CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

CDBG PROJECT NO. 03-C-NR-I-6-G-70

October, 2004

Prepared by:

MOLZEN-CORBIN & Associates
ENGINEERS/ARCHITECTS/PLANNERS

ACKNOWLEDGEMENTS
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CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

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SECTION 1
INTRODUCTION

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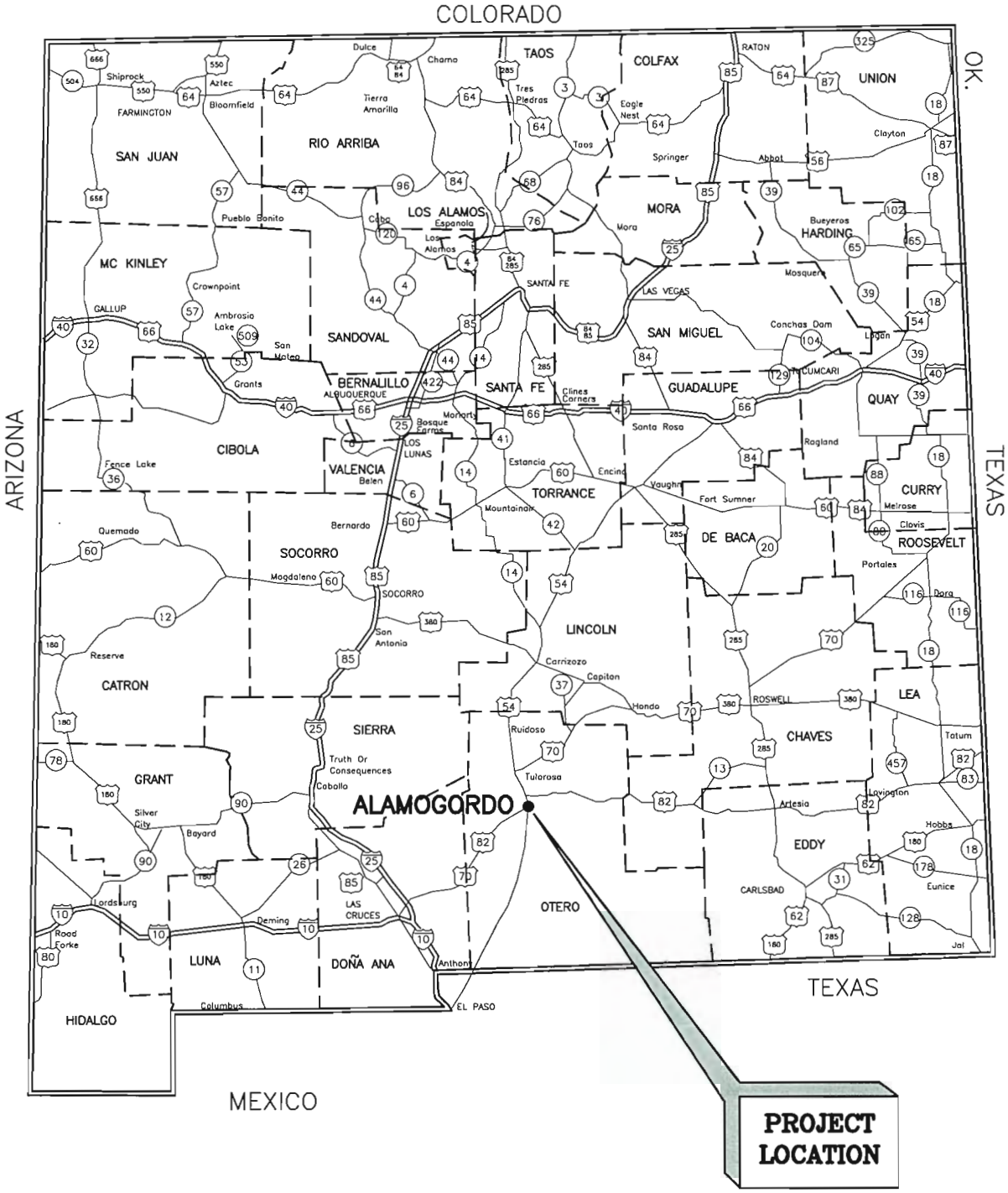
SECTION 1
INTRODUCTION

This report describes the work undertaken for the City of Alamogordo, New Mexico (City), by Molzen-Corbin & Associates to perform a Wastewater Master Plan that would guide the City's wastewater system planning for a 20 year period into the future. Figure 1 provides a Vicinity Map of the project location. The City has never conducted a comprehensive Wastewater Master Plan. All public works improvements over the years have been studied, designed and constructed on a case by case basis. In 1976, there were a number of significant wastewater improvement projects funded by the US Environmental Protection Agency (USEPA) that included most of the larger diameter interceptors leading toward the wastewater treatment plant. This Wastewater Master Plan not only reviews the adequacy of those interceptors for future growth, but also evaluates all other City interceptors.

PURPOSE OF REPORT

The purpose of this Wastewater Master Plan is to provide the City with a comprehensive technical evaluation of the existing wastewater interceptor system and determine any current or projected deficiencies for a 20 year planning period. This report will also identify interceptors that will be required to meet the growing needs of the planning area identified, as well as anticipated capital costs for all recommended improvements. An implementation plan will be developed to provide phasing of the improvements and right-of-way acquisition over the planning period. Public participation efforts were conducted to gather information from local developers, business owners, and real estate representatives regarding growth scenarios, as well as from local residents regarding any wastewater concerns.



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City of Alamogordo

VICINITY MAP

FIGURE 1

SCOPE OF REPORT

The Scope of this Wastewater Master Plan includes the complete evaluation of the wastewater interceptor system. The interceptor system consists of those sewer lines that generally connect to smaller diameter neighborhood collection lines throughout the planning area for eventual flow to the wastewater treatment plant. This report identifies new interceptors that will be required to meet the expanding growth areas of Alamogordo.

This Wastewater Master Plan has generally been prepared in accordance with the USDA, Rural Utility Service (RUS) preliminary engineering report (PER) format. The RUS format has been adopted by the New Mexico Environment Department (NMED), the New Mexico Finance Authority (NMFA), the NM Department of Finance and Administration (DFA), and the US Environmental Protection Agency (through reciprocity with NMED) as an acceptable technical standard. Preparation of this document in the RUS format will assist Alamogordo in future funding applications to these agencies if desired.

This report does not include the detailed evaluation of the wastewater treatment plant, which is anticipated to be preformed at a later date. This report also does not include a complete financial audit of the Alamogordo wastewater department enterprise fund. Funding agencies and/or bonding companies all have different financial reporting requirements which will need to be specifically addressed with each individual application. Guidance on expected environmental documentation or assessment requirements that may arise with the implementation of the improvements presented in this report is provided. However, a detailed environmental assessment or environmental impact statement for the entire document is outside the project scope.

Projected wastewater flows are calculated using state of the art computer software that simulates the characteristics unique to each system. Molzen-Corbin & Associates selected HYDRA Version 6.0 developed by PIZER Incorporated for use in the sanitary sewer collection system modeling. PIZER HYDRA is compatible with the City of Alamogordo's GIS system and can readily be added to the City's database. It has been our experience that PIZER software has been enhanced over the years to keep pace with the latest computer technology.

CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

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SECTION 2
PROJECT PLANNING AREA

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SECTION 2
PROJECT PLANNING AREA

The City of Alamogordo is situated in Otero County, New Mexico. The City extends from the relatively level lands of the Tularosa Valley eastward onto the sloping alluvial fans at the base of the Sacramento Mountains. To the west of the City is Holloman Air Force Base, along with White Sands National Monument. Elevations within the City range from 5000 MSL on the east toward the Sacramento Mountains to 4150 MSL near the wastewater treatment facility on the west.

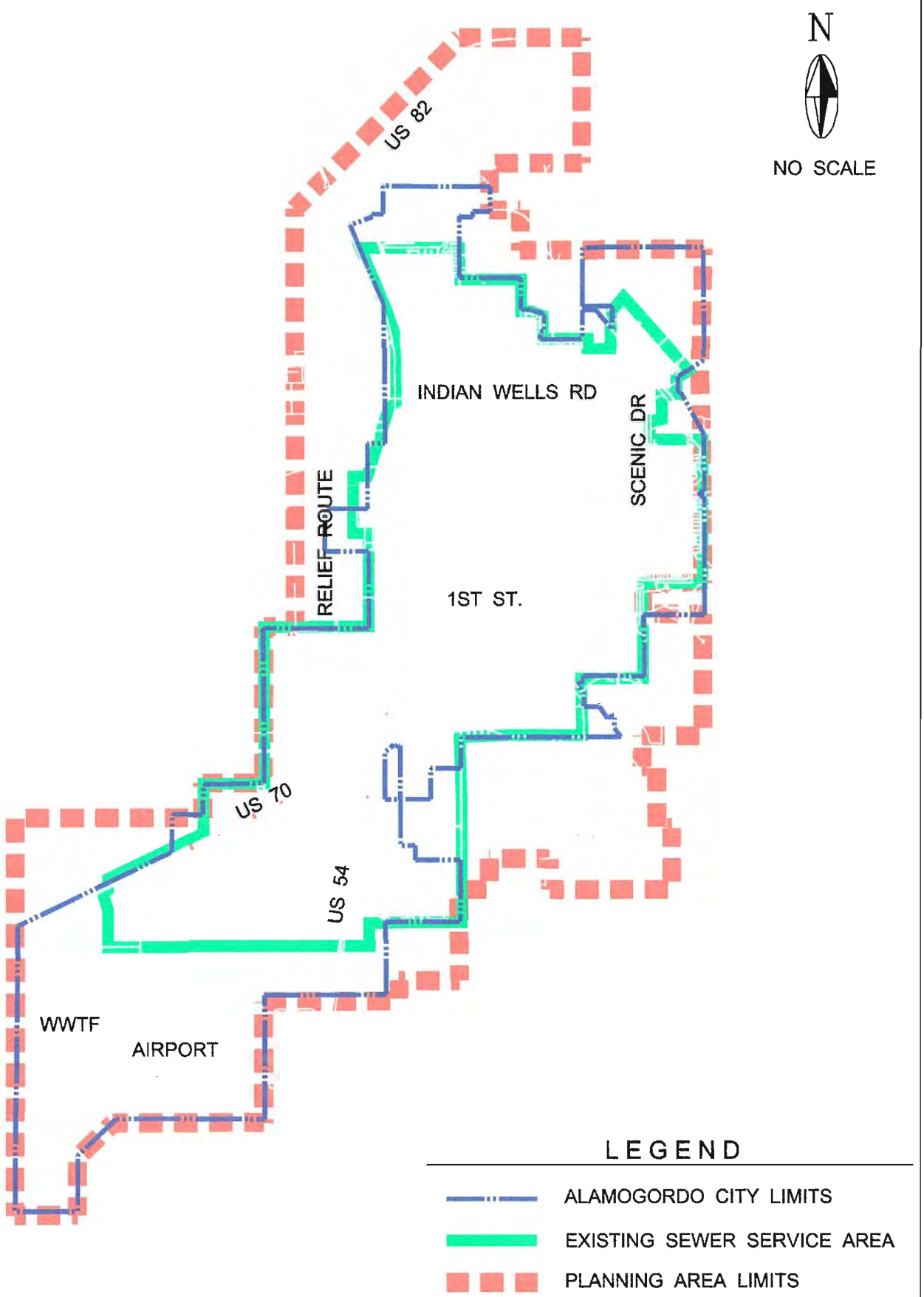
LOCATION

The Wastewater Master Plan planning area was determined by the project Technical Advisory Committee on the basis of anticipated development throughout the Alamogordo and surrounding area. The limits of the planning area are presented in Figure 2. The planning area encompasses the City Limits of Alamogordo plus a buffer area where development was anticipated to occur within the 20 year planning period.

The northern limits are generally bounded by a buffer zone north of US 82. The eastern limits are generally bounded by Bureau of Land Management (BLM) and US Forrest Service land. The southern limits are generally bounded by a buffer zone off of a future extension of South Scenic Drive and the Alamogordo Airport. The western limits are generally bounded by a buffer zone north of US 70 and west of the Alamogordo US 54 Relief Route.

LAND USE

The anticipated Land Use is a major factor in defining the need for, and location of wastewater interceptor lines. The City of Alamogordo has recently prepared their Comprehensive Plan in 2000. The land use projections provided in that document are the expected development



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City of Alamogordo

PLANNING AREA BOUNDARIES

FIGURE 2

basis for the preparation of this Wastewater Master Plan. The Future Land Use Map provided in the Comprehensive Plan is further illustrated on Figure 3. Land Use projections outside the City Limits conducted in the 2000 Comprehensive Plan were derived from the Alamogordo Comprehensive Traffic Study, prepared in 1998, which is a companion document to the Comprehensive Plan.

ENVIRONMENTAL RESOURCES PRESENT

The City of Alamogordo has a long and rich history over the past few centuries and beyond that blend Native American, agricultural & ranching, railroad expansion, military presence, and tourism cultures into this single community. Alamogordo is a desert city that receives little rainfall on an annual basis. Most of the public drinking water in Alamogordo is treated surface water from various streams and lakes originating in the Sacramento Mountains. This water supply has enabled Alamogordo to grow and prosper in an otherwise desert climate.

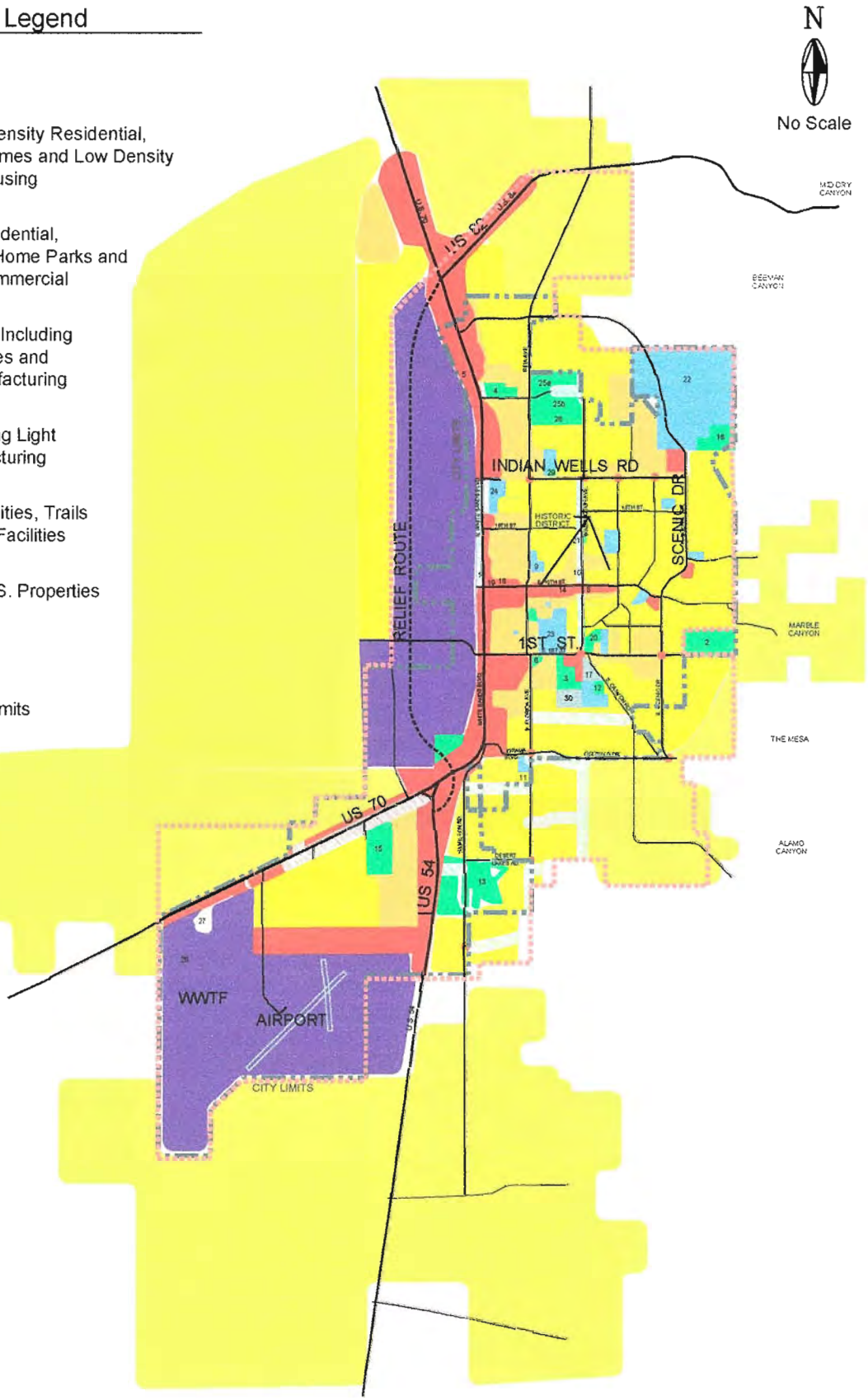
Environmental resources that are unique to the study limits of this report are presented on Figure 4. A significant portion of area within the study limits lie within the 100-year floodplain. This condition, in most instances, requires property owners to construct their homes above specified floodplain elevations. Future development within these floodplains will be somewhat relieved when flood control diversion channels are completed by the US Army Corps of Engineers by 2006.

A second environmental condition in Alamogordo includes the numerous historic districts that are characteristics of communities with a rich heritage. These historic districts include the Original Town Site, 10th Street Commercial, Chihuahua, College & Mountain View Additions, the Mill Site, and the NM School for the Visually Handicapped.

A third environmental feature in Alamogordo includes the state and federal lands that surround the community. These properties

Land Use Legend

- Very Low Density Residential
- Low to Medium Density Residential, Including Townhomes and Low Density Manufactured Housing
- High Density Residential, Including Mobile Home Parks and Limited Office/Commercial
- Business District, Including Commercial Offices and Some Light Manufacturing
- Industrial, Including Light to Heavy Manufacturing
- Recreational Facilities, Trails and Other Public Facilities
- Schools and A.P.S. Properties
- Cemetary
- Planning Area Limits
- City Limits



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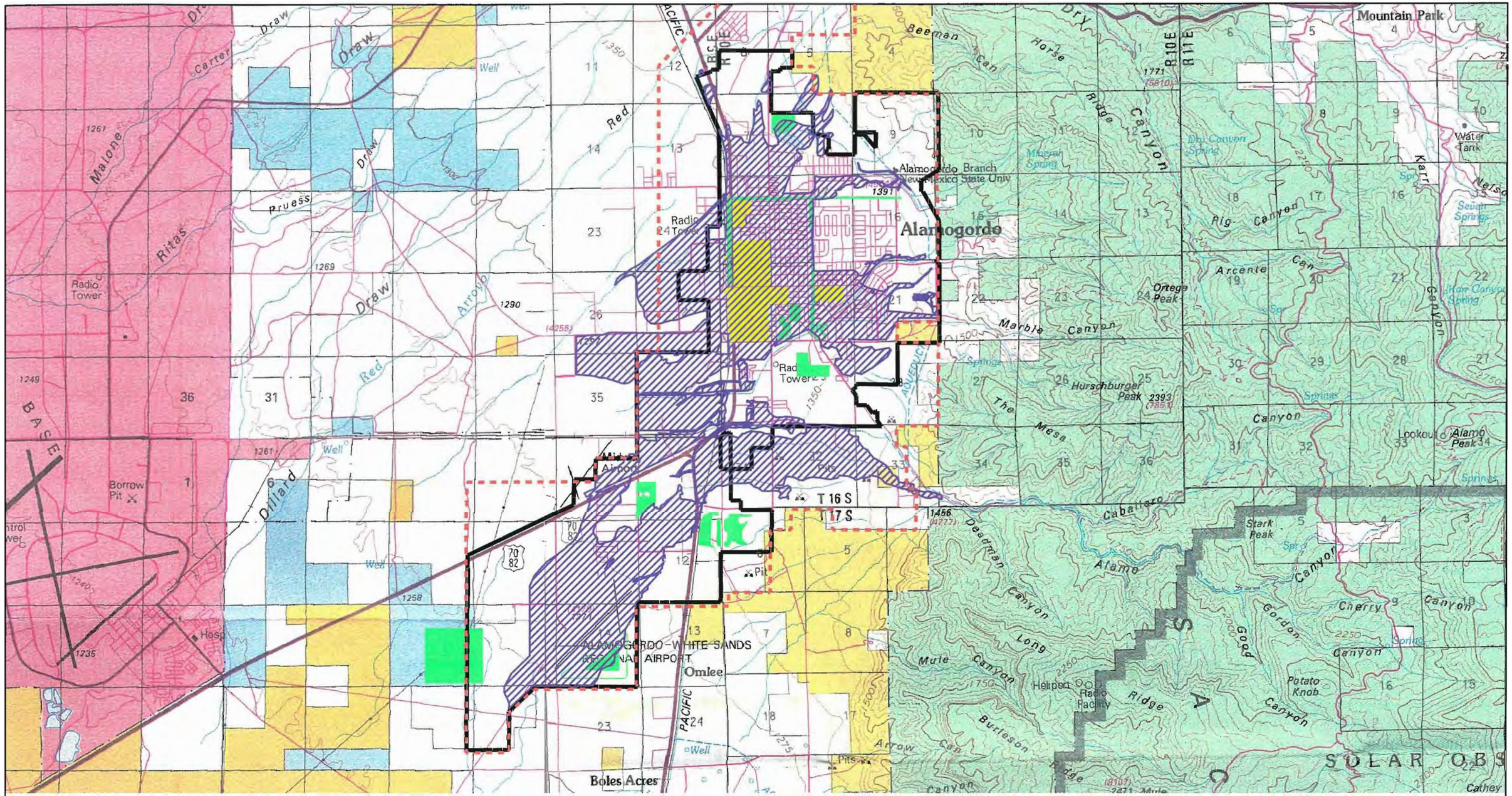
City of Alamogordo

LAND USE MAP

FIGURE 3



BUREAU OF LAND MANAGEMENT
LAND STATUS LEGEND

Public Lands (Administered By Bureau of Land Management)		National Parks and Monuments		Bankhead-Jones Land Use Lands (L.U. Lands)	NONE	Bureau of Reclamation		Department of Energy (DOE)	NONE	State, County, City, Wildlife, Park and Outdoor Recreation Areas		PLANNING AREA	
Oregon & California Lands (O&C Lands) Cous Bay Wagon Road (CBWR)	NONE	Indian Lands or Reservations	NONE	Tennessee Valley Authority	NONE	Power Withdrawals and Classifications	NONE	Oregon & California Lands (O&C Lands) Administered By US Forest Service	NONE	Acquired Lands (By Administering Agency)	NONE	CITY LIMITS	
National Forest	NONE	Military Reservations and Withdrawals Corps of Engineers		Patented Lands		Federal Agency Protective Withdrawals	NONE	Radio & Air Facilities	NONE			WW DISCHARGE PARKS	
National Grasslands	NONE	Wildlife Refuges		State Lands		Public Water Reserves		Miscellaneous				HISTORIC DISTRICT	
												FLOODZONE	

LEGEND

N

SCALE:1"=6000'

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ENVIRONMENTAL FEATURES

City of Alamogordo

FIGURE. 4

directly adjacent to the study limits include lands managed by the NM State Land Office, BLM, and the US Forrest Service. In addition, Holloman Air Force Base and White Sands National Monument are approximately 4 miles directly west of the study limits. A fourth environmental feature that is directly related to this Wastewater Master Plan is the treated effluent irrigation sites. These sites primarily consist of lawns and landscaping at various municipal parks, the golf course, the airport, roadway medians, surplus land at the wastewater treatment plant, and the Stallberg Farm. This discharge of treated effluent is in accordance with the regulations established by the NMED groundwater discharge requirements.

Alamogordo lies within the Chihuahuan desert, which is semi-arid shrub land and grassland. There does not appear to be any rare or unique vegetative communities within the study area. Alamogordo is also home to approximately 196 vertebrates (130 birds, 37 mammals, 24 reptiles, and 5 amphibians) and 9 invertebrates. It is possible that a number of threatened and endangered species may occur in the area, but they have most likely left the urbanized portion of the city.

TOPOGRAPHY

The topography of Alamogordo generally slopes from east to west at an overall grade of approximately 1.5%. At the base of the Sacramento Mountains, the slope rises to over 10% eastwards to the edge of the study limits. The north to south slope in the study area is between 0.7% and 1%. A topographic map of the study area is provided on Figure 5. All of these slopes are very conducive to gravity flow sanitary sewers. This adequate slope is one of the main reasons why the City does not have any lift stations to operate. The wastewater treatment facility is located in the southwest corner of the study area, making it the lowest point. This location is not only ideal for slope and gravity sewers, it is also ideal from a land use perspective given its proximity to the City and its growth patterns.

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City of Alamogordo

FIGURE 5

GROWTH AREAS AND POPULATION TRENDS

The City of Alamogordo has experienced steady growth, particularly for the past 15 years. This growth has been characterized in the 2000 Comprehensive Plan, and is heavily dependent on the activities at Holloman Air Force Base. The presence of the 49th Fighter Wing (Stealth F-117), the 46th Test Group, the German Air Force, and other support personnel have been the major contributing factor in the growth of Alamogordo. Other regional points of interest in the area including the NMSU Alamogordo Branch, White Sands National Monument, the NM School for the Visually Handicapped, Sunspot Solar Observatory, White Sands Missile Range, Apache Point Observatory, and the Sacramento Mountains have all contributed to stabilize the population growth.

Population projections were developed for this Wastewater Master Plan using several methods. Molzen-Corbin & Associates relied upon the existing planning studies conducted for the City of Alamogordo, and their methodology, to determine the population projections for this report. These reports include the 2000 Comprehensive Plan and the 1998 Comprehensive Traffic Study. In addition, we utilized the US Census Bureau records to examine the historical growth of Alamogordo as a way of possibly predicting future trends.

US Census Bureau Records

Molzen-Corbin & Associates examined historic growth trends as measured by the US Census Bureau as a way of predicting future growth. Table 1 shows the population of Alamogordo reported by the US Census Bureau. The annual percent change growth rate represents the compounded annual

Table 1 - US Census Bureau Data

Year	Population	10-Year % Change	Annual % Change
1960	21,723		
		6.04%	0.59%
1970	23,035		
		4.29%	0.42%
1980	24,024		
		14.87%	1.40%
1990	27,596		
		28.94%	2.58%
2000	35,582		

change. It can be seen from these figures that most of the growth in Alamogordo has occurred in the past 20 years. Based on current economic trends, and the anticipated continued presence of Holloman Air Force Base, it is likely that future growth predictions will more likely represent the growth rates between 1980 and 2000.

Alamogordo Comprehensive Plan 2000

The City of Alamogordo's 2000 Comprehensive Plan provides a thorough examination of the population growth for the City prepared by the Bureau of Business and Economic Research at the University of New Mexico. In that document, the projected population of Alamogordo is forecasted for three different scenarios based on low, medium, and high economic forecasting factors. The Low Series projection for the study area indicates Alamogordo will grow at an annual rate of 0.58%. The Medium Series has an annual growth rate in Alamogordo of 1.2%, and the High Series has an annual growth rate of 1.9%.

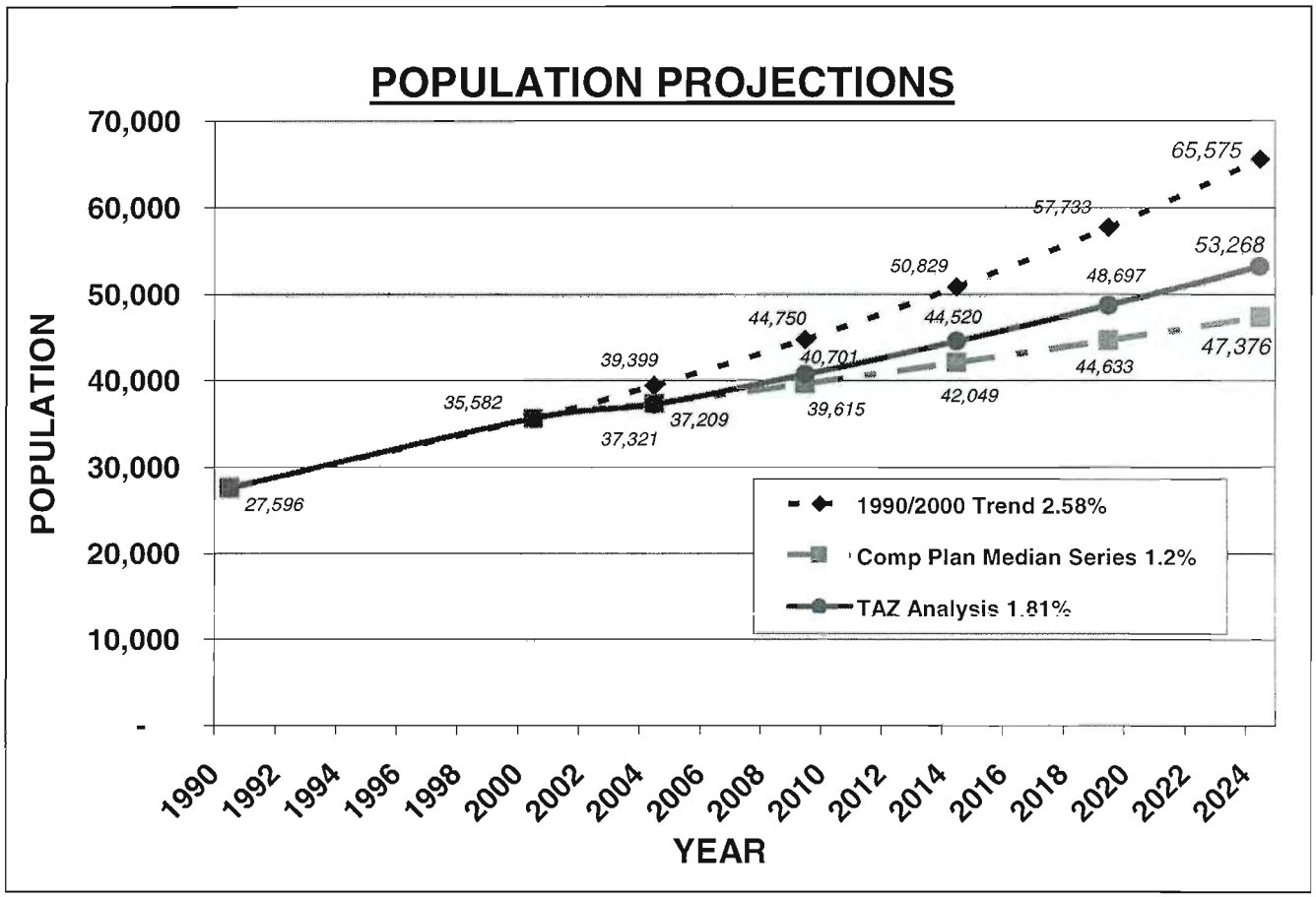
Alamogordo Comprehensive Traffic Study

The Alamogordo Comprehensive Traffic Study also provides community growth forecasts. The unique feature of this report is that the entire City of Alamogordo is segmented into smaller areas called traffic analysis zones (TAZ's). Growth projections are determined for each TAZ based on the land use and other unique economic features in those smaller areas. Thus, each TAZ has its own growth rate based on those factors. The entire growth of the community is the sum of growth if each TAZ. The overall annual growth rate in the City of Alamogordo based in the TAZ analysis is approximately 1.81%. Copies of the TAZ growth projections for 2004 and 2024 are included in Appendix A.

Study Population Projections

Based on the data examined by Molzen-Corbin & Associates, there are several techniques that could be used to project future populations and thus future demand on the wastewater interceptor system. The

following graph illustrates a few of the population projection methods that are utilized for this analysis.

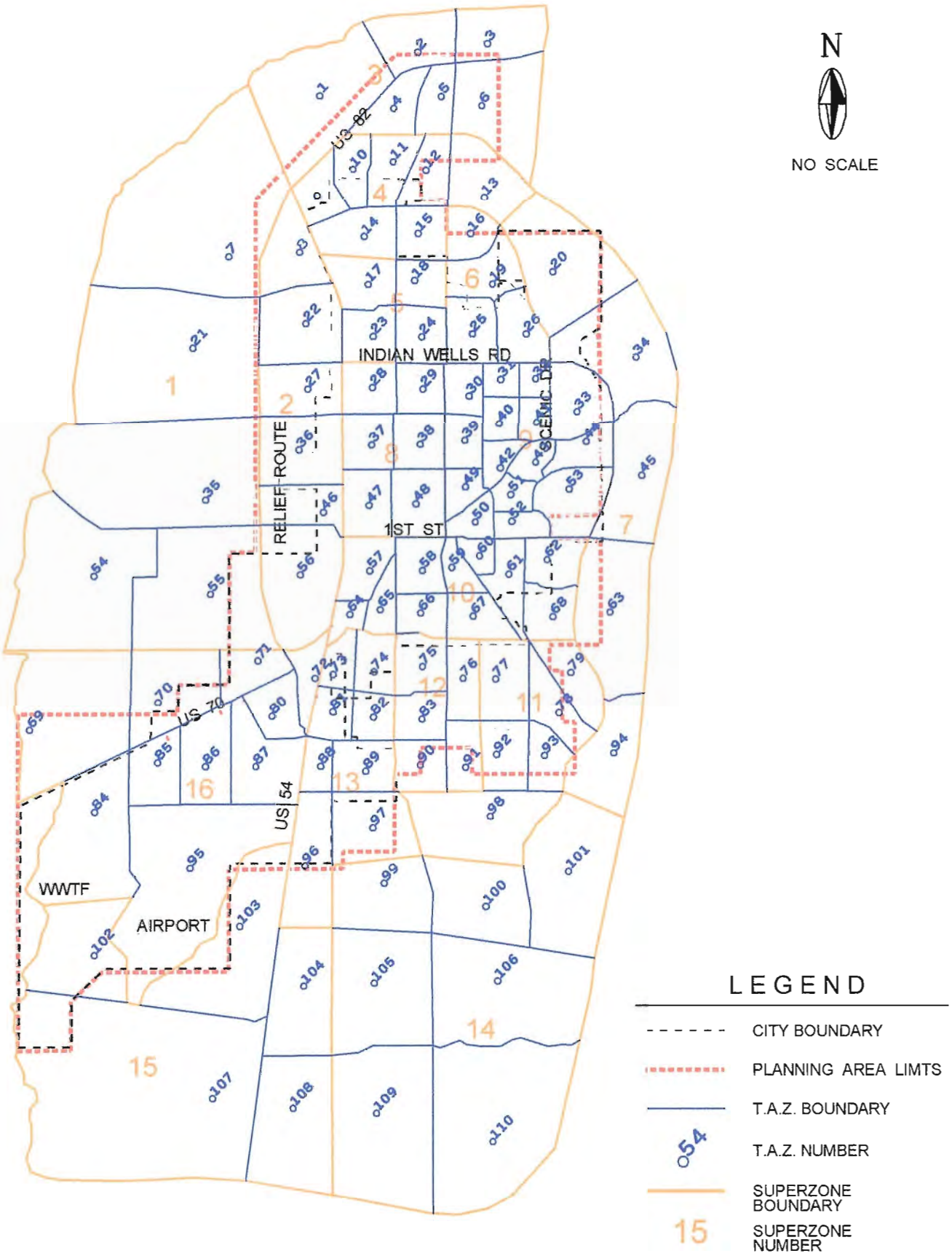


This graph shows that the Alamogordo Comprehensive Traffic Study, which utilized the individual TAZ's for the various areas within the study area, falls in between the Comprehensive Plan Median Series and the extension of the latest 10 year Census data.

Planning Area Units

One of the benefits of utilizing the same methodology as the Alamogordo Comprehensive Traffic Study is that the PIZER HYDRA computer model used in this report will accept the same TAZ boundaries and land use data already supplied for that model. This also adds compatibility to existing planning efforts in the City. Given

that the projections of the Traffic Study are representative of other methodologies, Molzen-Corbin & Associates has accepted the growth scenarios that are included in the TAZ's that were provided. This report has also incorporated the same TAZ boundaries for City model compatibility. Figure 6 illustrates the Planning Area Units for the Wastewater Master Plan, which is consistent with the TAZ boundaries. These TAZ area boundaries are overlaid with the service area zones, which are primarily based on topography. Figure 7 shows the Service Area Zones used for this study.



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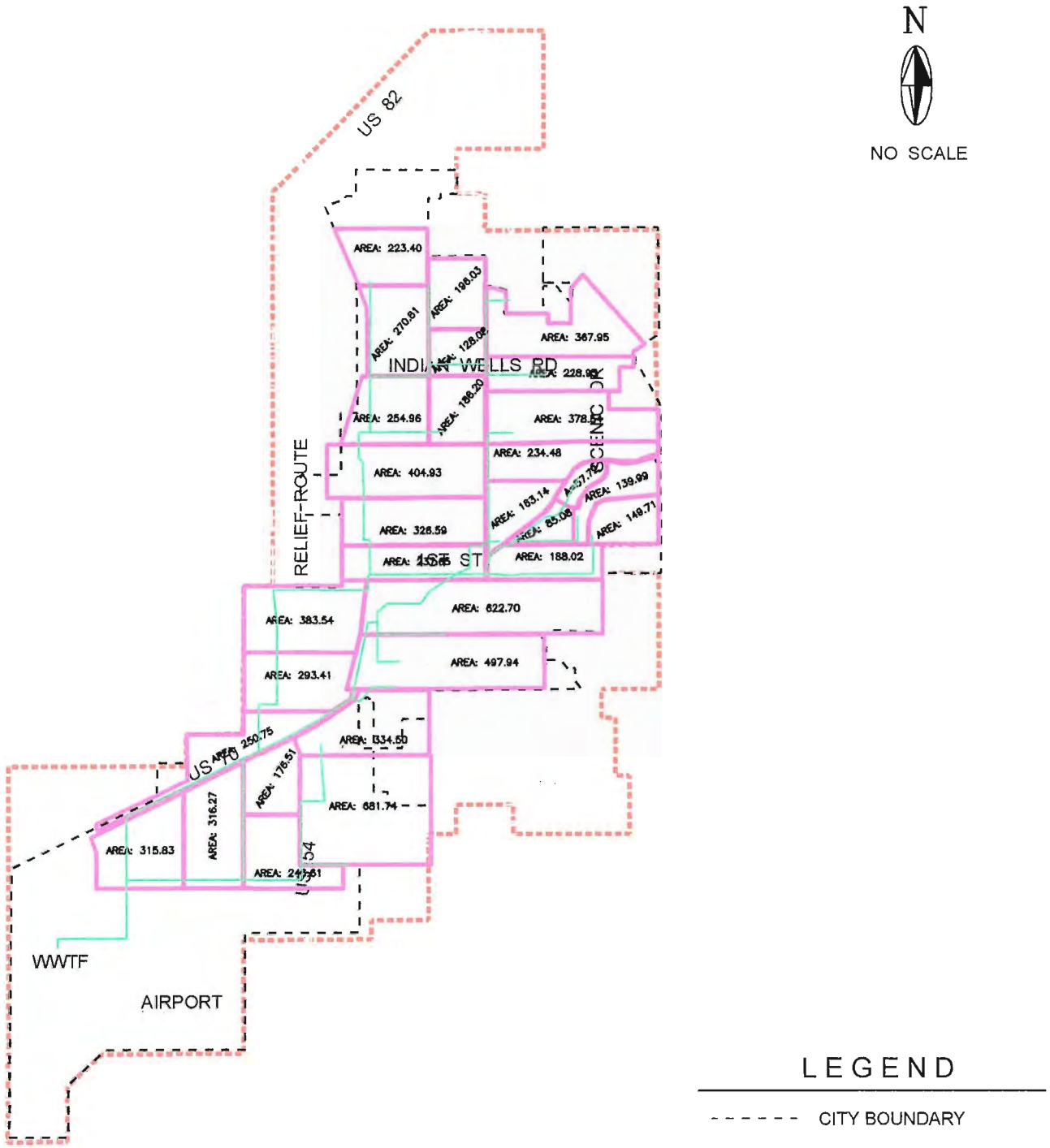
City of Alamogordo

PLANNING AREA UNITS

FIGURE 6



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SERVICE AREA ZONES

FIGURE 7

CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

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SECTION 3
EXISTING FACILITIES

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SECTION 3
EXISTING FACILITIES

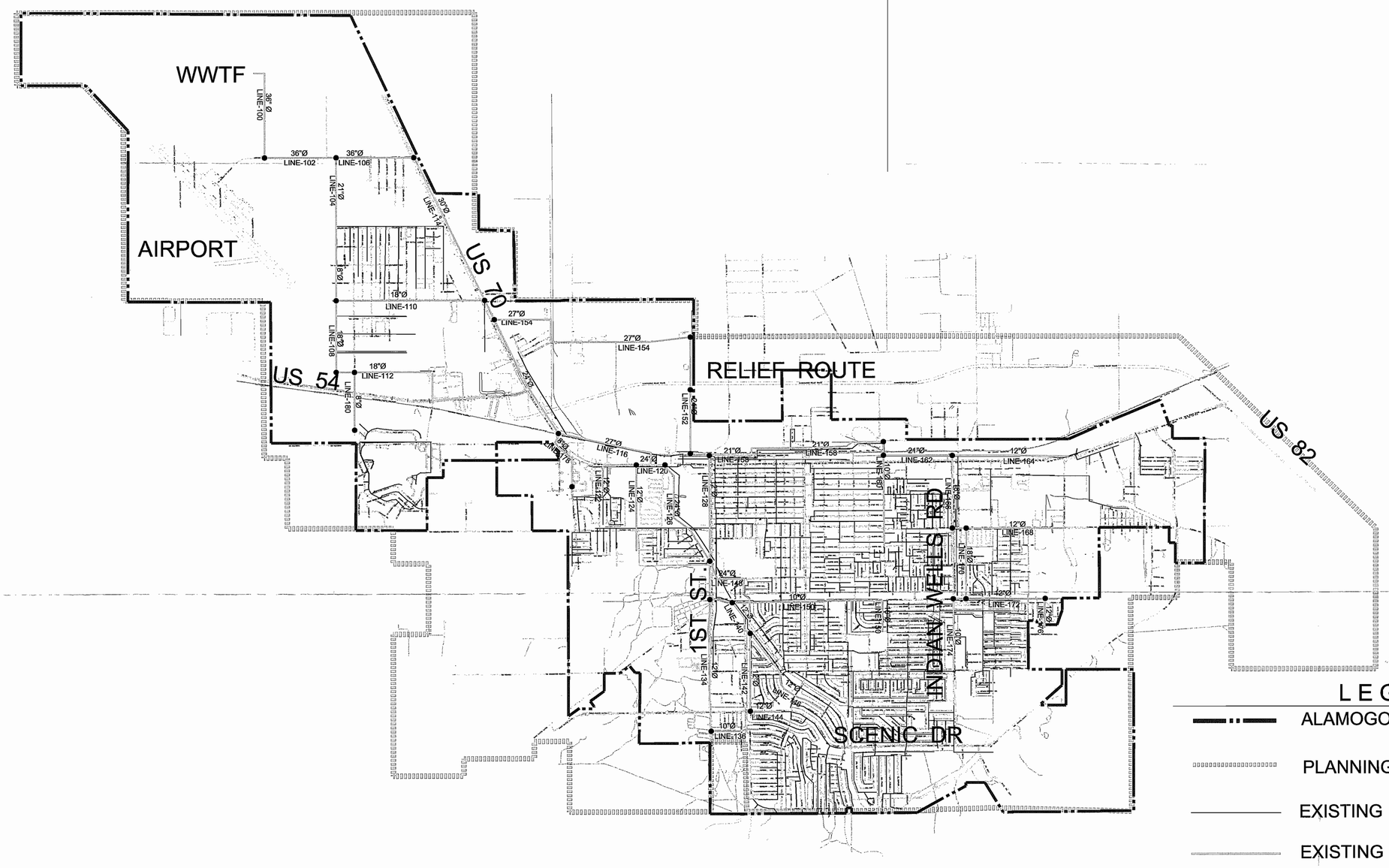
The existing wastewater collection and interceptor system service area in the City of Alamogordo is shown on Figure 2. This service area mainly consists of the incorporated limits of the City. The service area is entirely served with gravity sewer lines without any lift stations.

LOCATION MAP

The existing interceptor system consists of 37 interceptors as shown on Figure 8. The interceptors serve collection lines in various parts of the planning area for eventual flow to the wastewater treatment plant. Molzen-Corbin & Associates assigned interceptor segment numbers in increments of two beginning with 100. This will allow the City to assign intermediate interceptor numbers in the future and generally maintain a consecutive interceptor numbering system. Each interceptor is uniquely defined with a separate number until it intersects another interceptor or changes hydraulic characteristics such as line size, line slope, or pipe material. The interceptor system is graphically illustrated on a one-line flow schematic on Figure 9. The schematic illustrates how sewage is collected and conveyed from any interceptor to the wastewater treatment plant. Each interceptor number is in Figure 9 and referenced throughout this report for easy reference.

HISTORY

The City of Alamogordo was typical of many rural communities in New Mexico after World War II. It was largely unsewered, with most residents relying on on-site systems. Between 1950 and 1960, the population in Alamogordo rose from 6,783 people to 21,723 people with the build-up of Holloman Air Force Base. This sudden growth also required the construction of a municipal central sewage treatment plant located west of the intersection of 1st Street and US 54/70 and west of the railroad tracks. A lift station collected the community sewage on the



NO SCALE

LEGEND

- ALAMOGORDO CITY LIMITS
- PLANNING AREA LIMITS
- EXISTING SEWER LINES
- EXISTING SEWER INTERCEPTORS
- 10"Ø INTERCEPTOR SIZE
- LINE-214 INTERCEPTOR NUMBER
- • TERMINATION OF LINE LIMIT

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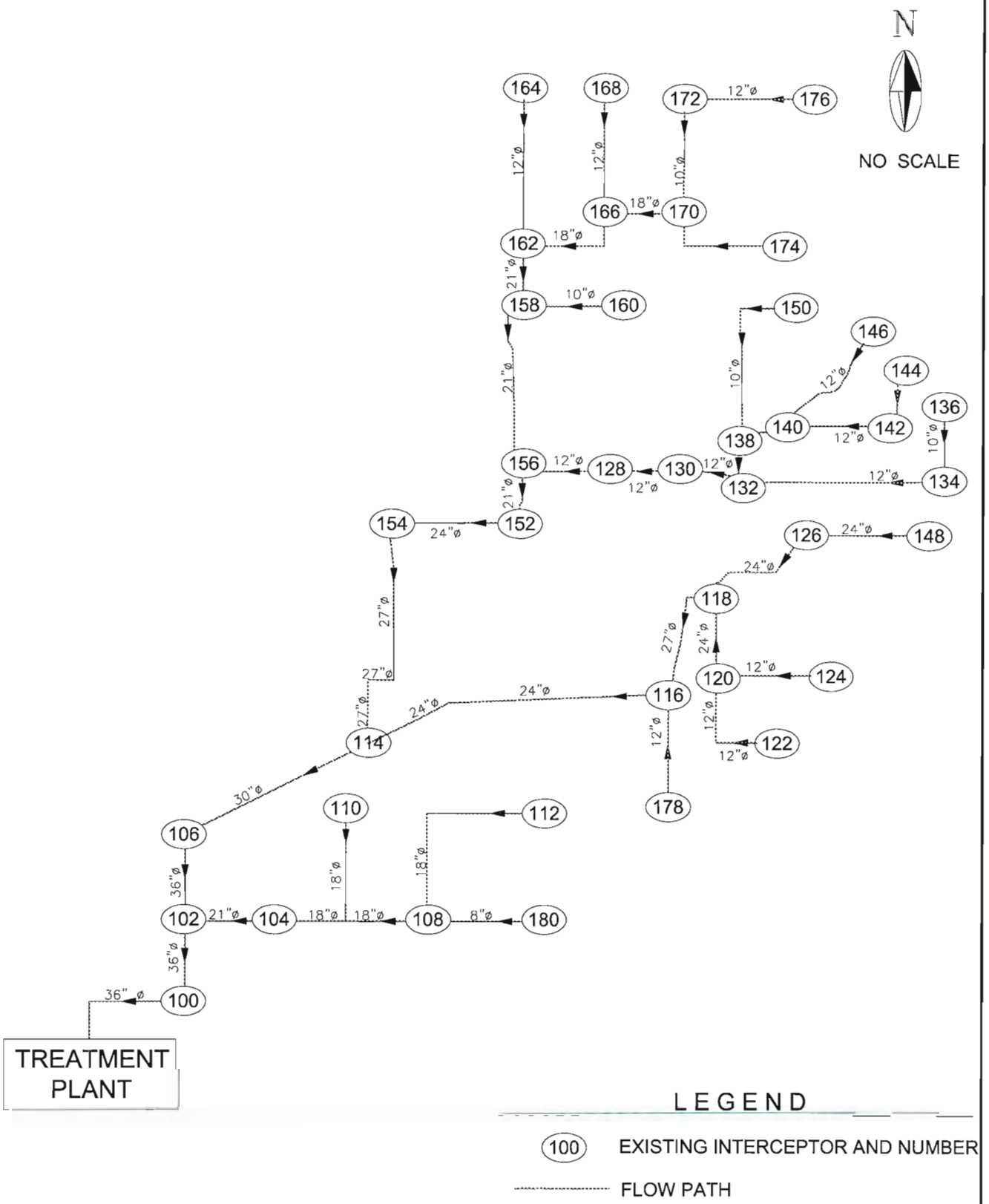
EXISTING WASTEWATER SYSTEM

City of Alamogordo

FIGURE 8



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City of Alamogordo

EXISTING CONVEYANCE SCHEMATIC

FIGURE 9

east side of the railroad tracks and pumped sewage to the west side treatment plant site. In the 1970's, after passage of the US Environmental Protection Agency Clean Water Act, the City of Alamogordo received federal funding for the construction of a new interceptor system and a new wastewater treatment plant that was moved to its present location west of the Alamogordo Municipal Airport. The new interceptor system consisted of large diameter gravity lines that eliminated the need for the City's old lift station. Since the 1970's, the City has replaced most of the old concrete sewer interceptors that were adequately sized, yet were deteriorated due to corrosion from the hydrogen sulfide gasses.

Effluent from the new wastewater treatment plant site constructed in 1975 was pumped back to the old treatment plant site, where it continued to be discharged onto the Stallberg Farms property. During the 1990's, the City of Alamogordo upgraded its sewage treatment plant and aggressively pursued effluent beneficial re-use projects. To date, nearly all municipal landscaping at parks, road medians, ball fields, and golf courses are irrigated with reclaimed wastewater effluent.

