. Therefore, the City of Lancaster requested that Malcolm Pirnie develop and calibrate a dynamic water distribution model for the maximum day demand conditions for the City of Lancaster water distribution system. The model is discussed in detail in Section 3 of this report.

2.3 DESIGN CRITERIA

Design criteria based on the references and resources discussed in Section 2.2 was established in order to effectively plan for the expansion of the City's utilities. The average water and sanitary flows were determined to be 1,000 gallons/acre/day for residential and commercial usage and 1,300 gallons/acre/day for industrial usage.

Based on evaluation of typical daily water demand data, the peak hourly water demand for any given day in Lancaster is approximately 1.33 times the average water demand for that day. Based on evaluation of daily water demands, the historical peak day flow for Lancaster is approximately 1.3 times the average day flow. In order to project future water needs, a peak day to average day factor of 1.5 was used. Therefore, the peak hourly water demand utilized for the water distribution system model is 1.33 times 1.5 equals 2.0 times the average day water demand.

A peaking factor of 3.5, as recommended in the Lancaster Sanitary Sewer Design Manual, was used to calculate peak hourly sanitary flows. The projected sanitary flows for the areas affecting the ***Immediate*** and ***Near-Term*** service needs for the years 2025 and 2045 are shown in Tables 1A – 1D. These areas and their associated drainage basins are also illustrated in Figure 3.

Piping was sized based on 2045 flow projections. The capacity of the proposed wastewater Pump Station and Hunters Run Water Pollution Control Facility (WPCF) were based on 2025 peak wastewater flow projections. The Pump Station and WPCF should be made expandable such that they can handle the 2045 peak flow conditions. Water storage was based on a minimum water distribution system pressure of 50 psig during peak demands and providing fire protection for a 5,000 gallon per minute industrial fire for a four-hour duration while maintaining a minimum pressure of 20 psig.

4.0 WASTEWATER SYSTEM IMPROVEMENTS

2.1 EXISTING FACILITIES

The City of Lancaster, Ohio owns and operates the Lancaster Water Pollution Control Facility (WCPF). The WCPF is adjacent to the Hocking River. It has an average design capacity of 10.0 MGD and a peak capacity of 18.0 MGD. Currently, the average dry day flow is approximately 6.0 MGD. The wastewater collection system conveys residential, commercial and industrial flows to the WPCF with pipe ranging between 6-inch and 60-inch in diameter. It is composed of two main drainage areas: the Baldwin Run (east side) and Hocking River (central and west side) drainage areas. The drainage areas contain both sanitary and combined sewers. There are four pump stations to transport flows to the WCPF where gravity flow is not possible.

Older sections of the City's wastewater collection system in the central part of Lancaster are classified as "combined sewers" since they were designed to carry both sanitary flow and storm water flow in the same pipe. During wet weather, flows greater than the sewer capacity are discharged to receiving streams through the systems 31 combined sewer overflow (CSO) structures. As Lancaster has grown, the wastewater system has expanded, causing the combined sewers in the older sections of town to become over-stressed. The addition of separate "express" sanitary sewers, which bypass the existing system and flow directly to the WCPF, interceptor sewers and the separation of storm flow from sanitary flow in some combined sewer areas have provided some relief to problem areas.

2.2 WASTEWATER SYSTEM RECOMMENDATIONS

Providing wastewater to the ***Immediate*** and ***Near-Term*** needs area includes approximately 3,030 linear feet of 48-inch diameter, 20,005 linear feet of 30-inch diameter, 4,512 linear feet of 24-inch diameter, 10,809 linear feet of 18-inch diameter, 2,281 linear feet of 15-inch diameter, 12,087 linear feet of 12-inch diameter and 4,560 linear feet of 10-inch diameter sewer line and appurtenances. Construction of a lift station, a pump station, a water pollution control facility and approximately 16,100 linear feet of 18-inch diameter force main will also be required. The drainage basins and associated development areas are outlined on Figures 3A – 3C. The projected sanitary flows for the basin areas are shown in Tables 1A –1D. A 1.0 MGD lift station is proposed for ***Immediate*** needs. In addition, a 6.6 MGD pump station and a 1.6 MGD WPCF are proposed for ***Near-Term*** needs. The ***Near-Term*** needs for wastewater service are shown on Figure 4.