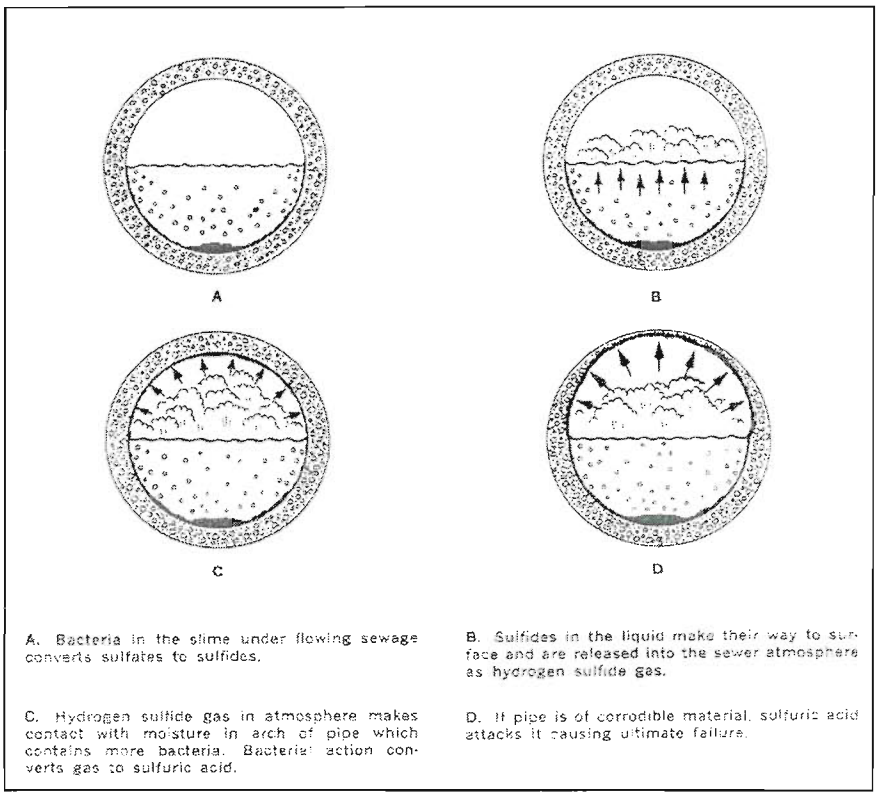
CONDITION OF EXISTING FACILITIES

Most if the interceptor system in the City of Alamogordo has performed reasonably well. However, the City has experienced major problems with some existing interceptors. Those notable exceptions consist of the collapse of numerous concrete lines.

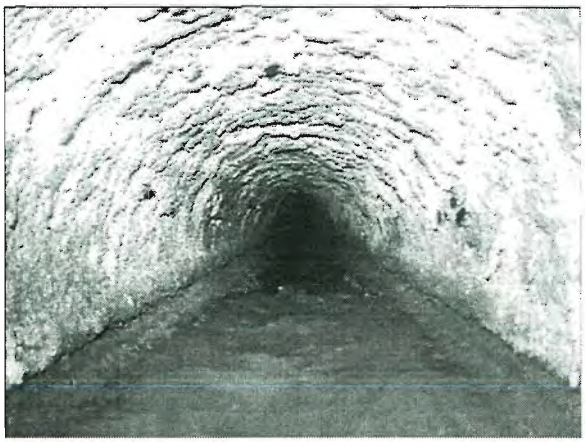
Physical Condition

Interceptors No. 156, No. 162, No. 164, No. 170, and No. 172 have all been replaced over the past 15 years due to severe corrosion and collapse of the concrete sewer lines. Concrete sewer lines have shown to be highly susceptible to corrosion due to the presence of hydrogen sulfide gasses inherent in municipal wastewater systems. After World War II, when many of these lines were installed, it was not known at the

time that this condition would lead to complete pipe failure. However, during the 1980's, many concrete sewer lines installed across the nation were failing due to this condition. The process of corrosion in concrete sewers is further illustrated in the adjacent figure (reprinted from clay pipe manual). Most of the 1975 sewer interceptors installed in Alamogordo consisted of clay pipe material. Clay pipe was used extensively nationwide until around 1985, when the emerging PVC market began to produce reliable and cost effective large diameter sewer line.



As this report was going to production, Interceptor No. 158 was under construction to by-pass interceptor No. 156 and No. 152 and tie directly into Interceptor No. 154 (see proposed interceptors). Interceptor 166 is the only remaining concrete sewer interceptor that has yet to be replaced. The adjacent photograph illustrates the condition of Interceptor No. 166.



should last the 20 year planning period. It is advisable for the City of Alamogordo to conduct a detailed line by line analysis to better budget for interceptor line replacement over the planning period and beyond.

Collection lines were outside the scope of this report. However, it should be noted that Molzen-Corbin & Associates prepared a separate investigation of small diameter concrete sewer lines in the University Park and Dyer Addition neighborhood. This analysis recommended sliplining these sewers in a total, or phased approach that will cost on the order of $1.2 million to improve. Smaller studies of this nature, prioritizing the City in key zones, should be undertaken by the City to identify collection lines that also require replacement or rehabilitation. As another example, Interceptor No. 180 has been reported to experience surcharge conditions. This situation should be alleviated by future interceptors that are designed to accommodate the growth of adjacent areas of highly developable land.

Hydraulic Evaluation

Molzen-Corbin & Associates prepared a detailed hydraulic evaluation using the PIZER HYDRA software computer program. The HYDRA model is a sophisticated Windows Based hydraulic analysis tool that is AutoCAD and GIS compatible. HYDRA utilizes layers of collection zones that discharge to each interceptor. Each collection zone follows the existing collection system, and uses the area topography for future interceptors. The TAZ's are then overlaid on the collection zones, which generates various wastewater flow patterns based on different land uses. Hydrographs are generated by HYDRA that simulate real-world flows in the sewers. All of these flows are gathered from all the analysis points in the interceptors and routed to the wastewater treatment plant. The Diurnal curve that occurs in wastewater flows are also modeled to reflect the daily peaks that are experienced. Appendix B includes Chapter 5 of the HYDRA Users Manual and provides a more detailed description of the computer model.

Molzen-Corbin & Associates conducted field flow tests in six manholes throughout the interceptor system for a period of 24 consecutive hours. Appendix C has the results of these field flow tests in the interceptors. A summary of the peak hour flows are shown in Table 2.

Table 2 - Field Flow Measurements

Station	Pipe Size (in)	Pipe Capacity (mgd)	2004 Peak Hr. Flow (mgd)
Manhole 1	36	22.0	5.1
Manhole 2	21	6.7	0.7
Manhole 3	30	18.0	6.5
Manhole 4	21	6.2	1.2
Manhole 5	21	6.2	1.4
Manhole 6	24	10.7	3.2

Once the computer model was constructed, it was compared to the actual flow results obtained in the field. New diurnal curves were generated based on the actual diurnal flows experienced. This procedure "calibrated" the model to better reflect what was observed. Molzen-Corbin & Associates also added point flows for the large users in Alamogordo. These large users include the NMSU Branch Campus, the Champion Hospital, the NM School for the Visually Handicapped, and the hotel area near Panorama and US 54/70. These point flows also helped match the actual flows to those generated by HYDRA.

Based on this sewer model prepared for the Alamogordo Wastewater Master Plan, there are no sewer interceptors in the City of Alamogordo that are surcharging under the Existing System Analysis. This condition is unique, and reflects the professional competence of the municipal staff and consulting engineers that designed the system over the years. They have managed to understand the nature of the community and design

facilities to not only meet their needs at the time, but also the needs into the future. It should be noted that only improvements to repair deteriorated sewer lines will be needed for the 20 year planning period, but none will be needed to add capacity.

Appendix D includes interceptor system reports including the projected flows in each of the sewer interceptors.

CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

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SECTION 4
PROJECT NEED

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SECTION 4
PROJECT NEED

Although there are some operation, maintenance, and line replacement issues that require immediate attention in the City of Alamogordo wastewater interceptor system, there are no immediate threats to the human health and environment. The purpose of this Wastewater Master Plan was to evaluate the existing system deficiencies and prepare a guiding document to expand the system as the City grows. Thus, this document is primarily for growth management tool in an attempt to avoid future environmental problems due to poor planning.

PUBLIC PARATICIPATION

Several outreach plans were implemented to gather public input. The following meetings were conducted:

1. A Task Force Meeting was held on November 13, 2003. The Task Force comprised of City Staff, as well as members of the real estate and business community.
2. A Public Meeting was held on March 2, 2004. This public meeting was advertised and held at the Alamogordo Civic Center. The purpose of this meeting was to invite comment from the public at the beginning of the study.
3. A second Task Force Meeting was held on July 1, 2004. This meeting provided preliminary findings to the Task Force and gathered input.
4. A second Public Meeting was held on July 1, 2004. The purpose of this meeting was to gather additional public input after presenting preliminary findings.
5. A third Public Meeting is scheduled for the Alamogordo City Council on October 26, 2004.

Copies of the Public Meeting announcements are found in Appendix E.

CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

CDBG PROJECT NO. 03-C-NR-I-6-G-70

SECTION 5
ALTERNATIVES CONSIDERED

MOLZEN-CORBIN & Associates
ENGINEERS/ARCHITECTS/PLANNERS

SECTION 5
ALTERNATIVES CONSIDERED

This section describes various alternates that will be considered for the conveyance of wastewater and expansion of the Alamogordo wastewater system and service. As in many instances, engineering evaluations that incorporate "one size fits all" type solutions are generally not the optimum. It is likely that the final recommendation will be a combination of several of these alternates.

DESIGN CRITERIA

The design criterion are established at the beginning and used as the basis for evaluating each alternate. This criterion includes both cost and non-cost factors. The following criteria will be used in this Wastewater Master Plan.

1. *Relative Cost:* Given the large number of varied alternates, this criteria only includes relative costs to the City of Alamogordo as compared to other alternates evaluated.
2. *Service Life:* This involves the ability of the alternate to meet the 20 year design standard.
3. *Expandability:* This involves the ability of the alternate to be expanded in the future as the community grows.
4. *Right-of-Way Requirements:* This involves the need to purchase land for the construction, operation and maintenance of the alternate.
5. *Environmental Impact:* This involves the impact the alternate will have on the environment.
6. *Minimize Odors:* This involves the odors that could be generated by the alternate evaluated.
7. *Constructability:* This involves the ease of construction methods and the need for specialty construction techniques.

8. *Operation and Maintenance:* This includes the relative cost for operation and maintenance for the 20 year design life as compared to other alternates.

DESCRIPTION

Each of the alternates evaluated will be described, and all of the evaluation criteria will be discussed individually. For each evaluation criteria, a score between 0 and 10 will be given. A zero score represents the highest and best rating. A 10 score represents the least desirable score. Alternates evaluated will include On-site Systems (septic tanks), Gravity Flow Interceptors, Realignment of Existing Lines, Pressure Sewers, Vacuum Sewers, and Trenchless Rehabilitation.

On-site Systems (Do Nothing)

On-site Systems consist of the standard septic tank and leach field. These systems are individually regulated by NMED and are obtained by the property owners. This system should not be recommended in the study for lots less than one acre. This alternate is considered the traditional "Do Nothing" alternate that all other alternates are compared to.

1. *Relative Cost:* These systems have no cost to the City of Alamogordo. (2)
2. *Service Life:* It is possible for on-site systems to last the 20 year service life if properly maintained. However, in many instances these systems are not pumped annually and the leach field becomes clogged and the system fails. (7)
3. *Expandability:* These systems are very limited. Property owners who wish to construct additions to their home must also expand the system, most likely after the landscaping has been installed. This system also has very little application for commercial operations thereby limiting economic development. (9)
4. *Right-of-Way Requirements:* This alternate does not require public right-of-ways. (0)

5. *Environmental Impact:* Given the geology in the Alamogordo area, particularly near the northern and eastern edge of the study limits, at the transition between mountain base and alluvial fan, it is likely that the septic tank effluent will enter the high permeable soils and rapidly reach the groundwater table. (10)
6. *Minimize Odors:* These units, if properly maintained, generally have little odors. (2)
7. *Constructability:* These units include standard construction techniques. (2)
8. *Operation and Maintenance:* Although this appears to have no operation and maintenance for the City, the City will need to coordinate with Otero County in the operation and maintenance of a central septage disposal facility. (4)

Gravity Flow Interceptors

Gravity flow interceptors include an extension of the existing system. Gravity flow interceptors work well in Alamogordo given the natural topography of the study limits toward the existing wastewater treatment plant. The Gravity Flow alternate should only be compared to Pressure and Vacuum alternates.

1. *Relative Cost:* Gravity sewers generally cost a little more up-front than Pressure or Vacuum systems. However, the annual operation and maintenance is significantly less expensive. Since the natural flow of the study area flows toward the existing interceptor system, new gravity interceptors should not be that deep to reach each of the collection zones. (5)
2. *Service Life:* Gravity sewers, given modern construction materials and techniques, should last 20 to 40 years. (2)
3. *Expandability:* Gravity interceptors can be expanded to meet the current and future growth of the City, if properly sized. (2)
4. *Right-of-Way Requirements:* Gravity interceptors can generally be constructed in City right-of-way. Since no lift stations are involved, additional land will not be required. (3)

5. *Environmental Impact:* Given that the study area flows naturally by gravity to the existing interceptor system, this system will consume less energy than either the pressure or vacuum systems. Gravity interceptors also has a benefit to the groundwater and community health. (2)
6. *Minimize Odors:* Gravity sewers generate odors when velocities are high and turbulent flows release hydrogen sulfide gas. Gravity sewers also generate odors when the velocities are below 2 feet per second and the wastewater turn septic from traveling too slow. (4)
7. *Constructability:* Gravity interceptor requires standard materials and construction techniques. (2)
8. *Operation and Maintenance:* Gravity sewers require routine maintenance, line cleaning, manhole repair, and service line repair. However, this is significantly lower than mechanical solutions. (3)

Pressure Sewers

Pressure Sewer systems involve small grinder pump stations for each resident or a cluster of no more than four residents. These pump stations discharge to small diameter forcemains that eventually connect to the existing interceptor system. The small grinder pump stations are positive displacement pumps, so the pressure into the forcemains is easy to overcome.

1. *Relative Cost:* Pressure sewers are generally lower in construction cost than gravity sewers and vacuum sewers. Pressure sewers use smaller diameter forcemains that do not need to be constructed on grade and can undulate with the natural topography. However, pressure sewers have grinder stations that require significant operation and maintenance. Pressure sewers work well in high groundwater, where the lower capital cost offsets the cost of building deep gravity interceptors. However, since the groundwater is over 200 feet deep, this is not an issue in Alamogordo. (6)

2. *Service Life:* Pressure sewers have a service life of 20 years. In that time, the grinder stations will likely need replacement. (5)
3. *Expandability:* If the forcemains are properly sized to accommodate growth, pressure sewers can be expanded, since the system uses positive displacement pumps. (3)
4. *Right-of-Way Requirements:* Pressure sewers can also be constructed within City right-of-way. However, the grinder station in most instances is constructed adjacent to the dwelling unit. This situation requires maintenance easements with property owners for access, (5)
5. *Environmental Impact:* Pressure sewers require pumping, which requires power consumption. This alternate is less energy efficient than gravity interceptors. Pressure sewers do protect the groundwater from contamination. (5)
6. *Minimize Odors:* Pressure sewers generally produce odors due to the slow velocities experienced in the forcemains. These odors generally occur at the discharge point in the existing interceptor system. (5)
7. *Constructability:* There are no special construction techniques required for pressure sewers. However, electrical construction trades are required for the installation of each grinder unit, which is not required in gravity interceptors. (3)
8. *Operation and Maintenance:* Each grinder unit requires operation and maintenance costs. This cost is significantly greater than for gravity interceptors. (4)

Vacuum Sewers

Vacuum Sewers consist of a central Vacuum station that the draws wastewater from its source. Individual or groups of households are equipped with fiberglass valve pits at the end of the household service line. The vacuum line from the valve pit to the vacuum station is constantly active and will draw wastewater once the valve pit is full and the valve opens. Vacuum Sewers are also beneficial in high

ground water, since dewatering costs are much lower. However, that is not a concern in Alamogordo.

1. *Relative Cost:* The capital cost of vacuum sewers is between pressure sewers and gravity sewers. Vacuum lines are generally larger than pressure forcemains, but smaller than gravity interceptors. Vacuum lines are constructed on grade, with vacuum breaks, which makes it more expensive to build than pressure forcemains. Since the topography of Alamogordo is sufficient for gravity interceptors, the excavation savings of vacuum lines is not as significant as in other applications. Vacuum stations include both vacuum and lift pumps, which require significantly greater operation and maintenance costs over gravity interceptors. If the terrain were to have significant rock excavation, vacuum sewers would become more attractive. (7)
2. *Service Life:* Vacuum sewers are designed to meet the 20 year design life. However, it is anticipated that the equipment will require replacement at the end if that period. (5)
3. *Expandability:* If designed properly, the vacuum stations could be situated to accommodate future growth. (3)
4. *Right-of-Way Requirements:* Vacuum sewers require right-of-way for the placement of the vacuum station. All other construction can be accommodated in City right-of-way. (5)
5. *Environmental Impact:* Vacuum sewer stations require energy to run the vacuum pumps and the lift pumps that is not required in gravity interceptors. One environmental advantage of vacuum sewers over gravity interceptors is that they do not leak (as the system is constantly under suction). (3)
6. *Minimize Odors:* Given the high velocities, and the introduction of air into the system, vacuum sewers generate less odors than gravity interceptors. (2)
7. *Constructability:* The vacuum station, including all electrical and mechanical equipment is generally more difficult than

conventional gravity sewers. In addition, the vacuum station requires a building that houses the unit. (3)

8. *Operation and Maintenance:* Like all mechanical equipment, regular operation and maintenance is required to maintain the life of the unit. This operation and maintenance is different for other systems, but no more complicated. (3)

Realignment of Existing Interceptors

The realignment of sewer interceptors only applies to those interceptors that have deteriorated. This alternate should be compared to trenchless rehabilitation. As stated earlier, Interceptor 158 was under replacement. The City has determined that realignment is the most feasible alternative for this situation given that the right-of-way is available.

1. *Relative Cost:* Realignment is generally less expensive than trenchless rehabilitation if right-of-way is available and the right-of-way is not encumbered with other utilities. In the case of Interceptor 166, the available right-of-way is limited, and encumbered with other utilities. (5)
2. *Service Life:* The service life should be 20 to 40 years. (2)
3. *Expandability:* If properly sized, the realigned interceptor should have expansion capability. Given the capacity of all existing interceptors, expandability should pose little problem. (2)
4. *Right-of-Way Requirements:* Relocation and/or realignment requires additional right-of-way over trenchless rehabilitation. (7)
5. *Environmental Impact:* Given that a number of sewer interceptors in Alamogordo are within historic areas, realignment will have greater environmental impact over trenchless methods. (4)
6. *Minimize Odors:* There would be little difference in odors of realigned sewers over trenchless rehabilitation. Both result in smooth walled PVC pipe. (4)
7. *Constructability:* Realignment of sewers will require working around existing conditions within the right-of-way. However, this

may be easier to build than trenchless methods that require specialty contractors. (4)

8. *Operation and Maintenance:* Both realigned sewers and trenchless rehabilitated sewers require the same operation and maintenance, unless one method results in a significant greater linear feet of sewer to maintain. (3)

Trenchless Rehabilitation

Trenchless Rehabilitation techniques generally consist of three methods that repair existing sewers without digging. The first method is Sliplining, which consists of pulling a smaller diameter polyethylene pipe inside the deteriorated sewer. This method reduces the diameter, but with improved flow characteristics of polyethylene, the capacity is not always decreased. The second method is Cured In Place Pipe, which consists of inserting fiber material that has been impregnated with PVC resin that hardens when heated. The pipe is filled with boiling water that sets the resin and forms the new pipe to the shape of the old deteriorated pipe. Since PVC is chemically inert, it eliminates further deterioration. The third method is Pipe Bursting, which consists of pulling a conical wedge through the old sewer line, breaking it and pushing it out toward the backfill, while pulling through a new polyethylene. The advantage of pipe bursting is that unlike sliplining, there is no reduction in capacity. In some cases, capacity can also be increased. With all techniques, sewer services must be reconnected, which usually involves digging.

1. *Relative Cost:* These trenchless rehabilitation techniques are generally more expensive than relocation or replacement. However, if the right-of-way is very limited, or other obstructions are interfering, it may be the most feasible alternative. (6)
2. *Service Life:* The service life should be 20 to 40 years. (2)
3. *Expandability:* With the reduction in pipe diameter, the ability to be expandable has been reduced. (4)

4. *Right-of-Way Requirements:* Right-of-way requirements are significantly reduced, which is one of the advantages of this method. (3)
5. *Environmental Impact:* Trenchless construction has significantly less disruption to existing residents and businesses. This is particularly important in historic neighborhoods. (4)
6. *Minimize Odors:* There is no difference in odor generation between construction methods. (4)
7. *Constructability:* Although trenchless construction is less disruptive, it is generally performed by specialty contractors. This typically results in high mobilization expenses than standard utility construction. (4)
8. *Operation and Maintenance:* There is no difference in operation between this method and realignment of sewers unless there is a significant change in pipe lengths. (3)

CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

CDBG PROJECT NO. 03-C-NR-I-6-G-70

SECTION 6
SELECTION OF AN ALTERNATIVE

MOLZEN-CORBIN & Associates
ENGINEERS/ARCHITECTS/PLANNERS

SECTION 6
SELECTION OF AN ALTERNATIVE

As with most technical evaluations, there is seldom one solution that completely satisfies every circumstance. Each of the alternates presented in Section 5 have merit worthy of future consideration. The following Evaluation Matrix, shown in Table 3, highlights the rating of each alternate considered.

Table 3
Alamogordo Wastewater Master Plan
Evaluation Matrix

Evaluation Factor	Service Area Expansion - New Sewers				Existing Sewers	
	Onsite Systems	Gravity Flow Interceptors	Pressure Sewers	Vacuum Sewers	Realignment of Existing	Trenchless Rehab.
Relative Cost	2	5	6	7	5	6
Service Life	7	2	5	5	2	2
Expandability	9	2	3	3	2	4
Right-of-Way	0	3	5	5	7	3
Environmental Impacts	10	2	5	3	4	4
Minimize Odors	2	4	5	2	4	4
Constructability	2	2	2	3	4	4
Operation & Maintenance	4	3	4	3	3	3
Total	36	23	35	31	31	30

Given the ratings presented in the Evaluation Matrix, there are some general observations that can be made. First, for all new interceptor line extensions, gravity interceptors offer the greatest advantages for the City of Alamogordo. There are no specialty construction techniques, right-of-way can be acquired as development occurs, and they are more energy efficient. Overall, gravity interceptors are recommended for new line extensions in Alamogordo for the service area defined.

Having made this general recommendation, there may be pockets within the service area where the other three alternates would be advantageous. If due to elevation, certain properties can not physically tie to a gravity collection or interceptor, the pressure system would be a better application. The City could even allow on-site systems in difficult to reach neighborhoods. However, on-site systems should be kept to a minimum, and only allowed on large lots, with minimal surrounding population density.

With respect to replacing deteriorated interceptors, both alternates can be considered viable solutions. Every interceptor will need to be evaluated individually; evaluate all obstructions that exist in implementing new alignments, and determine what is best for that line segment. In general, where there is minimal right-of-way and existing obstructions involved, realignment or replacement is recommended. In congested areas, and historic areas, trenchless methods would be preferable.

CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

CDBG PROJECT NO. 03-C-NR-I-6-G-70

SECTION 7
PROPOSED PROJECT

MOLZEN-CORBIN & Associates
ENGINEERS/ARCHITECTS/PLANNERS

SECTION 7
PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

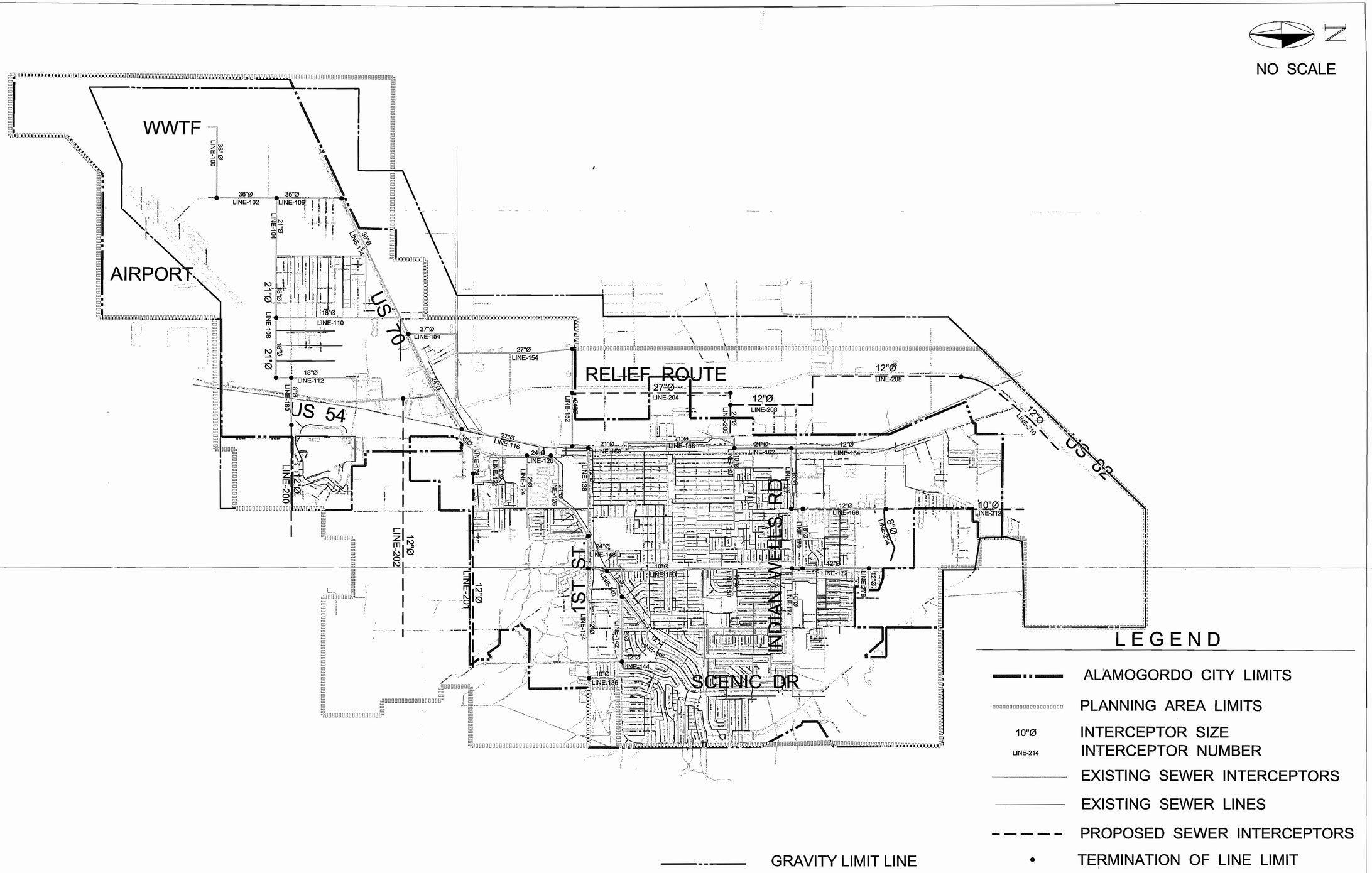
Based on the recommendation presented in Section 6, Molzen-Corbin & Associates has developed a detailed layout if the selected alternate. Appendix F contains the computer generated interceptor reports for this alternate.

PROJECT DESIGN

The expanded interceptor system that is proposed to serve the study area under consideration is shown on Figure 10. As with the existing system, there are no lift stations that have been added to this proposed plan. The following changes have been included in the proposed plan.

1. Interceptor 204 and 206 have been added to reflect construction now underway to relieve Interceptor 158, which is deteriorating.
2. Interceptor 200 has been added to allow for expansion east and south of Desert Lakes and the ultimate development of South Scenic Drive.
3. Interceptor 201 has been added to provide service east on Panorama and Ocotillo Road.
4. Interceptor 202 has been added to service the area east of US 54/70 between Panorama and Desert Lakes Drive.
5. Interceptors 208, 210, 212, and 214 have been added to provide wastewater service to the northern service area.

Figure 11 provides a flow schematic of the interceptor system. Rehabilitation of Line 166 should also be included in the near term capital improvement program. This line should be designed to maintain the same size and capacity, most likely through cured in place pipe trenchless methods.

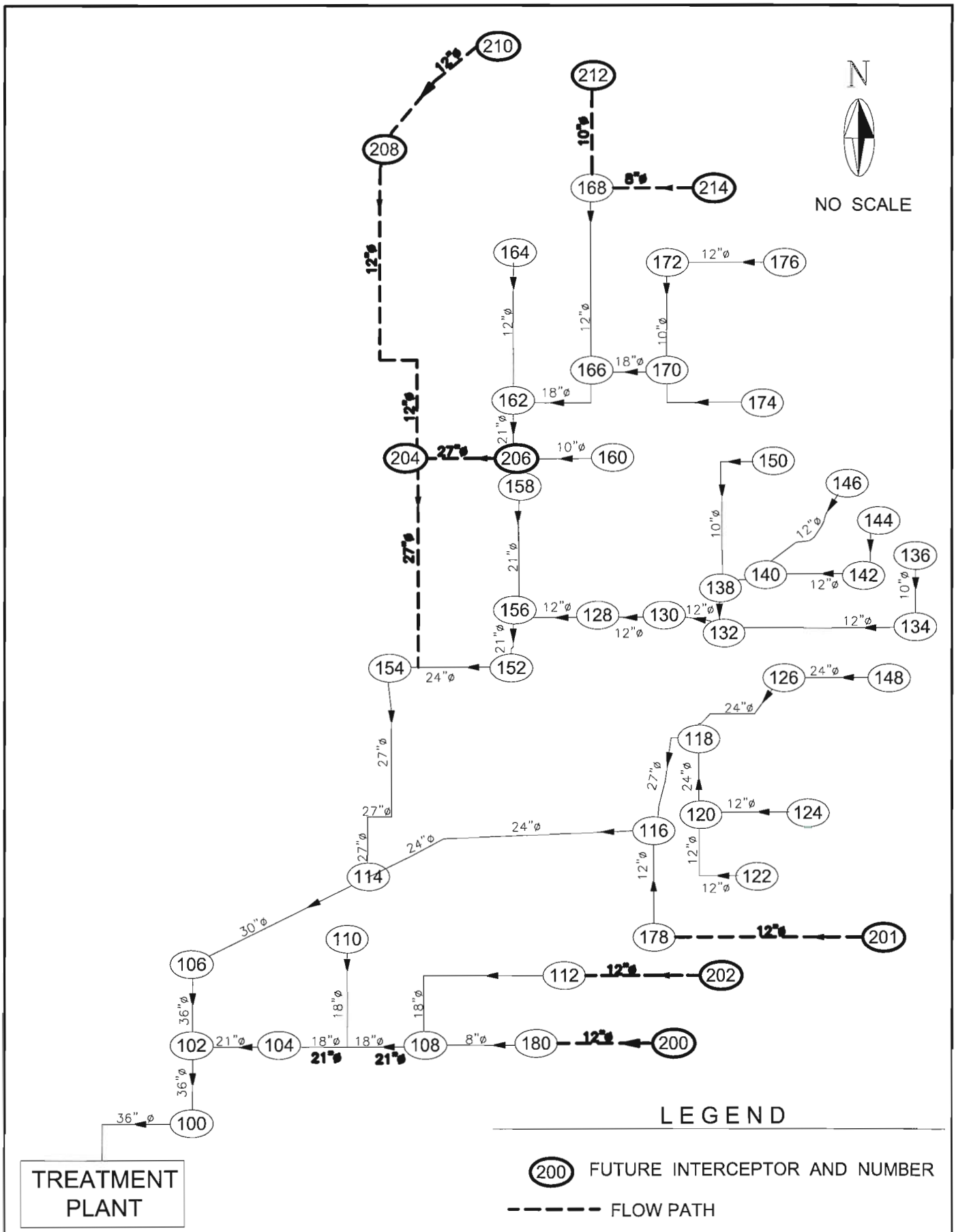


MOLZEN-CORBIN & Associates

PROPOSED INTERCEPTOR SYSTEM MAP

City of Alamogordo

FIGURE 10



MOLZEN-CORBIN & Associates

City of Alamogordo

PROPOSED CONVEYANCE SCHEMATIC

FIGURE 11

Wastewater Treatment

Evaluation of the wastewater treatment plant is not a part of this Wastewater Master Plan. However, based on flow projections, it is likely that the current treatment facility will exceed its design capacity by the year 2010. Flows for 2003 are provided in Appendix G along with the projected growth. The treatment facility does not operate under an USEPA NPDES permit, but rather it operates under an NMED Groundwater Discharge Permit. A copy of that permit is included in Appendix H for reference.

Capital Costs

Project costs have been computed for each of the new interceptors that will be required for the planning period. In addition, costs have been computed for interceptor rehabilitations that have been earlier identified. Detailed capital costs can be found in Appendix I. A summary of the project costs are found in Table 4.

Table 4
Alamogordo Wastewater Master Plan
Summary of Proposed Interceptor Costs

Interceptor	Estimated Cost
Interceptor No. 158	$ 145,800
Interceptor No. 166	$ 478,000
Interceptor No. 200	$ 496,750
Interceptor No. 201	$ 900,000
Interceptor No. 202	$ 1,241,900
Interceptor No. 208	$ 653,500
Interceptor No. 210	$ 496,150
Interceptor No. 212	$ 1,227,800
Interceptor No. 214	$ 438,500

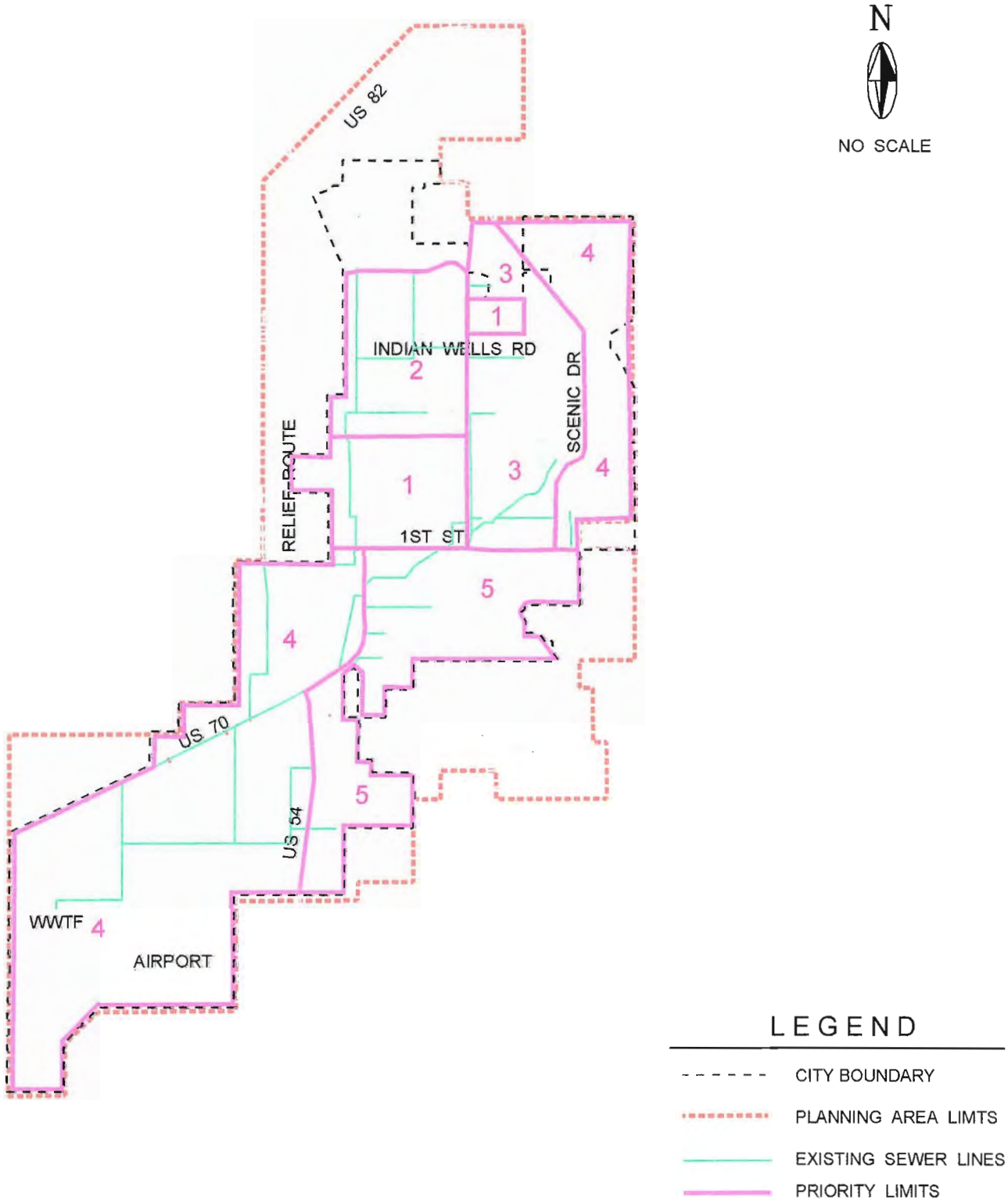
Funding for the proposed improvements are available from a number of sources including the following:

- Utility Impact Fees: These fees are generally subsidized by developers during the building permit process.
- Utility Rate Base: These funds are generally reserved for rehabilitation and replacement of existing interceptors.
- State Funds: These funds are allocated by New Mexico state agencies and/or through legislative appropriations.
- Federal Funds: These funds are generally allocated through federal agencies such as USEPA, or directly through congressional appropriations.

Based on the above capital expenses, the annual funding of improvements should include approximately $304,000 for master plan improvements as further shown in Appendix J.

Collection Line Maintenance

Although the collection system is generally outside the scope of this report, it is important to document that there are a number of areas that the system in some instances is over 40 years old and in need of maintenance. Maintenance issues due to cracked lines, root intrusion, exfiltration should be corrected over the planning period. Figure 12 provides a graphical representation of collection lines in the City of Alamogordo that will require rehabilitation in the planning period. It is estimated that approximately $100,000 per year should be allocated by the City for this annual maintenance requirement.



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City of Alamogordo

EXISTING COLLECTION LINE REHAB. PRIORITIES

FIGURE 12

CITY OF ALAMOGORDO, NEW MEXICO

WASTEWATER MASTER PLAN

CDBG PROJECT NO. 03-C-NR-I-6-G-70

SECTION 8
CONCLUSIONS AND RECOMMENDATIONS

MOLZEN-CORBIN & Associates
ENGINEERS/ARCHITECTS/PLANNERS

SECTION 8
CONCLUSIONS AND RECOMMENDATIONS

This Wastewater Master Plan addresses future growth patterns and projects wastewater service needs for the planning area defined. Improvements that will be required over the next 20 years are identified and recommended for construction. Implementing the recommended improvements is generally approached as development occurs. Progressing in this manner allows City representatives to budget for these improvements in a phased manner as funding becomes available. Depending on funding secured, environmental considerations will also need to be factored into the project costs.

The following Implementation Plan and Summary of Environmental Issues are presented as a recommendation in order of priority. Based on actual pressures the City experiences to extend wastewater service will be the dominant factor in the timing of these extensions.

IMPLEMENTATION PLAN

It is recommended that the City of Alamogordo proceed with implementing this Wastewater Master Plan in the following order:

1. Provide rehabilitation of Interceptor 158, which only includes minor with the construction of Interceptor 204 and 206,
2. Rehabilitate Interceptor 166 which is deteriorated.
3. Secure right-of-way from developers for the line extensions of Interceptors 200, 202 and 214.
4. Secure right-of-way for Interceptor 208 and 210 if outside the NMDOT right-of-way. It is preferable for future maintenance for the City to have its own right-of-way.
5. Construct Interceptor 201, which appears to have the greatest customer base at this time.
6. Construct Interceptors 200, 202, 208, 210, 212, and 214 to accommodate future growth based on demand.

SUMMARY OF ENVIRONMENTAL ISSUES

Funding will require preparing an environmental information document (EID) for the sewer and/or water system project. This work will include necessary field surveys; consultation with appropriate local, state, and federal agencies; preparation of a cultural resource report; consultation with Native American groups; a biological assessment; participation in a public information meeting and public hearing; preparation of the EID, and necessary design team meetings. The EID will provide the necessary information to prepare an environmental assessment (EA), to clear the funding for the project. All work will follow NMED procedures and comply with USEPA and other state and federal regulations.

A detailed guideline for future environmental documentation requirements can be found in Appendix K. A description of the expected environmental tasks is given below.

Scoping: Task will include initial data collection, review of plan, and field reviews as needed to understand the project.

Agency consultation and coordination: Contact will be made with agencies such as the U.S. Fish and Wildlife Service, US Forrest Service, BLM, and U.S. Army Corps of Engineers, according to NMED and EPA requirements.

Cultural resource investigation: Task will include records review, survey, and report on historic, archeological, and cultural resources. Coordination will take place with the NM State Historic preservation Officer (SHPO).

Consultation with Native American groups: Task will involve contact with appropriate Native American groups regarding traditional cultural properties or uses of the project area.

Biological assessment: Task will involve identification of potentially occurring protected, endangered, or threatened species and their critical habitat; field surveys; and a brief report on findings.

Public input: Task will involve participating in one public information meeting and one public hearing on the water system project.

Preparation of EID: Task will involve necessary additional research and investigations, preparation of the EID, technical editing, and revisions to

address comments. Copies of the draft EID will be made available for the public and NMED to review for 30 days. After the public hearing and review period, the NMED staff will prepare an EA to be sent to the EPA. The EPA will issue the EA and preliminary finding of no significant impacts (FONSI) for another 30-day public review period. The funding cannot be authorized until after this review period.

APPENDICES

Appendix A

CITY OF ALAMOGORDO, NEW MEXICO
WASTEWATER MASTER PLAN
TAZ EXTENSION - 2004 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
1	154	-	-	56	77	17	8	-	-	-	-	311
2	149	-	-	6	14	-	-	-	-	-	-	169
3	149	-	-	-	-	-	-	-	-	-	-	149
4	57	-	-	-	-	-	-	-	-	-	-	57
5	98	-	-	3	-	3	-	-	-	-	-	104
6	19	-	-	-	-	-	-	-	-	-	-	19
7	22	-	-	11	3	-	-	-	-	-	-	36
8	19	-	-	-	-	-	-	-	-	-	-	19
9	49	-	-	44	118	-	-	-	-	-	-	211
10	144	-	-	-	-	6	-	-	-	-	-	150
11	78	-	-	12	6	-	-	-	-	-	-	96
12	50	-	-	-	8	-	-	-	-	-	-	58
13	12	-	-	-	-	-	-	-	-	-	-	12
14	192	-	-	29	493	35	15	3	-	-	-	766
15	49	-	-	3	15	-	-	-	-	-	-	67
16	24	-	-	-	-	-	-	-	-	-	-	24
17	50	36	87	223	155	30	7	75	-	-	-	664
18	11	-	-	12	4	57	-	-	-	-	-	84
19	36	-	-	5	-	-	1	-	-	-	-	42
20	11	-	-	-	-	-	-	-	-	2,259	-	2,270
21	22	-	-	-	-	-	-	-	-	-	-	22
22	38	-	-	40	-	-	-	-	-	-	-	78
23	69	139	147	360	285	73	7	3	12	-	11	1,107
24	356	276	-	24	52	71	18	-	-	-	-	796
25	316	48	-	35	78	23	4	4	4	-	-	511
26	361	48	-	-	36	48	-	-	-	-	-	493
27	38	-	-	19	12	-	-	-	98	-	-	167
28	386	38	-	15	27	196	5	-	-	-	-	667
29	536	80	-	24	71	46	1	8	-	-	-	766

TAZ EXTENSION - 2004 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
30	349	-	-	24	123	35	4	10	-	-	-	545
31	126	-	-	33	35	-	3	-	-	-	-	197
32	192	31	-	-	11	44	4	42	-	-	-	324
33	187	35	-	5	20	7	-	-	-	-	-	255
34	138	24	-	-	11	-	12	-	-	-	-	184
35	76	-	-	-	3	-	-	-	-	-	-	79
36	115	-	-	64	44	-	-	-	-	-	-	222
37	493	44	25	42	371	586	142	77	48	-	-	1,829
38	439	139	-	150	298	213	82	14	-	-	-	1,336
39	185	177	-	7	162	138	44	60	4	-	-	777
40	265	-	-	-	3	11	-	-	-	-	-	279
41	192	23	-	17	3	-	-	1	-	-	-	236
42	328	-	-	16	12	-	35	-	-	-	-	391
43	366	5	-	3	5	14	3	-	-	-	-	396
44	282	-	-	20	4	3	-	-	-	-	-	309
45	160	-	-	-	-	50	-	-	-	-	-	210
46	38	-	-	72	10	-	-	-	-	-	-	120
47	510	-	19	142	815	398	261	37	4	-	-	2,185
48	237	35	-	238	280	681	78	505	-	2,475	-	4,529
49	249	191	-	18	117	91	21	73	-	-	-	760
50	178	193	-	-	3	82	9	-	-	-	-	465
51	250	3	-	26	31	34	11	-	-	-	-	355
52	109	191	-	1	8	9	15	129	-	-	-	462
53	337	-	-	3	9	1	-	3	-	-	-	353
54	-	-	-	-	-	-	-	-	-	-	-	-
55	3	9	-	171	3	-	3	-	4	-	13	206
56	8	30	-	413	5	145	-	-	-	-	-	601
57	171	301	349	33	1,181	66	141	6	-	-	-	2,248
58	200	-	-	-	45	-	11	5	-	-	-	261
59	63	-	-	1	-	3	3	-	-	-	-	70
60	96	-	-	46	58	-	-	-	-	-	-	200

TAZ EXTENSION - 2004 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
61	80	-	-	3	38	38	15	-	-	-	-	175
62	51	-	-	-	1	-	3	-	-	-	-	55
63	12	-	-	-	-	-	-	-	-	-	-	12
64	89	3	406	-	119	-	-	-	-	-	-	617
65	260	10	-	50	134	-	11	4	-	-	-	470
66	183	38	-	-	8	-	-	-	-	-	-	229
67	70	-	-	-	4	3	-	-	-	-	-	77
68	19	-	-	-	-	-	-	-	-	-	-	19
69	44	7	-	3	-	-	-	-	-	-	-	54
70	32	35	-	45	117	3	-	-	-	-	-	232
71	11	26	-	54	40	50	-	-	-	-	-	181
72	32	10	-	-	27	9	2	-	-	-	-	81
73	105	-	182	-	-	-	-	-	-	-	-	287
74	112	-	-	-	49	-	9	-	-	-	-	169
75	73	-	-	-	-	-	-	-	-	-	-	73
76	58	-	-	-	-	-	-	-	4	-	-	62
77	20	-	-	-	-	-	-	-	-	-	-	20
78	17	-	-	-	-	-	-	-	-	-	-	17
79	3	-	-	-	-	-	-	-	-	-	-	3
80	85	194	70	22	279	-	7	-	-	-	-	657
81	61	-	-	-	13	-	-	-	-	-	-	74
82	59	-	-	-	3	-	-	-	-	-	-	62
83	88	-	-	-	-	-	-	-	-	-	-	88
84	98	6	-	10	19	-	-	-	-	-	-	133
85	217	118	-	21	119	-	-	-	-	-	-	475
86	273	337	-	24	127	43	13	-	-	-	-	817
87	188	-	-	26	14	61	3	-	-	-	-	292
88	43	-	-	-	-	-	-	-	-	-	-	43
89	169	-	-	17	15	1	-	-	-	-	-	202
90	11	-	-	-	-	-	-	-	-	-	-	11
91	18	-	-	-	-	-	-	-	-	-	-	18

TAZ EXTENSION - 2004 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
92	20	-	-	-	-	-	-	-	-	-	-	20
93	3	-	-	-	-	-	-	-	-	-	-	3
94	85	2	-	-	-	-	-	-	-	-	-	87
95	22	3	-	7	10	24	3	-	41	-	-	110
96	11	-	-	6	-	-	-	-	-	-	-	17
97	50	-	-	-	-	-	-	-	-	-	-	50
98	6	-	-	-	-	-	-	-	-	-	-	6
99	23	-	-	-	-	-	-	-	-	-	-	23
100	17	-	-	-	-	-	-	-	-	-	-	17
101	85	3	-	-	-	-	-	-	-	-	-	88
102	85	3	-	-	-	-	-	-	-	-	-	88
103	83	10	-	2	-	-	6	-	4	-	-	105
104	20	-	-	-	-	-	-	-	-	-	-	20
105	26	-	-	-	-	-	-	-	-	-	-	26
106	3	-	-	-	-	-	-	-	-	-	-	3
107	256	9	-	-	-	-	-	-	-	-	-	265
108	85	3	-	-	-	-	-	-	-	-	-	88
109	43	2	-	-	-	-	-	-	-	-	-	45
110	43	2	-	-	-	-	-	-	-	-	-	45
111	46	2	-	-	8	-	-	-	-	-	-	56
112	43	2	-	-	-	-	-	-	-	-	-	45
113	301	1,115	-	74	683	1,583	-	-	-	398	-	
Total	**13,773**	**4,036**	**1,285**	**2,829**	**6,951**	**5,032**	**1,019**	**1,059**	**221**	**5,133**	**25**	**37,209**

CITY OF ALAMOGORDO, NEW MEXICO
WASTEWATER MASTER PLAN
TAZ EXTENSION - 2024 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
1	172	-	-	56	144	45	12	-	-	-	-	429
2	154	-	-	6	58	-	-	-	-	-	-	219
3	154	-	-	-	-	-	-	-	-	-	-	154
4	132	-	-	-	-	-	-	-	-	-	-	132
5	165	-	-	3	-	3	-	-	-	-	-	171
6	61	-	-	-	-	-	-	-	-	-	-	61
7	28	-	-	11	3	-	-	-	-	-	-	42
8	19	-	-	-	-	-	-	-	-	-	-	19
9	83	-	-	44	323	-	-	-	-	-	-	450
10	207	-	-	-	-	45	-	-	-	-	-	252
11	148	-	-	12	6	-	-	-	-	-	-	166
12	126	-	-	-	8	-	-	-	-	-	-	134
13	12	-	-	-	-	-	-	-	-	-	-	12
14	410	-	-	67	493	35	15	3	-	-	-	1,023
15	179	-	-	3	15	-	-	-	-	-	-	197
16	119	-	-	-	-	-	-	-	-	-	-	119
17	84	36	204	253	155	30	7	75	-	-	-	844
18	11	-	-	32	4	57	-	-	-	-	-	104
19	398	-	-	5	-	-	1	-	-	-	-	404
20	11	-	-	-	-	-	-	-	-	2,697	-	2,708
21	28	-	-	-	-	-	-	-	-	-	-	28
22	38	-	-	52	-	-	-	-	-	-	-	90
23	101	198	147	375	303	108	16	3	16	-	15	1,281
24	384	276	-	24	72	93	22	-	-	-	-	871
25	375	137	-	35	145	42	8	55	6	-	-	801
26	556	137	-	-	117	93	-	-	-	-	-	902
27	38	-	-	41	12	-	-	-	98	-	-	189
28	386	38	-	15	27	229	14	-	-	-	-	709
29	536	80	-	24	71	46	1	11	-	-	-	769

TAZ EXTENSION - 2024 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
30	349	-	-	24	123	59	10	14	-	-	-	579
31	126	-	-	33	56	-	6	-	-	-	-	221
32	192	57	-	-	38	55	7	49	-	-	-	398
33	248	75	-	5	43	44	-	-	-	-	-	415
34	156	24	-	-	131	-	19	-	-	-	-	330
35	76	-	-	-	3	-	-	-	-	-	-	79
36	115	-	-	139	192	-	-	-	-	-	-	446
37	493	44	25	42	371	638	153	78	66	-	-	1,910
38	439	139	-	150	298	245	89	14	-	-	-	1,374
39	185	177	-	7	162	138	44	60	6	-	-	779
40	265	-	-	-	3	11	-	-	-	-	-	279
41	192	23	-	17	3	-	-	1	-	-	-	236
42	328	-	-	16	12	-	35	-	-	-	-	391
43	366	5	-	3	5	14	3	-	-	-	-	396
44	282	-	-	20	4	3	-	-	-	-	-	309
45	172	-	-	-	-	50	-	-	-	-	-	222
46	38	-	-	104	107	-	-	-	-	-	-	249
47	510	-	19	142	815	451	272	43	6	-	-	2,257
48	237	35	-	238	280	723	86	509	-	2,966	-	5,074
49	249	191	-	18	117	91	21	73	-	-	-	760
50	178	193	-	-	3	130	19	-	-	-	-	524
51	250	3	-	26	31	34	11	-	-	-	-	355
52	109	191	-	1	8	43	19	129	-	-	-	500
53	337	-	-	3	9	1	-	3	-	-	-	353
54	-	-	-	-	-	-	-	-	-	-	-	-
55	3	9	-	171	3	-	3	-	6	-	17	211
56	8	30	-	441	128	145	-	-	-	-	-	752
57	171	301	349	70	1,293	181	157	24	-	-	-	2,546
58	334	-	-	-	65	-	14	14	-	-	-	427
59	239	-	-	1	-	3	3	-	-	-	-	246
60	96	-	-	46	161	-	-	-	-	-	-	303

TAZ EXTENSION - 2024 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
61	357	-	-	3	118	77	22	-	-	-	-	578
62	373	-	-	-	1	-	3	-	-	-	-	377
63	12	-	-	-	-	-	-	-	-	-	-	12
64	89	3	499	-	181	-	-	-	-	-	-	772
65	320	67	-	50	174	-	15	4	-	-	-	630
66	403	38	-	-	38	-	-	-	-	-	-	479
67	360	-	-	-	4	3	-	-	-	-	-	367
68	19	-	-	-	-	-	-	-	-	-	-	19
69	44	7	-	3	-	-	-	-	-	-	-	54
70	69	61	-	51	157	3	-	-	-	-	-	340
71	61	53	-	66	155	73	-	-	-	-	-	407
72	69	45	-	-	251	69	14	-	-	-	-	447
73	478	-	414	-	-	-	-	-	-	-	-	892
74	602	-	-	-	94	-	13	-	-	-	-	710
75	1,327	-	-	-	-	-	-	-	-	-	-	1,327
76	672	-	-	-	-	-	-	-	6	-	-	677
77	26	-	-	-	-	-	-	-	-	-	-	26
78	17	-	-	-	-	-	-	-	-	-	-	17
79	3	-	-	-	-	-	-	-	-	-	-	3
80	153	216	193	62	402	-	16	-	-	-	-	1,042
81	509	-	-	-	13	-	-	-	-	-	-	522
82	512	-	-	-	3	-	-	-	-	-	-	515
83	924	-	-	-	-	-	-	-	-	-	-	924
84	479	47	-	61	43	-	-	-	-	-	-	631
85	349	164	-	73	149	-	-	-	-	-	-	735
86	401	380	-	37	167	67	17	-	-	-	-	1,069
87	408	-	-	176	78	61	3	-	-	-	-	726
88	242	-	-	-	-	-	-	-	-	-	-	242
89	231	-	-	17	15	1	-	-	-	-	-	264
90	136	-	-	-	-	-	-	-	-	-	-	136
91	122	-	-	-	-	-	-	-	-	-	-	122

TAZ EXTENSION - 2024 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
92	26	-	-	-	-	-	-	-	-	-	-	26
93	3	-	-	-	-	-	-	-	-	-	-	3
94	85	2	-	-	-	-	-	-	-	-	-	87
95	22	3	-	383	10	24	3	-	56	-	-	501
96	136	-	-	6	-	-	-	-	-	-	-	142
97	239	-	-	-	-	-	-	-	-	-	-	239
98	29	-	-	-	-	-	-	-	-	-	-	29
99	29	-	-	-	-	-	-	-	-	-	-	29
100	17	-	-	-	-	-	-	-	-	-	-	17
101	85	3	-	-	-	-	-	-	-	-	-	88
102	85	3	-	-	-	-	-	-	-	-	-	88
103	129	10	-	2	-	-	6	-	6	-	-	153
104	20	-	-	-	-	-	-	-	-	-	-	20
105	26	-	-	-	-	-	-	-	-	-	-	26
106	3	-	-	-	-	-	-	-	-	-	-	3
107	256	9	-	-	-	-	-	-	-	-	-	265
108	85	3	-	-	-	-	-	-	-	-	-	88
109	43	2	-	-	-	-	-	-	-	-	-	45
110	43	2	-	-	-	-	-	-	-	-	-	45
111	52	2	-	-	8	-	-	-	-	-	-	62
112	43	2	-	-	-	-	-	-	-	-	-	45
113	312	1,115	-	74	683	1,583	-	-	-	488	-	
Total	**23,393**	**4,634**	**1,850**	**3,838**	**9,164**	**5,847**	**1,181**	**1,161**	**270**	**6,151**	**32**	**53,268**

Appendix B

Chapter 5: Modeling Sanitary Wastewater

Understanding Sanitary Flows

Daily Flow Patterns

Each structure (residence, apartment or commercial building) injects sanitary flow into the collection system in the form of a sanitary hydrograph. Each individual sanitary contribution only makes a very abrupt blip in the daily hydrograph, but if you average all these individual flow sources, the resulting daily pattern is quite smooth. These daily patterns are called diurnal curves. They look like hydrographs, but the ordinal values are only relative.

You can use diurnal curves to construct sanitary hydrographs by taking the average daily flow for a residence and proportionally adjusting the ordinances of the diurnal curve so the volume under the diurnal curve equals the average daily flow. This creates a sanitary hydrograph.

The shape of the sanitary hydrograph depends on the general type of contributors. For example, the average contributions from a family neighborhood are somewhat different than those from an apartment with mostly young childless adults who seldom occupy their residences during the day.

Flow Injections Hydrographs

HYDRA calculates sanitary flow injection hydrographs by using several population-based fields on the Land Use Area layer. Each land use area may contain one or more sets of flow-related population data, including residential, visiting population, and/or commercial contribution. Total average daily flow is injected into the collection system throughout the day, according to the diurnal curves selected for each type of use in that area or parcel. The resulting sanitary injection hydrograph is injected into the collection system and used by the analysis engine to determine the flows in the system at any place or time.

By injecting these sanitary hydrographs into the collection system on a pipe by pipe basis and dynamically routing them though our system, you can model actual collection system flows with great accuracy. In fact, the accuracy can be greater with this method. In storm water systems, the injection hydrographs are wildly variant, depending on the intensity of rainfall and relative runoff; values which vary rather dramatically over the city.

Hydrograph Flow Routing

As these sanitary hydrographs are time routed through the collection system, they are combined with slightly different clock times, depending on their point of injection. This time delayed offset results in a mushing factor as the peaks of the hydrographs are slightly offset. As a result, in a large sanitary sewer collection system, the outfall hydrograph, (which is the result of combining thousands of individual sanitary hydrographs with various time offsets) can approach uniform flow, 24 hours a day. This process was traditionally crudely represented by the use of a Peaking Factor Curve which estimates the peak flow by factoring up the average daily flow at any point in the system, depending on the number of upstream residences.

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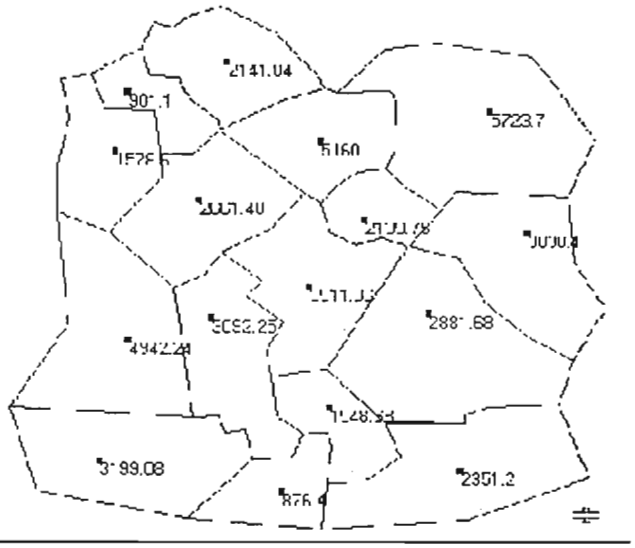

Land Use Layer from Anytown sample project annotated with residential population

Digitizing Tips for the Land Use Layer

These are the steps for preparing a map for digitizing:

- **Find an appropriate land use information source.** This might include existing land use maps, land use zoning maps, traffic analysis zones, or census data. You will need to organize the land use areas to work well both with data for both current population patterns and projections.
- **Create appropriate land use areas.** Land use areas should generally represent a homogenous land use designation and development pattern. Create land use areas that are small enough to reflect variable living and working patterns over a city, but large enough to make updates easier. Avoid making individual parcels that have been spot zoned their own land use areas. As a rule of thumb, use about one land use area for every 3,000 people.
- **Prepare the map before digitizing.** If you are starting with a paper map, consider using a colored pen to indicate all vertices for the polygons. Draw a line around each land-use polygon you want digitized. This greatly speeds the process since no decisions need to be made while digitizing and the common points on adjacent polygons will be identical. Keep the polygons simple. Excess vertices do little to improve accuracy of modeling and only create more work for the digitizer.
- **Use snaps.** As you are digitizing, use the snapping feature of your CAD program and try to use the same vertices that defined adjacent polygons. This process eliminates slivers of space between polygons or overlaps. Your drawing will look cleaner and the end result will be more reliable flow generation.
- **Use closed polyline.** Draw the land use areas using a polyline, not a series of lines. Be sure to close the polyline to form a polygon.
- **Consider the pick point of the polygon.** HYDRA will place the pick point for each land use area at the center of the polygon. In order to ensure easy selection and display of the land use areas in HYDRA, try to keep the polygons roughly rectangular or circular. If you must use highly irregular shapes, digitize the pick point yourself in a logical place.

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To input population-related data:

1. Enter the total population within the land use area in the RES_POP or VIS_POP field. You can either click on each land use area and manually enter the data, or from the Tools menu select Browse Active Table to enter the data in the database.
2. Enter the percentage of total population within the land use area that is connected to the collection system in the RES_ACTIVE or VIS_ACTIVE. If there are no septic systems in the project, create a Selection Set of all land use areas, then use the Update Table Using Selection Set feature to input 100.
3. Enter the actual contribution per capita into the RES_CPC or VIS_CPC field.

Diurnal Curves: Inputting Sanitary Injection Patterns

Diurnal curves represent the pattern of sanitary wastewater flows generated by a type of land use over a 24-hour period. Each structure (house, apartment, or commercial building) contributes some amount of sanitary flow to the collection system throughout the day. When combined with flows contributed by other similar structures or uses, they generate an average flow to the system in a unique hourly pattern. Because a diurnal curve represents the pattern of contribution, the individual values on the curve are not important. Flow values can be in any positive numeric range, such as 1 to 20 or 250.33 to 1567.33.

Types of Diurnal Curves

The shape of the diurnal curves will vary, depending on the type of land use. For example, an army barracks will have a different average hourly rate of contribution than a commercial laundry. For a typical municipal modeling project, you might have a different diurnal curve for single-family residences, multi-family residences, retail buildings, office buildings, hotels, etc.

On the Land Use Areas Layer, you can input up to three diurnal curves for each land use area. In the Entity Data Table, the names of the fields suggest residential, visiting, and commercial. The residential and visiting sets use population-based data to calculate a total average daily flow. The commercial fields require you to directly input the total average daily flow.

Obtaining Diurnal Curve Data

Diurnal curve data can be determined from winter water consumption records, literature, or dry-weather flow measurements. If using field flow measurements, recording gauges should be far enough downstream to allow averaging of individual sanitary hydrographs, but not so far downstream as to cause routing delays that soften the peaks. As a general rule, no upstream contributor should be more than 15 minutes upstream of the flow gauge when gathering data on diurnal curves.

Generation of a Sanitary Injection Hydrograph

HYDRA will use average daily flows, combined with the diurnal curves to create the sanitary flow injection hydrographs. HYDRA will then route and merge these sanitary injection hydrographs through the system to account for not only the system geometry, but also any structures that modify the shape of the sanitary hydrographs, such as pumps, diversion structures, and detention facilities.

Inputting Diurnal Curve Data

Diurnal curve data is input on the Land Use Areas Layer, along with population and contribution per capita data. The Entity Data Table diurnal curve fields reference the names of diurnal curves stored in Design Paragraphs (located in the Design Criteria file PROJECT.DES).

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The Sanitary Service Area Layer can be used in two very different ways:

- Usually, as a graphical filter to direct sanitary flows into the collection system from the Land Use Layer.
- Can also be used as a source of sanitary flows if you choose not to use the Land Use Layer or desire to make specific allocations of injections accounted for in the land use layer.

Regardless of how you use the layer, every service area is directly associated with an entity on the Collection System Layer where its flows are injected.

Components of the Sanitary Service Areas Layer

The Sanitary Service Areas Layer consists of the following:

- **Plan graphics**. The graphical entities that represent the boundaries of all service areas. These are digitized in AutoCAD and imported into HYDRA via a .DXA file.
- **Connects data**. The collection system entity which services each area. While every service area is associated to an entity such as a pipe, there does not need to be a one-to-one ratio of service areas to pipes. How you set the ratio depends somewhat on the scope of your project. If you have 1,000 pipes in your system and intend to inject flow into each pipe, there will be at least 1,000 service area polygons on the Sanitary Service Area Layer, each pointing at a different pipe. If you elect to inject flow into every fourth pipe, there might be only 300 sanitary service areas. If you decide only to model the trunks in your sanitary sewer system, you might elect to have 800 sanitary service areas, many of which inject into one of 45 pipes.
- **Sanitary flow data**. If you choose to use the Land Use Layer as a source for sanitary flow you will not need to enter data into the Sanitary Service Area layer data fields. If you are not using the Land Use Layer, then you will need to define the population by sanitary service area so injections can be generated.

Setting the Ratio of Service Areas to Collection System Links

While every service area is associated with an entity such as a pipe, there does not need to be a one-to-one ratio of service areas to pipes. How you set the ratio depends somewhat on the scope of your project.

If you have 1,000 pipes in your system and intend to inject flow into each pipe, there will be at least 1,000 service area polygons on the Sanitary Service Area Layer, each pointing at a different

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Set SE_AREA from G_SIZE	Resets the values in the SE_AREA field from G_SIZE, which is the area of the polygon in the CAD drawing.
Copy to Clipboard	Copies data or graphics to the Windows Clipboard.

Inputting Area Data for Sanitary Service Areas

On the Sanitary Service Areas layer, the SE_AREA field rather than the G_SIZE field is used for all flow injection computations. The SE_AREA field can be updated by manually inputting data into each record, or through an automatic process. The **Set SE_AREA from G_SIZE** in the **ServiceArea** menu updates the SE_AREA field to an area value based on the digitized size of the polygon.

Setting the SE_AREA field from the digitized size:

1. On the Sanitary Service Areas layer, in the ServiceArea menu, click on Set SE_AREA From G_SIZE.

Service Area Connects View

The contributions or runoff from any service area can be injected into any single entity (pipe, manhole, etc.) on the Collection System Layer. A system entity may have more than one service area that injects into it, but any single service area can only inject its contributions to the collection system into only one entity (pipe or manhole).

To graphically show the relationship between a service area and the collection system entity that it injects or contributes to, HYDRA displays a yellow line from the pick point of the service area to the collection system entity. It also indicates the relationship between the service area and the collection system entity by placing the G_ID of the pipe or manhole in the G_CONNECT field in the Service Area.

The Layer-Sensitive menu in the Connects View contains tools to input, edit, or delete the connects. Connects may be deleted, automatically drawn, or modified one at a time.

To view the service connects:

1. Be sure that the Service, Drainage, or Parcel Layer is active.
2. Select SE, DR, or PA Connects from the View menu. HYDRA displays a yellow line from the pick point of service areas to the nodes that serve them if that data has already been input.

Tools in the Connects Menu

On the Parcel Layer, Service Area Layer, and Drainage Sub-Basin Layer, in Connects View, the following special tools are available from the Connects menu:

Highlight Unconnected Entities	Highlights parcels or nodes where G_CONNECT is equal to 0.00, meaning there is not connection to an entity in the Collection System layer.
Connect to Closest	Automatically connects parcel, service area or drainage sub-basin to closest node in the Collection System layer.
Clear All Connects	Automatically deletes all values in G_CONNECT field, returning them to 0.00.

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Clearing All Existing Connections to the Collection System

The Connects menu contains a command which clears existing connections between service areas, drainage sub-basins, or parcels and collection system links. This allows the user to start with a clean slate and redefine the connections.

Make sure this is what you want to do before you actually do it. This command is not reversible. Consider backing up your data before using Clear Connects.

To clear existing connections:

1. Be sure the Service Area, Drainage Sub-Basin, or Parcel Layer is active.
2. Select SE, DR, or PA Connects view from the View Menu Box.
3. Select **Clear Connects** from the **Connects** menu. HYDRA deletes any existing connect lines and deletes any values in the G_CONNECTS field.

Highlighting Entities Which Are Not Connected to the System

You may need to check whether all the service areas have been connected to the system entities that service them.

To highlight unconnected service areas:

1. Be sure that the Service Area Layer is active.
2. Select SE Connects from the View menu. HYDRA will display yellow lines from entities to the connected nodes, if there are any.
3. Select **Highlight Unconnected Entities** from the **Connects** menu. HYDRA will highlight all service areas which are missing data in the G_CONNECT field.

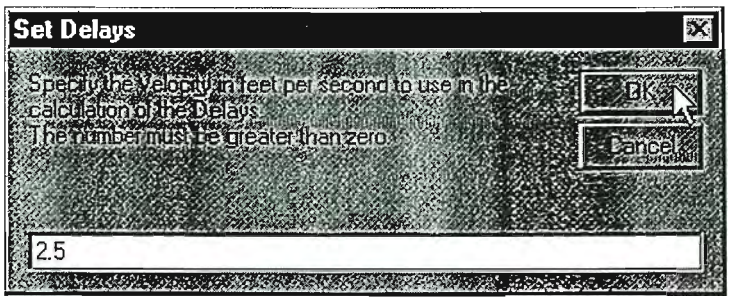
Setting Delays for Sanitary Service Connects

You can set a delay factor for each sanitary service area. The delay input into the SY_DELAY field represents the delay in minutes for the sanitary flow in this area to reach the collection system.

HYDRA includes a menu tool for quick data input into the SY_DELAY field. Based upon your input of a flow velocity (feet per second / meters per second), HYDRA will calculate an estimated delay time in minutes based on the length of the connect line. The farther the drainage area is to its injection point, the longer the delay.

To set flow delays for all drainage areas:

1. In the SE Connects view, select **Set Delays** from the **Connects** menu. The Set Delays dialog box will appear.



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PA -- Parcel Layer Flows

If you have chosen to use the Parcel Layer as a source for flow generation, this selection will generate a flow file (.FLO). This option injects the flow that has been defined for individual parcels.

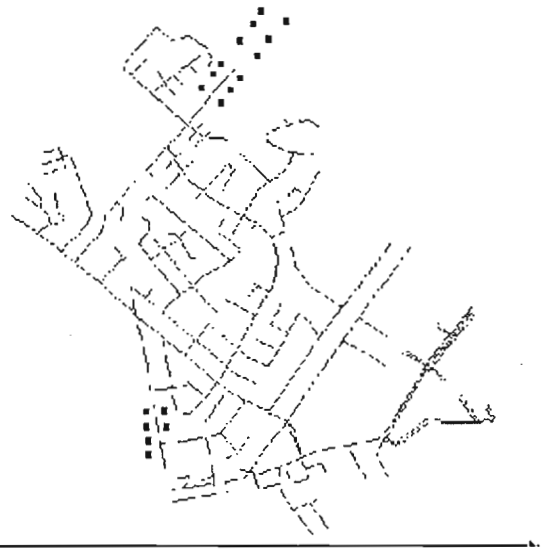
Using Service Areas as a Source of Sanitary Flow Data

Instead of or in conjunction with the Land Use Layer, The Service Area Layer can be used as a direct source for sanitary flow data. The same types of fields for population-based flows or miscellaneous flows which are found on the Land Use Layer can also be found on the Service Area Layer. You can use population-based or volume-based flow for each individual service area.

1. Digitize the service areas as closed polygons on a drawing layer and create a HYDRA DXA graphical input file. Display the Service Areas Layer in HYDRA and make it the active layer.
2. Connect all the service areas to entities on the collection system. First use Set Connects to Closest Link in the Connects menu. Then edit individual connects by dragging the connect lines, or by typing the collection system G_ID number into the SY_ID field.
3. Set the delay factors for the flows to enter into the collection system in the SY_DELAY field. You can set these automatically using **Set Delays** in the **Connects** menu.
4. Input the area of the service area. Use **Set SE_AREA From G_SIZE** to automatically input area based on the scale of the drawing.
5. Enter sanitary flow data. This might include population data, contribution per capita, and a diurnal curve. It might also include a total average daily flow volume and a diurnal curve.
6. Check the data entry on the layer with the **Check SE Data** in the **ServiceAreas** menu.

Using Parcels as a Source of Sanitary Flow Data

The parcel layer represents individual buildings or ownership lots. Each parcel can contain both population-based sanitary flows and volume flows. Each parcel is connected to a specific pipe or other entity on the Collection System layer.



Parcel Layer from Anytown sample project

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across the collection system according to how the parcels connect to the collection system. Generally, there will be several parcels for each pipe.

1. Digitize the parcel centroids as nodes on a drawing layer and create a HYDRA DXA graphical input file. Display the Parcel Layer in HYDRA and make it the active layer.
2. Connect all the parcels to entities on the collection system. First use **Set Connects to Closest Link**. Then edit individual connects by dragging the connect lines, or by typing the collection system G_ID number into the SY_ID field in the Parcel Entity Data Table.
3. Set the delay factors for the flows to enter into the collection system in the SY_DELAY field. You can set these automatically using the **Set Delays** command.
4. Input coordinate data for the parcel. You can input this automatically based on the drawing coordinates using the Update XCOOR/YCOOR command.
5. Enter the area of parcel into the PA_AREA field.
6. Check the data entry on the Parcel layer with **Check PA Data** in the **Parcels** menu.

Using Parcels and Land Use Areas for Separate Regions of the Project

In HYDRA, you can use the Parcels for one portion of the project area and Sanitary Service Areas for the other. Parcels are most useful for the highly developed portion of a city where land use varies greatly by parcel. For example, development of a single parcel, such as a proposed high-rise, may have a significant impact on the pipes immediately downstream of its injection point.

Land Use Areas combined with Service Areas are most useful for the outlying developing portion of the city which tend to have more homogenous land use patterns. In these outlying areas where it is often not known exactly where development will take place, Service Areas are more general.

Overlaying Flow Source Layers

In your project, you can use any combination of the various layers and methods for injecting flows into the collection system. Generally, it is better not to overlap the areas that different layers cover unless there is good reason. Overlapping makes data management more complicated. Also, whenever layers and methods are combined, care needs to be taken not to duplicate flows.

Overlaying Flows on the Service Area and Land Use Layers

Generally, when both the Service Area Layer and Land Use Layer are used in a project, sanitary flow input data is only put into the Land Use Layer. However, in certain cases, it may be useful to define the sanitary flow for some specific sanitary service areas.

If you elect to do this, the intersection process will utilize the values you have established for these sanitary service areas and subtract that contribution from the intersecting land use area. The remaining contributions in the land use polygons will then be redistributed through the sanitary service areas that have no contributing flow defined. For example in a land use area with a total population of 3,500 people, but most of them are located in a few of the intersected service areas in high rise apartments, you can account for a proper flow distribution by putting the apartment population on the Service Area layer. It also allows you to take into account specific industrial contributors and still use the very flexible intersecting routines.

Overlaying Flows on the Parcel and Land Use Layers

If you overlap the Parcel Layer and the Land Use Layer, you can still assign sanitary flow to individual entities within the same region of the project. The assigned flow in any parcel will be

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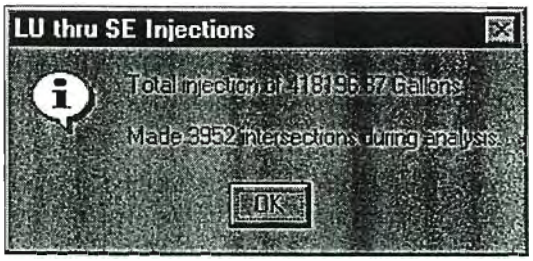
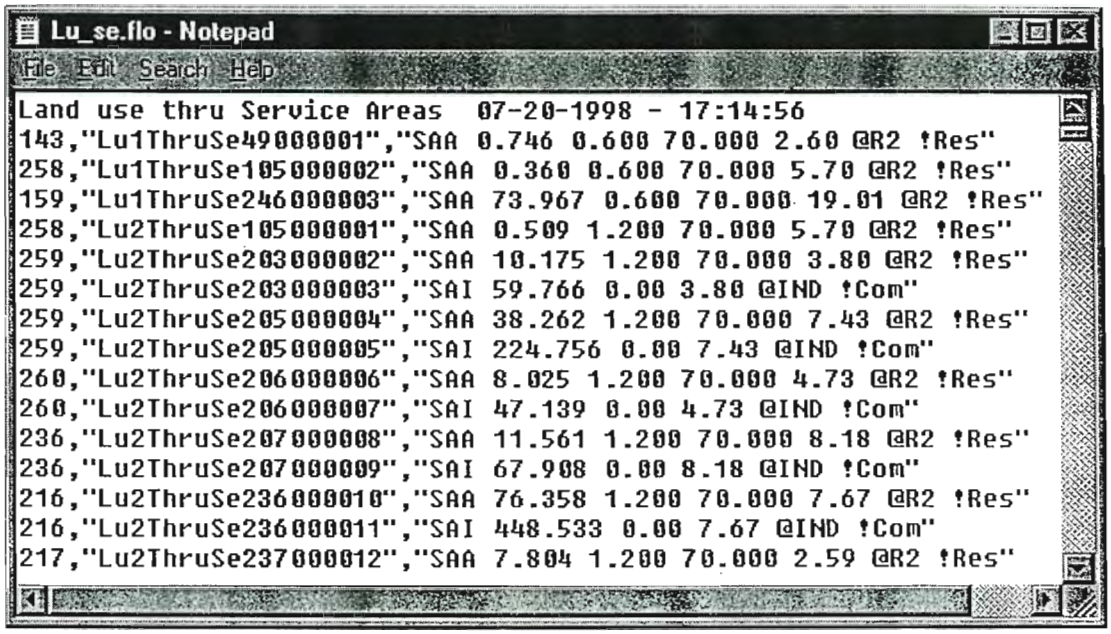


7. To view the sanitary flow file you just created, click on the View FLO File button at the bottom of the dialog box.



Sanitary Point Flow Injections

The Collection System Layer can contain sanitary flows which are directly injected into a particular point in the collection system, such as a pipe. These Point Flows can contain any combination, amount, or type of flow data or other hydraulic parameters. Each Point Flow can contain multiple sanitary flows, each with its own diurnal curve. This method may be used alone, or in combination with other sanitary flow layers. When used in combination with another sanitary flow layer, such as the Land Use Layer, point flows can quickly model possible future scenarios. For example, a proposed development by adding flows directly to one or more pipes without changing the existing land use data.

When to Use Point Flows

The Point Flow method is best used for these following conditions:

- To quickly add a specific flow to a specific pipe in an existing calibrated model when other options, such as adding the flow to a parcel or service area, are not available or desirable.
- To model specific complex contributions which do not conform to data structures of the flow generation layers.
- You only have a few very different flows to inject.

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Peaking Factor Method Analysis

Considerations for the Peaking Factor Method

The Peaking Factor Method is a traditional method that was used before the advent of computer modeling offered better alternatives. It is still used as a standard by many municipalities. It is simiple to use, but it can produce very distorted results.

Disadvantages of the Traditional Peaking Factor Method

The problem with the Peaking Factor Method is that reality is not that simple. Here are the problems:

- **Insensitive to service area characteristics.** If the upstream population is diverse, it is probable that the shape of the contributing sanitary hydrographs are different for different service areas. This is particularly true if you are servicing normal residential, multi-family and commercial areas.

  The Peaking Factor curve handles this problem by averaging all those different types of contributing sanitary hydrographs into one curve. Though this certainly simplifies the problem, it does not allow for a very accurate study of the characteristics of a given service area. For example, if an area changes from residential to commercial over time, the average daily flow can be identical, but the peak flow can be quite different. The Peaking Factor Method, will make the peaks identical. This method can cause errors approaching or even exceeding 50%.

- **No adjustment for system geometry.** Aside from variation in the contribution characteristics of different service areas, the other main variable in collection systems is the system geometry. This includes the effects of pipes, slopes, pumps, diversion structures and detention facilities. Differences in system geometry cause wide variation in system behavior. Accurately reflecting these geometric variations is complex, but very important to successfully modeling any collection system.

  The problem with the traditional peaking factor approach is that it simply lumps the geometry in with the averaging of service area characteristics. This makes it extremely difficult to accurately reflect the geometric complexity of a collection system. You must know the answer before you start, which is an impossibility in a complex system. While the Peaking Factor can be field measured for any particular pipe in an existing system, you can only guess what it will be for a proposed collection system.

- **Undermines Projections.** One of the most debilitating consequences of the traditional peaking factor method , is that it greatly hinders the ability of a model to make projections. When so many factors have been lumped together into one curve, it becomes virtually impossible to determine the outcome of changing just one of the factors. For example, if you were to modify the service area characteristics from single family to multiple family in order to evaluate the impact of future land use changes, the peaking factor approach would distort the results so badly that you could easily draw incorrect conclusions.

Why Peaking Factor is Still Used

The Peaking Factor Method is easy and traditional. Prior to the introduction of computers, it was the only practical approach to calculating sanitary flows because the only alternatives were time consuming hand techniques. The Peaking Factor Method appears to work because there are so many safety factors built into the process. Also, usually by the time an evaluation of the effectiveness of the results is made, so many factors have changed that checking the original design is very difficult.

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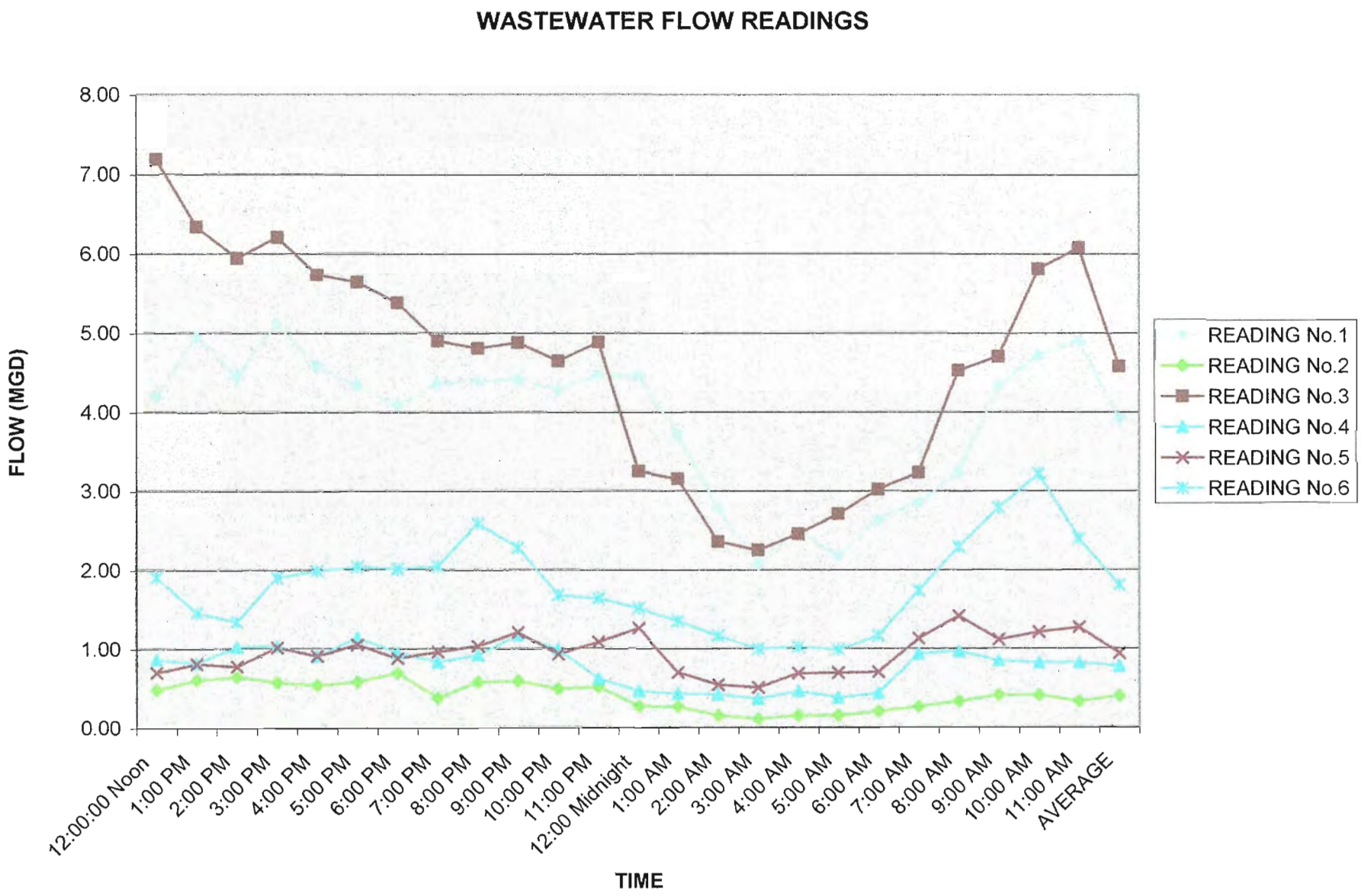
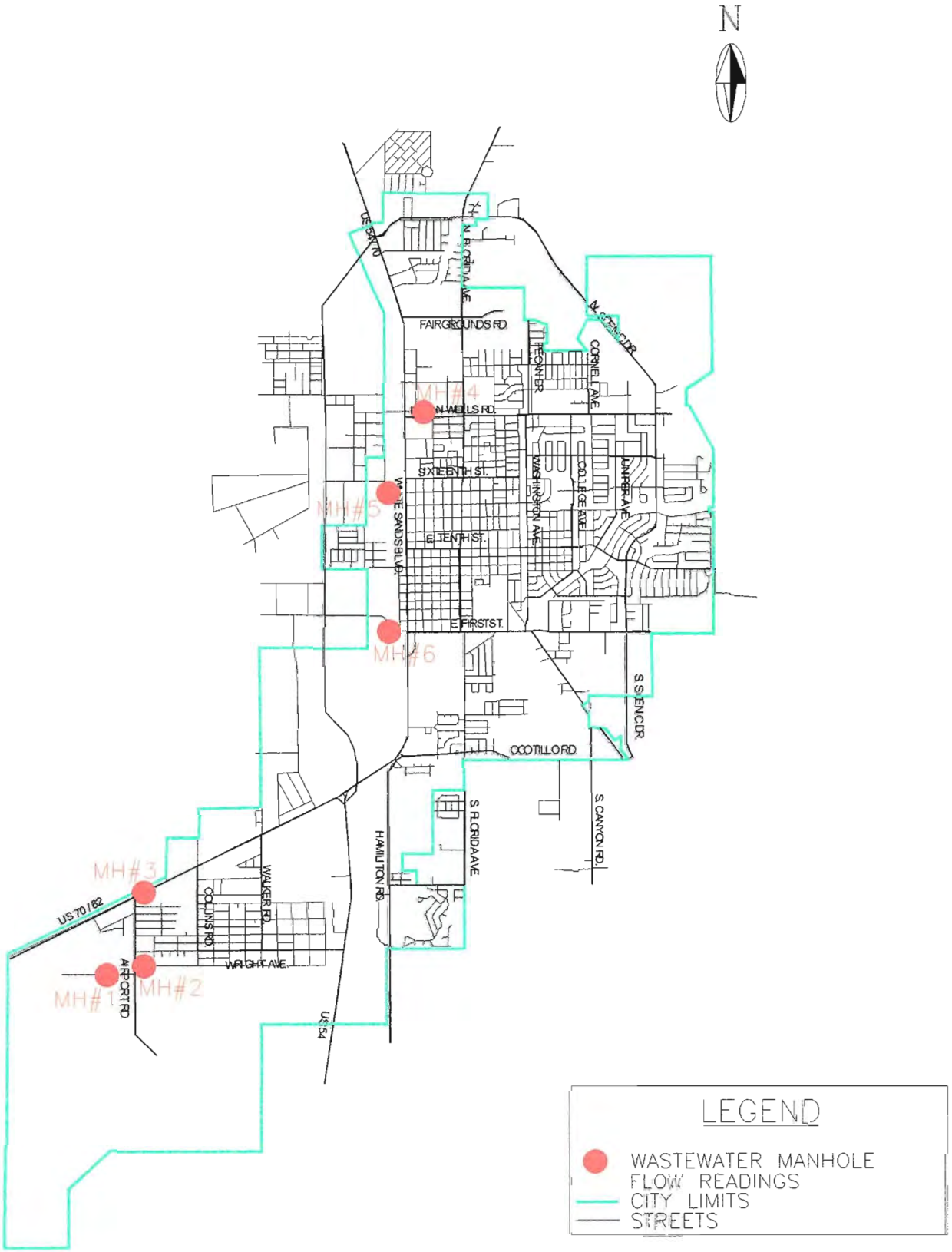
Appendix C


WASTEWATER FLOW READINGS
FLOW (MGD)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
12:00:00 Noon
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 Midnight
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
AVERAGE
TIME
READING No.1
READING No.2
READING No.3
READING No.4
READING No.5
READING No.6



WASTEWATER FLOW READINGS
CITY OF ALAMOGORDO

MOLZEN-CORBIN & Associates

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Alamogordo Wastewater Master Plan
Field Flow Measurements
Manhole No. 1

	Velocity	Depth	Diameter	Slope	Flow (MGD)
12:00:00 Noon	4.83	0.79	36"	0.0035	4.19
1:00 PM	5.7	0.79	36"	0.0035	4.94
2:00 PM	5.12	0.79	36"	0.0035	4.44
3:00 PM	5.13	0.88	36"	0.0035	**5.12**
4:00 PM	5.27	0.79	36"	0.0035	4.57
5:00 PM	5.38	0.75	36"	0.0035	4.32
6:00 PM	5.28	0.73	36"	0.0035	4.08
7:00 PM	5.41	0.75	36"	0.0035	4.35
8:00 PM	5.45	0.75	36"	0.0035	4.38
9:00 PM	5.48	0.75	36"	0.0035	4.41
10:00 PM	5.32	0.75	36"	0.0035	4.28
11:00 PM	5.55	0.75	36"	0.0035	4.46
12:00 Midnight	5.33	0.77	36"	0.0035	4.45
1:00 AM	5.01	0.71	36"	0.0035	3.71
2:00 AM	4.69	0.60	36"	0.0035	2.77
3:00 AM	4.59	0.50	36"	0.0035	2.07
4:00 AM	5.24	0.52	36"	0.0035	2.50
5:00 AM	4.54	0.52	36"	0.0035	2.17
6:00 AM	4.69	0.58	36"	0.0035	2.64
7:00 AM	4.82	0.60	36"	0.0035	2.85
8:00 AM	5.2	0.63	36"	0.0035	3.23
9:00 AM	5.4	0.75	36"	0.0035	4.34
10:00 AM	5.88	0.75	36"	0.0035	4.73
11:00 AM	5.88	0.77	36"	0.0035	4.91
AVERAGE					3.91

Data Taken by David Ornelas and John Wood
on Tuesday January 28, 2004 and Wednesday January 29, 2004

Alamogordo Wastewater Master Plam
Flow Field Measurements
Manhole No. 2

	Velocity	Depth	Diameter	Slope	Flow (MGD)
12:00:00 Noon	3.47	0.250	21"	0.005	0.47
1:00 PM	4.34	0.250	21"	0.005	0.59
2:00 PM	4.67	0.250	21"	0.005	0.64
3:00 PM	2.76	0.333	21"	0.005	0.57
4:00 PM	3.91	0.250	21"	0.005	0.53
5:00 PM	4.19	0.250	21"	0.005	0.57
6:00 PM	4.03	0.292	21"	0.005	**0.69**
7:00 PM	3.58	0.208	21"	0.005	0.37
8:00 PM	4.15	0.250	21"	0.005	0.57
9:00 PM	4.27	0.250	21"	0.005	0.58
10:00 PM	3.55	0.250	21"	0.005	0.48
11:00 PM	3.71	0.250	21"	0.005	0.51
12:00 Midnight	2.5	0.208	21"	0.005	0.26
1:00 AM	2.5	0.208	21"	0.005	0.26
2:00 AM	2	0.167	21"	0.005	0.15
3:00 AM	1.75	0.146	21"	0.005	0.11
4:00 AM	2	0.167	21"	0.005	0.15
5:00 AM	2	0.167	21"	0.005	0.15
6:00 AM	2.25	0.188	21"	0.005	0.20
7:00 AM	2.5	0.208	21"	0.005	0.26
8:00 AM	2.75	0.229	21"	0.005	0.33
9:00 AM	3	0.250	21"	0.005	0.41
10:00 AM	3	0.250	21"	0.005	0.41
11:00 AM	2.75	0.229	21"	0.005	0.33
AVERAGE					0.40

Data Taken by David Ornelas and John Wood
on Tuesday January 28, 2004 and Wednesday January 29, 2004

Alamogordo Wastewater Master Plan
Field Flow Measurements
Manhole No. 3

	Velocity	Depth	Diameter	Slope	Flow (MGD)
12:00:00 Noon	6.06	1.000	30"	0.0054	**6.46**
1:00 PM	6.01	0.917	30"	0.0054	5.70
2:00 PM	6.42	0.833	30"	0.0054	5.35
3:00 PM	6.27	0.875	30"	0.0054	5.58
4:00 PM	6.19	0.833	30"	0.0054	5.16
5:00 PM	6.09	0.833	30"	0.0054	5.07
6:00 PM	6.23	0.792	30"	0.0054	4.84
7:00 PM	6.11	0.750	30"	0.0054	4.40
8:00 PM	6.23	0.729	30"	0.0054	4.32
9:00 PM	6.08	0.750	30"	0.0054	4.38
10:00 PM	6.27	0.708	30"	0.0054	4.17
11:00 PM	6.09	0.750	30"	0.0054	4.39
12:00 Midnight	5.23	0.625	30"	0.0054	2.92
1:00 AM	5.33	0.604	30"	0.0054	2.84
2:00 AM	5.22	0.500	30"	0.0054	2.12
3:00 AM	4.98	0.500	30"	0.0054	2.02
4:00 AM	5.13	0.521	30"	0.0054	2.21
5:00 AM	5.35	0.542	30"	0.0054	2.44
6:00 AM	5.36	0.583	30"	0.0054	2.71
7:00 AM	5.47	0.604	30"	0.0054	2.91
8:00 AM	5.89	0.729	30"	0.0054	4.08
9:00 AM	5.88	0.750	30"	0.0054	4.24
10:00 AM	6.28	0.833	30"	0.0054	5.23
11:00 AM	6.35	0.854	30"	0.0054	5.47
AVERAGE					4.13

Data Taken by David Ornelas and John Wood
on Tuesday January 28, 2004 and Wednesday January 29, 2004

Alamogordo Wastewater Master Plan
Field Flow Measurements
Manhole No. 4

	Velocity	Depth	Diameter	Slope	Flow (MGD)
12:00:00 Noon	1.5	0.750	18"	0.0061	0.86
1:00 PM	1.42	0.917	18"	0.0061	0.81
2:00 PM	1.39	0.917	18"	0.0061	1.02
3:00 PM	1.41	0.917	18"	0.0061	1.03
4:00 PM	1.23	0.917	18"	0.0061	0.90
5:00 PM	1.56	0.917	18"	0.0061	1.14
6:00 PM	1.29	0.917	18"	0.0061	0.94
7:00 PM	1.13	1.000	18"	0.0061	0.83
8:00 PM	1.13	1.000	18"	0.0061	0.91
9:00 PM	1.44	1.000	18"	0.0061	**1.16**
10:00 PM	1.22	0.917	18"	0.0061	0.99
11:00 PM	0.84	0.667	18"	0.0061	0.61
12:00 Midnight	0.93	0.667	18"	0.0061	0.46
1:00 AM	0.87	0.646	18"	0.0061	0.43
2:00 AM	0.89	0.583	18"	0.0061	0.42
3:00 AM	0.88	0.667	18"	0.0061	0.36
4:00 AM	0.94	0.583	18"	0.0061	0.46
5:00 AM	0.92	0.667	18"	0.0061	0.38
6:00 AM	0.88	0.708	18"	0.0061	0.43
7:00 AM	1.76	0.833	18"	0.0061	0.93
8:00 AM	1.48	0.792	18"	0.0061	0.96
9:00 AM	1.38	0.792	18"	0.0061	0.84
10:00 AM	1.34	0.792	18"	0.0061	0.82
11:00 AM	1.34	0.833	18"	0.0061	0.82
AVERAGE					0.77

Data Taken by David Ornelas and John Wood
on Tuesday January 28, 2004 and Wednesday January 29, 2004

Alamogordo Wastewater Master Plan
Field Flow Measurements
Manhole No. 5

	Velocity	Depth	Diameter	Radius	Slope	Flow (MGD)
12:00:00 Noon	1.69	0.542	21"	0.875	0.0048	0.69
1:00 PM	1.95	0.542	21"	0.875	0.0048	0.80
2:00 PM	2.1	0.500	21"	0.875	0.0048	0.77
3:00 PM	2.23	0.583	21"	0.875	0.0048	1.01
4:00 PM	2.09	0.563	21"	0.875	0.0048	0.90
5:00 PM	2.31	0.583	21"	0.875	0.0048	1.05
6:00 PM	2.02	0.563	21"	0.875	0.0048	0.87
7:00 PM	2.1	0.583	21"	0.875	0.0048	0.95
8:00 PM	1.89	0.667	21"	0.875	0.0048	1.03
9:00 PM	2.21	0.667	21"	0.875	0.0048	1.20
10:00 PM	2.04	0.583	21"	0.875	0.0048	0.93
11:00 PM	2.38	0.583	21"	0.875	0.0048	1.08
12:00 Midnight	2.3	0.667	21"	0.875	0.0048	1.25
1:00 AM	1.79	0.521	21"	0.875	0.0048	0.69
2:00 AM	1.67	0.458	21"	0.875	0.0048	0.54
3:00 AM	1.78	0.417	21"	0.875	0.0048	0.50
4:00 AM	1.87	0.500	21"	0.875	0.0048	0.69
5:00 AM	1.88	0.500	21"	0.875	0.0048	0.69
6:00 AM	1.91	0.500	21"	0.875	0.0048	0.70
7:00 AM	2.27	0.625	21"	0.875	0.0048	1.13
8:00 AM	2.22	0.750	21"	0.875	0.0048	**1.41**
9:00 AM	1.89	0.708	21"	0.875	0.0048	1.11
10:00 AM	2.22	0.667	21"	0.875	0.0048	1.21
11:00 AM	1.99	0.750	21"	0.875	0.0048	1.27
AVERAGE						0.94

Data Taken by David Ornelas and John Wood
on Tuesday January 28, 2004 and Wednesday January 29, 2004

Alamogordo Wastewater Master Plan
Field Flow Measurements
Manhole No. 6

	Velocity	Depth	Diameter	Slope	Flow (MGD)
12:00:00 Noon	4.27	0.5417	24"	0.007	1.90
1:00 PM	3.65	0.5000	24"	0.007	1.45
2:00 PM	3.8	0.4583	24"	0.007	1.33
3:00 PM	3.85	0.5833	24"	0.007	1.90
4:00 PM	4.02	0.5833	24"	0.007	1.98
5:00 PM	4.12	0.5833	24"	0.007	2.03
6:00 PM	4.07	0.5833	24"	0.007	2.01
7:00 PM	4.14	0.5833	24"	0.007	2.04
8:00 PM	4.35	0.6667	24"	0.007	2.58
9:00 PM	4.2	0.6250	24"	0.007	2.28
10:00 PM	4.21	0.5000	24"	0.007	1.67
11:00 PM	4.11	0.5000	24"	0.007	1.63
12:00 Midnight	3.79	0.5000	24"	0.007	1.50
1:00 AM	3.4	0.5000	24"	0.007	1.35
2:00 AM	3.3	0.4583	24"	0.007	1.16
3:00 AM	3.24	0.4167	24"	0.007	0.99
4:00 AM	3.33	0.4167	24"	0.007	1.02
5:00 AM	3.22	0.4167	24"	0.007	0.99
6:00 AM	3.3	0.4583	24"	0.007	1.16
7:00 AM	3.91	0.5417	24"	0.007	1.74
8:00 AM	4.22	0.6250	24"	0.007	2.29
9:00 AM	4.33	0.7083	24"	0.007	2.79
10:00 AM	4.45	0.7708	24"	0.007	**3.21**
11:00 AM	4.22	0.6458	24"	0.007	2.39
AVERAGE					1.81

Data Taken by David Ornelas and John Wood
on Tuesday January 28, 2004 and Wednesday January 29, 2004