2.1.1 Immediate Infrastructure Needs

The infrastructure needs recommended in the immediate memorandum have been modified in the Near-Term Report. The proposed Anchor Avenue and U.S. 33 Bypass / S.R. 188 interchange sewer alignments were modified to better follow the existing grade

and avoid excessive excavation or depths of sewers. Also, the capacity of the proposed Lift Station at Rock Mill Corporate Park Phase 2 was modified.

In the Immediate Needs Memorandum, the capacity of the proposed Rock Mill Lift Station was based on 2025 peak wastewater flow projections. During the evaluation of the ***Near-Term*** wastewater needs, it was determined that rather than installing a ***Near-Term*** sewer parallel to the existing sewer downstream of the Rock Mill Lift Station to serve the projected 1.5 mgd flows by the year 2025, a ***Near-Term*** sewer could be installed upstream of the Rock Mill Lift Station. This would allow the ***Near-Term*** sewer to intercept the projected flows (1.5 mgd by 2025 and 3.1 mgd by 2045) and abandon the Rock Mill Lift Station. Therefore, the lift station could be sized based on the capacity of the existing sewer located in Rock Mill Park Phase 1. The existing 12-inch sewer capacity is approximately 1.1 mgd. A 1.0 mgd Lift Station could serve the ***Immediate*** needs until the ***Near-Term*** sewer could be installed to intercept the flow before it exceeds 1.0 mgd. The ***Immediate*** infrastructure needs are shown as the first improvement phase on Figure 4.

2.1.2 Near-Term Infrastructure Needs

Near-Term infrastructure needs supplement the ***Immediate*** needs by including sewer lines in Area C-5 to serve the interchange of the U.S. 33 Bypass and U.S. 22. ***Near-Term*** facilities must also transport increased flows received from the ***Immediate*** infrastructure. Because of the topography of the drainage basins west of Lancaster, gravity flow is limited. As previously discussed, the existing wastewater system is also limited. Therefore, a pump station and water pollution control facility are proposed to treat the projected flows generated from the bypass development.

In addition to serving the Hocking River tributary drainage basins, the Ety Road Pump Station would allow an interceptor sewer to be installed to relieve the older sections of CSOs in the system. This will also help to relieve the YMCA Pump Station, which is operating at full capacity while maintaining the City's commitment to keep CSO discharge volumes at or below 1995 levels. It was determined that the interceptor can divert approximately 4.3 MGD from the existing system to the proposed Ety Road Pump Station. A force main will transport the flows from the pump station to the proposed Hunters Run Water Pollution Control Facility. The proposed 1.6 MGD WPCF will also serve the Hunters Run tributary drainage basins.

In addition to the ***Immediate*** infrastructure needs, the ***Near-Term*** needs will require an additional approximately 3,030 linear feet of 48-inch diameter, 20,005 linear feet of 30-inch diameter, 3,160 linear feet of 24-inch diameter, 5,440 linear feet of 18-inch diameter, 4,010 linear feet of 12-inch diameter and 4,560 linear feet of 10-inch diameter sewer line and appurtenances. In addition, a 6.6 MGD pump station for Near-Term needs, expandable to 12.6 MGD for 2025 and 21.0 MGD for 2045 is proposed. A 1.6 MGD WPCF for ***Near-Term*** needs, expandable to 4.8 MGD for 2025 and 8.4 MGD for 2045 is also proposed. An 18-inch force main would be required to transport the Near-Term flows from the Ety Road Pump Station. An additional 18-inch force main

would be required at 2025, and a 21-inch force main would be required at 2045. The force mains are based on a velocity of approximately 5.5 feet per second. The ***Near-Term*** infrastructure is shown as the second improvement phase to the system on Figure 2A.