Appendix D

Tag	Interceptor Name	Entity Type Name	Entity Length	Ground Elev Up	Ground Elev Down	Invert Up	Invert Elev Down	Material Type	Size (in)	Sanitary Area (Acres)	Sanitary Peak Q (cfs)	Peak Factor (Diurnal)	Design Q (cfs)	Design Velocity (ft/sec)	Average Flow (cfs)	Water Surf Elev Down	Time In Entity	HGL up	HGL down	HGL Break Distance	HGL Break Elevation	Mannings N	Slope	Q Full (cfs)	Q Max Allowed (cfs)	Excess Capacity (cfs)	Depth (inches)	D over D
1	LINE-164	EPI	1999.1571	4406	4380	4398	4372	PVC	12	215.358	0.1445	1.5172	0.1445	1.7823	0.0953	4372.16	18.6941	4398.16	4372.245	1992.658	4372.245	0.013	0.01301	4.074	4.0699	3.9254	1.92	0.16
4	LINE-164	EPI	2333.5891	4380	4362.5	4372	4354.5	PVC	12	477.416	0.3866	1.5146	0.3866	2.1482	0.2482	4354.78	18.1048	4372.28	4355.033	2299.88	4355.033	0.013	0.0075	3.0936	3.0905	2.7038	3.36	0.28
6	LINE-162	EPI	2572.5071	4362.5	4350	4354.5	4342	OLDCONC	21	1606.905	1.356	1.3211	1.356	2.1494	1.0267	4342.54	19.9471	4355.04	4342.54	2572.507	4342.54	0.019	0.00486	7.5775	7.5699	6.2135	6.48	0.3086
8	LINE-158	EPI	505.6679	4350	4346	4342	4338	PVC	21	1777.763	1.5282	1.3484	1.5282	3.0306	1.1115	4338.46	2.7809	4342.46	4338.521	497.992	4338.521	0.013	0.00791	14.1305	14.1164	12.5871	5.52	0.2629
10	LINE-158	EPI	1172.22	4346	4340	4338	4334	PVC	21	1777.763	1.5197	1.3543	1.5197	2.5396	1.1051	4334.52	7.693	4338.52	4334.566	1158.598	4334.566	0.013	0.00341	9.2808	9.2715	7.7506	6.24	0.2971
12	LINE-158	EPI	257.0635	4340	4341	4334	4333	PVC	21	1777.763	1.5184	1.3725	1.5184	2.6798	1.0895	4333.5	1.5987	4334.5	4333.582	236.017	4333.582	0.013	0.00389	9.9092	9.8993	8.3797	6	0.2857
14	LINE-158	EPI	988.6194	4341	4335.8	4333	4327.8	PVC	21	2166.502	1.9583	1.3609	1.9583	3.2716	1.4398	4328.32	5.0364	4333.52	4328.32	988.619	4328.32	0.013	0.00526	11.5225	11.511	9.5517	6.24	0.2971
16	LINE-158	EPI	1325.8733	4335.8	4327.7	4327.8	4319.7	PVC	21	2166.502	1.947	1.3656	1.947	3.2524	1.4264	4320.22	6.7942	4328.32	4320.383	1299.216	4320.383	0.013	0.00611	12.418	12.4056	10.4578	6.24	0.2971
18	LINE-158	EPI	1237.074	4327.7	4320	4319.7	4315.9	PVC	21	2478.648	2.8024	1.4579	2.8024	3.122	1.924	4316.6	6.604	4320.4	4316.87	1149.049	4316.87	0.013	0.00307	8.8055	8.7967	5.9918	8.4	0.4
20	LINE-158	EPI	269.353	4320	4320	4315.9	4315.5	PVC	21	2478.648	2.7788	1.4605	2.7788	2.4357	1.9035	4316.34	1.8431	4316.74	4316.355	259.467	4316.355	0.013	0.00149	6.1225	6.1164	3.3362	10.08	0.48
22	LINE-158	EPI	1577.327	4320	4322	4315.5	4312	PVC	21	2478.648	2.7742	1.463	2.7742	2.7704	1.8974	4312.76	9.4891	4316.26	4312.773	1571.316	4312.773	0.013	0.00222	7.484	7.4765	4.7006	9.12	0.4343
24	LINE-156	EPI	97.6027	4322	4320	4312	4311	CLAY	24	3901.826	4.0196	1.5236	4.0196	4.6396	2.6391	4311.64	0.3506	4312.64	4311.924	69.885	4311.924	0.015	0.01025	19.8988	19.8789	15.8579	7.68	0.32
26	LINE-156	EPI	646.677	4320	4317	4311	4309	CLAY	24	3901.826	4.0171	1.5238	4.0171	3.111	2.6371	4309.86	3.4645	4311.86	4309.906	631.71	4309.906	0.015	0.00309	10.9328	10.9218	6.9033	10.32	0.43
28	LINE-152	EPI	2376.134	4317	4297.5	4309	4289.5	CLAY	24	3901.826	4.0078	1.5308	4.0078	4.257	2.6193	4290.18	9.3029	4309.68	4290.26	2366.386	4290.26	0.015	0.00821	17.809	17.7912	13.7816	8.16	0.34
30	LINE-152	EPI	1962.9499	4297.5	4288.3	4289.5	4280.3	CLAY	24	3901.826	3.9967	1.5543	3.9967	3.6508	2.573	4281.06	8.9613	4290.26	4281.226	1927.59	4281.226	0.015	0.00469	13.4585	13.4451	9.4458	9.12	0.38
32	LINE-154	EPI	1531.7854	4288.3	4282	4280.3	4274	CLAY	27	4285.826	4.0382	1.5748	4.0382	3.3015	2.5663	4274.78	7.7328	4281.08	4274.794	1528.393	4274.794	0.015	0.00411	17.2598	17.2426	13.2011	9.36	0.3467
34	LINE-154	EPI	3688.2051	4282	4267.8	4274	4259.8	CLAY	27	4566.815	4.064	1.5948	4.064	3.325	2.5522	4260.58	18.487	4274.78	4260.618	3678.27	4260.618	0.015	0.00385	16.6994	16.6827	12.6124	9.36	0.3467
36	LINE-154	EPI	170.505	4267.8	4264	4259.8	4256	CLAY	27	4566.815	4.0543	1.6495	4.0543	5.2499	2.4586	4256.56	0.5413	4260.36	4256.66	165.996	4256.66	0.015	0.02229	40.178	40.1378	36.0825	6.72	0.2489
38	LINE-154	EPI	672.2902	4264	4258.5	4256	4250.5	CLAY	27	4566.815	4.0522	1.6497	4.0522	3.999	2.4569	4251.18	2.8019	4256.68	4251.18	672.29	4251.18	0.015	0.00818	24.3427	24.3183	20.2651	8.16	0.3022
40	LINE-154	EPI	2125.4639	4258.5	4250	4250.05	4242	CLAY	27	4799.771	4.1046	1.6529	4.1046	3.2414	2.4848	4242.8	10.9289	4250.85	4242.8	2125.464	4242.8	0.015	0.00379	16.5629	16.5463	12.4392	9.6	0.3556
42	LINE-118	EPI	458.419	4324	4315	4314	4307	PVC	27	1259.506	1.043	1.5319	1.043	3.0148	0.6813	4307.32	2.5343	4314.32	4307.354	456.193	4307.354	0.013	0.01527	38.3734	38.3351	37.2914	3.84	0.1422
45	LINE-118	EPI	452.3626	4315	4310	4307	4302	PVC	27	1259.506	1.0379	1.532	1.0379	2.748	0.678	4302.34	2.7436	4307.34	4302.424	444.762	4302.424	0.013	0.01105	32.6478	32.6152	31.5764	4.08	0.1511
47	LINE-118	EPI	1200.4721	4310	4306	4302	4298	PVC	27	1259.506	1.0323	1.5302	1.0323	2.0132	0.6747	4298.42	9.9382	4302.42	4298.452	1190.976	4298.452	0.013	0.00333	17.9253	17.9074	16.875	5.04	0.1867
49	LINE-118	EPI	1881.8033	4306	4298	4298	4290	PVC	27	1259.506	1.0318	1.557	1.0318	2.1593	0.663	4290.4	14.5247	4298.4	4290.423	1876.498	4290.423	0.013	0.00425	20.2475	20.2272	19.1949	4.8	0.1778
51	LINE-116	EPI	1898.5645	4298	4277	4290	4269	PVC	24	1259.506	1.1305	1.5233	1.1305	3.1936	0.7425	4269.34	9.9083	4290.34	4269.349	1897.763	4269.349	0.013	0.01106	23.8563	23.8324	22.7015	4.08	0.17
53	LINE-116	EPI	1253.1974	4277	4266	4269	4258	PVC	24	1259.506	1.1267	1.5481	1.1267	2.9319	0.7283	4258.36	7.1238	4269.36	4258.36	1253.197	4258.36	0.013	0.00878	21.2517	21.2304	20.103	4.32	0.18
55	LINE-116	EPI	1735.6233	4266	4250	4258	4242	PVC	24	1259.506	1.1258	1.568	1.1258	2.9294	0.7184	4242.36	9.8749	4258.36	4242.762	1692.066	4242.762	0.013	0.00922	21.779	21.7572	20.6308	4.32	0.18
56	LINE-114	EPI	3385.6421	4250	4219.7	4242	4211.7	PVC	30	6059.277	5.2172	1.6662	5.2172	4.6382	3.1321	4212.4	12.1657	4242.7	4212.42	3383.407	4212.42	0.013	0.00895	38.9075	38.8686	33.65	8.4	0.28
58	LINE-114	EPI	3385.6426	4219.7	4196	4211.7	4188	PVC	30	6059.277	5.2015	1.7032	5.2015	4.4477	3.0559	4188.72	12.687	4212.42	4188.819	3371.559	4188.819	0.013	0.007	34.4101	34.3757	29.171	8.64	0.288
60	LINE-116	EPI	2906.7319	4196	4180	4188	4172	PVC	36	6059.277	5.1923	1.7437	5.1923	3.6894	2.9791	4172.76	13.1308	4188.76	4172.856	2889.272	4172.856	0.013	0.0055	49.6181	49.5685	44.3739	9.12	0.2533
62	LINE-102	EPI	2672.99	4180	4165.2	4172	4157.2	PVC	36	8047.57	5.8292	1.7276	5.8292	3.8531	3.3749	4158	11.5621	4172.8	4158.272	2623.777	4158.272	0.013	0.00554	49.764	49.7142	43.8836	9.6	0.2667
64	LINE-100	EPI	3147.29	4165.2	4153.6	4157.2	4145.6	PVC	36	8047.57	5.8164	1.7656	5.8164	3.5902	3.2945	4146.44	14.6106	4158.04	4146.743	3064.993	4146.743	0.013	0.00369	40.6016	40.561	34.7443	10.08	0.28
66	LINE-100	EPI	397.779	4153.6	4152	4145.6	4145	PVC	36	8047.57	5.816	1.8218	5.816	2.82	3.1927	4146	2.3509	4146.6	4146	397.779	4146	0.013	0.00151	25.9739	25.9479	20.1316	12	0.3333
76	LINE-160	EPI	3398.4202	4375.3	4350	4367.3	4342	PVC	10	170.858	0.1954	1.5193	0.1954	1.699	0.1288	4342.22	33.3377	4367.52	4342.417	3371.991	4342.417	0.013	0.00744	1.8955	1.8936	1.698	2.64	0.264
81	LINE-146	EPI	1271.7207	4496.5	4474.5	4488.5	4466.5	PVC	10	58.11	0.0544	1.5596	0.0544	1.4673	0.0349	4466.6	14.445	4488.6	4466.6	1271.721	4466.6	0.013	0.0173	2.8895	2.8866	2.8322	1.2	0.12
84	LINE-146	EPI	1171.6327	4474.5	4450	4466.5	4442	PVC	10	141.715	0.1427	1.7282	0.1427	2.3689	0.0828	4442.14	8.2431	4466.64	4442.14	1171.633	4442.14	0.013	0.02091	3.1769	3.1737	3.0305	1.68	0.168
86	LINE-146	EPI	1720.4695	4450	4410	4442	4402	PVC	12	141.715	0.1421	1.7414	0.1421	2.127	0.0816	4402.14	13.4809	4442.14	4402.198	1717.971	4402.198	0.013	0.02325	5.4471	5.4417	5.2995	1.68	0.14
88	LINE-146	EPI	62.6679	4410	4410	4402	4401	PVC	10	141.715	0.1413	1.7821	0.1413	1.9338	0.0795	4401.16	0.5401	4402.16	4401.209	59.59	4401.209	0.013	0.01596	2.7752	2.7724	2.6307	1.92	0.192
90	LINE-140	EPI	148.1975	4410	4407.5	4401	4399.5	PVC	10	265.423	0.2031	1.7256	0.2031	2.0191	0.1178	4399.7	1.2233	4401.2	4399.711	147.087	4399.711	0.013	0.01012	2.2102	2.208	2.0048	2.4	0.24
92	LINE-140	EPI	100.361	4407.5	4405	4399.5	4397	PVC	10	265.423	0.2029	1.7286	0.2029	2.7719	0.1175	4397.16	0.6034	4399.66	4397.27	95.937	4397.27	0.013	0.02491	3.4673	3.4639	3.2608	1.92	0.192
94	LINE-140	EPI	476.279	4405	4396	4397	4388	PVC	10	265.423	0.2027	1.7301	0.2027	2.3397	0.1172	4388.18	3.3927	4397.18	4388.26	472.044	4388.26	0.013	0.0189	3.02	3.0169	2.8141	2.16	0.216
96	LINE-140	EPI	735.5347	4396	4388.5	4388	4382.1	PVC	10	265.423	0.2017	1.736	0.2017	1.7539	0.1163	4382.32	6.9896	4388.22	4382.473	716.483	4382.473	0.013	0.00802	1.9676	1.9656	1.7637	2.64	0.264
98	LINE-144	EPI	1140.2776	4488	4484	4480	4476	PVC	12	123.708	0.0662	1.5617	0.0662	0.8161	0.0424	4476.16	23.286	4480.16	4476.16	1140.278	4476.16	0.013	0.00351	2.1158	2.1137	2.0475	1.92	0.16
101	LINE-142	EPI	2906.0049	4484	4410	4476	4402	PVC	12	123.708	0.0661	1.6217	0.0661	1.6194	0.0408	4402.1	29.9079	4476.1	4402.1	2906.005	4402.1	0.013	0.02546	5.7007	5.695	5.6288	1.2	0.1
102	LINE-136	EPI	425.3508	4510	4508.5	4502	4500.5	PVC	10	151.365	0.0493	1.8517	0.0493	0.8154	0.0266	4500.64	8.6937	4502.14	4500.64	425.351	4500.64	0.013	0.00353	1.3046	1.3033	1.254	1.68	0.168
105	LINE-136	EPI	238.3268	4508.5	4507.5	4500.5	4499.5	PVC	10	151.365	0.0493	1.8794	0.0493	0.8154	0.0262	4499.64	4.8711	4500.64	4499.64	238.327	4499.64	0.013	0.0042	1.4231	1.4216	1.3723	1.68	0.168
107	LINE-136	EPI	1108.924	4507.5	4502	4499.5	4494	PVC	10	151.365	0.0492	1.8974	0.0492	0.8153	0.026	4494.14	22.6698	4499.64	4494.14	1108.924	4494.14	0.013	0.00496	1.5472	1.5456	1.4964	1.68	0.168
109	LINE-134	EPI	257.1855	4502	4494.3	4494	4486.3	PVC	12	151.365	0.0492	1.9843	0.0492	1.6723	0.0248	4486.38	2.5631	4494.08	4486.46	254.513	4486.46	0.013	0.02994	6.1813	6.1751	6.1259	0.96	0.08
111	LINE-134	EPI	1120.0277	4494.3	4457	4486.3	4449	PVC	12	340.147	0.2344	1.7403	0.2344	2.8933	0.1349	4449.16	6.4518	4486.46	4449.163	1119.95	4449.163	0.013	0.0333	6.5193	6.5128	6.2781	1.92	0.16
113	LINE-134	EPI	832.46	4457	4432	4449	4424	PVC	12	340.147	0.2335	1.7483	0.2335	2.8802	0.1336	4424.16	4.8172	4449.16	4424.16	832.455	4424.16	0.013	0.03003	6.1908	6.1846	5.951	1.92	0.16
115	LINE-134	EPI	1218.313	4432	4410	4424	4402	PVC	12	340.147	0.2322	1.7503	0.2322	2.4161	0.1327	4402.18	8.4042	4424.18	4402.237	1215.135	4402.237	0.013	0.01806	4.8006	4.7958	4.5635	2.16	0.18
117	LINE-134	EPI	286.5845	4410	4396	4402	4388	PVC	12	340.147	0.2321	1.7724	0.2321	2.8627	0.131	4388.16	1.6685	4402.16	4388.237	284.998	4388.237	0.013	0.04885	7.8958	7.8879	7.6557	1.92	0.16
119	LINE-134	EPI	694.6737	4396	4391.5	4388	4383.5	PVC	12	340.147	0.2318	1.7754	0.2318	1.8102	0.1306	4383.72	6.3961	4388.22	4383.758	688.801	4383.758	0.013	0.00648	2.8752	2.8724	2.6405	2.64	0.22
121	LINE-134	EPI	518.373	4391.5	4387	4383.5	4379	PVC	12	340.147	0.2305	1.786	0.2305	2.0616	0.1291	4379.2	4.1908	4383.7	4379.389	496.552	4379.389	0.013	0.00868	3.3285	3.3251	3.0946	2.4	0.2
122	LINE-130	EPI	1313.5861	4387	4370.5	4379	4362.5	PVC	12	1194.206	0.7485	1.5628	0.7485	3.4554	0.4791	4362.82	6.3359	4379.32	4362.82	1313.586	4362.82	0.013	0.01256	4.0038	3.9998	3.2511	3.84	0.32
124	LINE-130	EPI	1348.517	4370.5	4354.3	4362.5	4346.3	PVC	12	1194.206	0.7472	1.579	0.7472	3.449	0.4732	4346.62	6.5165	4362.82	4346.969	1319.494	4346.969	0.013	0.01201	3.9155	3.9116	3.1643	3.84	0.32
126	LINE-128	EPI	195.4575	4354.3	4351.9	4346.3	4343.9	PVC	12	1423.178	1.2879	1.6401	1.2879	4.3946	0.7861	4344.3	0.7413	4346.7	4344.605	170.591	4344.605	0.013	0.01228	3.9586	3.9546	2.6654	4.8	0.4
128	LINE-128	EPI	1449.507	4351.9	4335	4343.9	4327	PVC	12	1423.178	1.2854	1.6384	1.2854	4.1099	0.7853	4327.42	5.8781	4344.32	4327.42	1449.507	4327.42	0.013	0.01166	3.8574	3.8535	2.5669	5.04	0.42
130	LINE-128	EPI	1080.3249	4335	4322	4327	4312	PVC	12	1423.178	1.2764	1.6424	1.2764	4.3535	0.7777	4312.4	4.1358	4327.4	4312.773	1053.437	4312.773	0.013	0.01388	4.2095	4.2053	2.9281	4.8	0.4
131	LINE-148	EPI	616.84	4394.8	4383	4386.8	4375	PVC	24	154.152	0.2247	1.6784	0.2247	1.9081	0.1339	4375.16	5.3878	4386.96	4375.216	613.893	4375.216	0.013	0.01913	31.3733	31.342	31.1173	1.92	0.08
134	LINE-148	EPI	289.4022	4383	4381.5	4375	4373.5	PVC	24	154.152	0.2246	1.6925	0.2246	1.1949	0.1327	4373.72	4.0367	4375.22	4373.72	289.402	4373.72	0.013	0.00518	16.3306	16.3142	16.0896	2.64	0.11
136	LINE-148	EPI	584.884	4381.5	4373.1	4373.5	4366.5	PVC	24	154.152	0.2241	1.6992	0.2241	1.6009	0.1319	4366.68	6.0892	4373.68	4366.782	576.346	4366.782	0.013	0.01197	24.8153	24.7905	24.5663	2.16	0.09
138	LINE-148	EPI	328.541	4373.1	4374.1	4366.5	4366.1	PVC	24	154.152	0.2231	1.7079	0.2231	0.8356	0.1308	4366.38	6.5529	4366.78	4366.38	328.541	4366.38	0.013	0.00122	7.9148	7.9069	7.6835	3.36	0.14
140	LINE-148	EPI	655.0203	4374.1	4376	4366.1	4364	PVC	24	154.152	0.2227	1.7251	0.2227	1.0441	0.1292	4364.24	10.4562	4366.34	4364.24	655.02	4364.24	0.013	0.00321	12.8436	12.8308	12.6079	2.88	0.12
142	LINE-148	EPI	779.0077	4376	4367.8	4364	4359.8	PVC	24	154.152	0.221	1.7433	0.221	1.1758	0.1268	4360.02	11.0426	4364.22	4360.02	779.008	4360.02	0.013	0.00539	16.6556	16.6389	16.4179	2.64	0.11

Tag	Interceptor Name	Entity Type Name	Entity Length	Ground Elev Up	Ground Elev Down	Invert Up	Invert Elev Down	Material Type	Size (in)	Sanitary Area (Acres)	Sanitary Peak Q (cfs)	Peak Factor (Diurnal)	Design Q (cfs)	Design Velocity (ft/sec)	Average Flow (cfs)	Water Surf Elev Down	Time In Entity	HGL up	HGL down	HGL Break Distance	HGL Break Elevation	Mannings N	Slope	Q Full (cfs)	Q Max Allowed (cfs)	Excess Capacity (cfs)	Depth (inches)	D over D
144	LINE-126	EPI	1330.0581	4367.8	4351.2	4359.8	4343.2	PVC	24	154.152	0.2204	1.7757	0.2204	1.5749	0.1242	4343.38	14.0759	4359.98	4343.397	1328.734	4343.397	0.013	0.01248	25.3411	25.3157	25.0952	2.16	0.09
146	LINE-126	EPI	744.5897	4351.2	4340	4343.2	4332	PVC	24	154.152	0.2195	1.8215	0.2195	1.8655	0.1206	4332.16	6.6522	4343.36	4332.345	732.276	4332.345	0.013	0.01504	27.82	27.7921	27.5725	1.92	0.08
148	LINE-126	EPI	1566.696	4340	4326	4332	4318	PVC	24	768.362	0.713	1.6717	0.713	2.1996	0.4269	4318.32	11.871	4332.32	4318.372	1560.837	4318.372	0.013	0.00894	21.4426	21.4212	20.7075	3.84	0.16
150	LINE-126	EPI	470.564	4326	4324	4318	4316	PVC	24	768.362	0.7094	1.6936	0.7094	1.8455	0.419	4316.36	4.2497	4318.36	4316.689	393.04	4316.689	0.013	0.00425	14.7881	14.7733	14.0636	4.32	0.18
152	LINE-126	EPI	83.719	4324	4324	4316.3	4316	PVC	24	768.362	0.7071	1.7004	0.7071	1.8409	0.4163	4316.36	0.758	4316.66	4316.397	73.351	4316.397	0.013	0.00358	13.5786	13.565	12.8571	4.32	0.18
154	LINE-126	EPI	527.442	4324	4324	4316	4314	PVC	24	768.362	0.7044	1.6983	0.7044	1.834	0.4153	4314.36	4.7931	4316.36	4314.363	526.582	4314.363	0.013	0.00379	13.968	13.954	13.2488	4.32	0.18
155	LINE-124	EPI	3189.5591	4375	4324	4367	4316	PVC	12	0	0.1	1	0.1	1.4963	0.1	4316.14	35.5281	4367.14	4316.14	3189.559	4316.14	0.013	0.01599	4.5173	4.5128	4.4128	1.68	0.14
158	LINE-120	EPI	545.581	4324	4324	4316	4314	PVC	12	491.144	0.3724	1.3692	0.3724	1.8795	0.272	4314.3	4.8379	4316.3	4314.366	527.52	4314.366	0.013	0.00367	2.1629	2.1608	1.7883	3.6	0.3
159	LINE-122	EPI	987.013	4338	4327	4330	4319	PVC	12	491.144	0.2725	1.4877	0.2725	2.127	0.1832	4319.22	7.7341	4330.22	4319.326	977.525	4319.326	0.013	0.01114	3.7713	3.7676	3.4951	2.64	0.22
162	LINE-122	EPI	1248.7469	4327	4324	4319	4316	PVC	12	491.144	0.2725	1.5048	0.2725	1.3751	0.1811	4316.3	15.1356	4319.3	4316.311	1244.284	4316.311	0.013	0.0024	1.751	1.7492	1.4767	3.6	0.3
163	LINE-112	EPI	524.1605	4279	4278	4271	4270	PVC	18	322.493	0.0982	1.4464	0.0982	0.7014	0.0679	4270.2	12.4551	4271.2	4270.2	524.16	4270.2	0.013	0.00191	4.6005	4.5959	4.4976	2.4	0.1333
166	LINE-112	EPI	2085.3167	4278	4274.1	4270	4266.1	PVC	18	322.493	0.0982	1.475	0.0982	0.7014	0.0666	4266.3	49.5512	4270.2	4266.3	2085.317	4266.3	0.013	0.00187	4.5549	4.5504	4.4521	2.4	0.1333
168	LINE-112	EPI	1066.2516	4274.1	4258.8	4266.1	4250.8	PVC	18	494.666	0.1712	1.6075	0.1712	1.6945	0.1066	4250.96	10.4874	4266.26	4251.013	1062.548	4251.013	0.013	0.01435	12.6169	12.6043	12.433	1.92	0.1067
170	LINE-112	EPI	3600.6269	4258.8	4242	4250.8	4234	PVC	18	494.666	0.17	1.6338	0.17	1.2189	0.1045	4234.2	49.2349	4251	4234.268	3586.066	4234.268	0.013	0.00467	7.1945	7.1873	7.0166	2.4	0.1333
172	LINE-108	EPI	2671.439	4240.5	4216.2	4232.5	4208.2	PVC	18	1372.368	0.3067	1.6921	0.3067	1.9108	0.1817	4208.42	23.3013	4232.72	4208.496	2663.055	4208.496	0.013	0.0091	10.0454	10.0353	9.7279	2.64	0.1467
174	LINE-104	EPI	2718.169	4216.2	4198	4208.2	4190	PVC	18	1687.45	0.562	1.5665	0.562	2.2353	0.359	4190.3	20.2674	4208.5	4190.32	2715.182	4190.32	0.013	0.0067	8.6185	8.6099	8.0475	3.6	0.2
176	LINE-104	EPI	2629.9541	4198	4180	4190	4172	PVC	21	1988.293	0.718	1.462	0.718	2.3858	0.4915	4172.32	18.3723	4190.32	4172.856	2551.624	4172.856	0.013	0.00684	13.1439	13.1307	12.4122	3.84	0.1829
180	LINE-168	EPI	3708.1631	4419.7	4382	4411.7	4374	PVC	12	304.616	0.1658	1.5866	0.1658	1.7249	0.1045	4374.18	35.8303	4411.88	4374.411	3685.408	4374.411	0.013	0.01017	3.6021	3.5985	3.4326	2.16	0.18
181	LINE-166	EPI	517.551	4382	4379.9	4374	4371.9	OLDCONC	18	877.254	0.6312	1.3599	0.6312	1.5585	0.4642	4372.32	5.5348	4374.42	4372.42	492.813	4372.42	0.019	0.00406	4.5905	4.5859	3.9546	5.04	0.28
183	LINE-166	EPI	2711.2261	4379.9	4362.5	4371.9	4354.5	OLDCONC	18	1129.489	1.0134	1.239	1.0134	2.2068	0.8149	4354.96	20.4759	4372.36	4355.045	2698.031	4355.045	0.019	0.00642	5.7732	5.7674	4.753	5.52	0.3067
184	LINE-176	EPI	945.682	4435.4	4431.3	4429.4	4423.3	PVC	12	0	0	0	0	0.2	0	4423.3	78.8068	4429.4	4423.3	0	4429.4	0.013	0.00645	2.8691	2.8663	2.8663	0	0
186	LINE-172	EPI	806.944	4431.3	4420.1	4423.3	4412.1	PVC	10	360.706	0.1704	1.7418	0.1704	1.9658	0.0963	4412.28	6.8415	4423.48	4412.301	805.454	4412.301	0.013	0.01388	2.5882	2.5856	2.4152	2.16	0.216
188	LINE-172	EPI	627.4246	4420.1	4417.4	4412.1	4409.4	PVC	12	360.706	0.1703	1.7645	0.1703	1.3299	0.095	4409.62	7.8628	4412.32	4409.62	627.425	4409.62	0.013	0.0043	2.3435	2.3411	2.1707	2.64	0.22
190	LINE-172	EPI	1033.5568	4417.4	4411.4	4409.4	4403.4	PVC	12	360.706	0.1701	1.7895	0.1701	1.5225	0.0936	4403.6	11.314	4409.6	4403.721	1012.663	4403.721	0.013	0.00581	2.7219	2.7192	2.5489	2.4	0.2
191	LINE-170	EPI	2655.603	4411.4	4382	4403.4	4374	OLDCONC	18	572.638	0.4936	1.2689	0.4936	1.9627	0.3814	4374.3	22.5506	4403.7	4374.417	2645.051	4374.417	0.019	0.01107	7.5826	7.575	7.0812	3.6	0.2
192	LINE-174	EPI	2644.0298	4472.4	4412.7	4464.4	4404.7	PVC	10	211.932	0.3412	1.1432	0.3412	2.9636	0.2984	4404.92	14.8692	4464.62	4405	2640.499	4405	0.013	0.02258	3.3011	3.2978	2.9566	2.64	0.264
194	LINE-174	EPI	477.6643	4412.7	4411.4	4404.7	4403.4	PVC	10	211.932	0.3412	1.1695	0.3412	1.7689	0.2917	4403.72	4.5005	4405.02	4403.72	477.664	4403.72	0.013	0.00272	1.1461	1.1449	0.8038	3.84	0.384
195	LINE-150	EPI	1156.505	4423.6	4405.1	4417	4398.9	PVC	10	360.853	0.2297	1.5661	0.2297	2.2823	0.1467	4399.1	8.4456	4417.2	4399.193	1150.581	4399.193	0.013	0.01565	2.7484	2.7456	2.5159	2.4	0.24
197	LINE-150	EPI	1210.418	4405.1	4401.5	4398.9	4395.2	PVC	10	360.853	0.2296	1.5871	0.2296	1.5811	0.1448	4395.46	12.7596	4399.16	4395.46	1210.418	4395.46	0.013	0.00306	1.2146	1.2134	0.9837	3.12	0.312
199	LINE-150	EPI	810.009	4401.5	4399	4395.2	4392.6	PVC	10	360.853	0.2295	1.617	0.2295	1.5804	0.142	4392.86	8.5421	4395.46	4392.915	792.906	4392.915	0.013	0.00321	1.2447	1.2434	1.0138	3.12	0.312
201	LINE-150	EPI	200.9846	4399	4398.3	4392.6	4392	PVC	10	588.636	0.3751	1.463	0.3751	1.7945	0.2566	4392.34	1.8667	4392.94	4392.34	200.985	4392.34	0.013	0.00299	1.2003	1.1991	0.8238	4.08	0.408
203	LINE-150	EPI	662.571	4398.3	4397.1	4392	4390	PVC	10	588.636	0.3741	1.4636	0.3741	1.7894	0.2557	4390.34	6.1713	4392.34	4390.34	662.571	4390.34	0.013	0.00302	1.207	1.2058	0.8315	4.08	0.408
205	LINE-150	EPI	1049.759	4397.1	4392.8	4390	4386.8	PVC	10	588.636	0.3714	1.4677	0.3714	1.7769	0.2532	4387.14	9.8464	4390.34	4387.192	1032.845	4387.192	0.013	0.00305	1.2129	1.2117	0.84	4.08	0.408
207	LINE-150	EPI	893.4643	4392.8	4391	4386.8	4384.3	PVC	10	588.636	0.3703	1.4889	0.3703	1.7707	0.2488	4384.64	8.4096	4387.14	4384.64	893.464	4384.64	0.013	0.0028	1.1621	1.1609	0.7905	4.08	0.408
209	LINE-150	EPI	296.751	4391	4390.1	4384.3	4383.4	PVC	10	588.636	0.3699	1.5104	0.3699	1.7691	0.245	4383.74	2.7956	4384.64	4383.74	296.751	4383.74	0.013	0.00303	1.2099	1.2086	0.8386	4.08	0.408
211	LINE-150	EPI	500.275	4390.1	4388.5	4383.4	4382.1	PVC	10	588.636	0.3684	1.5135	0.3684	1.7625	0.2436	4382.44	4.7307	4383.74	4382.497	478.157	4382.497	0.013	0.0026	1.1199	1.1188	0.7501	4.08	0.408
212	LINE-138	EPI	170.65	4388.5	4388.5	4382.1	4381.5	PVC	12	854.059	0.5318	1.4944	0.5318	2.0911	0.3562	4381.86	1.3601	4382.46	4381.86	170.65	4381.86	0.013	0.00352	2.1183	2.1162	1.5839	4.32	0.36
214	LINE-138	EPI	397.3336	4388.5	4387.5	4381.5	4380	PVC	12	854.059	0.5297	1.4937	0.5297	2.0827	0.3549	4380.36	3.1797	4381.86	4380.421	381.293	4380.421	0.013	0.00378	2.195	2.1928	1.6626	4.32	0.36
216	LINE-138	EPI	287.072	4387.5	4387	4380	4379	PVC	12	854.059	0.5283	1.4983	0.5283	2.076	0.3527	4379.36	2.3047	4380.36	4379.389	278.625	4379.389	0.013	0.00348	2.1085	2.1063	1.5779	4.32	0.36
220	LINE-110	EPI	2419.78	4239.5	4226	4231.5	4218	PVC	10	0	0.1	1	0.1	1.3653	0.1	4218.16	29.5394	4231.66	4218.16	2419.78	4218.16	0.013	0.00558	1.6409	1.6393	1.5393	1.92	0.192
221	LINE-110	EPI	2419.78	4226	4216.2	4218	4208.2	PVC	10	0	0.1	1.0427	0.1	1.1537	0.0959	4208.38	34.9553	4218.18	4208.38	2419.78	4208.38	0.013	0.00405	1.3981	1.3967	1.2967	2.16	0.216
222	LINE 178	EPI	833.9996	4327.9	4320.4	4322.6	4312	Default	8	0	0.1	1	0.1	1.8766	0.1	4312.14	7.407	4322.74	4312.14	834	4312.14	0.013	0.01271	1.366	1.3646	1.2646	1.68	0.21
225	LINE 178	EPI	818.9996	4320.4	4304.9	4312	4292.7	Default	12	0	0.1	1.0105	0.1	1.8732	0.099	4292.82	7.2871	4312.12	4292.82	819	4292.82	0.013	0.02357	5.484	5.4785	5.3785	1.44	0.12
227	LINE-178	EPI	349.9999	4304.9	4298	4292.7	4290.5	Default	12	0	0.1	1.0213	0.1	1.2329	0.0979	4290.66	4.7316	4292.86	4290.66	350	4290.66	0.013	0.00629	2.8323	2.8295	2.7295	1.92	0.16
228	LINE-180	EPI	150	4255.5	4255.95	4251.5	4248.05	Default	8	644.943	0.1306	1.757	0.1306	2.4505	0.0743	4248.19	1.0202	4251.64	4248.19	150	4248.19	0.013	0.023	1.8376	1.8357	1.7052	1.68	0.21
231	LINE-180	EPI	100	4255.95	4253.3	4248.05	4246.2	Default	8	644.943	0.1305	1.7611	0.1305	2.027	0.0741	4246.36	0.8222	4248.21	4246.38	98.919	4246.38	0.013	0.0185	1.648	1.6464	1.5158	1.92	0.24
233	LINE-180	EPI	185	4253.3	4252	4246.2	4244	Default	8	644.943	0.1303	1.7635	0.1303	1.7159	0.074	4244.18	1.7969	4246.38	4244.18	184.988	4244.18	0.013	0.01189	1.3213	1.32	1.1895	2.16	0.27
235	LINE-180	EPI	889.8261	4252	4242	4244	4234	Default	8	644.943	0.1301	1.765	0.1301	1.7122	0.0738	4234.18	8.6618	4244.18	4234.288	880.183	4234.288	0.013	0.01124	1.2845	1.2832	1.153	2.16	0.27
238	LINE-176	EPI	966.1685	4448	4435.4	4442	4429.4	Default	12	0	0	0	0	0.2	0	4429.4	80.514	4442	4429.4	0	4442	0.013	0.01304	4.0796	4.0755	4.0755	0	0
240	LINE-108	EPI	680.042	4242	4240.5	4234	4232.5	Default	18	1139.609	0.2893	1.7241	0.2893	1.27	0.1679	4232.78	8.9241	4234.28	4232.78	680.042	4232.78	0.013	0.00221	4.9467	4.9417	4.6523	3.36	0.1867

City of Alamogordo
Sewer System Analysis of Existing System

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Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,999.16	4,406.00	4,398.00	0.0130	12	0.013	0.145	1.78	0.16	4.074	0	4,398.16	No
2	1		4,380.00	4,372.00							4.070	0	4,372.25	
											3.925			
		1,172.22	4,346.00	4,338.00	0.0034	21	0.013	1.520	2.54	0.30	9.281	0	4,338.52	No
188	10		4,340.00	4,334.00							9.272	0	4,334.57	
											7.751			
		2,906.00	4,484.00	4,476.00	0.0255	12	0.013	0.066	1.62	0.10	5.701	0	4,476.10	No
42	101		4,410.00	4,402.00							5.695	0	4,402.10	
											5.629			
		425.35	4,510.00	4,502.00	0.0035	10	0.013	0.049	0.82	0.17	1.305	0	4,502.14	No
58	102		4,508.50	4,500.50							1.303	0	4,500.64	
											1.254			
		238.33	4,508.50	4,500.50	0.0042	10	0.013	0.049	0.82	0.17	1.423	0	4,500.64	No
60	105		4,507.50	4,499.50							1.422	0	4,499.64	
											1.372			
		1,108.92	4,507.50	4,499.50	0.0050	10	0.013	0.049	0.82	0.17	1.547	0	4,499.64	No
62	107		4,502.00	4,494.00							1.546	0	4,494.14	
											1.496			
		257.19	4,502.00	4,494.00	0.0299	12	0.013	0.049	1.67	0.08	6.181	0	4,494.08	No
64	109		4,494.30	4,486.30							6.175	0	4,486.46	
											6.126			
		1,120.03	4,494.30	4,486.30	0.0333	12	0.013	0.234	2.89	0.16	6.519	0	4,486.46	No
66	111		4,457.00	4,449.00							6.513	0	4,449.16	
											6.278			
		832.46	4,457.00	4,449.00	0.0300	12	0.013	0.234	2.88	0.16	6.191	0	4,449.16	No
68	113		4,432.00	4,424.00							6.185	0	4,424.16	
											5.951			
		1,218.31	4,432.00	4,424.00	0.0181	12	0.013	0.232	2.42	0.18	4.801	0	4,424.18	No
70	115		4,410.00	4,402.00							4.796	0	4,402.24	
											4.564			
		286.58	4,410.00	4,402.00	0.0489	12	0.013	0.232	2.86	0.16	7.896	0	4,402.16	No
72	117		4,396.00	4,388.00							7.888	0	4,388.24	
											7.656			
		694.67	4,396.00	4,388.00	0.0065	12	0.013	0.232	1.81	0.22	2.875	0	4,388.22	No
74	119		4,391.50	4,383.50							2.872	0	4,383.76	
											2.641			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		257.06	4,340.00	4,334.00	0.0039	21	0.013	1.518	2.68	0.29	9.909	0	4,334.50	No
190	12		4,341.00	4,333.00							9.899	0	4,333.58	
											8.380			
		518.37	4,391.50	4,383.50	0.0087	12	0.013	0.231	2.06	0.20	3.329	0	4,383.70	No
76	121		4,387.00	4,379.00							3.325	0	4,379.39	
											3.095			
		1,313.59	4,387.00	4,379.00	0.0126	12	0.013	0.749	3.46	0.32	4.004	0	4,379.32	No
78	122		4,370.50	4,362.50							4.000	0	4,362.82	
											3.251			
		1,348.52	4,370.50	4,362.50	0.0120	12	0.013	0.747	3.45	0.32	3.916	0	4,362.82	No
80	124		4,354.30	4,346.30							3.912	0	4,346.97	
											3.164			
		195.46	4,354.30	4,346.30	0.0123	12	0.013	1.288	4.39	0.40	3.959	0	4,346.70	No
82	126		4,351.90	4,343.90							3.955	0	4,344.61	
											2.665			
		1,449.51	4,351.90	4,343.90	0.0117	12	0.013	1.285	4.11	0.42	3.857	0	4,344.32	No
84	128		4,335.00	4,327.00							3.854	0	4,327.42	
											2.567			
		1,080.32	4,335.00	4,327.00	0.0139	12	0.013	1.276	4.35	0.40	4.210	0	4,327.40	No
86	130		4,322.00	4,312.00							4.205	0	4,312.77	
											2.928			
		616.84	4,394.80	4,386.80	0.0191	24	0.013	0.225	1.91	0.08	31.373	0	4,386.96	No
88	131		4,383.00	4,375.00							31.342	0	4,375.22	
											31.117			
		289.40	4,383.00	4,375.00	0.0052	24	0.013	0.225	1.19	0.11	16.331	0	4,375.22	No
90	134		4,381.50	4,373.50							16.314	0	4,373.72	
											16.090			
		584.88	4,381.50	4,373.50	0.0120	24	0.013	0.224	1.60	0.09	24.815	0	4,373.68	No
92	136		4,373.10	4,366.50							24.791	0	4,366.78	
											24.566			
		328.54	4,373.10	4,366.50	0.0012	24	0.013	0.223	0.84	0.14	7.915	0	4,366.78	No
94	138		4,374.10	4,366.10							7.907	0	4,366.38	
											7.684			
		988.62	4,341.00	4,333.00	0.0053	21	0.013	1.958	3.27	0.30	11.523	0	4,333.52	No
192	14		4,335.80	4,327.80							11.511	0	4,328.32	
											9.552			
		655.02	4,374.10	4,366.10	0.0032	24	0.013	0.223	1.04	0.12	12.844	0	4,366.34	No
96	140		4,376.00	4,364.00							12.831	0	4,364.24	
											12.608			
		779.01	4,376.00	4,364.00	0.0054	24	0.013	0.221	1.18	0.11	16.656	0	4,364.22	No
98	142		4,367.80	4,359.80							16.639	0	4,360.02	
											16.418			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,330.06	4,367.80	4,359.80	0.0125	24	0.013	0.220	1.57	0.09	25.341	0	4,359.98	No
100	144		4,351.20	4,343.20							25.316	0	4,343.40	
											25.095			
		744.59	4,351.20	4,343.20	0.0150	24	0.013	0.220	1.87	0.08	27.820	0	4,343.36	No
102	146		4,340.00	4,332.00							27.792	0	4,332.35	
											27.573			
		1,566.70	4,340.00	4,332.00	0.0089	24	0.013	0.713	2.20	0.16	21.443	0	4,332.32	No
104	148		4,326.00	4,318.00							21.421	0	4,318.37	
											20.708			
		470.56	4,326.00	4,318.00	0.0043	24	0.013	0.709	1.85	0.18	14.788	0	4,318.36	No
106	150		4,324.00	4,316.00							14.773	0	4,316.69	
											14.064			
		83.72	4,324.00	4,316.30	0.0036	24	0.013	0.707	1.84	0.18	13.579	0	4,316.66	No
108	152		4,324.00	4,316.00							13.565	0	4,316.40	
											12.857			
		527.44	4,324.00	4,316.00	0.0038	24	0.013	0.704	1.83	0.18	13.968	0	4,316.36	No
110	154		4,324.00	4,314.00							13.954	0	4,314.36	
											13.249			
		3,189.56	4,375.00	4,367.00	0.0160	12	0.013	0.100	1.50	0.14	4.517	0	4,367.14	No
112	155		4,324.00	4,316.00							4.513	0	4,316.14	
											4.413			
		545.58	4,324.00	4,316.00	0.0037	12	0.013	0.372	1.88	0.30	2.163	0	4,316.30	No
118	158		4,324.00	4,314.00							2.161	0	4,314.37	
											1.788			
		987.01	4,338.00	4,330.00	0.0111	12	0.013	0.273	2.13	0.22	3.771	0	4,330.22	No
114	159		4,327.00	4,319.00							3.768	0	4,319.33	
											3.495			
		1,325.87	4,335.80	4,327.80	0.0061	21	0.013	1.947	3.25	0.30	12.418	0	4,328.32	No
194	16		4,327.70	4,319.70							12.406	0	4,320.38	
											10.458			
		1,248.75	4,327.00	4,319.00	0.0024	12	0.013	0.273	1.38	0.30	1.751	0	4,319.30	No
116	162		4,324.00	4,316.00							1.749	0	4,316.31	
											1.477			
		524.16	4,279.00	4,271.00	0.0019	18	0.013	0.098	0.70	0.13	4.601	0	4,271.20	No
128	163		4,278.00	4,270.00							4.596	0	4,270.20	
											4.498			
		2,085.32	4,278.00	4,270.00	0.0019	18	0.013	0.098	0.70	0.13	4.555	0	4,270.20	No
130	166		4,274.10	4,266.10							4.550	0	4,266.30	
											4.452			
		1,066.25	4,274.10	4,266.10	0.0144	18	0.013	0.171	1.69	0.11	12.617	0	4,266.26	No
132	168		4,258.80	4,250.80							12.604	0	4,251.01	
											12.433			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		3,600.63	4,258.80	4,250.80	0.0047	18	0.013	0.170	1.22	0.13	7.195	0	4,251.00	No
134	170		4,242.00	4,234.00							7.187	0	4,234.27	
											7.017			
		2,671.44	4,240.50	4,232.50	0.0091	18	0.013	0.307	1.91	0.15	10.045	0	4,232.72	No
162	172		4,216.20	4,208.20							10.035	0	4,208.50	
											9.728			
		2,718.17	4,216.20	4,208.20	0.0067	18	0.013	0.562	2.24	0.20	8.619	0	4,208.50	No
164	174		4,198.00	4,190.00							8.610	0	4,190.32	
											8.048			
		2,629.95	4,198.00	4,190.00	0.0068	21	0.013	0.718	2.39	0.18	13.144	0	4,190.32	No
166	176		4,180.00	4,172.00							13.131	0	4,172.86	
											12.412			
		1,237.07	4,327.70	4,319.70	0.0031	21	0.013	2.802	3.12	0.40	8.806	0	4,320.40	No
196	18		4,320.00	4,315.90							8.797	0	4,316.87	
											5.992			
		3,708.16	4,419.70	4,411.70	0.0102	12	0.013	0.166	1.72	0.18	3.602	0	4,411.88	No
6	180		4,382.00	4,374.00							3.599	0	4,374.41	
											3.433			
		517.55	4,382.00	4,374.00	0.0041	18	0.019	0.631	1.56	0.28	4.591	0	4,374.42	No
180	181		4,379.90	4,371.90							4.586	0	4,372.42	
											3.955			
		2,711.23	4,379.90	4,371.90	0.0064	18	0.019	1.013	2.21	0.31	5.773	0	4,372.36	No
182	183		4,362.50	4,354.50							5.767	0	4,355.05	
											4.753			
		945.68	4,435.40	4,429.40	0.0065	12	0.013	0.000	0.20	0.00	2.869	0	4,429.40	No
170	184		4,431.30	4,423.30							2.866	0	4,423.30	
											2.866			
		806.94	4,431.30	4,423.30	0.0139	10	0.013	0.170	1.97	0.22	2.588	0	4,423.48	No
172	186		4,420.10	4,412.10							2.586	0	4,412.30	
											2.415			
		627.42	4,420.10	4,412.10	0.0043	12	0.013	0.170	1.33	0.22	2.344	0	4,412.32	No
174	188		4,417.40	4,409.40							2.341	0	4,409.62	
											2.171			
		1,033.56	4,417.40	4,409.40	0.0058	12	0.013	0.170	1.52	0.20	2.722	0	4,409.60	No
176	190		4,411.40	4,403.40							2.719	0	4,403.72	
											2.549			
		2,655.60	4,411.40	4,403.40	0.0111	18	0.019	0.494	1.96	0.20	7.583	0	4,403.70	No
178	191		4,382.00	4,374.00							7.575	0	4,374.42	
											7.081			
		2,644.03	4,472.40	4,464.40	0.0226	10	0.013	0.341	2.96	0.26	3.301	0	4,464.62	No
8	192		4,412.70	4,404.70							3.298	0	4,405.00	
											2.957			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		477.66	4,412.70	4,404.70	0.0027	10	0.013	0.341	1.77	0.38	1.146	0	4,405.02	No
10	194		4,411.40	4,403.40							1.145	0	4,403.72	
											0.804			
		1,156.51	4,423.60	4,417.00	0.0157	10	0.013	0.230	2.28	0.24	2.748	0	4,417.20	No
14	195		4,405.10	4,398.90							2.746	0	4,399.19	
											2.516			
		1,210.42	4,405.10	4,398.90	0.0031	10	0.013	0.230	1.58	0.31	1.215	0	4,399.16	No
16	197		4,401.50	4,395.20							1.213	0	4,395.46	
											0.984			
		810.01	4,401.50	4,395.20	0.0032	10	0.013	0.230	1.58	0.31	1.245	0	4,395.46	No
18	199		4,399.00	4,392.60							1.243	0	4,392.92	
											1.014			
		269.35	4,320.00	4,315.90	0.0015	21	0.013	2.779	2.44	0.48	6.123	0	4,316.74	No
198	20		4,320.00	4,315.50							6.116	0	4,316.36	
											3.336			
		200.98	4,399.00	4,392.60	0.0030	10	0.013	0.375	1.79	0.41	1.200	0	4,392.94	No
20	201		4,398.30	4,392.00							1.199	0	4,392.34	
											0.824			
		662.57	4,398.30	4,392.00	0.0030	10	0.013	0.374	1.79	0.41	1.207	0	4,392.34	No
22	203		4,397.10	4,390.00							1.206	0	4,390.34	
											0.832			
		1,049.76	4,397.10	4,390.00	0.0031	10	0.013	0.371	1.78	0.41	1.213	0	4,390.34	No
24	205		4,392.80	4,386.80							1.212	0	4,387.19	
											0.840			
		893.46	4,392.80	4,386.80	0.0028	10	0.013	0.370	1.77	0.41	1.162	0	4,387.14	No
26	207		4,391.00	4,384.30							1.161	0	4,384.64	
											0.791			
		296.75	4,391.00	4,384.30	0.0030	10	0.013	0.370	1.77	0.41	1.210	0	4,384.64	No
28	209		4,390.10	4,383.40							1.209	0	4,383.74	
											0.839			
		500.28	4,390.10	4,383.40	0.0026	10	0.013	0.368	1.76	0.41	1.120	0	4,383.74	No
30	211		4,388.50	4,382.10							1.119	0	4,382.50	
											0.750			
		170.65	4,388.50	4,382.10	0.0035	12	0.013	0.532	2.09	0.36	2.118	0	4,382.46	No
52	212		4,388.50	4,381.50							2.116	0	4,381.86	
											1.584			
		397.33	4,388.50	4,381.50	0.0038	12	0.013	0.530	2.08	0.36	2.195	0	4,381.86	No
54	214		4,387.50	4,380.00							2.193	0	4,380.42	
											1.663			
		287.07	4,387.50	4,380.00	0.0035	12	0.013	0.528	2.08	0.36	2.109	0	4,380.36	No
56	216		4,387.00	4,379.00							2.106	0	4,379.39	
											1.578			

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		1,577.33	4,320.00	4,315.50	0.0022	21	0.013	2.774	2.77	0.43	7.484	0	4,316.26	No
200	22		4,322.00	4,312.00							7.477	0	4,312.77	
											4.701			
		2,419.78	4,239.50	4,231.50	0.0056	10	0.013	0.100	1.37	0.19	1.641	0	4,231.66	No
136	220		4,226.00	4,218.00							1.639	0	4,218.16	
											1.539			
		2,419.78	4,226.00	4,218.00	0.0041	10	0.013	0.100	1.15	0.22	1.398	0	4,218.18	No
138	221		4,216.20	4,208.20							1.397	0	4,208.38	
											1.297			
		834.00	4,327.90	4,322.60	0.0127	8	0.013	0.100	1.88	0.21	1.366	0	4,322.74	No
140	222		4,320.40	4,312.00							1.365	0	4,312.14	
											1.265			
		819.00	4,320.40	4,312.00	0.0236	12	0.013	0.100	1.87	0.12	5.484	0	4,312.12	No
142	225		4,304.90	4,292.70							5.479	0	4,292.82	
											5.379			
		350.00	4,304.90	4,292.70	0.0063	12	0.013	0.100	1.23	0.16	2.832	0	4,292.86	No
144	227		4,298.00	4,290.50							2.830	0	4,290.66	
											2.730			
		150.00	4,255.50	4,251.50	0.0230	8	0.013	0.131	2.45	0.21	1.838	0	4,251.64	No
152	228		4,255.95	4,248.05							1.836	0	4,248.19	
											1.705			
		100.00	4,255.95	4,248.05	0.0185	8	0.013	0.131	2.03	0.24	1.648	0	4,248.21	No
154	231		4,253.30	4,246.20							1.646	0	4,246.38	
											1.516			
		185.00	4,253.30	4,246.20	0.0119	8	0.013	0.130	1.72	0.27	1.321	0	4,246.38	No
156	233		4,252.00	4,244.00							1.320	0	4,244.18	
											1.190		-	
		889.83	4,252.00	4,244.00	0.0112	8	0.013	0.130	1.71	0.27	1.285	0	4,244.18	No
158	235		4,242.00	4,234.00							1.283	0	4,234.29	
											1.153			
		966.17	4,448.00	4,442.00	0.0130	12	0.013	0.000	0.20	0.00	4.080	0	4,442.00	No
168	238		4,435.40	4,429.40							4.076	0	4,429.40	
											4.076			
		97.60	4,322.00	4,312.00	0.0103	24	0.015	4.020	4.64	0.32	19.899	0	4,312.64	No
202	24		4,320.00	4,311.00							19.879	0	4,311.92	
											15.858			
		680.04	4,242.00	4,234.00	0.0022	18	0.013	0.289	1.27	0.19	4.947	0	4,234.28	No
160	240		4,240.50	4,232.50							4.942	0	4,232.78	
											4.652			
		646.68	4,320.00	4,311.00	0.0031	24	0.015	4.017	3.11	0.43	10.933	0	4,311.86	No
204	26		4,317.00	4,309.00							10.922	0	4,309.91	
											6.903			

Existing Pipes - Sorted by Geographic ID

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		2,376.13	4,317.00	4,309.00	0.0082	24	0.015	4.008	4.26	0.34	17.809	0	4,309.68	No
206	28		4,297.50	4,289.50							17.791	0	4,290.26	
											13.782			
		1,962.95	4,297.50	4,289.50	0.0047	24	0.015	3.997	3.65	0.38	13.459	0	4,290.26	No
208	30		4,288.30	4,280.30							13.445	0	4,281.23	
											9.446			
		1,531.79	4,288.30	4,280.30	0.0041	27	0.015	4.038	3.30	0.35	17.260	0	4,281.08	No
210	32		4,282.00	4,274.00							17.243	0	4,274.79	
											13.201			
		3,688.21	4,282.00	4,274.00	0.0039	27	0.015	4.064	3.33	0.35	16.699	0	4,274.78	No
212	34		4,267.80	4,259.80							16.683	0	4,260.62	
											12.612			
		170.51	4,267.80	4,259.80	0.0223	27	0.015	4.054	5.25	0.25	40.178	0	4,260.36	No
214	36		4,264.00	4,256.00							40.138	0	4,256.66	
											36.083			
		672.29	4,264.00	4,256.00	0.0082	27	0.015	4.052	4.00	0.30	24.343	0	4,256.68	No
216	38		4,258.50	4,250.50							24.318	0	4,251.18	
											20.265			
		2,333.59	4,380.00	4,372.00	0.0075	12	0.013	0.387	2.15	0.28	3.094	0	4,372.28	No
4	4		4,362.50	4,354.50							3.091	0	4,355.03	
											2.704			
		2,125.46	4,258.50	4,250.05	0.0038	27	0.015	4.105	3.24	0.36	16.563	0	4,250.85	No
218	40		4,250.00	4,242.00							16.546	0	4,242.80	
											12.439			
		458.42	4,324.00	4,314.00	0.0153	27	0.013	1.043	3.01	0.14	38.373	0	4,314.32	No
120	42		4,315.00	4,307.00							38.335	0	4,307.35	
											37.291			
		452.36	4,315.00	4,307.00	0.0111	27	0.013	1.038	2.75	0.15	32.648	0	4,307.34	No
122	45		4,310.00	4,302.00							32.615	0	4,302.42	
											31.576			
		1,200.47	4,310.00	4,302.00	0.0033	27	0.013	1.032	2.01	0.19	17.925	0	4,302.42	No
124	47		4,306.00	4,298.00							17.907	0	4,298.45	
											16.875			
		1,881.80	4,306.00	4,298.00	0.0043	27	0.013	1.032	2.16	0.18	20.248	0	4,298.40	No
126	49		4,298.00	4,290.00							20.227	0	4,290.42	
											19.195			
		1,898.56	4,298.00	4,290.00	0.0111	24	0.013	1.131	3.19	0.17	23.856	0	4,290.34	No
146	51		4,277.00	4,269.00							23.832	0	4,269.35	
											22.702			
		1,253.20	4,277.00	4,269.00	0.0088	24	0.013	1.127	2.93	0.18	21.252	0	4,269.36	No
148	53		4,266.00	4,258.00							21.230	0	4,258.36	
											20.103			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,735.62	4,266.00	4,258.00	0.0092	24	0.013	1.126	2.93	0.18	21.779	0	4,258.36	No
150	55		4,250.00	4,242.00							21.757	0	4,242.76	
											20.631			
		3,385.64	4,250.00	4,242.00	0.0090	30	0.013	5.217	4.64	0.28	38.908	0	4,242.70	No
220	56		4,219.70	4,211.70							38.869	0	4,212.42	
											33.650			
		3,385.64	4,219.70	4,211.70	0.0070	30	0.013	5.202	4.45	0.29	34.410	0	4,212.42	No
222	58		4,196.00	4,188.00							34.376	0	4,188.82	
											29.171			
		2,572.51	4,362.50	4,354.50	0.0049	21	0.019	1.356	2.15	0.31	7.578	0	4,355.04	No
184	6		4,350.00	4,342.00							7.570	0	4,342.54	
											6.214			
		2,906.73	4,196.00	4,188.00	0.0055	36	0.013	5.192	3.69	0.25	49.618	0	4,188.76	No
224	60		4,180.00	4,172.00							49.569	0	4,172.86	
											44.374			
		2,672.99	4,180.00	4,172.00	0.0055	36	0.013	5.829	3.85	0.27	49.764	0	4,172.80	No
226	62		4,165.20	4,157.20							49.714	0	4,158.27	
											43.884			
		3,147.29	4,165.20	4,157.20	0.0037	36	0.013	5.816	3.59	0.28	40.602	0	4,158.04	No
228	64		4,153.60	4,145.60							40.561	0	4,146.74	
											34.744			
		397.78	4,153.60	4,145.60	0.0015	36	0.013	5.816	2.82	0.33	25.974	0	4,146.60	No
230	66		4,152.00	4,145.00							25.948	0	4,146.00	
											20.132			
		3,398.42	4,375.30	4,367.30	0.0074	10	0.013	0.195	1.70	0.26	1.896	0	4,367.52	No
12	76		4,350.00	4,342.00							1.894	0	4,342.42	
											1.698			
		505.67	4,350.00	4,342.00	0.0079	21	0.013	1.528	3.03	0.26	14.131	0	4,342.46	No
186	8		4,346.00	4,338.00							14.116	0	4,338.52	
											12.587			
		1,271.72	4,496.50	4,488.50	0.0173	10	0.013	0.054	1.47	0.12	2.890	0	4,488.60	No
32	81		4,474.50	4,466.50							2.887	0	4,466.60	
											2.832			
		1,171.63	4,474.50	4,466.50	0.0209	10	0.013	0.143	2.37	0.17	3.177	0	4,466.64	No
34	84		4,450.00	4,442.00							3.174	0	4,442.14	
											3.031			
		1,720.47	4,450.00	4,442.00	0.0233	12	0.013	0.142	2.13	0.14	5.447	0	4,442.14	No
36	86		4,410.00	4,402.00							5.442	0	4,402.20	
											5.300			
		62.67	4,410.00	4,402.00	0.0160	10	0.013	0.141	1.93	0.19	2.775	0	4,402.16	No
38	88		4,410.00	4,401.00							2.772	0	4,401.21	
											2.631			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		148.20	4,410.00	4,401.00	0.0101	10	0.013	0.203	2.02	0.24	2.210	0	4,401.20	No
44	90		4,407.50	4,399.50							2.208	0	4,399.71	
											2.005			
		100.36	4,407.50	4,399.50	0.0249	10	0.013	0.203	2.77	0.19	3.467	0	4,399.66	No
46	92		4,405.00	4,397.00							3.464	0	4,397.27	
											3.261			
		476.28	4,405.00	4,397.00	0.0189	10	0.013	0.203	2.34	0.22	3.020	0	4,397.18	No
48	94		4,396.00	4,388.00							3.017	0	4,388.26	
											2.814			
		735.53	4,396.00	4,388.00	0.0080	10	0.013	0.202	1.75	0.26	1.968	0	4,388.22	No
50	96		4,388.50	4,382.10							1.966	0	4,382.47	
											1.764			
		1,140.28	4,488.00	4,480.00	0.0035	12	0.013	0.066	0.82	0.16	2.116	0	4,480.16	No
40	98		4,484.00	4,476.00							2.114	0	4,476.16	
											2.048			

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Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,484.00	4,476.00	0.00	0.066	4,476.10	-7.9
41	100			4,475.90			4,476.10	
		4.00	4,510.00	4,502.00	0.00	0.049	4,502.14	-7.86
57	103			4,501.90			4,502.14	
		4.00	4,508.50	4,500.50	0.00	0.049	4,500.64	-7.86
59	104			4,500.40			4,500.64	
		4.00	4,507.50	4,499.50	0.00	0.049	4,499.64	-7.86
61	106			4,499.40			4,499.64	
		4.00	4,502.00	4,494.00	0.00	0.049	4,494.08	-7.92
63	108			4,493.90			4,494.08	
		4.00	4,340.00	4,334.00	0.00	1.520	4,334.57	-5.43
189	11			4,333.90			4,334.50	
		4.00	4,494.30	4,486.30	0.00	0.049	4,486.46	-7.84
65	110			4,486.20			4,486.46	
		4.00	4,457.00	4,449.00	0.00	0.234	4,449.16	-7.84
67	112			4,448.90			4,449.16	
		4.00	4,432.00	4,424.00	0.00	0.232	4,424.18	-7.82
69	114			4,423.90			4,424.18	
		4.00	4,410.00	4,402.00	0.00	0.232	4,402.27	-7.73
71	116			4,401.90			4,402.16	
		4.00	4,396.00	4,388.00	0.00	0.232	4,388.24	-7.76
73	118			4,387.90			4,388.22	
		4.00	4,391.50	4,383.50	0.00	0.231	4,383.77	-7.74
75	120			4,383.40			4,383.70	
		4.00	4,370.50	4,362.50	0.00	0.747	4,362.82	-7.68
79	123			4,362.40			4,362.82	
		4.00	4,354.30	4,346.30	0.00	0.747	4,346.97	-7.33
81	125			4,346.20			4,346.70	
		4.00	4,351.90	4,343.90	0.00	1.287	4,344.63	-7.27
83	127			4,343.80			4,344.32	
		4.00	4,335.00	4,327.00	0.00	1.277	4,327.40	-7.6
85	129			4,326.90			4,327.40	
		4.00	4,341.00	4,333.00	0.00	1.959	4,333.58	-7.42
191	13			4,332.90			4,333.52	
		4.00	4,394.80	4,386.80	0.00	0.225	4,386.96	-7.84
87	132			4,386.70			4,386.96	

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,383.00	4,375.00	0.00	0.225	4,375.24	-7.76
89	133			4,374.90			4,375.22	
		4.00	4,381.50	4,373.50	0.00	0.224	4,373.70	-7.8
91	135			4,373.40			4,373.68	
		4.00	4,373.10	4,366.50	0.00	0.223	4,366.81	-6.29
93	137			4,366.40			4,366.78	
		4.00	4,374.10	4,366.10	0.00	0.223	4,366.36	-7.74
95	139			4,366.00			4,366.34	
		4.00	4,376.00	4,364.00	0.00	0.221	4,364.24	-11.76
97	141			4,363.90			4,364.22	
		4.00	4,367.80	4,359.80	0.00	0.221	4,360.01	-7.79
99	143			4,359.70			4,359.98	
		4.00	4,351.20	4,343.20	0.00	0.220	4,343.41	-7.79
101	145			4,343.10			4,343.36	
		4.00	4,340.00	4,332.00	0.00	0.714	4,332.37	-7.63
103	147			4,331.90			4,332.32	
		4.00	4,326.00	4,318.00	0.00	0.710	4,318.40	-7.6
105	149			4,317.90			4,318.36	
		4.00	4,335.80	4,327.80	0.00	1.948	4,328.32	-7.48
193	15			4,327.70			4,328.32	
		4.00	4,324.00	4,316.00	0.00	0.708	4,316.69	-7.31
107	151			4,315.90			4,316.66	
		4.00	4,324.00	4,316.00	0.00	0.705	4,316.42	-7.58
109	153			4,315.90			4,316.36	
		4.00	4,375.00	4,367.00	0.00	0.000	4,367.14	-7.86
111	156			4,366.90			4,367.14	
		4.00	4,324.00	4,316.00	0.00	0.373	4,316.32	-7.68
117	157			4,315.90			4,316.30	
		4.00	4,338.00	4,330.00	0.00	0.273	4,330.22	-7.78
113	160			4,329.90			4,330.22	
		4.00	4,327.00	4,319.00	0.00	0.273	4,319.35	-7.65
115	161			4,318.90			4,319.30	
		4.00	4,279.00	4,271.00	0.00	0.098	4,271.20	-7.8
127	164			4,270.90			4,271.20	
		4.00	4,278.00	4,270.00	0.00	0.098	4,270.20	-7.8
129	165			4,269.90			4,270.20	
		4.00	4,274.10	4,266.10	0.00	0.098	4,266.26	-7.84
131	167			4,266.00			4,266.26	
		4.00	4,258.80	4,250.80	0.00	0.171	4,251.04	-7.76
133	169			4,250.70			4,251.00	

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,327.70	4,319.70	0.00	2.805	4,320.40	-7.3
195	17			4,319.60			4,320.40	
		4.00	4,240.50	4,232.50	0.00	0.289	4,232.77	-7.73
161	171			4,232.40			4,232.72	
		4.00	4,216.20	4,208.20	0.00	0.406	4,208.52	-7.68
163	173			4,208.10			4,208.50	
		4.00	4,198.00	4,190.00	0.00	0.561	4,190.32	-7.68
165	175			4,189.90			4,190.32	
		4.00	4,180.00	4,172.00	0.00	5.831	4,172.88	-7.12
225	177			4,171.90			4,172.80	
		4.00	4,379.90	4,371.90	0.00	0.631	4,372.42	-7.48
181	182			4,371.80			4,372.36	
		4.00	4,431.30	4,423.30	0.00	0.170	4,423.48	-7.82
171	185			4,423.20			4,423.48	
		4.00	4,420.10	4,412.10	0.00	0.170	4,412.32	-7.78
173	187			4,412.00			4,412.32	
		4.00	4,417.40	4,409.40	0.00	0.170	4,409.64	-7.76
175	189			4,409.30			4,409.60	
		4.00	4,320.00	4,315.90	0.00	2.780	4,316.88	-3.12
197	19			4,315.80			4,316.74	
		4.00	4,412.70	4,404.70	0.00	0.341	4,405.02	-7.68
9	193			4,404.60			4,405.02	
		4.00	4,405.10	4,398.90	0.00	0.230	4,399.26	-5.84
15	196			4,398.80			4,399.16	
		4.00	4,401.50	4,395.20	0.00	0.230	4,395.46	-6.04
17	198			4,395.10			4,395.46	
		4.00	4,406.00	4,398.00	0.00	0.145	4,398.16	-7.84
1	2			4,397.90			4,398.16	
		4.00	4,399.00	4,392.60	0.00	0.375	4,392.99	-6.01
19	200			4,392.50			4,392.94	
		4.00	4,398.30	4,392.00	0.00	0.374	4,392.35	-5.95
21	202			4,391.90			4,392.34	
		4.00	4,397.10	4,390.00	0.00	0.372	4,390.34	-6.76
23	204			4,389.90			4,390.34	
		4.00	4,392.80	4,386.80	0.00	0.370	4,387.20	-5.6
25	206			4,386.70			4,387.14	
		4.00	4,391.00	4,384.30	0.00	0.370	4,384.64	-6.36
27	208			4,384.20			4,384.64	
		4.00	4,320.00	4,315.50	0.00	2.776	4,316.38	-3.62
199	21			4,315.40			4,316.26	

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,390.10	4,383.40	0.00	0.369	4,383.74	-6.36
29	210			4,383.30			4,383.74	
		4.00	4,388.50	4,381.50	0.00	0.530	4,381.87	-6.63
53	213			4,381.40			4,381.86	
		4.00	4,387.50	4,380.00	0.00	0.528	4,380.42	-7.08
55	215			4,379.90			4,380.36	
		4.00	4,239.50	4,231.50	0.00	0.000	4,231.66	-7.84
135	218			4,231.40			4,231.66	
		4.00	4,226.00	4,218.00	0.00	0.100	4,218.18	-7.82
137	219			4,217.90			4,218.18	
		4.00	4,327.90	4,322.60	0.00	0.000	4,322.74	-5.16
139	223			4,322.50			4,322.74	
		4.00	4,320.40	4,312.00	0.00	0.100	4,312.15	-8.25
141	224			4,311.90			4,312.12	
		4.00	4,304.90	4,292.70	0.00	0.100	4,292.89	-12.02
143	226			4,292.60			4,292.86	
		4.00	4,255.50	4,251.50	0.00	0.131	4,251.64	-3.86
151	229			4,251.40			4,251.64	
		4.00	4,322.00	4,312.00	0.00	4.021	4,312.78	-9.22
201	23			4,311.90			4,312.64	
		4.00	4,255.95	4,248.05	0.00	0.131	4,248.21	-7.74
153	230			4,247.95			4,248.21	
		4.00	4,253.30	4,246.20	0.00	0.131	4,246.38	-6.92
155	232			4,246.10			4,246.38	
		4.00	4,252.00	4,244.00	0.00	0.130	4,244.18	-7.82
157	234			4,243.90			4,244.18	
		4.00	4,242.00	4,234.00	0.00	0.290	4,234.30	-7.7
159	236			4,233.90			4,234.26	
		4.00	4,435.40	4,429.40	0.00	0.000	4,429.40	-6
169	237			4,429.30			4,429.40	
		4.00	4,448.00	4,442.00	0.00	0.000	4,442.00	-6
167	239			4,441.90			4,442.00	
		4.00	4,320.00	4,311.00	0.00	4.019	4,311.97	-8.03
203	25			4,310.90			4,311.86	
		4.00	4,317.00	4,309.00	0.00	4.010	4,309.91	-7.09
205	27			4,308.90			4,309.68	
		4.00	4,297.50	4,289.50	0.00	3.999	4,290.26	-7.24
207	29			4,289.40			4,290.26	
		4.00	4,380.00	4,372.00	0.00	0.387	4,372.37	-7.63
3	3			4,371.90			4,372.28	

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,288.30	4,280.30	0.00	3.987	4,281.27	-7.03
209	31			4,280.20			4,281.08	
		4.00	4,282.00	4,274.00	0.00	4.038	4,274.79	-7.21
211	33			4,273.90			4,274.78	
		4.00	4,267.80	4,259.80	0.00	4.055	4,260.68	-7.12
213	35			4,259.70			4,260.36	
		4.00	4,264.00	4,256.00	0.00	4.053	4,256.68	-7.32
215	37			4,255.90			4,256.68	
		4.00	4,258.50	4,250.05	0.00	4.046	4,251.07	-7.43
217	39			4,249.95			4,250.85	
		4.00	4,250.00	4,242.00	0.00	5.219	4,242.81	-7.19
219	41			4,241.90			4,242.70	
		4.00	4,324.00	4,314.00	0.00	1.044	4,314.39	-9.61
119	43			4,313.90			4,314.32	
		4.00	4,315.00	4,307.00	0.00	1.039	4,307.35	-7.65
121	44			4,306.90			4,307.34	
		4.00	4,310.00	4,302.00	0.00	1.032	4,302.42	-7.58
123	46			4,301.90			4,302.42	
		4.00	4,306.00	4,298.00	0.00	1.032	4,298.48	-7.52
125	48			4,297.90			4,298.40	
		4.00	4,362.50	4,354.50	0.00	1.356	4,355.10	-7.4
183	5			4,354.40			4,355.04	
		4.00	4,298.00	4,290.00	0.00	1.131	4,290.44	-7.56
145	50			4,289.90			4,290.34	
		4.00	4,277.00	4,269.00	0.00	1.127	4,269.37	-7.63
147	52			4,268.90			4,269.36	
		4.00	4,266.00	4,258.00	0.00	1.126	4,258.36	-7.64
149	54			4,257.90			4,258.36	
		4.00	4,219.70	4,211.70	0.00	5.205	4,212.42	-7.28
221	57			4,211.60			4,212.42	
		4.00	4,196.00	4,188.00	0.00	5.195	4,188.85	-7.15
223	59			4,187.90			4,188.76	
		4.00	4,165.20	4,157.20	0.00	5.817	4,158.29	-6.91
227	63			4,157.10			4,158.04	
		4.00	4,153.60	4,145.60	0.00	5.816	4,146.78	-6.82
229	65			4,145.50			4,146.60	
		4.00	4,419.70	4,411.70	0.00	0.059	4,411.88	-7.82
5	69			4,411.60			4,411.88	
		4.00	4,350.00	4,342.00	0.00	1.529	4,342.50	-7.5
185	7			4,341.90			4,342.46	

1015RUN

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,382.00	4,374.00	0.00	0.631	4,374.46	-7.54
179	72			4,373.90			4,374.42	
		4.00	4,472.40	4,464.40	0.00	0.111	4,464.62	-7.78
7	74			4,464.30			4,464.62	
		4.00	4,411.40	4,403.40	0.00	0.494	4,403.73	-7.67
177	75			4,403.30			4,403.70	
		4.00	4,375.30	4,367.30	0.00	0.196	4,367.52	-7.78
11	77			4,367.20			4,367.52	
		4.00	4,423.60	4,417.00	0.00	0.230	4,417.20	-6.4
13	79			4,416.90			4,417.20	
		4.00	4,387.00	4,379.00	0.00	0.749	4,379.41	-7.59
77	80			4,378.90			4,379.32	
		4.00	4,496.50	4,488.50	0.00	0.000	4,488.60	-7.9
31	82			4,488.40			4,488.60	
		4.00	4,474.50	4,466.50	0.00	0.054	4,466.64	-7.86
33	83			4,466.40			4,466.64	
		4.00	4,450.00	4,442.00	0.00	0.142	4,442.16	-7.84
35	85			4,441.90			4,442.14	
		4.00	4,410.00	4,402.00	0.00	0.142	4,402.23	-7.77
37	87			4,401.90			4,402.16	
		4.00	4,410.00	4,401.00	0.00	0.203	4,401.27	-8.73
43	89			4,400.90			4,401.20	
		4.00	4,346.00	4,338.00	0.00	1.521	4,338.52	-7.48
187	9			4,337.90			4,338.52	
		4.00	4,407.50	4,399.50	0.00	0.203	4,399.71	-7.79
45	91			4,399.40			4,399.66	
		4.00	4,405.00	4,397.00	0.00	0.203	4,397.29	-7.71
47	93			4,396.90			4,397.18	
		4.00	4,396.00	4,388.00	0.00	0.202	4,388.26	-7.74
49	95			4,387.90			4,388.22	
		4.00	4,388.50	4,382.10	0.00	0.532	4,382.51	-6
51	97			4,382.00			4,382.44	
		4.00	4,488.00	4,480.00	0.00	0.066	4,480.16	-7.84
39	99			4,479.90			4,480.16	

TAZ EXTENSION - 2024 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
61	357	-	-	3	118	77	22	-	-	-	-	578
62	373	-	-	-	1	-	3	-	-	-	-	377
63	12	-	-	-	-	-	-	-	-	-	-	12
64	89	3	499	-	181	-	-	-	-	-	-	772
65	320	67	-	50	174	-	15	4	-	-	-	630
66	403	38	-	-	38	-	-	-	-	-	-	479
67	360	-	-	-	4	3	-	-	-	-	-	367
68	19	-	-	-	-	-	-	-	-	-	-	19
69	44	7	-	3	-	-	-	-	-	-	-	54
70	69	61	-	51	157	3	-	-	-	-	-	340
71	61	53	-	66	155	73	-	-	-	-	-	407
72	69	45	-	-	251	69	14	-	-	-	-	447
73	478	-	414	-	-	-	-	-	-	-	-	892
74	602	-	-	-	94	-	13	-	-	-	-	710
75	1,327	-	-	-	-	-	-	-	-	-	-	1,327
76	672	-	-	-	-	-	-	-	6	-	-	677
77	26	-	-	-	-	-	-	-	-	-	-	26
78	17	-	-	-	-	-	-	-	-	-	-	17
79	3	-	-	-	-	-	-	-	-	-	-	3
80	153	216	193	62	402	-	16	-	-	-	-	1,042
81	509	-	-	-	13	-	-	-	-	-	-	522
82	512	-	-	-	3	-	-	-	-	-	-	515
83	924	-	-	-	-	-	-	-	-	-	-	924
84	479	47	-	61	43	-	-	-	-	-	-	631
85	349	164	-	73	149	-	-	-	-	-	-	735
86	401	380	-	37	167	67	17	-	-	-	-	1,069
87	408	-	-	176	78	61	3	-	-	-	-	726
88	242	-	-	-	-	-	-	-	-	-	-	242
89	231	-	-	17	15	1	-	-	-	-	-	264
90	136	-	-	-	-	-	-	-	-	-	-	136
91	122	-	-	-	-	-	-	-	-	-	-	122

TAZ EXTENSION - 2024 ESTIMATES

TAZ	Single Family LU1 DU'S	Multi Family LU2 UNITS	Hotels LU3 ROOMS	Industrial LU4	Retail LU5	Office LU6	FIRES LU7	Medical LU8	AFM LU9	School LU10 STUD's	Other LU11	
92	26	-	-	-	-	-	-	-	-	-	-	26
93	3	-	-	-	-	-	-	-	-	-	-	3
94	85	2	-	-	-	-	-	-	-	-	-	87
95	22	3	-	383	10	24	3	-	56	-	-	501
96	136	-	-	6	-	-	-	-	-	-	-	142
97	239	-	-	-	-	-	-	-	-	-	-	239
98	29	-	-	-	-	-	-	-	-	-	-	29
99	29	-	-	-	-	-	-	-	-	-	-	29
100	17	-	-	-	-	-	-	-	-	-	-	17
101	85	3	-	-	-	-	-	-	-	-	-	88
102	85	3	-	-	-	-	-	-	-	-	-	88
103	129	10	-	2	-	-	6	-	6	-	-	153
104	20	-	-	-	-	-	-	-	-	-	-	20
105	26	-	-	-	-	-	-	-	-	-	-	26
106	3	-	-	-	-	-	-	-	-	-	-	3
107	256	9	-	-	-	-	-	-	-	-	-	265
108	85	3	-	-	-	-	-	-	-	-	-	88
109	43	2	-	-	-	-	-	-	-	-	-	45
110	43	2	-	-	-	-	-	-	-	-	-	45
111	52	2	-	-	8	-	-	-	-	-	-	62
112	43	2	-	-	-	-	-	-	-	-	-	45
113	312	1,115	-	74	683	1,583	-	-	-	488	-	
Total	**23,393**	**4,634**	**1,850**	**3,838**	**9,164**	**5,847**	**1,181**	**1,161**	**270**	**6,151**	**32**	**53,268**

Appendix E

Alamogordo Sewer Master Plan
ALA32-11.S20
CDBG 03-C-HR-I-6-G-70

Technical Team Kickoff Meeting
Thursday, November 13, 2003
10 AM – 12:00 noon
City Hall

INVITED:

Brian McGuire, Acting City Engineer, City of Alamogordo
Jose Miramontes, Public Works Director, City of Alamogordo
Maureen Schmittle, CDBG Representative, City of Alamogordo
Dennis Wing, Severn Trent
Doug Nelson, True-Value Hardware
Jim French, Real Estate
~~Tom French, Real Estate~~
~~Ginna Sanders, Real Estate~~
Michael Shyne, Real Estate
Jerry Paz, Molzen-Corbin & Associates, Project Manager
Joe Moore, Molzen-Corbin & Associates
Pat McCart, City Manager
Brian Cesar, Utility Maintenance

AGENDA:

1. Introduction of team members

2. Scope of Project

3. Schedule and Milestone Dates

4. Responsibilities & Duties

5. Other

Name	Representing	Phone #
Doug Nelson	Tool Belt Home Land Development	437-1418
Jim French	French Brothers	437-2134
Brian Ceser	COA	439-4044
Jose Miramontes	COA	439-4240
Dennis Wing	Severn Trent	437-5991

City of Alamogordo

Sanitary Sewer Master Plan

Public Meeting

Meeting Info

Date: Tuesday, March 2, 2004

Time: 6:00 to 7:30 pm

Location: Civic Center
Conference Rm A-B
800 East First Street
Alamogordo, NM
Corner of First and
South Florida

The City of Alamogordo invites you to participate in our planning process for sanitary sewer services. The City has procured the services of Molzen-Corbin & Associates to develop a 20-year Sanitary Sewer Master Plan to ensure adequate facilities for community growth and development. The City is seeking public comment to aide in the development of planning priorities. Come learn about the study process, get a project update, and participate in an open discussion about the project. This is a great opportunity to ask questions, voice concerns, and provide input regarding the study. We hope you'll join us!

Highlights

- Meet City staff: Brian McGuire, Community Development Director; Sharon Few, City Planner; Jose Miramontes, Public Works Director; Maureen Schmittle, Grants Coordinator
- Meet Community Development Advisory Council Members: Paul T. Burnett, Ralph Davis, Tech Sgt. Bruce Knee, Jack Spears, Nancy Taylor, Rep. Gloria Vaughn
- Meet Project Engineers from Molzen-Corbin & Associates: Jerry Paz, Joe P. Moore

Contact person:
Mr. Brian McGuire, Director
Community Development
City of Alamogordo
1376 East Ninth Street
Alamogordo, New Mexico 88310
Phone: (505) 439-4226
Fax: (505) 4339-4343

City of Alamogordo

CITY OF ALAMOGORDO

WASTEWATER MASTERPLAN

Project No. 03-C-NR-I-6-G-70

Initial Public Meeting

March 2, 2004

MOLZEN-CORBIN & Associates

PURPOSE AND SCOPE OF WASTEWTER MASTER PLAN

- Assist the City of Alamogordo with Long Term Management of Wastewater Flows
- Review the Conditions of Existing Wastewater Collection System and Determine Existing Deficiencies
- Project Development Trends and Determine if Existing is Adequate
- Identify Future Capital Improvements Needed to Meet Community Growth

PROJECT TASKS

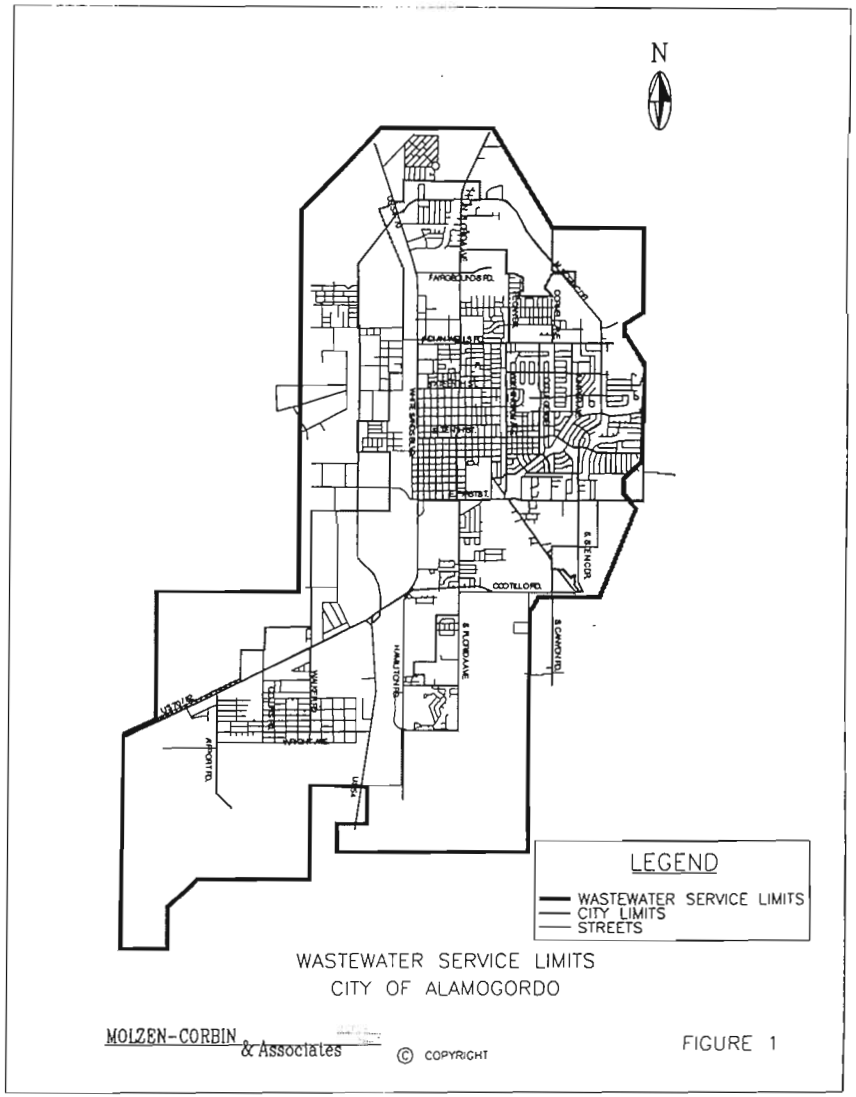
- Step One: Define Planning Area and Planning Period
- Step Two: Develop Population Analysis and Projections
- Step Three: Develop Wastewater Flow Projections
- Step Four: Analyze Existing Collection System
- Step Five: Develop Design Alternatives

PROJECT TASKS (cont…)

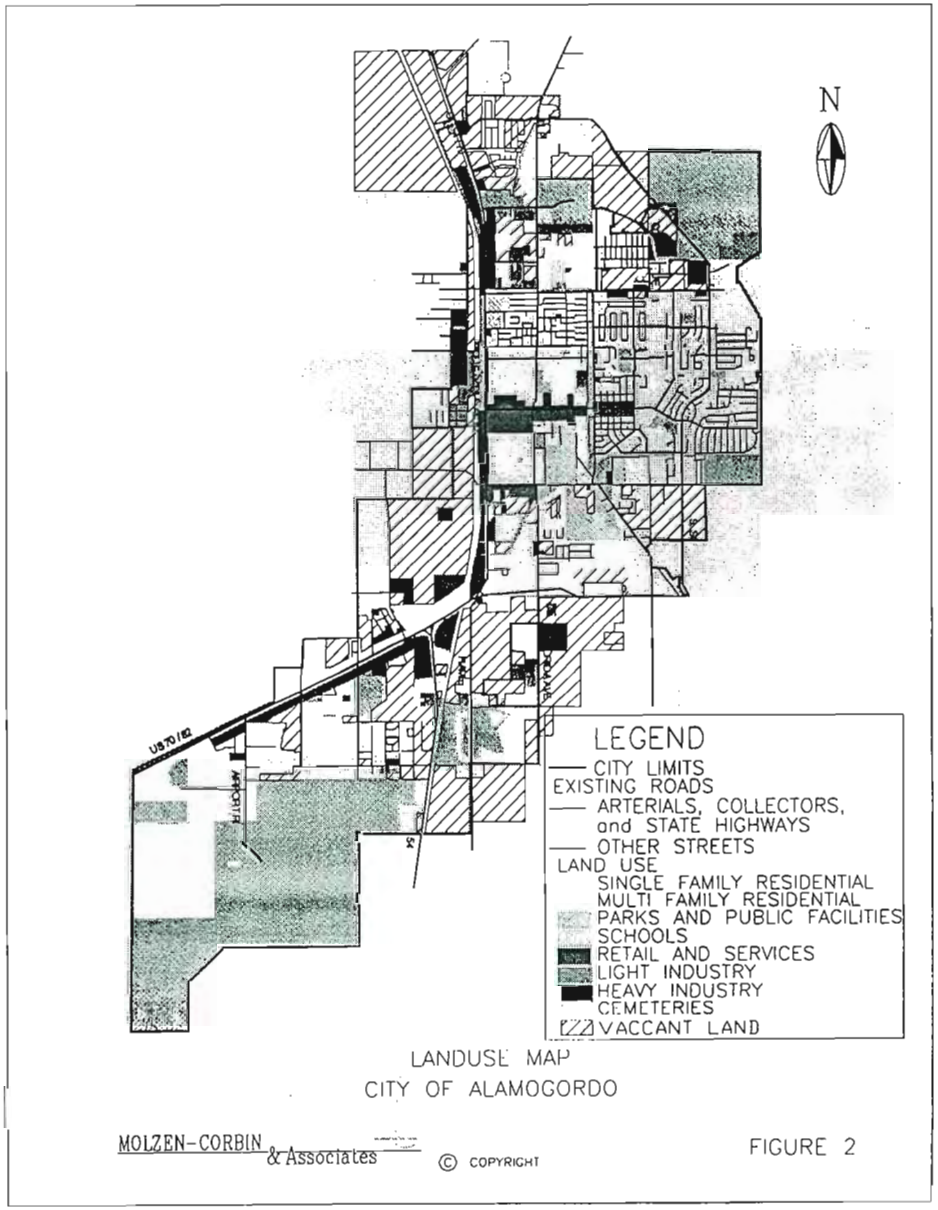
- Step Six: Analyze Alternatives
- Step Seven: Develop Master Plan
- Step Eight: Present Master Plan to City
- Step Nine: Public Involvement
- Step Ten: Finalize Master Plan
- Schedule

STUDY AREA

- Established by Study Team
- Generally Follows Water Service Area
- Includes Areas North of US 54 Bypass
- Includes Area on South US 54



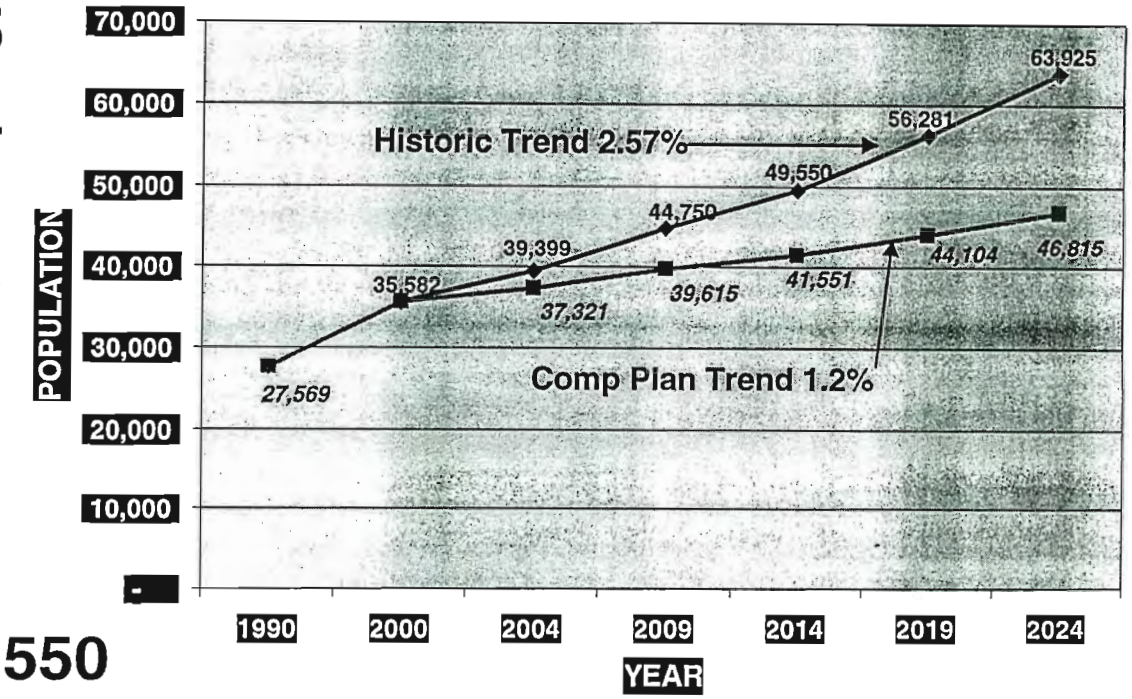
LAND USE



Source:
2000 Alamogordo Comprehensive Plan

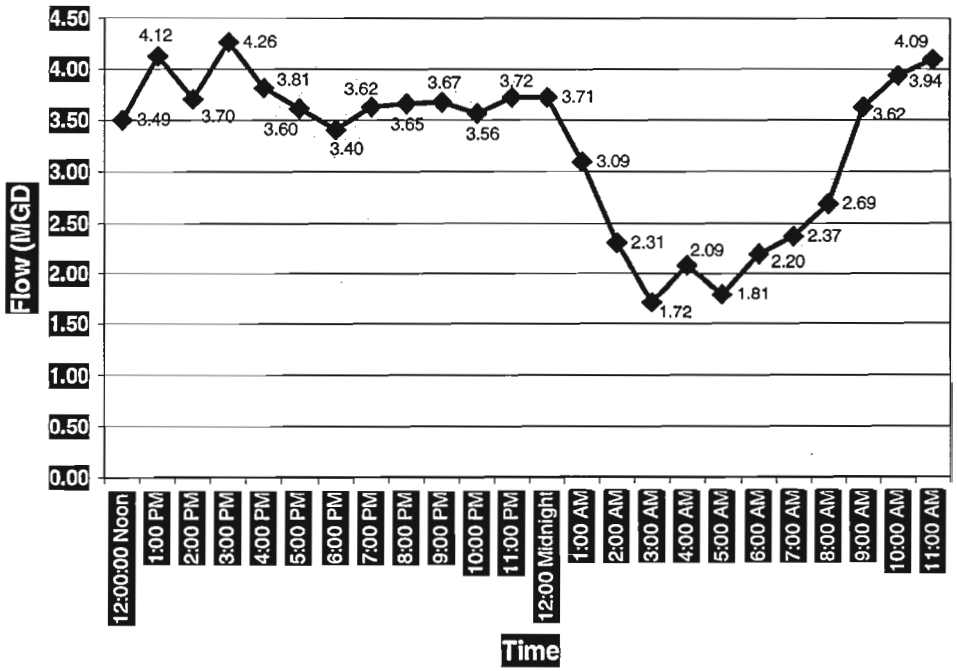
POPULATION ANALYSIS

- **1970 Census: 23,035**
- **1980 Census: 24,024**
  (0.42% Annual Average)
- **1990 Census: 27,596**
  (1.4% Annual Average)
- **2000 Census: 35,582**
  (2.57% Annual Average)
- **10 Year Projection: Between 41,551 & 49,550**
- **20 Year Projection: Between 46,815 and 63,925**



FLOW PROJECTIONS

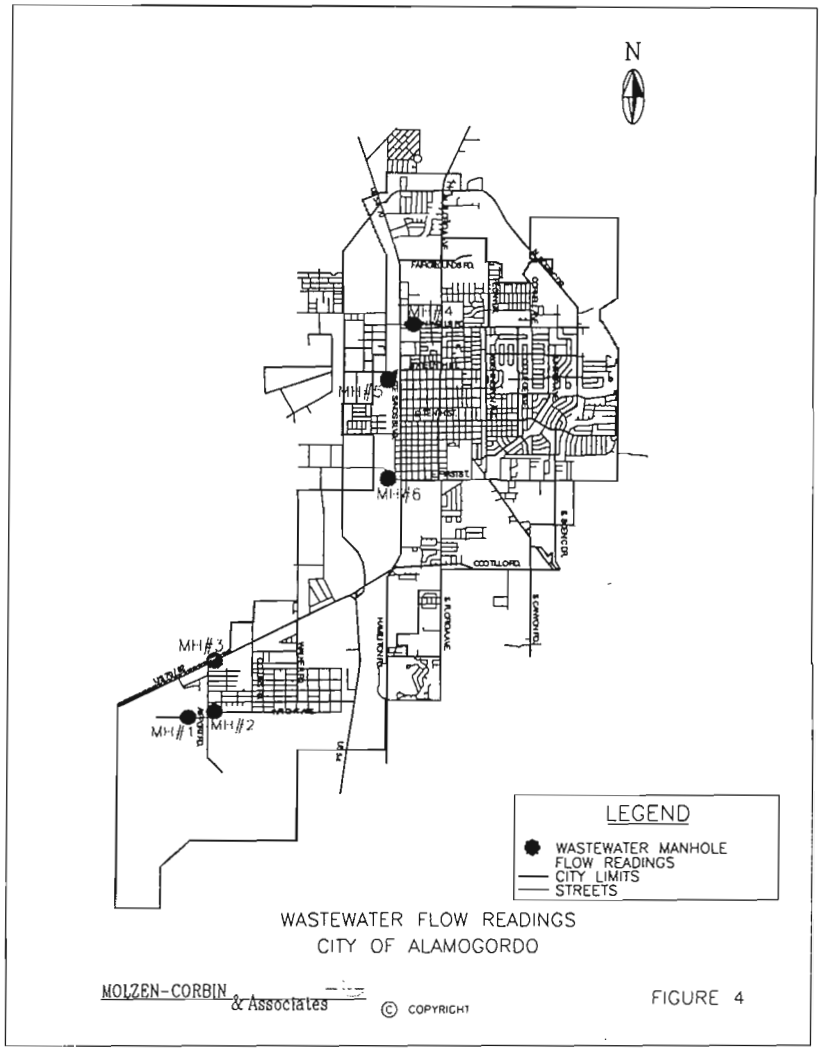
- 2003 Average Total Wastewater Flow: 2.67 Million Gallons per Day
- 2003 Average Per Capita Flow: 73 gpcpd
- 2014 Estimated Average Daily Flow: 4.04 MGD
- 43% Daily Peak, 30% Hourly Peak
- 2014 Estimated Hourly Peak Day Flow: 7.68 MGD



January 28, 2004

EXISTING COLLECTION SYSTEM ANALYSIS

- Survey of Existing Flows Collected in January, 2004
- Existing System to be Modeled in GIS Based Computer Program (HYDRA)
- Currently At This Phase



City of Alamogordo

Thank you for your time. We will now take Questions?

MOLZEN-CORBIN & Associates

Thank You

City of Alamogordo

Sanitary Sewer Master Plan

Public Meeting

Meeting Info

Date: Tuesday, July 1, 2004

Time: 4:00 to 5:30 pm

Location: Civic Center
Conference Rm A-B
800 East First Street
Alamogordo, NM
Corner of First and
South Florida

The City of Alamogordo has begun the development of a 20-year Sanitary Sewer Master Plan with the assistance of Molzen-Corbin & Associates. The purpose of the Sanitary Sewer Master Plan is to ensure adequate facilities for community growth and development. In this second public meeting of the process, the City will present the preliminary results of the engineering analysis of the sanitary sewer collection system. Come and see what we've discovered and learn what the next steps are. This is a great opportunity to ask questions, voice concerns, and provide input regarding the study. We hope you'll join us!

Highlights

- Meet City staff: Brian McGuire, Community Development Director; Maureen Schmittle, Grants Coordinator; Jose Miramontes, Public Works Director
- Meet Jerry Paz, the Project Engineer from Molzen-Corbin & Associates
- Community Development Advisor Committee Members will be present.

Contact person:
Mr. Brian McGuire, Director
Community Development
City of Alamogordo
1376 East Ninth Street
Alamogordo, New Mexico 88310
Phone: (505) 439-4226
Fax: (505) 4339-4343

CITY OF ALAMOGORDO
WASTEWATER MASTERPLAN
Project No. 03-C-NR-I-6-G-70
Second Public Meeting
July 1, 2004 4pm

SIGN IN SHEET

NAME	REPRESENTING	TELEPHONE NUMBER	E-MAIL ADDRESS
Maureen Schmitt	City of Alamogordo	439-4245	
Don Cooper	City of Alamo.	FAX 439-8123 434-5383	
Nancy Taylor	CDAC	437-8105	ntaylor@fs.fed.us
Pat McCann	City of Alamogordo	439-4200	
Jose Miramontes	C.O.A	439-4240	
Gloria Vaughn	State Rep #59	434-2819	None
Dennis Wing	Severn Trent	437-5991	dwing@stes.com
James M. Vaughn	Self	434-2819	none
Paul Burnett	CDAC	434-1533	pburnette@zia.net
Nina Burnett	—	434-1533	"
Jerry Ruiz	Molzen-Corbin	522-0049	jruiz@molzencorbin.com
Jose Terrones	Molzen Corbin	522-0049	jterrones@molzencorbin.com
Gaston Sanders	CDAC	434 4434	YESGOS@TULAROSA.NET

City of Alamogordo

CITY OF ALAMOGORDO

WASTEWATER MASTERPLAN

Project No. 03-C-NR-I-6-G-70

Second Public Meeting

July 1, 2004

MOLZEN-CORBIN & Associates

PURPOSE AND SCOPE OF WASTEWTER MASTER PLAN

- Assist the City of Alamogordo with Long Term Management of Wastewater Flows
- Review the Conditions of Existing Wastewater Collection System and Determine Existing Deficiencies
- Project Development Trends and Determine if Existing is Adequate
- Identify Future Capital Improvements Needed to Meet Community Growth

PROJECT TASKS

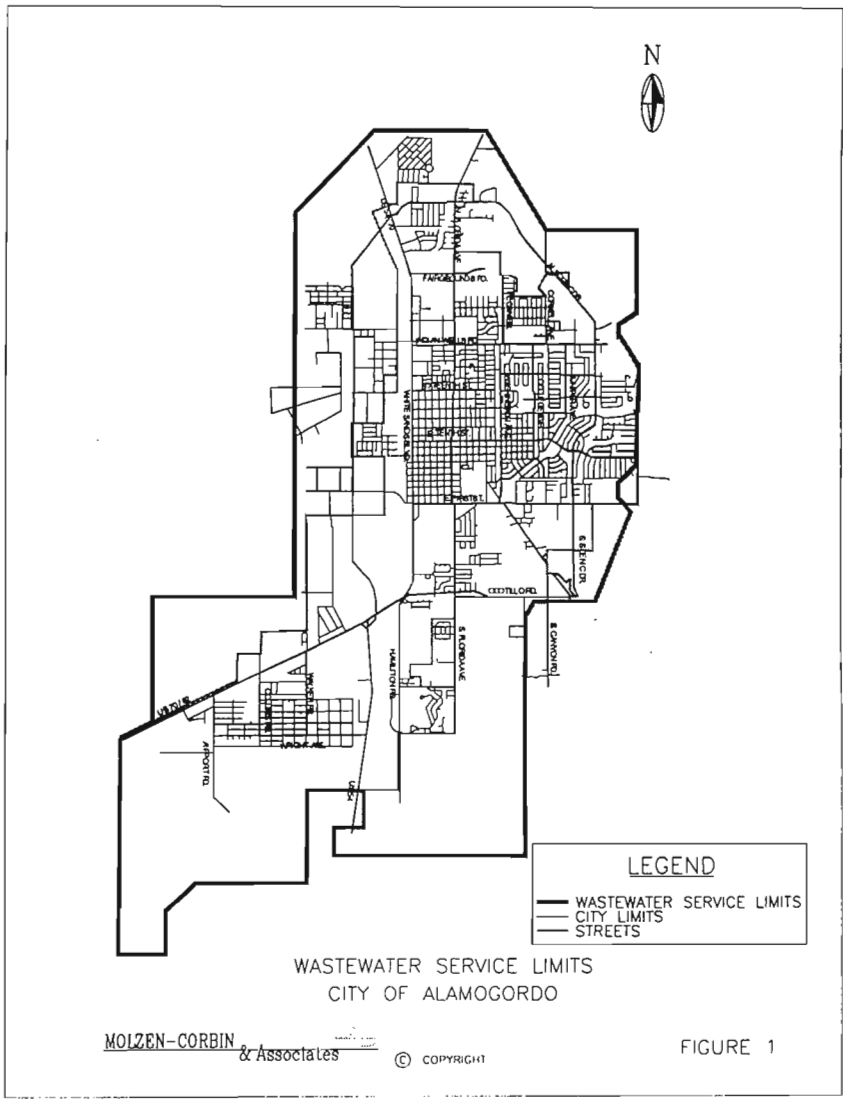
- Step One: Define Planning Area and Planning Period
- Step Two: Develop Population Analysis and Projections
- Step Three: Develop Wastewater Flow Projections
- Step Four: Analyze Existing Collection System
- Step Five: Develop Design Alternatives

PROJECT TASKS (cont…)

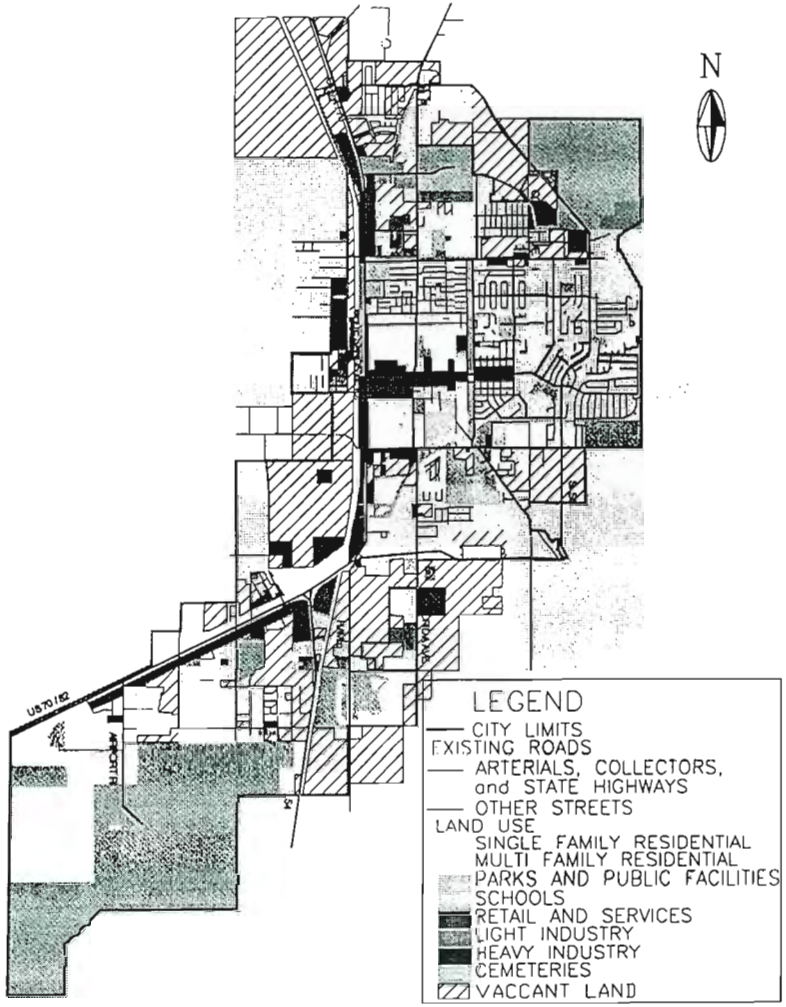
- Step Six: Analyze Alternatives
- Step Seven: Develop Master Plan
- Step Eight: Present Master Plan to City
- Step Nine: Public Involvement
- Step Ten: Finalize Master Plan
- Schedule

STUDY AREA

- Established by Study Team
- Generally Follows Water Service Area
- Includes Areas North of US 54 Bypass
- Includes Offset West of Bypass Road
- Includes Area on South US 54
- East to Public Lands



LAND USE



LANDUSE MAP
CITY OF ALAMOGORDO

MOLZEN-CORBIN & Associates © COPYRIGHT

FIGURE 2

Source:
2000 Alamogordo Comprehensive Plan

POPULATION ANALYSIS

- **1970 Census: 23,035**
- **1980 Census: 24,024**
  (0.42% Annual Average)
- **1990 Census: 27,596**
  (1.4% Annual Average)
- **2000 Census: 35,582**
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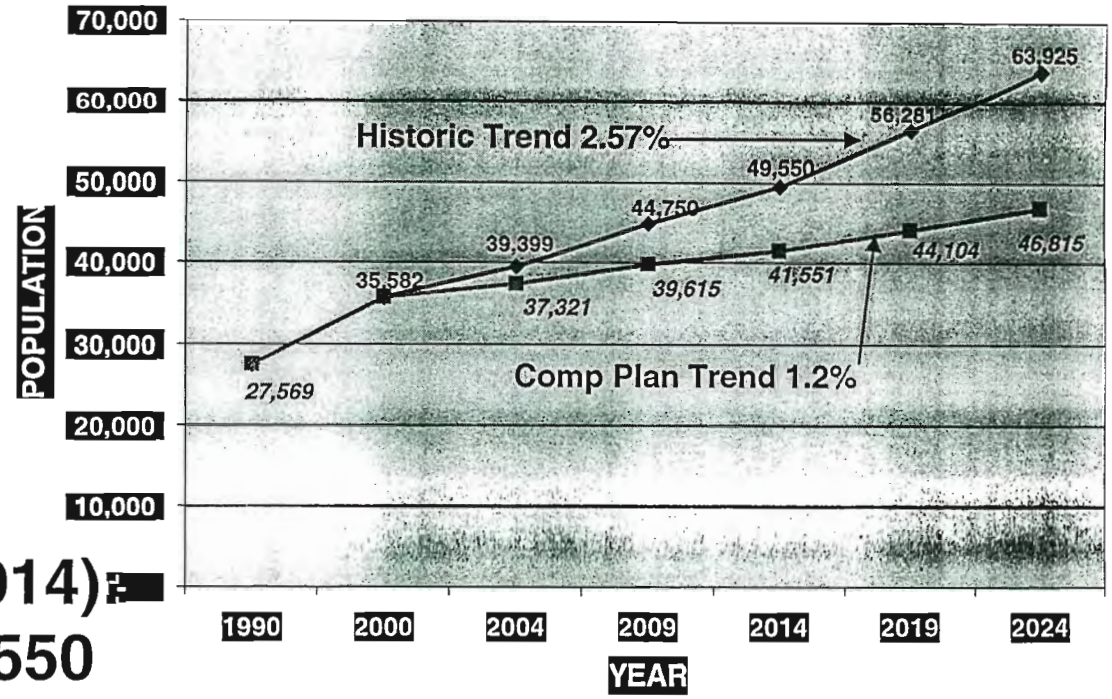
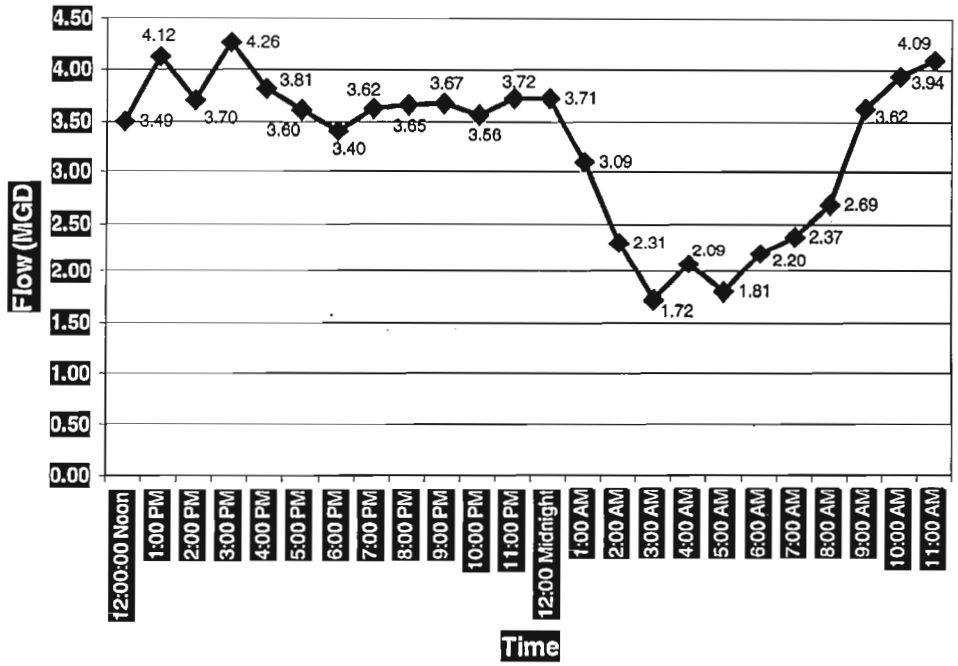
- **20 Year Projection (2024): Between 46,815 and 63,925**



FLOW DATA

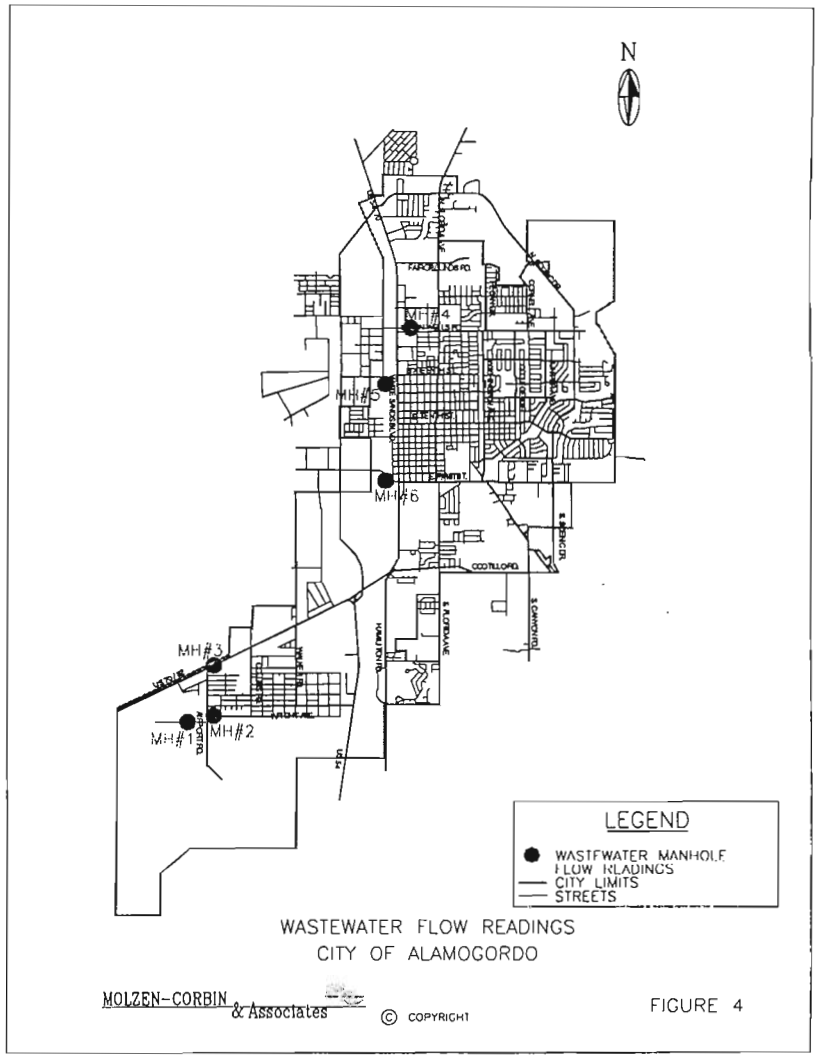
- 2003 Average Total Wastewater Flow: 2.67 Million Gallons per Day
- 2003 Peak Day Flow: 3.83 MGD
- 4.26 MGD Peak Hour Flow Recorded 1/04
- 2003 Average Per Capita Flow: 73 gpcpd
- 43% Daily Peak, 30% Hourly Peak



January 28, 2004

EXISTING COLLECTION SYSTEM ANALYSIS

- Survey of Existing Flows Collected in January, 2004
- Existing System Modeled in GIS Based Computer Program (HYDRA)
- Corrected to Measured Flows
- Projections Based on 2% Growth Rate



Peak Flow Estimates

Station	Pipe Size (mgd)	Capacity (mgd)	Peak Hour Flows (mgd)				
			2004	2009	2014	2019	2024
Manhole 1	36	22.0	4.3	4.7	5.2	5.7	6.3
Manhole 2	21	6.7	0.7	0.8	0.8	0.9	1.0
Manhole 3	30	18.0	5.4	6.0	6.6	7.3	8.0
Manhole 4	21	6.2	1.2	1.3	1.4	1.6	1.7
Manhole 5	21	6.2	1.4	1.6	1.7	1.9	2.1
Manhole 6	24	10.7	3.2	3.6	3.9	4.3	4.8

Peak Day Projections

Station	Pipe Size (Inches)	Capacity (mgd)	Peak Day / Peak Hour Flows (mgd)				
			2004	2009	2014	2019	2024
Manhole 1	36	22.0	6.4	7.1	7.8	8.6	9.5
Manhole 2	21	6.7	1.0	1.1	1.3	1.4	1.5
Manhole 3	30	18.0	8.1	8.9	9.9	10.9	12.0
Manhole 4	21	6.2	1.7	1.9	2.1	2.4	2.6
Manhole 5	21	6.2	2.1	2.3	2.6	2.9	3.2
Manhole 6	24	10.7	4.8	5.3	5.9	6.5	7.2

FINDINGS OF EXISTING SYSTEM ANALYSIS

- There are no sewer Interceptors in the City of Alamogordo that are undersized.
- All interceptors meet 20 year flow projection needs.
- Existing interceptors were mostly designed with good flow characteristics
- During course of Masterplanning effort, City has reported numerous problems with collection system pipe integrity.

ALTERNATIVE ALIGNMENTS

- Alignments have been developed to reach out to underserved areas and Limits of Study Area
- Preliminary at this time and subject to change
- Analysis assumes feasible right-of-way acquisition
- New interceptors will increase flows beyond existing system analysis
- Capital Improvement Program will be developed to include replacement of failing lines.

City of Alamogordo

Thank you for your time. We will now take Questions?

MOLZEN-CORBIN & Associates

Thank You

Appendix F

Tag	Interceptor Name	Entity Type Name	Entity Length	Ground Elev Up	Ground Elev Down	Invert Up	Invert Elev Down	Material Type	Size (in)	Sanitary Area (Acres)	Sanitary Peak Q (cfs)	Peak Factor (Diurnal)	Design Q (cfs)	Design Velocity (ft/sec)	Average Flow (cfs)	Water Surf Elev Down	Time In Entity	HGL up	HGL down	HGL Break Distance	HGL Break Elevation	Mannings N	Slope	Q Full	Q Max Allowed (cfs)	Excess Capacity (cfs)	Depth	D over D
1	LINE-164	EPI	1999.157	4406	4380	4398	4372	PVC	12	490.5	0.333	1.491	0.333	2.98	0.223	4372.2	11.182	4398.2	4372.453	1979.682	4372.453	0.013	0.013	4.815	4.81	4.477	2.4	0.2
4	LINE-164	EPI	2333.589	4380	4362.5	4372	4354.5	PVC	12	752.6	0.645	1.487	0.645	2.975	0.433	4354.82	13.071	4372.32	4355.227	2279.323	4355.227	0.011	0.007	3.656	3.652	3.008	3.84	0.32
6	LINE-162	EPI	2572.507	4362.5	4350	4354.5	4342	OLDCONC	21	3149.4	2.505	1.238	2.505	2.685	2.023	4342.72	15.969	4355.22	4342.86	2543.702	4342.86	0.019	0.005	7.578	7.57	5.065	8.64	0.411
14	LINE-158	EPI	988.619	4341	4335.8	4333	4327.8	PVC	21	388.7	0.563	1.438	0.563	2.052	0.391	4328.1	8.031	4333.3	4328.1	988.619	4328.1	0.013	0.005	13.618	13.604	13.041	3.6	0.171
16	LINE-158	EPI	1325.873	4335.8	4327.7	4327.8	4319.7	PVC	21	388.7	0.563	1.438	0.563	2.267	0.391	4319.98	9.749	4328.08	4320.121	1302.771	4320.121	0.013	0.006	14.676	14.661	14.098	3.36	0.16
18	LINE-158	EPI	1237.074	4327.7	4320	4319.7	4315.9	PVC	21	700.9	1.57	1.624	1.57	2.769	0.967	4316.4	7.445	4320.2	4316.564	1183.813	4316.564	0.013	0.003	10.407	10.396	8.826	6	0.286
20	LINE-158	EPI	269.353	4320	4320	4315.9	4315.5	PVC	21	700.9	1.564	1.618	1.564	2.246	0.967	4316.08	1.999	4316.48	4316.134	232.887	4316.134	0.013	0.001	7.236	7.228	5.664	6.96	0.331
22	LINE-158	EPI	1577.327	4320	4322	4315.5	4312	PVC	21	700.9	1.562	1.617	1.562	2.475	0.966	4312.54	10.622	4316.04	4312.589	1555.249	4312.589	0.013	0.002	8.845	8.836	7.274	6.48	0.309
24	LINE-156	EPI	97.603	4322	4320	4312	4311	CLAY	24	2224.8	2.993	1.558	2.993	3.958	1.921	4311.58	0.411	4312.58	4311.802	75.948	4311.802	0.015	0.01	19.899	19.879	16.886	6.96	0.29
26	LINE-156	EPI	646.677	4320	4317	4311	4309	CLAY	24	2224.8	2.993	1.558	2.993	2.832	1.921	4309.74	3.806	4311.74	4309.781	633.352	4309.781	0.015	0.003	10.933	10.922	7.929	8.88	0.37
28	LINE-152	EPI	2376.134	4317	4297.5	4309	4289.5	CLAY	24	2224.8	2.982	1.552	2.982	3.761	1.921	4290.1	10.529	4309.6	4290.586	2316.906	4290.586	0.015	0.008	17.809	17.791	14.81	7.2	0.3
30	LINE-152	EPI	1962.95	4297.5	4288.3	4289.5	4280.3	CLAY	24	7634	5.568	1.299	5.568	4.061	4.286	4281.2	8.056	4290.4	4281.423	1915.366	4281.423	0.015	0.005	13.459	13.445	7.877	10.8	0.45
32	LINE-154	EPI	1531.785	4288.3	4282	4280.3	4274	CLAY	27	8018	5.642	1.3	5.642	3.799	4.34	4274.9	6.72	4281.2	4274.938	1522.61	4274.938	0.015	0.004	17.26	17.243	11.6	10.8	0.4
34	LINE-154	EPI	3688.205	4282	4267.8	4274	4259.8	CLAY	27	8299	5.706	1.298	5.706	3.731	4.396	4260.72	16.476	4274.92	4260.805	3666.23	4260.805	0.015	0.004	16.699	16.683	10.977	11.04	0.409
36	LINE-154	EPI	170.505	4267.8	4264	4259.8	4256	CLAY	27	8299	5.703	1.298	5.703	6.121	4.394	4256.64	0.464	4260.44	4256.762	165.019	4256.762	0.015	0.022	40.178	40.138	34.435	7.68	0.284
38	LINE-154	EPI	672.29	4264	4258.5	4256	4250.5	CLAY	27	8299	5.703	1.298	5.703	4.659	4.394	4251.28	2.405	4256.78	4251.282	672.089	4251.282	0.015	0.008	24.343	24.318	18.616	9.36	0.347
40	LINE-154	EPI	2125.464	4258.5	4250	4250.05	4242	CLAY	27	8532	5.8	1.297	5.8	3.685	4.471	4242.94	9.612	4250.99	4242.94	2125.464	4242.94	0.015	0.004	16.563	16.546	10.747	11.28	0.418
42	LINE-118	EPI	458.419	4324	4315	4314	4307	PVC	27	1704	1.67	1.42	1.67	4.066	1.176	4307.36	1.879	4314.36	4307.385	456.759	4307.385	0.013	0.015	45.35	45.305	43.635	4.32	0.16
45	LINE-118	EPI	452.363	4315	4310	4307	4302	PVC	27	1704	1.668	1.419	1.668	3.758	1.176	4302.38	2.006	4307.38	4302.487	442.714	4302.487	0.013	0.011	38.584	38.545	36.877	4.56	0.169
47	LINE-118	EPI	1200.472	4310	4306	4302	4298	PVC	27	1704	1.666	1.417	1.666	2.533	1.176	4298.5	7.9	4302.5	4298.582	1175.805	4298.582	0.013	0.003	21.184	21.163	19.497	6	0.222
49	LINE-118	EPI	1881.803	4306	4298	4298	4290	PVC	27	1704	1.659	1.411	1.659	2.84	1.176	4290.46	11.042	4298.46	4290.561	1857.982	4290.561	0.013	0.004	23.929	23.905	22.246	5.52	0.204
51	LINE-116	EPI	1898.564	4298	4277	4290	4269	PVC	24	1971.7	1.769	1.367	1.769	3.956	1.294	4269.4	7.999	4290.4	4269.414	1897.267	4269.414	0.013	0.011	28.194	28.166	26.396	4.8	0.2
53	LINE-116	EPI	1253.197	4277	4266	4269	4258	PVC	24	1971.7	1.769	1.367	1.769	3.689	1.294	4258.42	5.661	4269.42	4258.42	1253.197	4258.42	0.013	0.009	25.116	25.09	23.321	5.04	0.21
55	LINE-116	EPI	1735.623	4266	4250	4258	4242	PVC	24	1971.7	1.765	1.364	1.765	3.945	1.294	4242.4	7.332	4258.4	4242.902	1681.137	4242.902	0.013	0.009	25.739	25.713	23.948	4.8	0.2
56	LINE-114	EPI	3385.642	4250	4219.7	4242	4211.7	PVC	30	10503.6	7.564	1.312	7.564	6.222	5.765	4212.44	9.069	4242.74	4212.46	3383.407	4212.46	0.013	0.009	45.982	45.936	38.371	8.88	0.296
58	LINE-114	EPI	3385.643	4219.7	4196	4211.7	4188	PVC	30	10503.6	7.552	1.31	7.552	5.775	5.765	4188.78	9.771	4212.48	4188.938	3363.015	4188.938	0.013	0.007	40.667	40.626	33.074	9.36	0.312
60	LINE-116	EPI	2906.732	4196	4180	4188	4172	PVC	36	10987.5	7.561	1.308	7.561	4.826	5.78	4172.82	10.038	4188.82	4173.078	2859.876	4173.078	0.013	0.006	58.64	58.581	51.02	9.84	0.273
62	LINE-102	EPI	2672.99	4180	4165.2	4172	4157.2	PVC	36	15177.8	9.237	1.262	9.237	5.343	7.319	4158.08	8.338	4172.88	4158.583	2582.146	4158.583	0.013	0.006	58.812	58.753	49.516	10.56	0.293
64	LINE-100	EPI	3147.29	4165.2	4153.6	4157.2	4145.6	PVC	36	15177.8	9.227	1.261	9.227	4.871	7.317	4146.54	10.769	4158.14	4147.043	3010.694	4147.043	0.013	0.004	47.984	47.936	38.709	11.28	0.313
66	LINE-100	EPI	397.779	4153.6	4152	4145.6	4145	PVC	36	15823.6	9.278	1.26	9.278	3.677	7.362	4146.16	1.803	4146.76	4146.16	397.779	4146.16	0.013	0.002	30.696	30.666	21.388	13.92	0.387
76	LINE-160	EPI	3398.42	4375.3	4350	4367.3	4342	PVC	10	170.9	0.198	1.506	0.198	1.969	0.132	4342.2	28.771	4367.5	4342.781	3320.357	4342.781	0.013	0.007	2.24	2.238	2.04	2.4	0.24
81	LINE-146	EPI	1271.721	4496.5	4474.5	4488.5	4466.5	PVC	10	58.1	0.054	1.496	0.054	1.467	0.036	4466.6	14.445	4488.6	4466.62	1270.565	4466.62	0.013	0.017	3.415	3.411	3.357	1.2	0.12
84	LINE-146	EPI	1171.633	4474.5	4450	4466.5	4442	PVC	10	141.7	0.142	1.607	0.142	2.346	0.088	4442.14	8.322	4466.64	4442.14	1171.633	4442.14	0.013	0.021	3.754	3.751	3.609	1.68	0.168
86	LINE-146	EPI	1720.469	4450	4410	4442	4402	PVC	12	141.7	0.142	1.606	0.142	2.122	0.088	4402.14	13.512	4442.14	4402.211	1717.427	4402.211	0.013	0.023	6.437	6.431	6.289	1.68	0.14
88	LINE-146	EPI	62.668	4410	4410	4402	4401	PVC	10	141.7	0.141	1.598	0.141	2.336	0.088	4401.14	0.447	4402.14	4401.182	60.064	4401.182	0.013	0.016	3.28	3.276	3.135	1.68	0.168
90	LINE-140	EPI	148.197	4410	4407.5	4401	4399.5	PVC	10	265.4	0.206	1.547	0.206	2.376	0.133	4399.68	1.04	4401.18	4399.701	146.112	4399.701	0.013	0.01	2.612	2.609	2.404	2.16	0.216
92	LINE-140	EPI	100.361	4407.5	4405	4399.5	4397	PVC	10	265.4	0.206	1.546	0.206	2.808	0.133	4397.16	0.596	4399.66	4397.294	94.971	4397.294	0.013	0.025	4.098	4.094	3.888	1.92	0.192
94	LINE-140	EPI	476.279	4405	4396	4397	4388	PVC	10	265.4	0.205	1.544	0.205	2.805	0.133	4388.16	2.83	4397.16	4388.235	472.29	4388.235	0.013	0.019	3.569	3.565	3.36	1.92	0.192
96	LINE-140	EPI	735.535	4396	4388.5	4388	4382.1	PVC	10	265.4	0.205	1.538	0.205	2.034	0.133	4382.3	6.028	4388.2	4382.451	716.698	4382.451	0.013	0.008	2.325	2.323	2.118	2.4	0.24
98	LINE-144	EPI	1140.278	4488	4484	4480	4476	PVC	12	123.7	0.066	1.487	0.066	0.995	0.045	4476.14	19.102	4480.14	4476.14	1140.278	4476.14	0.013	0.004	2.501	2.498	2.432	1.68	0.14
101	LINE-142	EPI	2906.005	4484	4410	4476	4402	PVC	12	123.7	0.066	1.487	0.066	1.627	0.045	4402.1	29.774	4476.1	4402.1	2906.005	4402.1	0.013	0.025	6.737	6.73	6.664	1.2	0.1
102	LINE-136	EPI	425.351	4510	4508.5	4502	4500.5	PVC	10	151.6	0.049	1.775	0.049	0.817	0.028	4500.64	8.676	4502.14	4500.64	425.351	4500.64	0.013	0.004	1.542	1.54	1.491	1.68	0.168
105	LINE-136	EPI	238.327	4508.5	4507.5	4500.5	4499.5	PVC	10	151.6	0.049	1.775	0.049	1.021	0.028	4499.62	3.889	4500.62	4499.62	238.327	4499.62	0.013	0.004	1.682	1.68	1.631	1.44	0.144
107	LINE-136	EPI	1108.924	4507.5	4502	4499.5	4494	PVC	10	151.6	0.049	1.775	0.049	1.021	0.028	4494.12	18.095	4499.62	4494.12	1108.924	4494.12	0.013	0.005	1.828	1.827	1.777	1.44	0.144
109	LINE-134	EPI	257.186	4502	4494.3	4494	4486.3	PVC	12	151.6	0.049	1.771	0.049	1.673	0.028	4486.38	2.562	4494.08	4486.46	254.513	4486.46	0.013	0.03	7.305	7.298	7.249	0.96	0.08
111	LINE-134	EPI	1120.028	4494.3	4457	4486.3	4449	PVC	12	340.4	0.271	1.764	0.271	3.336	0.153	4449.16	5.596	4486.46	4449.163	1119.926	4449.163	0.013	0.033	7.705	7.697	7.426	1.92	0.16
113	LINE-134	EPI	832.46	4457	4432	4449	4424	PVC	12	340.4	0.27	1.759	0.27	3.325	0.153	4424.16	4.173	4449.16	4424.16	832.457	4424.16	0.013	0.03	7.316	7.309	7.039	1.92	0.16
115	LINE-134	EPI	1218.313	4432	4410	4424	4402	PVC	12	340.4	0.269	1.755	0.269	2.799	0.153	4402.18	7.255	4424.18	4402.304	1211.434	4402.304	0.013	0.018	5.673	5.668	5.399	2.16	0.18
117	LINE-134	EPI	286.585	4410	4396	4402	4388	PVC	12	340.4	0.267	1.745	0.267	4.002	0.153	4388.14	1.193	4402.14	4388.229	284.772	4388.229	0.013	0.049	9.331	9.322	9.055	1.68	0.14
119	LINE-134	EPI	694.674	4396	4391.5	4388	4383.5	PVC	12	340.4	0.267	1.745	0.267	2.088	0.153	4383.72	5.546	4388.22	4383.778	685.698	4383.778	0.013	0.006	3.398	3.395	3.127	2.64	0.22
121	LINE-134	EPI	518.373	4391.5	4387	4383.5	4379	PVC	12	340.4	0.267	1.741	0.267	2.386	0.153	4379.2	3.62	4383.7	4379.418	493.288	4379.418	0.013	0.009	3.934	3.93	3.663	2.4	0.2
122	LINE-130	EPI	1313.586	4387	4370.5	4379	4362.5	PVC	12	1294.9	0.873	1.466	0.873	4.027	0.595	4362.82	5.436	4379.32	4362.82	1313.586	4362.82	0.013	0.013	4.732	4.727	3.854	3.84	0.32
124	LINE-130	EPI	1348.517	4370.5	4354.3	4362.5	4346.3	PVC	12	1294.9	0.873	1.466	0.873	4.027	0.595	4346.62	5.581	4362.82	4347.058	1312.024	4347.058	0.013	0.012	4.627	4.623	3.75	3.84	0.32
126	LINE-128	EPI	195.457	4354.3	4351.9	4346.3	4343.9	PVC	12	1523.9	1.481	1.55	1.481	5.049	0.956	4344.3	0.645	4346.7	4344.734	160.083	4344.734	0.013	0.012	4.678	4.674	3.192	4.8	0.4
128	LINE-128	EPI	1449.507	4351.9	4335	4343.9	4327	PVC	12	1523.9	1.478	1.547	1.478	5.038	0.956	4327.4	4.795	4344.3	4327.4	1449.507	4327.4	0.013	0.012	4.559	4.554	3.076	4.8	0.4
130	LINE-128	EPI	1080.325	4335	4322	4327	4312	PVC	12	1523.9	1.471	1.539	1.471	5.37	0.956	4312.38	3.353	4327.38	4312.576	1066.201	4312.576	0.013	0.014	4.975	4.97	3.499	4.56	0.38
131	LINE-148	EPI	616.84	4394.8	4383	4386.8	4375	PVC	24	154.2	0.224	1.643	0.224	2.313	0.136	4375.14	4.446	4386.94	4375.204	613.502	4375.204	0.013	0.019	37.078	37.041	36.817	1.68	0.07
134	LINE-148	EPI	289.402	4383	4381.5	4375	4373.5	PVC	24	154.2	0.224	1.644	0.224	1.367	0.136	4373.7	3.528	4375.2	4373.7	289.402	4373.7	0.013	0.005	19.3	19.28	19.057	2.4	0.1
136	LINE-148	EPI	584.884	4381.5	4373.1	4373.5	4366.5	PVC	24	154.2	0.223	1.642	0.223	1.896	0.136	4366.66	5.141	4373.66	4366.769	575.754	4366.769	0.013	0.012	29.327	29.298	29.075	1.92	0.08
138	LINE-148	EPI	328.541	4373.1	4374.1	4366.5	4366.1	PVC	24	154.2	0.222	1.635	0.222	0.926	0.136	4366.36	5.911	4366.76	4366.36	328.541	4366.36	0.013	0.001	9.354	9.345	9.122	3.12	0.13
140	LINE-148	EPI	655.02	4374.1	4376	4366.1	4364	PVC	24	154.2	0.222	1.633	0.222	1.181	0.136	4364.22	9.247	4366.32	4364.22	655.02	4364.22	0.013	0.003	15.179	15.164	14.942	2.64	0.11
142	LINE-148	EPI	779.008	4376	4367.8	4364	4359.8	PVC	24	154.2	0.221	1.625	0.221	1.352	0.136	4360	9.606	4364.2	4360	779.008	4360	0.013	0.005	19.684	19.664	19.443	2.4	0.1
144	LINE-126	EPI	1330.058	4367.8	4351.2	4359.8	4343.2	PVC	24	154.2	0.22	1.616	0.22	1.866	0.136	4343.36	11.88	4359.96	4343.384	1328.108	4343.384	0.013	0.012	29.949	29.919	29.699	1.92	0.08
146	LINE-126	EPI	744.59	4351.2	4340	4343.2	4332	PVC	24	154.2	0.218	1.604	0.218	1.852	0.136	4332.16	6.701	4343.36	4332.348	732.09	4332.348	0.013	0.015	32.878	32.845	32.627	1.92	0.08
148	LINE-126	EPI	1566.696	4340	4326	4332	4318	PVC	24	768.4	0.984	1.69	0.984	3.033	0.582	4318.32	8.61	4332.32	4318.42	1555.544	4318.42	0.013	0.009	25.341	25.316	24.332	3.84	0.16
150	LINE-126	EPI	470.564	4326	4324	4318	4316	PVC	24	768.4	0.978	1.679	0.978	2.352	0.582	4316.38	3.334	4318.38	4316.728	388.725	4316.728	0.013	0.004	17.477	17.459	16.482	4.56	0.19
152	LINE-126	EPI	83.719	4324	4324	4316.3	4316	PVC	24	768.4	0.977	1.678	0.977	2.351	0.582	4316.38	0.593	4316.68	4316.454	63.098	4316.454	0.013	0.004	16.047	16.031	15.054	4.56	0.19

Tag	Interceptor Name	Entity Type Name	Entity Length	Ground Elev Up	Ground Elev Down	Invert Up	Invert Elev Down	Material Type	Size (in)	Sanitary Area (Acres)	Sanitary Peak Q (cfs)	Peak Factor (Diurnal)	Design Q (cfs)	Design Velocity (ft/sec)	Average Flow (cfs)	Water Surf Elev Down	Time In Entity	HGL up	HGL down	HGL Break Distance	HGL Break Elevation	Mannings N	Slope	Q Full	Q Max Allowed (cfs)	Excess Capacity (cfs)	Depth	D over D
154	LINE-126	EPI	527.442	4324	4324	4316	4314	PVC	24	768.4	0.977	1.678	0.977	2.35	0.582	4314.38	3.74	4316.38	4314.513	492.27	4314.513	0.013	0.004	16.508	16.491	15.514	4.56	0.19
155	LINE-124	EPI	3189.559	4375	4324	4367	4316	PVC	12	444.5	0.286	1.142	0.286	2.973	0.25	4316.18	17.88	4367.18	4316.405	3175.495	4316.405	0.013	0.016	5.339	5.333	5.047	2.16	0.18
158	LINE-120	EPI	545.581	4324	4324	4316	4314	PVC	12	935.6	0.76	1.279	0.76	2.774	0.594	4314.38	3.278	4316.38	4314.519	507.704	4314.519	0.013	0.004	2.556	2.554	1.794	4.56	0.38
159	LINE-122	EPI	987.013	4338	4327	4330	4319	PVC	12	491.1	0.476	1.387	0.476	2.934	0.343	4319.26	5.607	4330.26	4319.439	970.965	4319.439	0.013	0.011	4.457	4.453	3.977	3.12	0.26
162	LINE-122	EPI	1248.747	4327	4324	4319	4316	PVC	12	491.1	0.476	1.387	0.476	2.022	0.343	4316.34	10.295	4319.34	4316.424	1213.824	4316.424	0.013	0.002	2.069	2.067	1.591	4.08	0.34
163	LINE-112	EPI	524.16	4279	4278	4271	4270	PVC	18	322.5	0.345	1.432	0.345	1.372	0.241	4270.3	6.366	4271.3	4270.394	474.741	4270.394	0.013	0.002	5.437	5.432	5.086	3.6	0.2
166	LINE-112	EPI	2085.317	4278	4274.1	4270	4266.1	PVC	18	780.8	0.592	1.42	0.592	1.565	0.417	4266.5	22.207	4270.4	4266.5	2085.317	4266.5	0.013	0.002	5.383	5.378	4.786	4.8	0.267
168	LINE-112	EPI	1066.252	4274.1	4258.8	4266.1	4250.8	PVC	18	1597.9	1.103	1.506	1.103	3.999	0.733	4251.12	4.444	4266.42	4251.397	1046.955	4251.397	0.013	0.014	14.911	14.896	13.793	3.84	0.213
170	LINE-112	EPI	3600.627	4258.8	4240.5	4250.8	4232.5	PVC	18	1597.9	1.101	1.502	1.101	2.909	0.733	4232.9	20.626	4251.2	4232.986	3583.658	4232.986	0.013	0.005	8.874	8.865	7.765	4.8	0.267
172	LINE-108	EPI	2671.439	4240.5	4216.2	4232.5	4208.2	PVC	18	2770.5	1.282	1.476	1.282	3.388	0.869	4208.6	13.14	4232.9	4208.667	2664.093	4208.667	0.013	0.009	11.872	11.86	10.578	4.8	0.267
174	LINE-104	EPI	2718.169	4216.2	4198	4208.2	4190	PVC	18	3085.6	1.697	1.414	1.697	3.693	1.2	4190.46	12.268	4208.66	4190.48	2715.182	4190.48	0.013	0.007	10.186	10.175	8.478	5.52	0.307
176	LINE-104	EPI	2629.954	4198	4180	4190	4172	PVC	21	3386.4	1.992	1.342	1.992	3.718	1.484	4172.48	11.788	4190.48	4173.162	2530.241	4173.162	0.013	0.007	15.534	15.518	13.526	5.76	0.274
180	LINE-168	EPI	3708.163	4419.7	4382	4411.7	4374	PVC	12	928.7	0.291	1.454	0.291	2.598	0.2	4374.2	23.789	4411.9	4374.653	3663.633	4374.653	0.013	0.01	4.257	4.253	3.962	2.4	0.2
181	LINE-166	EPI	517.551	4382	4379.9	4374	4371.9	OLDCONC	18	2144.6	1.536	1.263	1.536	2.227	1.215	4372.52	3.874	4374.62	4372.626	491.368	4372.626	0.019	0.004	4.59	4.586	3.05	7.44	0.413
183	LINE-166	EPI	2711.226	4379.9	4362.5	4371.9	4354.5	OLDCONC	18	2396.9	1.928	1.213	1.928	2.797	1.59	4355.12	16.158	4372.52	4355.26	2689.438	4355.26	0.019	0.006	5.773	5.767	3.839	7.44	0.413
184	LINE-176	EPI	945.682	4444	4431.3	4436	4423.3	PVC	10	256	0.341	1.12	0.341	2.965	0.305	4423.52	5.315	4436.22	4423.6	939.725	4423.6	0.013	0.013	3.009	3.006	2.664	2.64	0.264
186	LINE-172	EPI	806.944	4431.3	4420.1	4423.3	4412.1	PVC	10	866	0.8	1.307	0.8	4.526	0.612	4412.4	2.972	4423.6	4412.485	800.83	4412.485	0.013	0.014	3.059	3.056	2.256	3.6	0.36
188	LINE-172	EPI	627.425	4420.1	4417.4	4412.1	4409.4	PVC	10	866	0.8	1.307	0.8	2.904	0.612	4409.82	3.601	4412.52	4409.937	600.254	4409.937	0.013	0.004	1.703	1.701	0.901	5.04	0.504
190	LINE-172	EPI	1033.557	4417.4	4411.4	4409.4	4403.4	PVC	10	866	0.799	1.305	0.799	3.298	0.612	4403.78	5.223	4409.78	4403.945	1005.174	4403.945	0.013	0.006	1.978	1.976	1.177	4.56	0.456
191	LINE-170	EPI	2655.603	4411.4	4382	4403.4	4374	OLDCONC	18	1215.9	1.252	1.233	1.252	2.897	1.016	4374.44	15.277	4403.84	4374.653	2636.389	4374.653	0.019	0.011	7.583	7.575	6.323	5.28	0.293
192	LINE-174	EPI	2644.03	4472.4	4412.7	4464.4	4404.7	PVC	10	349.8	0.46	1.14	0.46	3.994	0.403	4404.92	11.034	4464.62	4405.04	2638.7	4405.04	0.013	0.023	3.901	3.897	3.438	2.64	0.264
194	LINE-174	EPI	477.664	4412.7	4411.4	4404.7	4403.4	PVC	10	349.8	0.459	1.139	0.459	2.196	0.403	4403.74	3.626	4405.04	4403.951	400.226	4403.951	0.013	0.003	1.354	1.353	0.894	4.08	0.408
195	LINE-150	EPI	1156.505	4423.6	4405.1	4417	4398.9	PVC	10	461.3	0.28	1.502	0.28	2.783	0.187	4399.1	6.926	4417.2	4399.239	1147.599	4399.239	0.013	0.016	3.248	3.245	2.965	2.4	0.24
197	LINE-150	EPI	1210.418	4405.1	4401.5	4398.9	4395.2	PVC	10	461.3	0.28	1.501	0.28	1.741	0.187	4395.48	11.586	4399.18	4395.48	1210.418	4395.48	0.013	0.003	1.435	1.434	1.154	3.36	0.336
199	LINE-150	EPI	810.009	4401.5	4399	4395.2	4392.6	PVC	10	461.3	0.279	1.496	0.279	1.92	0.187	4392.86	7.031	4395.46	4392.982	772.122	4392.982	0.013	0.003	1.471	1.469	1.191	3.12	0.312
201	LINE-150	EPI	200.985	4399	4398.3	4392.6	4392	PVC	10	689.1	0.458	1.482	0.458	2.189	0.309	4392.34	1.53	4392.94	4392.352	197.098	4392.352	0.013	0.003	1.419	1.417	0.959	4.08	0.408
203	LINE-150	EPI	662.571	4398.3	4397.1	4392	4390	PVC	10	689.1	0.456	1.475	0.456	2.179	0.309	4390.34	5.069	4392.34	4390.34	662.571	4390.34	0.013	0.003	1.426	1.425	0.969	4.08	0.408
205	LINE-150	EPI	1049.759	4397.1	4392.8	4390	4386.8	PVC	10	689.1	0.452	1.463	0.452	2.16	0.309	4387.14	8.1	4390.34	4387.217	1024.459	4387.217	0.013	0.003	1.433	1.432	0.98	4.08	0.408
207	LINE-150	EPI	893.464	4392.8	4391	4386.8	4384.3	PVC	10	689.1	0.451	1.459	0.451	2.154	0.309	4384.64	6.913	4387.14	4384.64	893.464	4384.64	0.013	0.003	1.373	1.372	0.921	4.08	0.408
209	LINE-150	EPI	296.751	4391	4390.1	4384.3	4383.4	PVC	10	689.1	0.445	1.442	0.445	2.129	0.309	4383.74	2.323	4384.64	4383.74	296.751	4383.74	0.013	0.003	1.43	1.428	0.983	4.08	0.408
211	LINE-150	EPI	500.275	4390.1	4388.5	4383.4	4382.1	PVC	10	689.1	0.445	1.442	0.445	2.129	0.309	4382.44	3.916	4383.74	4382.523	468.519	4382.523	0.013	0.003	1.324	1.322	0.877	4.08	0.408
212	LINE-138	EPI	170.65	4388.5	4388.5	4382.1	4381.5	PVC	12	954.5	0.615	1.392	0.615	2.417	0.442	4381.86	1.177	4382.46	4381.861	170.496	4381.861	0.013	0.004	2.503	2.501	1.886	4.32	0.36
214	LINE-138	EPI	397.334	4388.5	4387.5	4381.5	4380	PVC	12	954.5	0.614	1.39	0.614	2.609	0.442	4380.34	2.539	4381.84	4380.427	374.362	4380.427	0.013	0.004	2.594	2.591	1.977	4.08	0.34
216	LINE-138	EPI	287.072	4387.5	4387	4380	4379	PVC	12	954.5	0.612	1.385	0.612	2.405	0.442	4379.36	1.989	4380.36	4379.431	266.713	4379.431	0.013	0.003	2.492	2.489	1.877	4.32	0.36
220	LINE-110	EPI	2419.78	4239.5	4226	4231.5	4218	PVC	10	0	0.2	1	0.2	1.737	0.2	4218.22	23.215	4231.72	4218.22	2419.78	4218.22	0.013	0.006	1.939	1.937	1.737	2.64	0.264
221	LINE-110	EPI	2419.78	4226	4216.2	4218	4208.2	PVC	10	0	0.2	1	0.2	1.737	0.2	4208.42	23.215	4218.22	4208.652	2362.59	4208.652	0.013	0.004	1.652	1.651	1.451	2.64	0.264

City of Alamogordo
Sewer Analysis with Future Populations

10/15/2004 1:35:09 PM

RUN10-6

Design Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
158	222	5,477.26	4,554.00 4,376.00	4,546.00 4,368.00		12		0.537	3.70				4,546.24 4,368.26	No
160	225	5,177.84	4,376.00 4,278.00	4,368.00 4,270.00		12		0.537	3.31				4,368.26 4,270.43	No
168	226	4,926.97	4,320.00 4,240.50	4,312.00 4,232.50		12		0.265	2.37				4,312.20 4,233.01	No
176	228	5,516.06	4,520.00 4,426.60	4,518.00 4,418.60		12		0.288	2.57				4,518.20 4,418.84	No
178	231	6,642.52	4,426.60 4,348.00	4,418.60 4,344.00		12		0.319	2.20				4,418.84 4,344.34	No
180	233	1,301.46	4,348.00 4,357.10	4,344.00 4,338.80		12		0.351	1.77				4,344.30 4,339.11	No
182	235	3,512.90	4,357.10 4,309.00	4,338.80 4,301.00		12		0.351	2.42				4,339.04 4,301.64	No
184	237	7,480.18	4,466.00 4,298.00	4,458.00 4,290.00		12		0.365	3.27				4,458.20 4,290.38	No
204	239	1,928.00	4,350.00 4,309.00	4,342.00 4,301.00		27		5.310	6.24				4,342.60 4,301.64	No
206	240	542.18	4,309.00 4,324.00	4,301.00 4,289.50		27		5.614	6.60				4,301.60 4,294.27	Yes
208	242	7,213.90	4,324.00 4,297.50	4,289.50 4,289.50		27		5.797	4.02				4,294.27 4,291.75	Yes
192	243	6,151.56	4,535.00 4,419.70	4,527.00 4,411.70		10		0.211	2.44				4,527.18 4,411.90	No

HYDRA™ Version 6.3.9.1

System Manager
mca

Design Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,824.60	4,443.00	4,435.00		8		0.000	0.00				4,435.00	No
194	245		4,419.70	4,411.70									4,411.90	

City of Alamogordo
Sewer Analysis with Future Populations

RUN10-6 10/15/2004 1:35:12 PM

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,999.16	4,406.00	4,398.00	0.0130	12	0.011	0.333	2.98	0.20	4.815	0	4,398.20	No
2	1		4,380.00	4,372.00							4.810	0	4,372.45	
											4.477			
		2,906.01	4,484.00	4,476.00	0.0250	12	0.011	0.066	1.63	0.10	6.737	0	4,476.10	No
60	101		4,410.00	4,402.00							6.730	0	4,402.10	
											6.664			
		425.35	4,510.00	4,502.00	0.0040	10	0.011	0.049	0.82	0.17	1.542	0	4,502.14	No
76	102		4,508.50	4,500.50							1.540	0	4,500.64	
											1.491			
		238.33	4,508.50	4,500.50	0.0040	10	0.011	0.049	1.02	0.14	1.682	0	4,500.62	No
78	105		4,507.50	4,499.50							1.680	0	4,499.62	
											1.631			
		1,108.92	4,507.50	4,499.50	0.0050	10	0.011	0.049	1.02	0.14	1.828	0	4,499.62	No
80	107		4,502.00	4,494.00							1.827	0	4,494.12	
											1.777			
		257.19	4,502.00	4,494.00	0.0300	12	0.011	0.049	1.67	0.08	7.305	0	4,494.08	No
82	109		4,494.30	4,486.30							7.298	0	4,486.46	
											7.249			
		1,120.03	4,494.30	4,486.30	0.0330	12	0.011	0.271	3.34	0.16	7.705	0	4,486.46	No
84	111		4,457.00	4,449.00							7.697	0	4,449.16	
											7.426			
		832.46	4,457.00	4,449.00	0.0300	12	0.011	0.270	3.33	0.16	7.316	0	4,449.16	No
86	113		4,432.00	4,424.00							7.309	0	4,424.16	
											7.039			
		1,218.31	4,432.00	4,424.00	0.0180	12	0.011	0.269	2.80	0.18	5.673	0	4,424.18	No
88	115		4,410.00	4,402.00							5.668	0	4,402.30	
											5.399			
		286.59	4,410.00	4,402.00	0.0490	12	0.011	0.267	4.00	0.14	9.331	0	4,402.14	No
90	117		4,396.00	4,388.00							9.322	0	4,388.23	
											9.055			
		694.67	4,396.00	4,388.00	0.0060	12	0.011	0.267	2.09	0.22	3.398	0	4,388.22	No
92	119		4,391.50	4,383.50							3.395	0	4,383.78	
											3.127			
		518.37	4,391.50	4,383.50	0.0090	12	0.011	0.267	2.39	0.20	3.934	0	4,383.70	No
94	121		4,387.00	4,379.00							3.930	0	4,379.42	
											3.663			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,313.59	4,387.00	4,379.00	0.0130	12	0.011	0.873	4.03	0.32	4.732	0	4,379.32	No
96	122		4,370.50	4,362.50							4.727	0	4,362.82	
											3.854			
		1,348.52	4,370.50	4,362.50	0.0120	12	0.011	0.873	4.03	0.32	4.627	0	4,362.82	No
98	124		4,354.30	4,346.30							4.623	0	4,347.06	
											3.750			
		195.46	4,354.30	4,346.30	0.0120	12	0.011	1.481	5.05	0.40	4.678	0	4,346.70	No
100	126		4,351.90	4,343.90							4.674	0	4,344.73	
											3.192			
		1,449.51	4,351.90	4,343.90	0.0120	12	0.011	1.478	5.04	0.40	4.559	0	4,344.30	No
102	128		4,335.00	4,327.00							4.554	0	4,327.40	
											3.076			
		1,080.33	4,335.00	4,327.00	0.0140	12	0.011	1.471	5.37	0.38	4.975	0	4,327.38	No
104	130		4,322.00	4,312.00							4.970	0	4,312.58	
											3.499			
		616.84	4,394.80	4,386.80	0.0190	24	0.011	0.224	2.31	0.07	37.078	0	4,386.94	No
112	131		4,383.00	4,375.00							37.041	0	4,375.20	
											36.817			
		289.40	4,383.00	4,375.00	0.0050	24	0.011	0.224	1.37	0.10	19.300	0	4,375.20	No
114	134		4,381.50	4,373.50							19.280	0	4,373.70	
											19.057			
		584.88	4,381.50	4,373.50	0.0120	24	0.011	0.223	1.90	0.08	29.327	0	4,373.66	No
116	136		4,373.10	4,366.50							29.298	0	4,366.77	
											29.075			
		328.54	4,373.10	4,366.50	0.0010	24	0.011	0.222	0.93	0.13	9.354	0	4,366.76	No
118	138		4,374.10	4,366.10							9.345	0	4,366.36	
											9.122			
		988.62	4,341.00	4,333.00	0.0050	21	0.011	0.563	2.05	0.17	13.618	0	4,333.30	No
6	14		4,335.80	4,327.80							13.604	0	4,328.10	
											13.041			
		655.02	4,374.10	4,366.10	0.0030	24	0.011	0.222	1.18	0.11	15.179	0	4,366.32	No
120	140		4,376.00	4,364.00							15.164	0	4,364.22	
											14.942			
		779.01	4,376.00	4,364.00	0.0050	24	0.011	0.221	1.35	0.10	19.684	0	4,364.20	No
122	142		4,367.80	4,359.80							19.664	0	4,360.00	
											19.443			
		1,330.06	4,367.80	4,359.80	0.0120	24	0.011	0.220	1.87	0.08	29.949	0	4,359.96	No
124	144		4,351.20	4,343.20							29.919	0	4,343.38	
											29.699			
		744.59	4,351.20	4,343.20	0.0150	24	0.011	0.218	1.85	0.08	32.878	0	4,343.36	No
126	146		4,340.00	4,332.00							32.845	0	4,332.35	
											32.627			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,566.70	4,340.00	4,332.00	0.0090	24	0.011	0.984	3.03	0.16	25.341	0	4,332.32	No
128	148		4,326.00	4,318.00							25.316	0	4,318.42	
											24.332			
		470.56	4,326.00	4,318.00	0.0040	24	0.011	0.978	2.35	0.19	17.477	0	4,318.38	No
130	150		4,324.00	4,316.00							17.459	0	4,316.73	
											16.482			
		83.72	4,324.00	4,316.30	0.0040	24	0.011	0.977	2.35	0.19	16.047	0	4,316.68	No
132	152		4,324.00	4,316.00							16.031	0	4,316.45	
											15.054			
		527.44	4,324.00	4,316.00	0.0040	24	0.011	0.977	2.35	0.19	16.508	0	4,316.38	No
134	154		4,324.00	4,314.00							16.491	0	4,314.51	
											15.514			
		3,189.56	4,375.00	4,367.00	0.0160	12	0.011	0.286	2.97	0.18	5.339	0	4,367.18	No
136	155		4,324.00	4,316.00							5.333	0	4,316.41	
											5.047			
		545.58	4,324.00	4,316.00	0.0040	12	0.011	0.760	2.77	0.38	2.556	0	4,316.38	No
142	158		4,324.00	4,314.00							2.554	0	4,314.52	
											1.794			
		987.01	4,338.00	4,330.00	0.0110	12	0.011	0.476	2.93	0.26	4.457	0	4,330.26	No
138	159		4,327.00	4,319.00							4.453	0	4,319.44	
											3.977			
		1,325.87	4,335.80	4,327.80	0.0060	21	0.011	0.563	2.27	0.16	14.676	0	4,328.08	No
8	16		4,327.70	4,319.70							14.661	0	4,320.12	
											14.098			
		1,248.75	4,327.00	4,319.00	0.0020	12	0.011	0.476	2.02	0.34	2.069	0	4,319.34	No
140	162		4,324.00	4,316.00							2.067	0	4,316.42	
											1.591			
		524.16	4,279.00	4,271.00	0.0020	18	0.011	0.345	1.37	0.20	5.437	0	4,271.30	No
152	163		4,278.00	4,270.00							5.432	0	4,270.39	
											5.086			
		2,085.32	4,278.00	4,270.00	0.0020	18	0.011	0.592	1.57	0.27	5.383	0	4,270.40	No
162	166		4,274.10	4,266.10							5.378	0	4,266.50	
											4.786			
		1,066.25	4,274.10	4,266.10	0.0140	18	0.011	1.103	4.00	0.21	14.911	0	4,266.42	No
164	168		4,258.80	4,250.80							14.896	0	4,251.40	
											13.793			
		3,600.63	4,258.80	4,250.80	0.0050	18	0.011	1.101	2.91	0.27	8.874	0	4,251.20	No
166	170		4,240.50	4,232.50							8.865	0	4,232.99	
											7.765			
		2,671.44	4,240.50	4,232.50	0.0090	18	0.011	1.282	3.39	0.27	11.872	0	4,232.90	No
170	172		4,216.20	4,208.20							11.860	0	4,208.67	
											10.578			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		2,718.17	4,216.20	4,208.20	0.0070	18	0.011	1.697	3.69	0.31	10.186	0	4,208.66	No
172	174		4,198.00	4,190.00							10.175	0	4,190.48	
											8.478			
		2,629.95	4,198.00	4,190.00	0.0070	21	0.011	1.992	3.72	0.27	15.534	0	4,190.48	No
174	176		4,180.00	4,172.00							15.518	0	4,173.16	
											13.526			
		1,237.07	4,327.70	4,319.70	0.0030	21	0.011	1.570	2.77	0.29	10.407	0	4,320.20	No
10	18		4,320.00	4,315.90							10.396	0	4,316.56	
											8.826			
		3,708.16	4,419.70	4,411.70	0.0100	12	0.011	0.291	2.60	0.20	4.257	0	4,411.90	No
196	180		4,382.00	4,374.00							4.253	0	4,374.65	
											3.962			
		517.55	4,382.00	4,374.00	0.0040	18	0.019	1.536	2.23	0.41	4.590	0	4,374.62	No
198	181		4,379.90	4,371.90							4.586	0	4,372.63	
											3.050			
		2,711.23	4,379.90	4,371.90	0.0060	18	0.019	1.928	2.80	0.41	5.773	0	4,372.52	No
200	183		4,362.50	4,354.50							5.767	0	4,355.26	
											3.839			
		945.68	4,444.00	4,436.00	0.0130	10	0.011	0.341	2.97	0.26	3.009	0	4,436.22	No
16	184		4,431.30	4,423.30							3.006	0	4,423.60	
											2.664			
		806.94	4,431.30	4,423.30	0.0140	10	0.011	0.800	4.53	0.36	3.059	0	4,423.60	No
18	186		4,420.10	4,412.10							3.056	0	4,412.49	
											2.256			
		627.43	4,420.10	4,412.10	0.0040	10	0.011	0.800	2.90	0.50	1.703	0	4,412.52	No
20	188		4,417.40	4,409.40							1.701	0	4,409.94	
											0.901			
		1,033.56	4,417.40	4,409.40	0.0060	10	0.011	0.799	3.30	0.46	1.978	0	4,409.78	No
22	190		4,411.40	4,403.40							1.976	0	4,403.95	
											1.177			
		2,655.60	4,411.40	4,403.40	0.0110	18	0.019	1.252	2.90	0.29	7.583	0	4,403.84	No
28	191		4,382.00	4,374.00							7.575	0	4,374.65	
											6.323			
		2,644.03	4,472.40	4,464.40	0.0230	10	0.011	0.460	3.99	0.26	3.901	0	4,464.62	No
24	192		4,412.70	4,404.70							3.897	0	4,405.04	
											3.438			
		477.66	4,412.70	4,404.70	0.0030	10	0.011	0.459	2.20	0.41	1.354	0	4,405.04	No
26	194		4,411.40	4,403.40							1.353	0	4,403.95	
											0.894			
		1,156.51	4,423.60	4,417.00	0.0160	10	0.011	0.280	2.78	0.24	3.248	0	4,417.20	No
32	195		4,405.10	4,398.90							3.245	0	4,399.24	
											2.965			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,210.42	4,405.10	4,398.90	0.0030	10	0.011	0.280	1.74	0.34	1.435	0	4,399.18	No
34	197		4,401.50	4,395.20							1.434	0	4,395.48	
											1.154			
		810.01	4,401.50	4,395.20	0.0030	10	0.011	0.279	1.92	0.31	1.471	0	4,395.46	No
36	199		4,399.00	4,392.60							1.469	0	4,392.98	
											1.191			
		269.35	4,320.00	4,315.90	0.0010	21	0.011	1.564	2.25	0.33	7.236	0	4,316.48	No
12	20		4,320.00	4,315.50							7.228	0	4,316.13	
											5.664			
		200.99	4,399.00	4,392.60	0.0030	10	0.011	0.458	2.19	0.41	1.419	0	4,392.94	No
38	201		4,398.30	4,392.00							1.417	0	4,392.35	
											0.959			
		662.57	4,398.30	4,392.00	0.0030	10	0.011	0.456	2.18	0.41	1.426	0	4,392.34	No
40	203		4,397.10	4,390.00							1.425	0	4,390.34	
											0.969			
		1,049.76	4,397.10	4,390.00	0.0030	10	0.011	0.452	2.16	0.41	1.433	0	4,390.34	No
42	205		4,392.80	4,386.80							1.432	0	4,387.22	
											0.980			
		893.46	4,392.80	4,386.80	0.0030	10	0.011	0.451	2.15	0.41	1.373	0	4,387.14	No
44	207		4,391.00	4,384.30							1.372	0	4,384.64	
											0.921			
		296.75	4,391.00	4,384.30	0.0030	10	0.011	0.445	2.13	0.41	1.430	0	4,384.64	No
46	209		4,390.10	4,383.40							1.428	0	4,383.74	
											0.983			
		500.28	4,390.10	4,383.40	0.0030	10	0.011	0.445	2.13	0.41	1.324	0	4,383.74	No
48	211		4,388.50	4,382.10							1.322	0	4,382.52	
											0.877			
		170.65	4,388.50	4,382.10	0.0040	12	0.011	0.615	2.42	0.36	2.503	0	4,382.46	No
70	212		4,388.50	4,381.50							2.501	0	4,381.86	
											1.886			
		397.33	4,388.50	4,381.50	0.0040	12	0.011	0.614	2.61	0.34	2.594	0	4,381.84	No
72	214		4,387.50	4,380.00							2.591	0	4,380.43	
											1.977			
		287.07	4,387.50	4,380.00	0.0030	12	0.011	0.612	2.41	0.36	2.492	0	4,380.36	No
74	216		4,387.00	4,379.00							2.489	0	4,379.43	
											1.877			
		1,577.33	4,320.00	4,315.50	0.0020	21	0.011	1.562	2.48	0.31	8.845	0	4,316.04	No
14	22		4,322.00	4,312.00							8.836	0	4,312.59	
											7.274			
		2,419.78	4,239.50	4,231.50	0.0060	10	0.011	0.200	1.74	0.26	1.939	0	4,231.72	No
154	220		4,226.00	4,218.00							1.937	0	4,218.22	
											1.737			

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		2,419.78	4,226.00	4,218.00	0.0040	10	0.011	0.200	1.74	0.26	1.652	0	4,218.22	No
156	221		4,216.20	4,208.20							1.651	0	4,208.65	
											1.451			
		97.60	4,322.00	4,312.00	0.0100	24	0.015	2.993	3.96	0.29	19.899	0	4,312.58	No
106	24		4,320.00	4,311.00							19.879	0	4,311.80	
											16.886			
		646.68	4,320.00	4,311.00	0.0030	24	0.015	2.993	2.83	0.37	10.933	0	4,311.74	No
108	26		4,317.00	4,309.00							10.922	0	4,309.78	
											7.929			
		2,376.13	4,317.00	4,309.00	0.0080	24	0.015	2.982	3.76	0.30	17.809	0	4,309.60	No
110	28		4,297.50	4,289.50							17.791	0	4,290.59	
											14.810			
		1,962.95	4,297.50	4,289.50	0.0050	24	0.015	5.568	4.06	0.45	13.459	0	4,290.40	No
210	30		4,288.30	4,280.30							13.445	0	4,281.42	
											7.877			
		1,531.79	4,288.30	4,280.30	0.0040	27	0.015	5.642	3.80	0.40	17.260	0	4,281.20	No
212	32		4,282.00	4,274.00							17.243	0	4,274.94	
											11.600			
		3,688.21	4,282.00	4,274.00	0.0040	27	0.015	5.706	3.73	0.41	16.699	0	4,274.92	No
214	34		4,267.80	4,259.80							16.683	0	4,260.81	
											10.977			
		170.51	4,267.80	4,259.80	0.0220	27	0.015	5.703	6.12	0.28	40.178	0	4,260.44	No
216	36		4,264.00	4,256.00							40.138	0	4,256.76	
											34.435			
		672.29	4,264.00	4,256.00	0.0080	27	0.015	5.703	4.66	0.35	24.343	0	4,256.78	No
218	38		4,258.50	4,250.50							24.318	0	4,251.28	
											18.616			
		2,333.59	4,380.00	4,372.00	0.0070	12	0.011	0.645	2.98	0.32	3.656	0	4,372.32	No
4	4		4,362.50	4,354.50							3.652	0	4,355.23	
											3.008			
		2,125.46	4,258.50	4,250.05	0.0040	27	0.015	5.800	3.69	0.42	16.563	0	4,250.99	No
220	40		4,250.00	4,242.00							16.546	0	4,242.94	
											10.747			
		458.42	4,324.00	4,314.00	0.0150	27	0.011	1.670	4.07	0.16	45.350	0	4,314.36	No
144	42		4,315.00	4,307.00							45.305	0	4,307.39	
											43.635			
		452.36	4,315.00	4,307.00	0.0110	27	0.011	1.668	3.76	0.17	38.584	0	4,307.38	No
146	45		4,310.00	4,302.00							38.545	0	4,302.49	
											36.877			
		1,200.47	4,310.00	4,302.00	0.0030	27	0.011	1.666	2.53	0.22	21.184	0	4,302.50	No
148	47		4,306.00	4,298.00							21.163	0	4,298.58	
											19.497			

RUN10-6

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
150	49	1,881.80	4,306.00 4,298.00	4,298.00 4,290.00	0.0040	27	0.011	1.659	2.84	0.20	23.929 23.905 22.246	0 0	4,298.46 4,290.56	No
186	51	1,898.56	4,298.00 4,277.00	4,290.00 4,269.00	0.0110	24	0.011	1.769	3.96	0.20	28.194 28.166 26.396	0 0	4,290.40 4,269.41	No
188	53	1,253.20	4,277.00 4,266.00	4,269.00 4,258.00	0.0090	24	0.011	1.769	3.69	0.21	25.116 25.090 23.321	0 0	4,269.42 4,258.42	No
190	55	1,735.62	4,266.00 4,250.00	4,258.00 4,242.00	0.0090	24	0.011	1.765	3.95	0.20	25.739 25.713 23.948	0 0	4,258.40 4,242.90	No
222	56	3,385.64	4,250.00 4,219.70	4,242.00 4,211.70	0.0090	30	0.011	7.564	6.22	0.30	45.982 45.936 38.371	0 0	4,242.74 4,212.46	No
224	58	3,385.64	4,219.70 4,196.00	4,211.70 4,188.00	0.0070	30	0.011	7.552	5.78	0.31	40.667 40.626 33.074	0 0	4,212.48 4,188.94	No
202	6	2,572.51	4,362.50 4,350.00	4,354.50 4,342.00	0.0050	21	0.010	2.505	2.69	0.41	7.578 7.570 5.065	0 0	4,355.22 4,342.86	No
226	60	2,906.73	4,196.00 4,180.00	4,188.00 4,172.00	0.0060	36	0.011	7.561	4.83	0.27	58.640 58.581 51.020	0 0	4,188.82 4,173.08	No
228	62	2,672.99	4,180.00 4,165.20	4,172.00 4,157.20	0.0060	36	0.011	9.237	5.34	0.29	58.812 58.753 49.516	0 0	4,172.88 4,158.58	No
230	64	3,147.29	4,165.20 4,153.60	4,157.20 4,145.60	0.0040	36	0.011	9.227	4.87	0.31	47.984 47.936 38.709	0 0	4,158.14 4,147.04	No
232	66	397.78	4,153.60 4,152.00	4,145.60 4,145.00	0.0020	36	0.011	9.278	3.68	0.39	30.696 30.666 21.388	0 0	4,146.76 4,146.16	No
30	76	3,398.42	4,375.30 4,350.00	4,367.30 4,342.00	0.0070	10	0.011	0.198	1.97	0.24	2.240 2.238 2.040	0 0	4,367.50 4,342.78	No
50	81	1,271.72	4,496.50 4,474.50	4,488.50 4,466.50	0.0170	10	0.011	0.054	1.47	0.12	3.415 3.411 3.357	0 0	4,488.60 4,466.62	No
52	84	1,171.63	4,474.50 4,450.00	4,466.50 4,442.00	0.0210	10	0.011	0.142	2.35	0.17	3.754 3.751 3.609	0 0	4,466.64 4,442.14	No

Existing Pipes - Sorted by Geographic ID

UserID SEQ	G_ID	Length	Ground Up/Dn	Invert Up/Dn	Slope	Diam	"n"	DesignQ	DesVel	d/D	Qfull Qmax Qexcess	NewDiam ParDiam	HGL Up/Dn	Surchge
		1,720.47	4,450.00	4,442.00	0.0230	12	0.011	0.142	2.12	0.14	6.437	0	4,442.14	No
54	86		4,410.00	4,402.00							6.431	0	4,402.21	
											6.289			
		62.67	4,410.00	4,402.00	0.0160	10	0.011	0.141	2.34	0.17	3.280	0	4,402.14	No
56	88		4,410.00	4,401.00							3.276	0	4,401.18	
											3.135			
		148.20	4,410.00	4,401.00	0.0100	10	0.011	0.206	2.38	0.22	2.612	0	4,401.18	No
62	90		4,407.50	4,399.50							2.609	0	4,399.70	
											2.404			
		100.36	4,407.50	4,399.50	0.0250	10	0.011	0.206	2.81	0.19	4.098	0	4,399.66	No
64	92		4,405.00	4,397.00							4.094	0	4,397.29	
											3.888			
		476.28	4,405.00	4,397.00	0.0190	10	0.011	0.205	2.81	0.19	3.569	0	4,397.16	No
66	94		4,396.00	4,388.00							3.565	0	4,388.24	
											3.360			
		735.54	4,396.00	4,388.00	0.0080	10	0.011	0.205	2.03	0.24	2.325	0	4,388.20	No
68	96		4,388.50	4,382.10							2.323	0	4,382.45	
											2.118			
		1,140.28	4,488.00	4,480.00	0.0040	12	0.011	0.066	1.00	0.14	2.501	0	4,480.14	No
58	98		4,484.00	4,476.00							2.498	0	4,476.14	
											2.432			

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RUN10-6

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,484.00	4,476.00	0.00	0.066	4,476.10	-7.9
59	100			4,475.90			4,476.10	
		4.00	4,510.00	4,502.00	0.00	0.000	4,502.14	-7.86
75	103			4,501.90			4,502.14	
		4.00	4,508.50	4,500.50	0.00	0.049	4,500.62	-7.88
77	104			4,500.40			4,500.62	
		4.00	4,507.50	4,499.50	0.00	0.049	4,499.62	-7.88
79	106			4,499.40			4,499.62	
		4.00	4,502.00	4,494.00	0.00	0.049	4,494.08	-7.92
81	108			4,493.90			4,494.08	
		4.00	4,494.30	4,486.30	0.00	0.049	4,486.46	-7.84
83	110			4,486.20			4,486.46	
		4.00	4,457.00	4,449.00	0.00	0.270	4,449.16	-7.84
85	112			4,448.90			4,449.16	
		4.00	4,432.00	4,424.00	0.00	0.269	4,424.18	-7.82
87	114			4,423.90			4,424.18	
		4.00	4,410.00	4,402.00	0.00	0.267	4,402.32	-7.68
89	116			4,401.90			4,402.14	
		4.00	4,396.00	4,388.00	0.00	0.267	4,388.25	-7.75
91	118			4,387.90			4,388.00	
		4.00	4,391.50	4,383.50	0.00	0.267	4,383.78	-7.72
93	120			4,383.40			4,383.70	
		4.00	4,370.50	4,362.50	0.00	0.873	4,362.82	-7.68
97	123			4,362.40			4,362.82	
		4.00	4,354.30	4,346.30	0.00	0.871	4,347.06	-7.24
99	125			4,346.20			4,346.70	
		4.00	4,351.90	4,343.90	0.00	1.478	4,344.74	-7.16
101	127			4,343.80			4,344.30	
		4.00	4,335.00	4,327.00	0.00	1.471	4,327.38	-7.62
103	129			4,326.90			4,327.38	
		4.00	4,341.00	4,333.00	0.00	0.563	4,333.30	-7.7
5	13			4,332.90			4,333.30	
		4.00	4,394.80	4,386.80	0.00	0.224	4,386.94	-7.86
111	132			4,386.70			4,386.94	
		4.00	4,383.00	4,375.00	0.00	0.224	4,375.23	-7.78
113	133			4,374.90			4,375.20	

RUN10-6

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,381.50	4,373.50	0.00	0.223	4,373.69	-7.82
115	135			4,373.40			4,373.66	
		4.00	4,373.10	4,366.50	0.00	0.222	4,366.79	-6.31
117	137			4,366.40			4,366.76	
		4.00	4,374.10	4,366.10	0.00	0.222	4,366.34	-7.76
119	139			4,366.00			4,366.32	
		4.00	4,376.00	4,364.00	0.00	0.221	4,364.22	-11.78
121	141			4,363.90			4,364.20	
		4.00	4,367.80	4,359.80	0.00	0.220	4,360.00	-7.8
123	143			4,359.70			4,359.96	
		4.00	4,351.20	4,343.20	0.00	0.218	4,343.41	-7.79
125	145			4,343.10			4,343.36	
		4.00	4,340.00	4,332.00	0.00	0.984	4,332.38	-7.62
127	147			4,331.90			4,332.32	
		4.00	4,326.00	4,318.00	0.00	0.978	4,318.44	-7.56
129	149			4,317.90			4,318.38	
		4.00	4,335.80	4,327.80	0.00	0.563	4,328.08	-7.72
7	15			4,327.70			4,328.08	
		4.00	4,324.00	4,316.00	0.00	0.977	4,316.73	-7.27
131	151			4,315.90			4,316.68	
		4.00	4,324.00	4,316.00	0.00	0.977	4,316.48	-7.52
133	153			4,315.90			4,316.38	
		4.00	4,375.00	4,367.00	0.00	0.086	4,367.18	-7.82
135	156			4,366.90			4,367.18	
		4.00	4,324.00	4,316.00	0.00	0.760	4,316.43	-7.58
141	157			4,315.90			4,316.38	
		4.00	4,338.00	4,330.00	0.00	0.476	4,330.26	-7.74
137	160			4,329.90			4,330.26	
		4.00	4,327.00	4,319.00	0.00	0.476	4,319.44	-7.56
139	161			4,318.90			4,319.34	
		4.00	4,279.00	4,271.00	0.00	0.345	4,271.30	-7.7
151	164			4,270.90			4,271.30	
		4.00	4,278.00	4,270.00	0.00	0.592	4,270.46	-7.54
161	165			4,269.90			4,270.40	
		4.00	4,274.10	4,266.10	0.00	0.591	4,266.43	-7.68
163	167			4,266.00			4,266.42	
		4.00	4,258.80	4,250.80	0.00	1.101	4,251.41	-7.39
165	169			4,250.70			4,251.20	
		4.00	4,327.70	4,319.70	0.00	1.570	4,320.20	-7.5
9	17			4,319.60			4,320.20	

RUN10-6

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,240.50	4,232.50	0.00	1.216	4,233.03	-7.47
169	171			4,232.40			4,232.90	
		4.00	4,216.20	4,208.20	0.00	1.479	4,208.69	-7.51
171	173			4,208.10			4,208.66	
		4.00	4,198.00	4,190.00	0.00	1.682	4,190.48	-7.52
173	175			4,189.90			4,190.48	
		4.00	4,180.00	4,172.00	0.00	9.168	4,173.17	-6.83
227	177			4,171.90			4,172.84	
		4.00	4,379.90	4,371.90	0.00	1.531	4,372.63	-7.27
199	182			4,371.80			4,372.52	
		4.00	4,431.30	4,423.30	0.00	0.800	4,423.60	-7.7
17	185			4,423.20			4,423.60	
		4.00	4,420.10	4,412.10	0.00	0.800	4,412.53	-7.58
19	187			4,412.00			4,412.52	
		4.00	4,417.40	4,409.40	0.00	0.799	4,409.94	-7.46
21	189			4,409.30			4,409.78	
		4.00	4,320.00	4,315.90	0.00	1.564	4,316.59	-3.41
11	19			4,315.80			4,316.48	
		4.00	4,412.70	4,404.70	0.00	0.459	4,405.04	-7.66
25	193			4,404.60			4,405.04	
		4.00	4,405.10	4,398.90	0.00	0.280	4,399.26	-5.84
33	196			4,398.80			4,399.18	
		4.00	4,401.50	4,395.20	0.00	0.279	4,395.46	-6.04
35	198			4,395.10			4,395.46	
		4.00	4,406.00	4,398.00	0.00	0.333	4,398.20	-7.8
1	2			4,397.90			4,398.20	
		4.00	4,399.00	4,392.60	0.00	0.458	4,393.00	-6
37	200			4,392.50			4,392.94	
		4.00	4,398.30	4,392.00	0.00	0.456	4,392.35	-5.95
39	202			4,391.90			4,392.34	
		4.00	4,397.10	4,390.00	0.00	0.452	4,390.34	-6.76
41	204			4,389.90			4,390.34	
		4.00	4,392.80	4,386.80	0.00	0.451	4,387.22	-5.58
43	206			4,386.70			4,387.14	
		4.00	4,391.00	4,384.30	0.00	0.445	4,384.64	-6.36
45	208			4,384.20			4,384.64	
		4.00	4,320.00	4,315.50	0.00	1.562	4,316.14	-3.86
13	21			4,315.40			4,316.04	
		4.00	4,390.10	4,383.40	0.00	0.445	4,383.74	-6.36
47	210			4,383.30			4,383.74	

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,388.50	4,381.50	0.00	0.614	4,381.86	-6.64
71	213			4,381.40			4,381.84	
		4.00	4,387.50	4,380.00	0.00	0.612	4,380.45	-7.05
73	215			4,379.90			4,380.36	
		4.00	4,239.50	4,231.50	0.00	0.000	4,231.72	-7.78
153	218			4,231.40			4,231.72	
		4.00	4,226.00	4,218.00	0.00	0.200	4,218.22	-7.78
155	219			4,217.90			4,218.22	
		4.00	4,554.00	4,546.00	0.00	0.268	4,546.24	-7.76
157	223			4,545.90			4,546.24	
		4.00	4,376.00	4,368.00	0.00	0.268	4,368.26	-7.74
159	224			4,367.90			4,368.26	
		4.00	4,320.00	4,312.00	0.00	0.132	4,312.20	-7.8
167	227			4,311.90			4,312.20	
		4.00	4,520.00	4,518.00	0.00	0.144	4,518.20	-1.8
175	229			4,517.90			4,518.20	
		4.00	4,322.00	4,312.00	0.00	2.993	4,312.85	-9.15
105	23			4,311.90			4,312.58	
		4.00	4,426.60	4,418.60	0.00	0.144	4,418.90	-7.7
177	230			4,418.50			4,418.80	
		4.00	4,348.00	4,344.00	0.00	0.176	4,344.42	-3.58
179	232			4,343.90			4,344.28	
		4.00	4,357.10	4,338.80	0.00	0.175	4,339.12	-17.98
181	234			4,338.70			4,339.04	
		4.00	4,309.00	4,301.00	0.00	2.807	4,301.64	-7.36
205	236			4,300.90			4,301.60	
		4.00	4,466.00	4,458.00	0.00	0.183	4,458.20	-7.8
183	238			4,457.90			4,458.20	
		4.00	4,324.00	4,289.50	0.00	2.899	4,294.27	-29.73
207	241			4,289.40			4,294.27	
		4.00	4,535.00	4,527.00	0.00	0.053	4,527.18	-7.82
191	244			4,526.90			4,527.18	
		4.00	4,443.00	4,435.00	0.00	0.000	4,435.00	-8
193	246			4,434.90			4,435.00	
		4.00	4,320.00	4,311.00	0.00	2.993	4,311.82	-8.18
107	25			4,310.90			4,311.74	
		4.00	4,317.00	4,309.00	0.00	2.982	4,309.78	-7.22
109	27			4,308.90			4,309.60	
		4.00	4,297.50	4,289.50	0.00	5.568	4,290.59	-6.91
209	29			4,289.40			4,290.40	

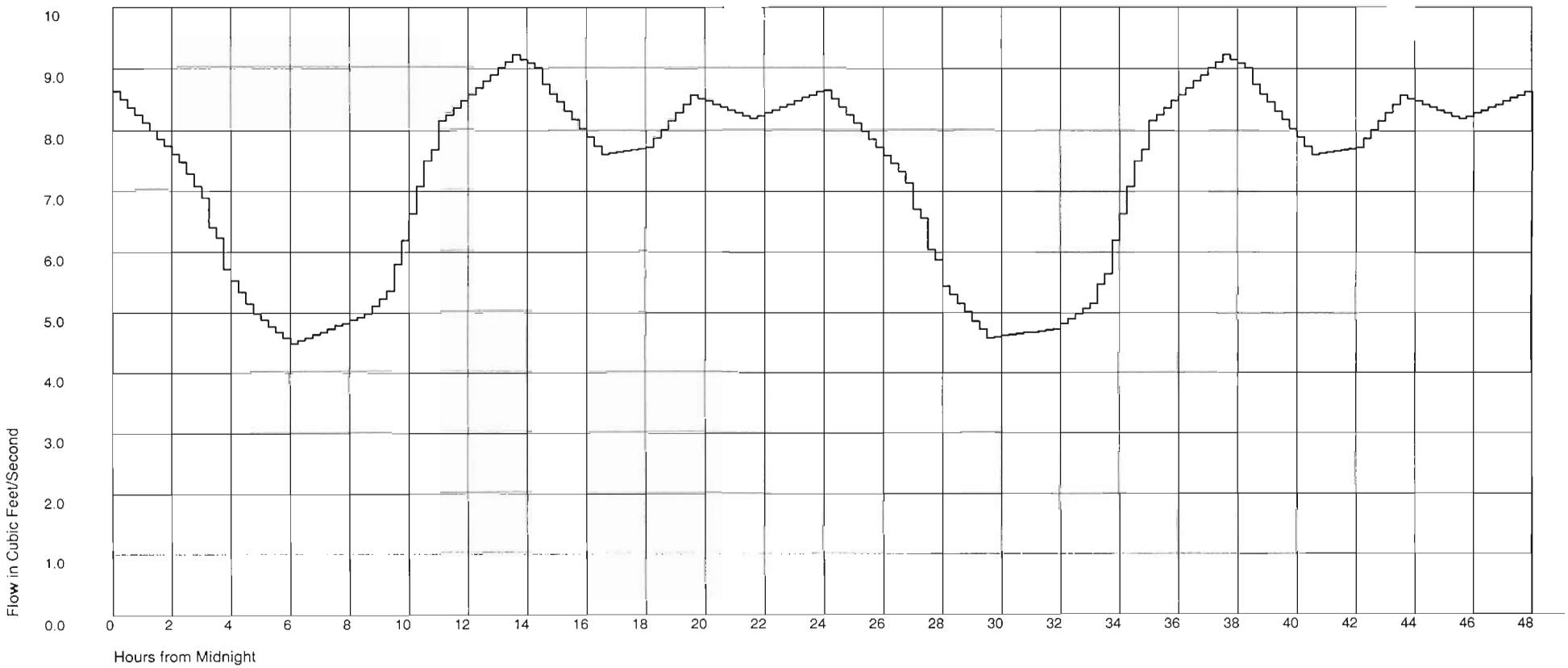
RUN10-6

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,380.00	4,372.00	0.00	0.645	4,372.47	-7.53
3	3			4,371.90			4,372.32	
		4.00	4,288.30	4,280.30	0.00	5.562	4,281.45	-6.85
211	31			4,280.20			4,281.20	
		4.00	4,282.00	4,274.00	0.00	5.631	4,274.94	-7.06
213	33			4,273.90			4,274.92	
		4.00	4,267.80	4,259.80	0.00	5.703	4,260.84	-6.96
215	35			4,259.70			4,260.44	
		4.00	4,264.00	4,256.00	0.00	5.703	4,256.78	-7.22
217	37			4,255.90			4,256.78	
		4.00	4,258.50	4,250.05	0.00	5.696	4,251.28	-7.22
219	39			4,249.95			4,250.99	
		4.00	4,250.00	4,242.00	0.00	7.564	4,242.94	-7.06
221	41			4,241.90			4,242.74	
		4.00	4,324.00	4,314.00	0.00	1.670	4,314.54	-9.46
143	43			4,313.90			4,314.36	
		4.00	4,315.00	4,307.00	0.00	1.668	4,307.41	-7.59
145	44			4,306.90			4,307.38	
		4.00	4,310.00	4,302.00	0.00	1.666	4,302.51	-7.49
147	46			4,301.90			4,302.50	
		4.00	4,306.00	4,298.00	0.00	1.659	4,298.59	-7.42
149	48			4,297.90			4,298.46	
		4.00	4,362.50	4,354.50	0.00	2.505	4,355.27	-7.23
201	5			4,354.40			4,355.20	
		4.00	4,298.00	4,290.00	0.00	1.769	4,290.60	-7.4
185	50			4,289.90			4,290.40	
		4.00	4,277.00	4,269.00	0.00	1.769	4,269.44	-7.56
187	52			4,268.90			4,269.42	
		4.00	4,266.00	4,258.00	0.00	1.765	4,258.41	-7.6
189	54			4,257.90			4,258.40	
		4.00	4,219.70	4,211.70	0.00	7.552	4,212.48	-7.22
223	57			4,211.60			4,212.48	
		4.00	4,196.00	4,188.00	0.00	7.561	4,188.96	-7.04
225	59			4,187.90			4,188.82	
		4.00	4,165.20	4,157.20	0.00	9.227	4,158.59	-6.61
229	63			4,157.10			4,158.14	
		4.00	4,153.60	4,145.60	0.00	9.278	4,147.07	-6.53
231	65			4,145.50			4,146.76	
		4.00	4,419.70	4,411.70	0.00	0.171	4,411.90	-7.8
195	69			4,411.60			4,411.90	

Manholes - Sorted by Geographic ID

UserID SEQ	G_ID	Diameter	Rim Elev	Invert Up/Dn	Fixed Drop	DesignQ	HGL Up/Dn	Surcharge
		4.00	4,350.00	4,342.00	0.00	2.655	4,342.87	-7.13
203	7			4,341.90			4,342.60	
		4.00	4,444.00	4,436.00	0.00	0.111	4,436.22	-7.78
15	71			4,435.90			4,436.22	
		4.00	4,382.00	4,374.00	0.00	1.536	4,374.67	-7.33
197	72			4,373.90			4,374.60	
		4.00	4,472.40	4,464.40	0.00	0.230	4,464.62	-7.78
23	74			4,464.30			4,464.62	
		4.00	4,411.40	4,403.40	0.00	1.252	4,403.96	-7.44
27	75			4,403.30			4,403.84	
		4.00	4,375.30	4,367.30	0.00	0.198	4,367.50	-7.8
29	77			4,367.20			4,367.50	
		4.00	4,423.60	4,417.00	0.00	0.280	4,417.20	-6.4
31	79			4,416.90			4,417.20	
		4.00	4,387.00	4,379.00	0.00	0.873	4,379.44	-7.56
95	80			4,378.90			4,379.32	
		4.00	4,496.50	4,488.50	0.00	0.000	4,488.60	-7.9
49	82			4,488.40			4,488.60	
		4.00	4,474.50	4,466.50	0.00	0.054	4,466.64	-7.86
51	83			4,466.40			4,466.64	
		4.00	4,450.00	4,442.00	0.00	0.142	4,442.16	-7.84
53	85			4,441.90			4,442.14	
		4.00	4,410.00	4,402.00	0.00	0.141	4,402.23	-7.77
55	87			4,401.90			4,402.14	
		4.00	4,410.00	4,401.00	0.00	0.206	4,401.20	-8.8
61	89			4,400.90			4,401.18	
		4.00	4,407.50	4,399.50	0.00	0.206	4,399.72	-7.78
63	91			4,399.40			4,399.66	
		4.00	4,405.00	4,397.00	0.00	0.205	4,397.30	-7.7
65	93			4,396.90			4,397.16	
		4.00	4,396.00	4,388.00	0.00	0.205	4,388.26	-7.74
67	95			4,387.90			4,388.20	
		4.00	4,388.50	4,382.10	0.00	0.615	4,382.55	-5.95
69	97			4,382.00			4,382.46	
		4.00	4,488.00	4,480.00	0.00	0.066	4,480.14	-7.86
57	99			4,479.90			4,480.14	



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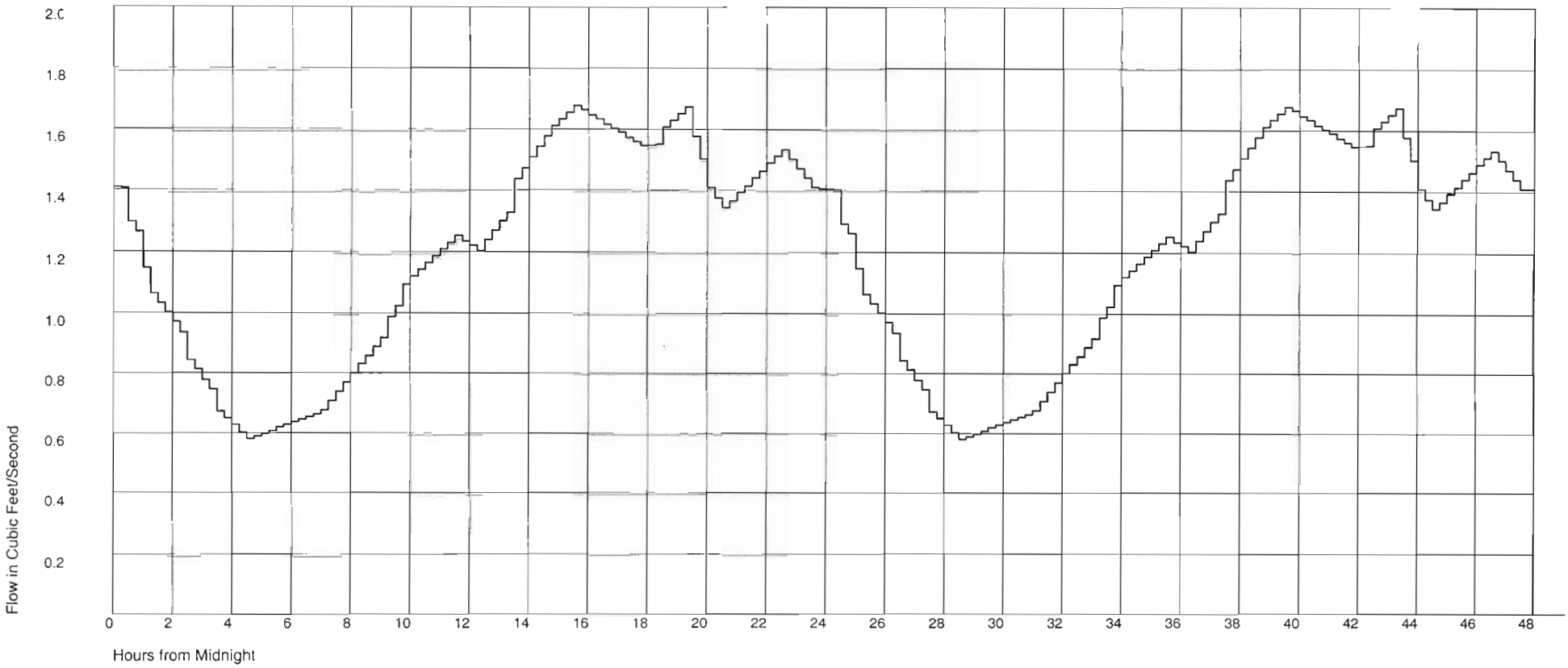
Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

Existing Pipe:	LINE-100		
Size:	36.0 Inch	Design Q:	9.227 CFS
Length:	3147.29 Feet	Average Q:	7.317 CFS
Slope:	0.004	D Over D:	0.313
Invert Up:	4157.2 Feet	Velocity:	4.871 Ft/Sec
Invert Dn:	4145.6 Feet	Peaking Fctr:	1.261



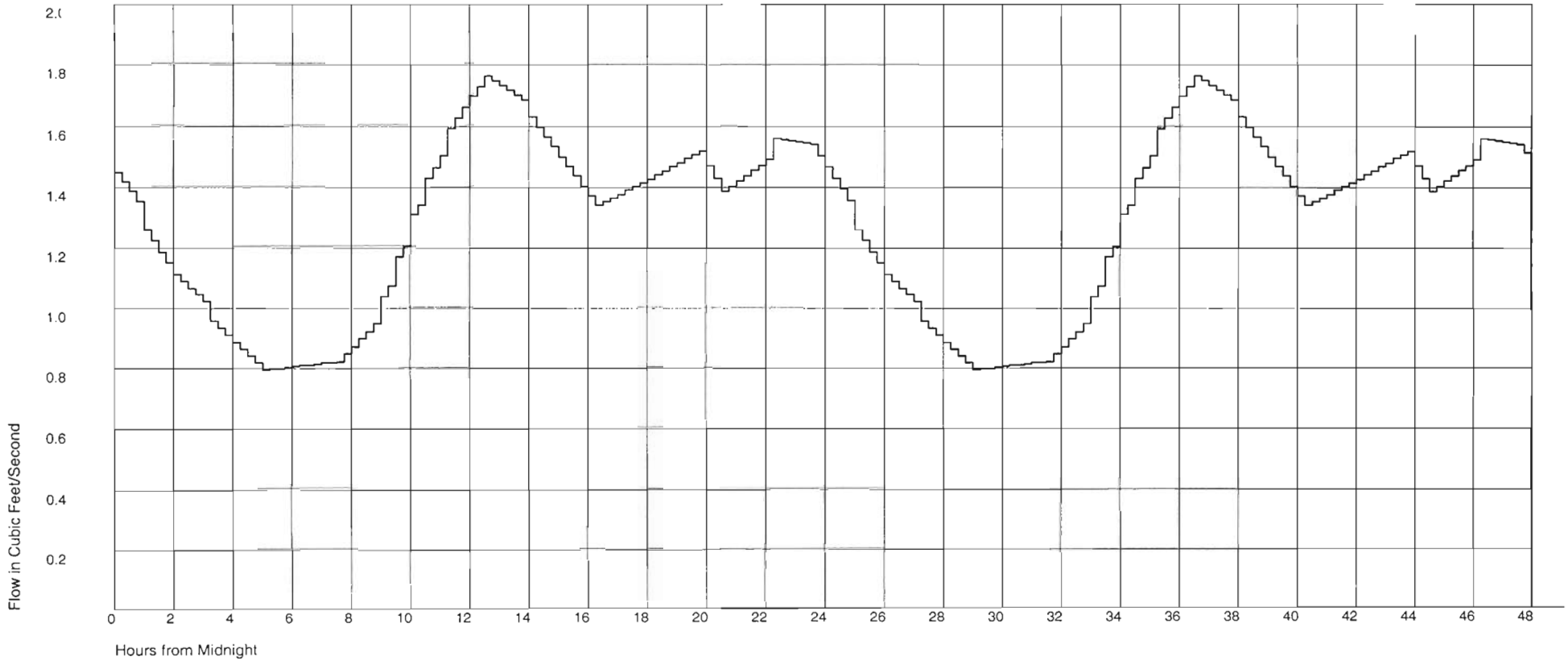
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

Existing Pipe:	LINE-104		
Size:	18.0 Inch	Design Q:	1.697 CFS
Length:	2718.169 Feet	Average Q:	1.2 CFS
Slope:	0.007	D Over D:	0.307
Invert Up:	4208.2 Feet	Velocity:	3.693 Ft/Sec
Invert Dn:	4190.0 Feet	Peaking Fctr:	1.414



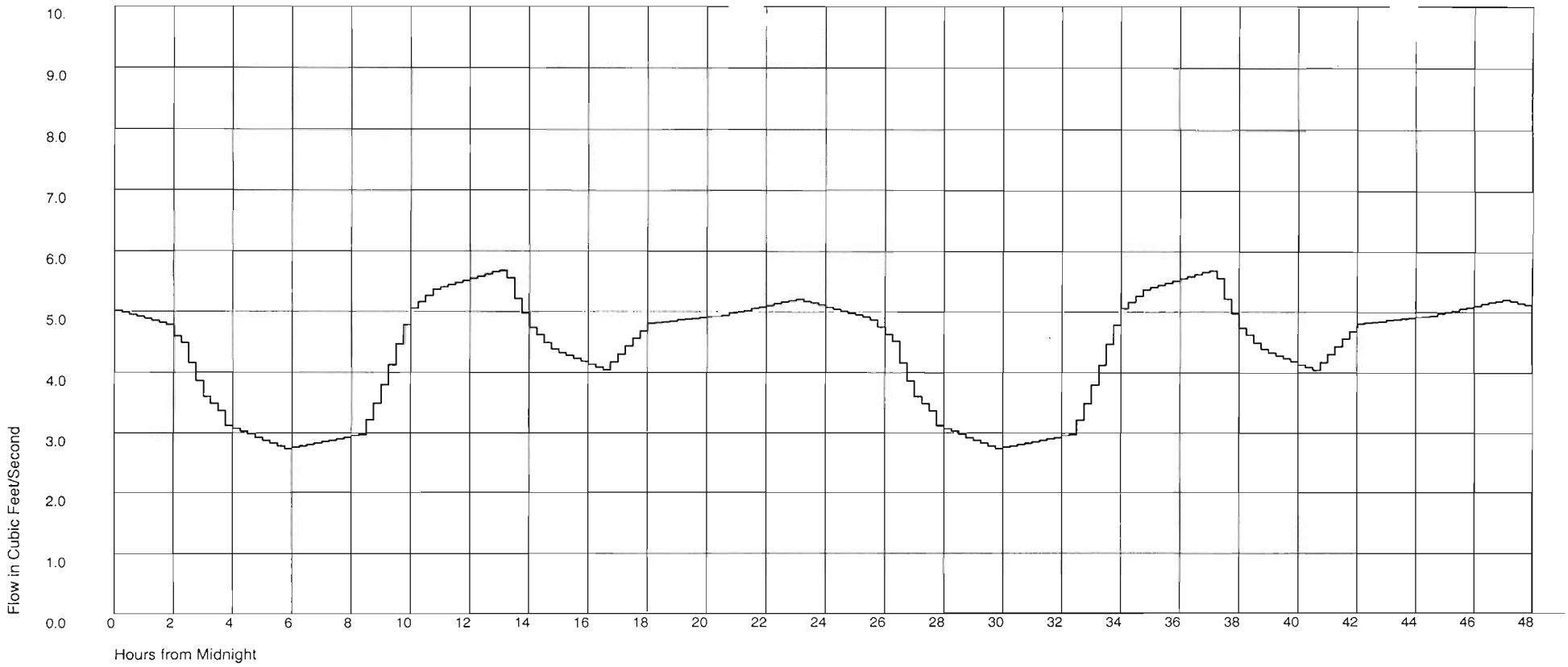
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

Existing Pipe:	LINE-116		
Size:	24.0 Inch	Design Q:	1.765 CFS
Length:	1735.623 Feet	Average Q:	1.294 CFS
Slope:	0.009	D Over D:	0.2
Invert Up:	4258.0 Feet	Velocity:	3.945 Ft/Sec
Invert Dn:	4242.0 Feet	Peaking Fctr:	1.364



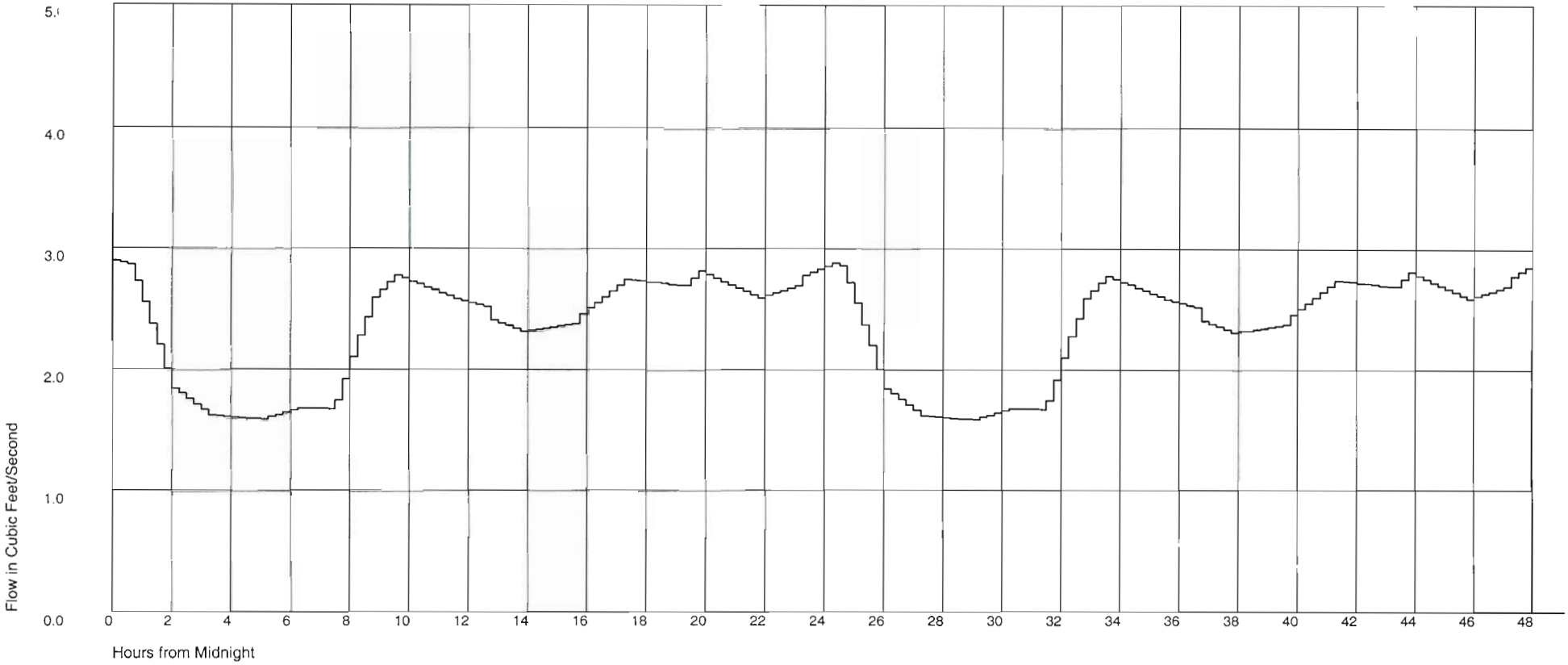
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

Existing Pipe:	LINE-154		
Size:	27.0 Inch	Design Q:	5.703 CFS
Length:	672.29 Feet	Average Q:	4.394 CFS
Slope:	0.008	D Over D:	0.347
Invert Up:	4256.0 Feet	Velocity:	4.659 Ft/Sec
Invert Dn:	4250.5 Feet	Peaking Fctr:	1.298



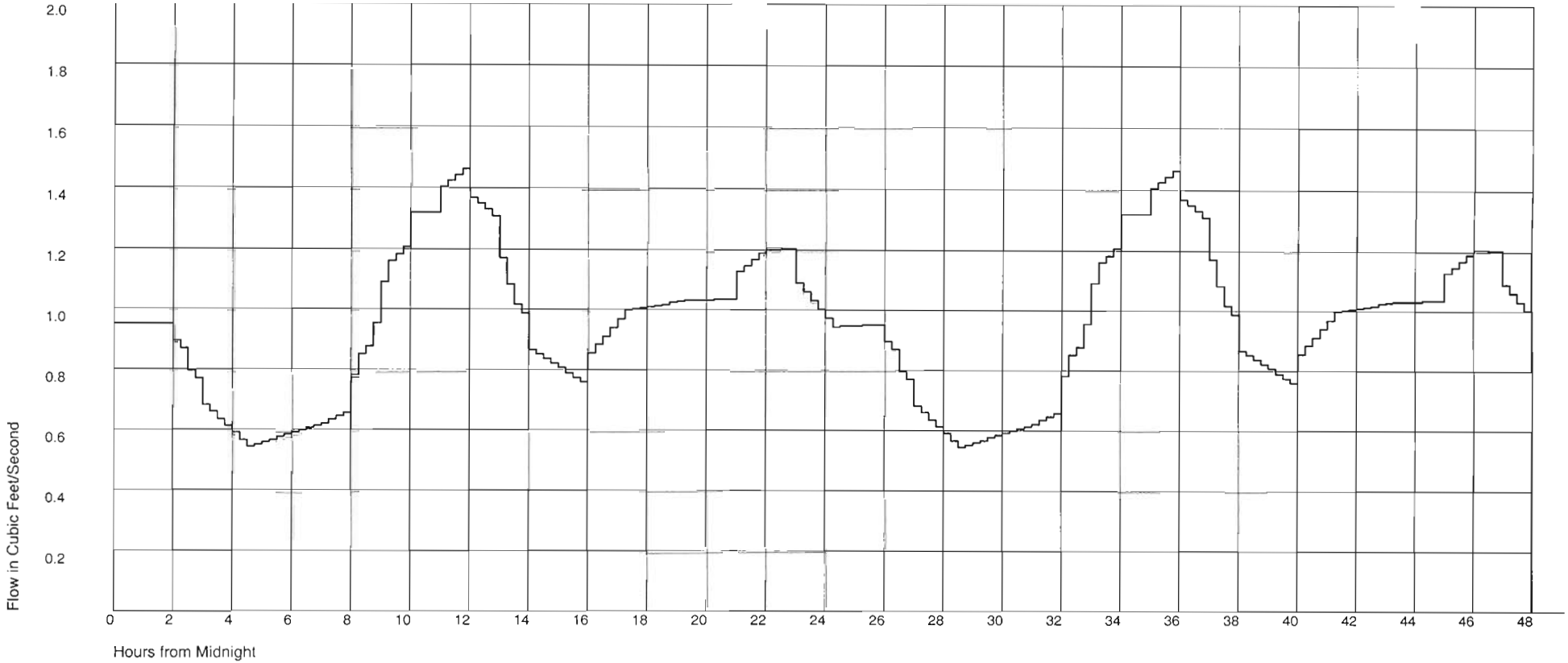
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

Designed Pipe:	LINE-204		
Size:	27.0 Inch	Design Q:	5.797 CFS
Length:	7213.9 Feet	Average Q:	4.727 CFS
Slope:	0.004	D Over D:	0.391
Invert Up:	4289.5 Feet	Velocity:	4.023 Ft/Sec
Invert Dn:	4289.5 Feet	Peaking Fctr:	1.226



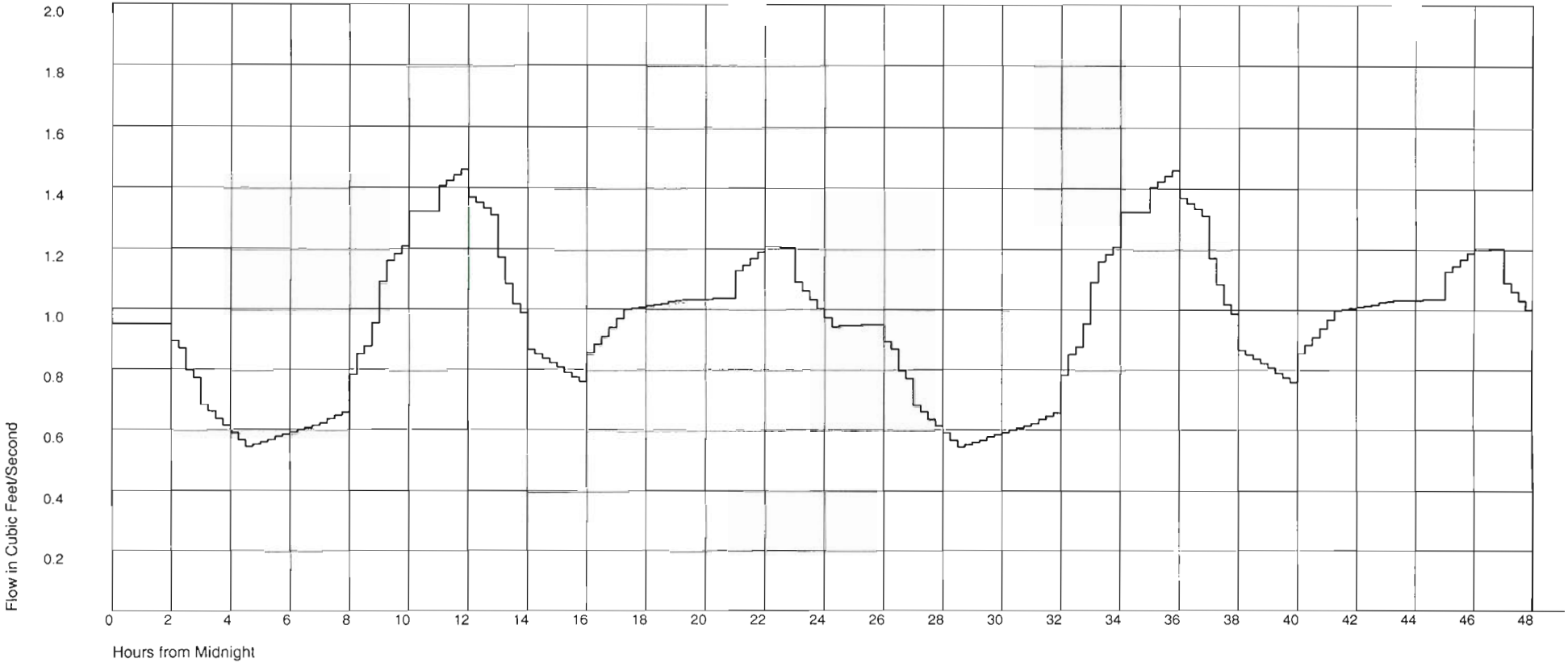
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

ManHole:	127		
Size:	0.0	Design Q:	1.084 CFS
Invert Elev:	4343.8	Average Q:	0.868 CFS
		Peaking Fctr:	1.248



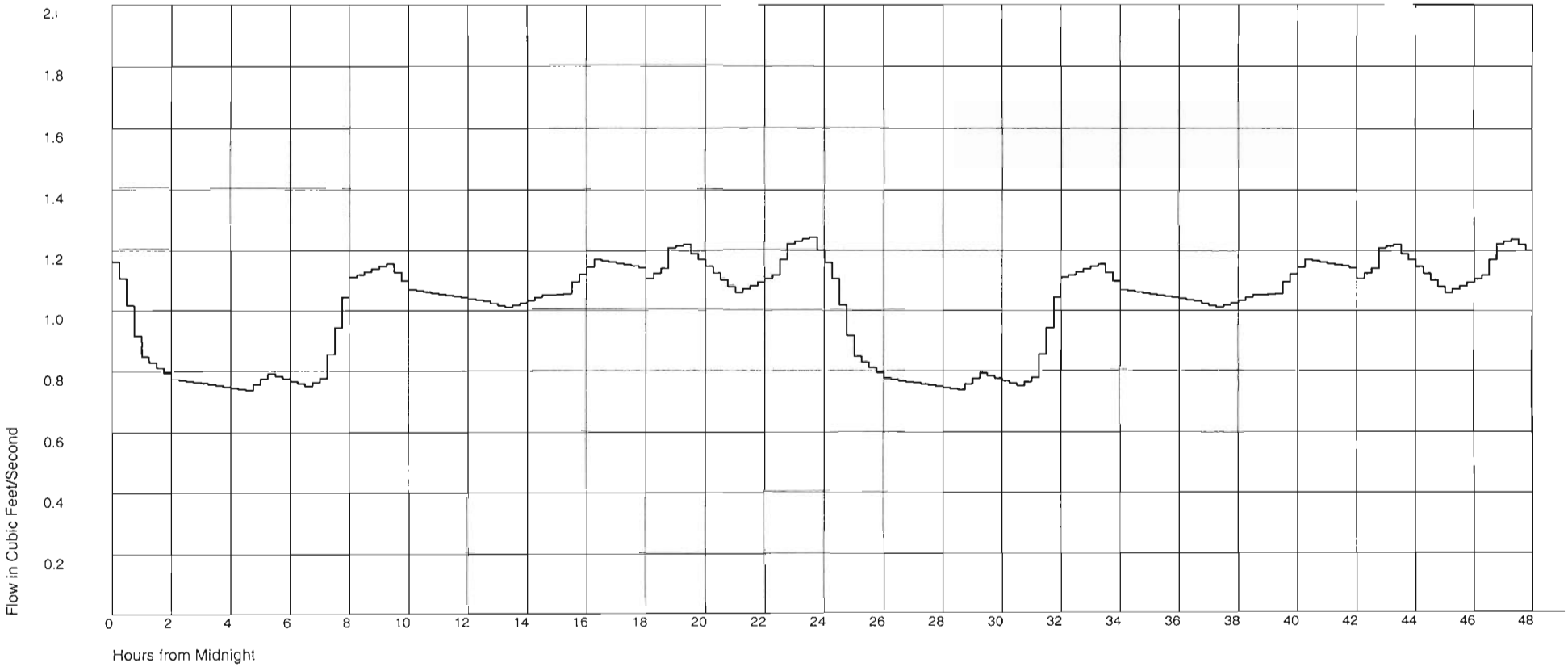
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

Existing Pipe:	LINE-128		
Size:	12.0 Inch	Design Q:	1.478 CFS
Length:	1449.507 Feet	Average Q:	0.956 CFS
Slope:	0.012	D Over D:	0.4
Invert Up:	4343.9 Feet	Velocity:	5.038 Ft/Sec
Invert Dn:	4327.0 Feet	Peaking Fctr:	1.547



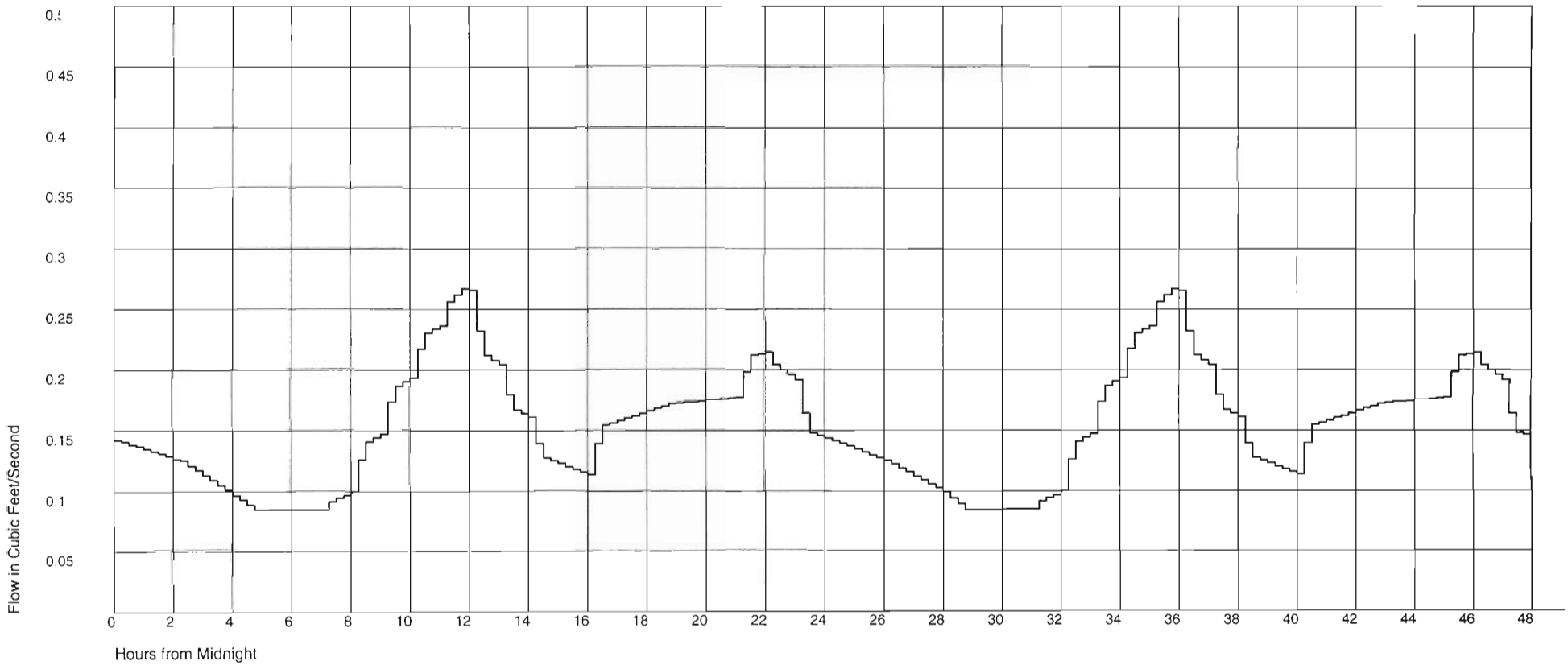
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

Sanitary

Existing Pipe:	LINE-170		
Size:	18.0 Inch	Design Q:	1.252 CFS
Length:	2655.603 Feet	Average Q:	1.016 CFS
Slope:	0.011	D Over D:	0.293
Invert Up:	4403.4 Feet	Velocity:	2.897 Ft/Sec
Invert Dn:	4374.0 Feet	Peaking Fctr:	1.233



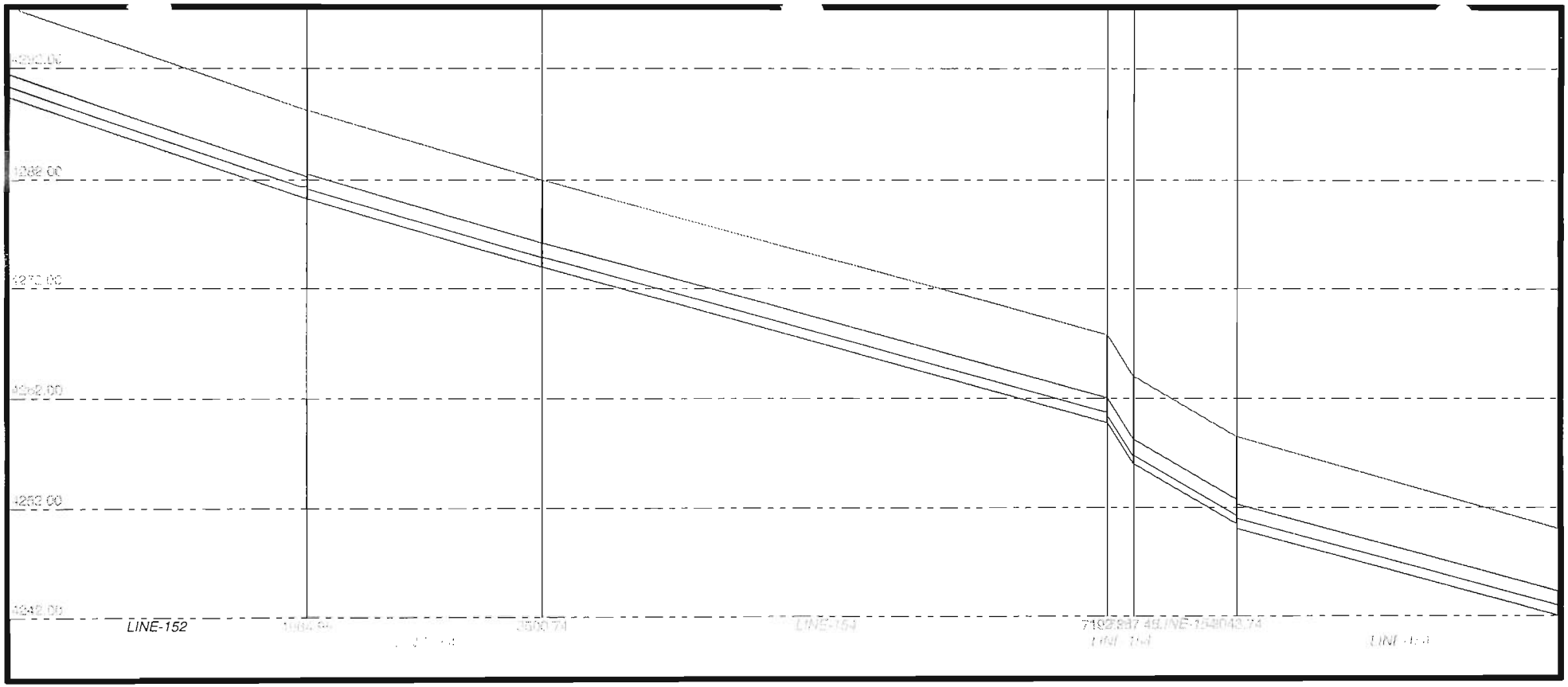
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\

Run: (10/6/2004 8:35:54 AM)

Total

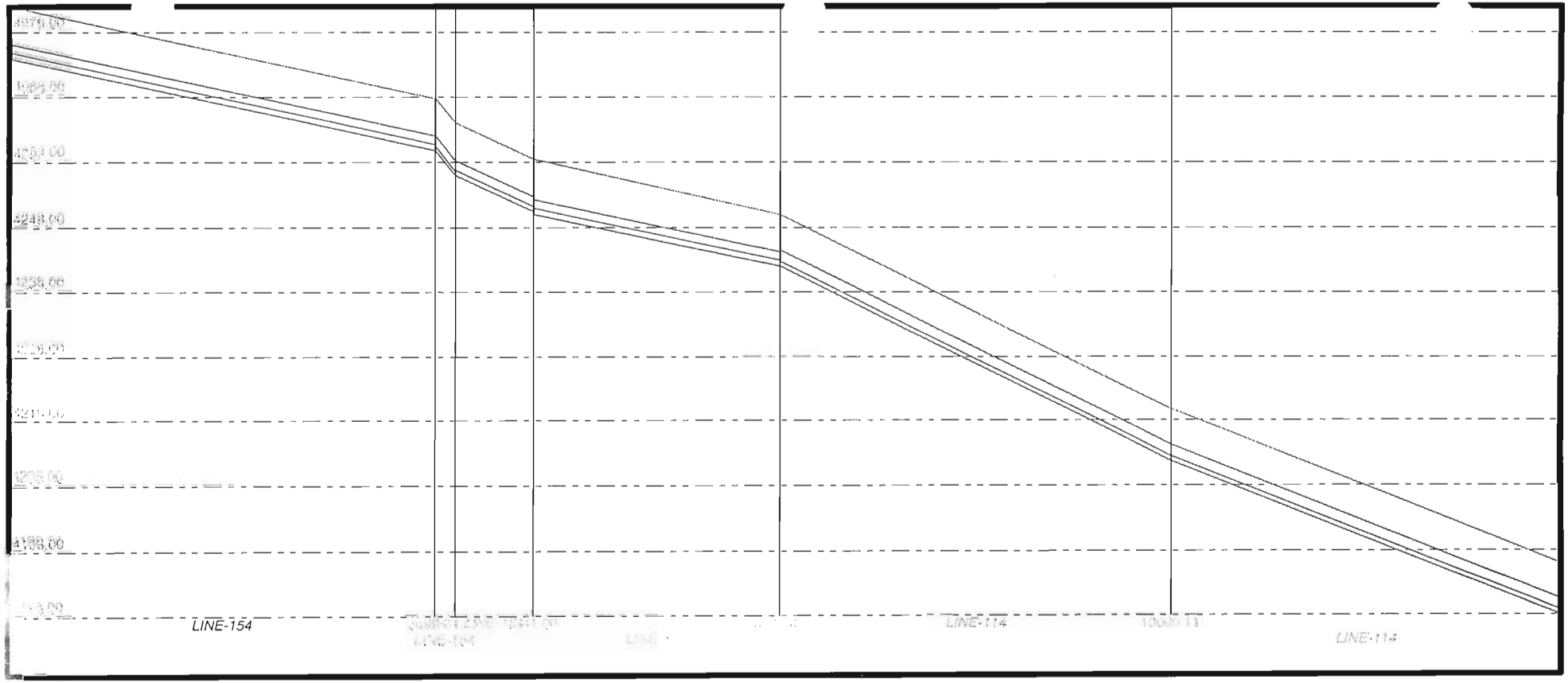
Sanitary

Existing Pipe:	LINE-134		
Size:	12.0 Inch	Design Q:	0.27 CFS
Length:	832.46 Feet	Average Q:	0.153 CFS
Slope:	0.03	D Over D:	0.16
Invert Up:	4449.0 Feet	Velocity:	3.325 Ft/Sec
Invert Dn:	4424.0 Feet	Peaking Fctr:	1.759



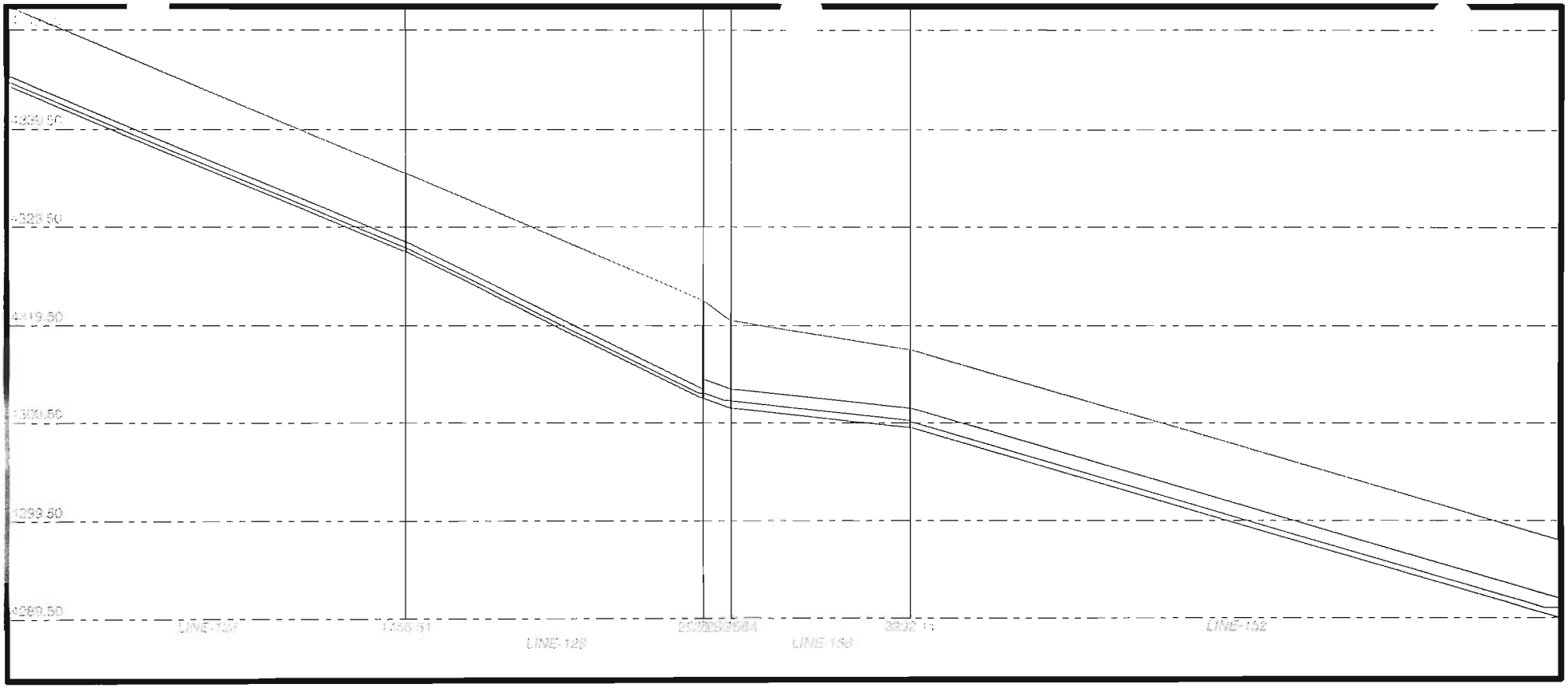
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\
Run: (10/6/2004 8:35:54 AM)

Name	Type	Length	Size	Inv. Up	Inv. Dn	HGL Up	HGL Dn	Gr. Up	Gr. Dn
LINE-152	EPI	1962.95	24.00	4289.50	4280.30	4290.40	4281.42	4297.50	4288.30
LINE-154	EPI	1531.79	27.00	4280.30	4274.00	4281.20	4274.94	4288.30	4282.00
LINE-154	EPI	3688.21	27.00	4274.00	4259.80	4274.92	4260.81	4282.00	4267.80
LINE-154	EPI	170.51	27.00	4259.80	4256.00	4260.44	4256.76	4267.80	4264.00
LINE-154	EPI	672.29	27.00	4256.00	4250.50	4256.78	4251.28	4264.00	4258.50
LINE-154	EPI	2125.46	27.00	4250.05	4242.00	4250.99	4242.94	4258.50	4250.00



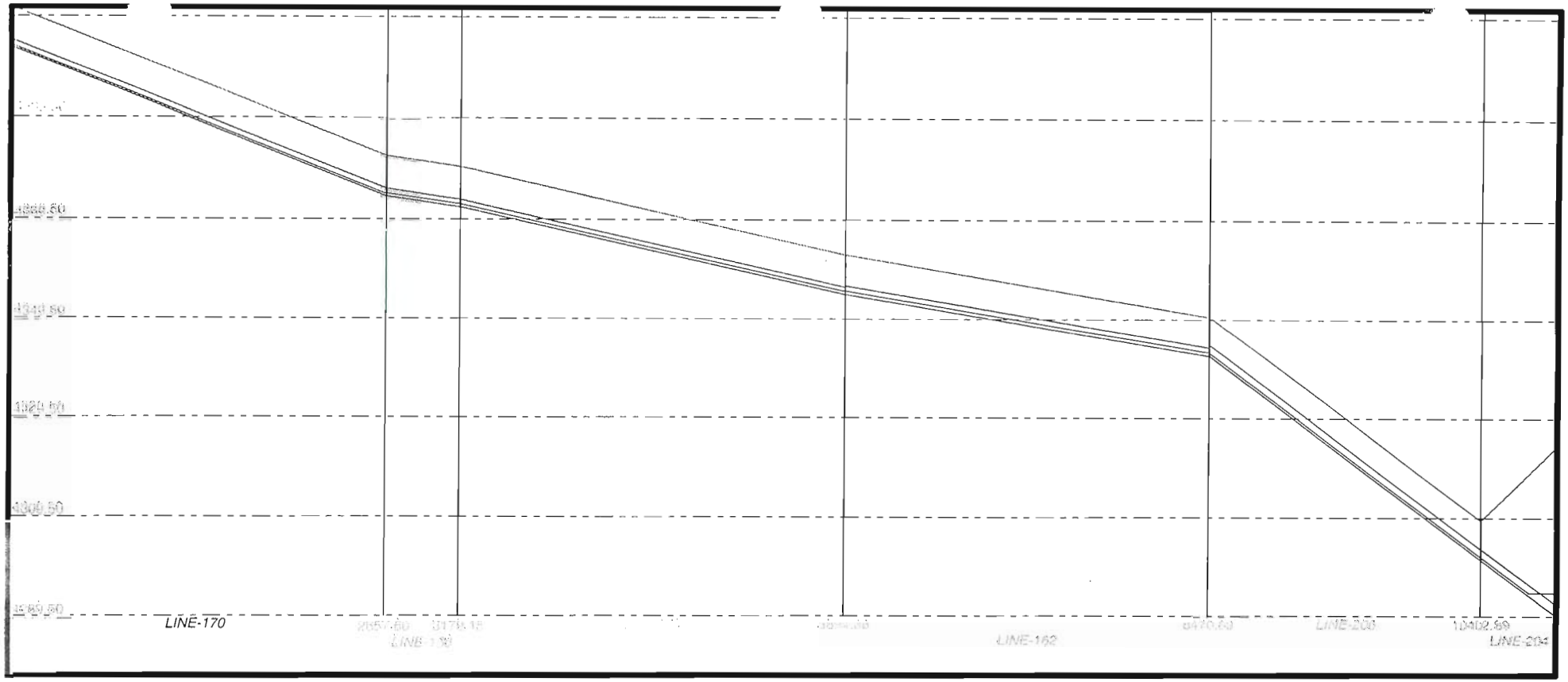
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\
Run: (10/6/2004 8:35:54 AM)

Name	Type	Length	Size	Inv. Up	Inv. Dn	HGL Up	HGL Dn	Gr. Up	Gr. Dn
LINE-154	EPI	3688.21	27.00	4274.00	4259.80	4274.92	4260.81	4282.00	4267.80
LINE-154	EPI	170.51	27.00	4259.80	4256.00	4260.44	4256.76	4267.80	4264.00
LINE-154	EPI	672.29	27.00	4256.00	4250.50	4256.78	4251.28	4264.00	4258.50
LINE-154	EPI	2125.46	27.00	4250.05	4242.00	4250.99	4242.94	4258.50	4250.00
LINE-114	EPI	3385.64	30.00	4242.00	4211.70	4242.74	4212.46	4250.00	4219.70
LINE-114	EPI	3385.64	30.00	4211.70	4188.00	4212.48	4188.94	4219.70	4196.00



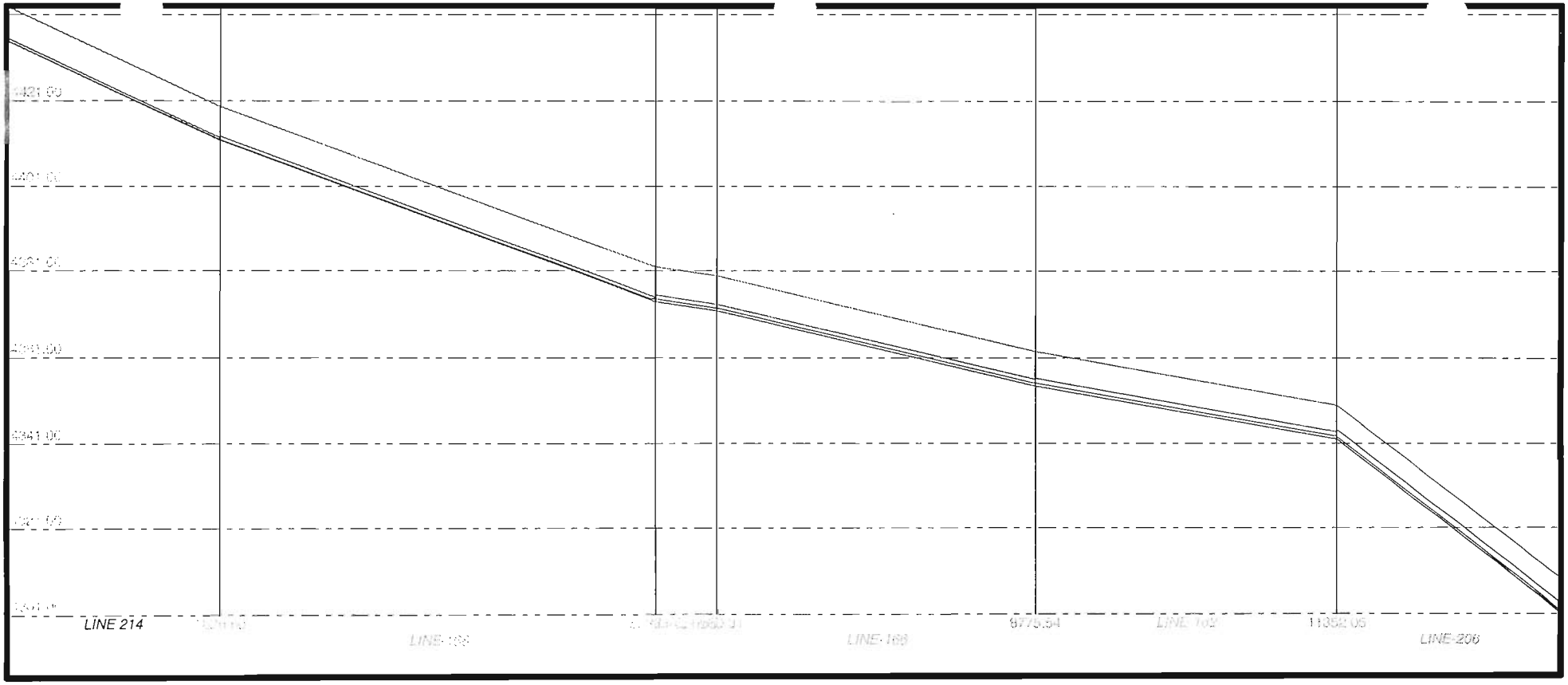
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\
Run: (10/6/2004 8:35:54 AM)

Name	Type	Length	Size	Inv. Up	Inv. Dn	HGL Up	HGL Dn	Gr. Up	Gr. Dn
LINE-128	EPI	1449.51	12.00	4343.90	4327.00	4344.30	4327.40	4351.90	4335.00
LINE-128	EPI	1080.33	12.00	4327.00	4312.00	4327.38	4312.58	4335.00	4322.00
LINE-156	EPI	97.60	24.00	4312.00	4311.00	4312.58	4311.80	4322.00	4320.00
LINE-156	EPI	646.68	24.00	4311.00	4309.00	4311.74	4309.78	4320.00	4317.00
LINE-152	EPI	2376.13	24.00	4309.00	4289.50	4309.60	4290.59	4317.00	4297.50



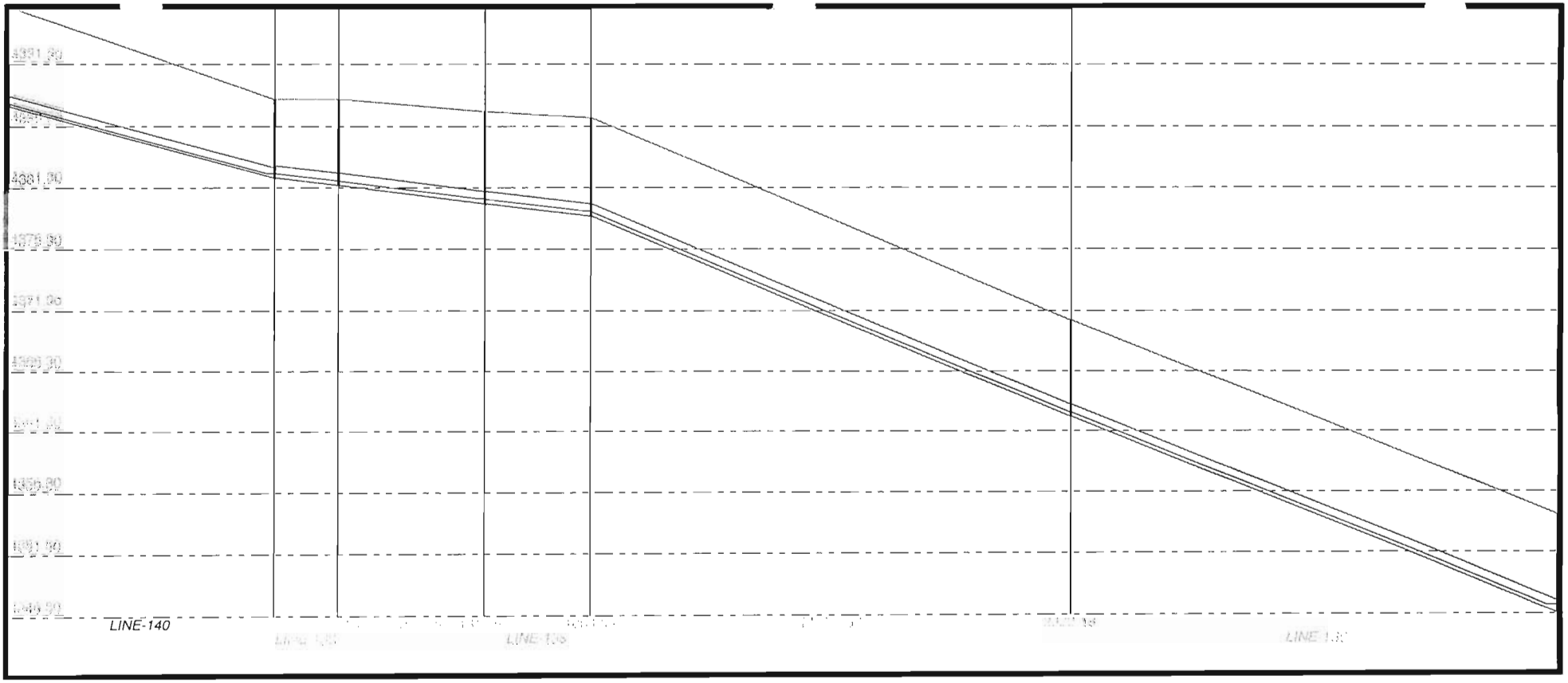
Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\
Run: (10/6/2004 8:35:54 AM)

Name	Type	Length	Size	Inv. Up	Inv. Dn	HGL Up	HGL Dn	Gr. Up	Gr. Dn
LINE-170	EPI	2655.60	18.00	4403.40	4374.00	4403.84	4374.65	4411.40	4382.00
LINE-166	EPI	517.55	18.00	4374.00	4371.90	4374.62	4372.63	4382.00	4379.90
LINE-166	EPI	2711.23	18.00	4371.90	4354.50	4372.52	4355.26	4379.90	4362.50
LINE-162	EPI	2572.51	21.00	4354.50	4342.00	4355.22	4342.86	4362.50	4350.00
LINE-206	DPI	1928.00	27.00	4342.00	4301.00	4342.60	4301.64	4350.00	4309.00
LINE-204	DPI	542.18	27.00	4301.00	4289.50	4301.60	4294.27	4309.00	4324.00



Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\
Run: (10/6/2004 8:35:54 AM)

Name	Type	Length	Size	Inv. Up	Inv. Dn	HGL Up	HGL Dn	Gr. Up	Gr. Dn
LINE 214	DPI	1824.60	8.00	4435.00	4411.70	4435.00	4411.90	4443.00	4419.70
LINE-168	EPI	3708.16	12.00	4411.70	4374.00	4411.90	4374.65	4419.70	4382.00
LINE-166	EPI	517.55	18.00	4374.00	4371.90	4374.62	4372.63	4382.00	4379.90
LINE-166	EPI	2711.23	18.00	4371.90	4354.50	4372.52	4355.26	4379.90	4362.50
LINE-162	EPI	2572.51	21.00	4354.50	4342.00	4355.22	4342.86	4362.50	4350.00
LINE-206	DPI	1928.00	27.00	4342.00	4301.00	4342.60	4301.64	4350.00	4309.00



Project: r:\Alamogordo\ALA32-11\DWG\SAS-2024\
Run: (10/6/2004 8:35:54 AM)

Name	Type	Length	Size	Inv. Up	Inv. Dn	HGL Up	HGL Dn	Gr. Up	Gr. Dn
LINE-140	EPI	735.54	10.00	4388.00	4382.10	4388.20	4382.45	4396.00	4388.50
LINE-138	EPI	170.65	12.00	4382.10	4381.50	4382.46	4381.86	4388.50	4388.50
LINE-138	EPI	397.33	12.00	4381.50	4380.00	4381.84	4380.43	4388.50	4387.50
LINE-138	EPI	287.07	12.00	4380.00	4379.00	4380.36	4379.43	4387.50	4387.00
LINE-130	EPI	1313.59	12.00	4379.00	4362.50	4379.32	4362.82	4387.00	4370.50
LINE-130	EPI	1348.52	12.00	4362.50	4346.30	4362.82	4347.06	4370.50	4354.30

Appendix G

CITY OF ALAMOGORDO, NEW MEXICO
ESTIMATED WWTP FLOWS

Year	Average Flow	Peak Flow	Peak Flow + 15%
2003	2,670,000	3830000	4,404,500
2004	2,718,327	3,899,323	4,484,221
2005	2,767,529	3,969,901	4,565,386
2006	2,817,621	4,041,756	4,648,019
2007	2,868,620	4,114,912	4,732,148
2008	2,920,542	4,189,392	4,817,800
2009	2,973,404	4,265,220	4,905,003
2010	3,027,222	4,342,420	4,993,783
2011	3,082,015	4,421,018	5,084,171
2012	3,137,800	4,501,038	5,176,194
2013	3,194,594	4,582,507	5,269,883

Av. Annual Flow	2,670,000
Population 2003	37,643
Average	71
Maximum Flow	3830000
Population 2003	37,643
Average	102
Minimum Flow	1190000
Population 2003	37,643
Average	32

City of Alamogordo WWTP Effluent Discharges
Alamogordo WRF
1/1/2003 TO 12/31/2003

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
1/1/2003	2.52	0.313		0.023	0.000			0.630	0.000	0.463	1.091
1/2/2003	2.30	0.236		0.046	0.000			0.977	0.000	0.000	1.041
1/3/2003	2.64	0.288		0.000	0.547			0.000	0.000	1.226	0.579
1/4/2003	2.76	0.287		0.022	0.045			0.000	0.000	1.839	0.567
1/5/2003	2.35	0.253		0.043	0.021			0.000	0.000	1.838	0.195
1/6/2003	2.50	0.301		0.027	0.000			0.000	0.000	0.000	2.172
1/7/2003	2.60	0.312		0.000	0.636			0.695	0.000	0.000	0.957
1/8/2003	2.52	0.320		0.004	0.000			0.276	0.000	1.049	0.871
1/9/2003	2.04	0.269		0.037	0.152			0.000	0.000	1.742	-0.160
1/10/2003	2.37	0.394		0.000	0.108			0.000	0.000	1.469	0.399
1/11/2003	2.44	0.264		0.000	0.000			0.000	0.384	0.000	1.792
1/12/2003	2.50	0.271		0.000	0.128			0.000	0.000	0.000	2.101
1/13/2003	2.53	0.250		0.000	0.114			0.000	0.000	0.000	2.166
1/14/2003	2.52	0.294		0.000	0.695			0.635	0.000	0.000	0.896
1/15/2003	2.42	0.338		0.000	0.000			0.842	0.825	0.000	0.415
1/16/2003	2.51	0.273		0.042	0.000			0.625	0.351	0.000	1.219
1/17/2003	2.36	0.306		0.000	0.000			0.631	0.356	0.000	1.067
1/18/2003	2.37	0.327		0.006	0.449			0.000	0.339	0.000	1.249
1/19/2003	2.93	0.315		0.016	0.622			0.000	0.000	0.000	1.977
1/20/2003	2.60	0.260		0.030	0.000			0.000	0.000	0.000	2.310
1/21/2003	1.87	0.315		0.000	0.000			0.000	0.312	0.000	1.243
1/22/2003	2.76	0.381		0.008	0.080			0.000	0.392	0.941	0.958
1/23/2003	2.61	0.389		0.030	0.181			0.000	0.364	0.883	0.763
1/24/2003	2.44	0.330		0.001	0.155			0.664	0.395	0.000	0.895
1/25/2003	2.44	0.628		0.042	0.155			0.708	0.362	0.000	0.545
1/26/2003	2.44	0.464		0.043	0.350			0.000	0.000	0.000	1.583
1/27/2003	2.16	0.315		0.037	0.323			0.000	0.000	0.000	1.485
1/28/2003	2.50	0.481		0.000	0.137			0.803	0.354	0.000	0.725
1/29/2003	2.19	0.456		0.000	0.153			0.000	0.357	0.935	0.289
1/30/2003	2.43	0.406		0.037	0.249			0.000	0.441	0.000	1.297
1/31/2003	2.25	0.618		0.000	0.248			0.000	0.452	0.000	0.932
2/1/2003	2.41	0.393		0.000	0.008			0.366	0.000	0.000	1.643
2/2/2003	2.98	0.488		0.021	0.021			0.000	0.000	0.000	2.450
2/3/2003	2.65	0.374		0.036	0.313			0.000	0.000	0.000	1.927
2/4/2003	2.38	0.651		0.000	0.418			0.000	0.000	0.441	0.870
2/5/2003	2.50	0.640		0.000	0.000			0.000	0.408	0.000	1.452
2/6/2003	2.46	0.690		0.034	0.671			0.360	0.000	0.000	0.705
2/7/2003	2.10	0.637		0.000	0.144			0.000	0.000	0.409	0.910
2/8/2003	2.36	0.442		0.000	0.025			0.000	0.000	0.000	1.893
2/9/2003	2.91	0.521		0.010	0.113			0.000	0.000	0.000	2.266
2/10/2003	2.64	0.507		0.018	0.120			0.000	0.000	0.000	1.995
2/11/2003	2.78	0.554		0.000	0.884			0.000	0.000	0.000	1.342

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
2/12/2003	2.73	0.484		0.000	0.312			0.000	0.000	0.000	1.934
2/13/2003	2.72	0.441		0.015	0.199			0.000	0.000	0.401	1.664
2/14/2003	2.73	0.599		0.002	0.190			0.000	0.553	0.000	1.386
2/15/2003	2.75	0.455		0.002	0.215			0.000	0.000	0.000	2.078
2/16/2003	2.94	0.563		0.021	0.001			0.000	0.000	0.000	2.355
2/17/2003	2.73	0.366		0.020	0.571			0.000	0.000	0.000	1.773
2/18/2003	2.59	0.489		0.000	0.330			1.350	0.000	0.000	0.421
2/19/2003	2.70	0.484		0.000	0.182			0.000	0.000	1.375	0.659
2/20/2003	2.77	0.451		0.040	0.232			1.107	0.000	0.000	0.940
2/21/2003	3.04	0.330		0.000	0.085			0.000	0.000	0.000	2.625
2/22/2003	2.80	0.345		0.024	0.000			0.000	0.000	0.000	2.431
2/23/2003	2.43	0.443		0.045	0.105			0.000	0.000	0.000	1.837
2/24/2003	2.74	0.288		0.036	0.085			0.000	0.000	0.000	2.331
2/25/2003	2.49	0.471		0.000	0.186			0.775	0.344	0.000	0.714
2/26/2003	2.48	0.296		0.024	0.232			0.000	0.388	0.951	0.589
2/27/2003	2.83	0.362		0.036	0.060			0.000	0.000	0.000	2.372
2/28/2003	2.75	0.374		0.000	0.048			0.740	0.316	0.000	1.272
3/1/2003	2.87	0.393		0.000	0.428			0.000	0.339	1.037	0.673
3/2/2003	2.80	0.420		0.042	0.360			0.000	0.000	0.000	1.978
3/3/2003	2.90	0.348		0.042	0.204			0.000	0.000	0.000	2.306
3/4/2003	2.47	0.410		0.000	0.229			0.951	0.361	0.000	0.519
3/5/2003	2.20	0.410		0.000	0.242			0.000	0.354	0.933	0.261
3/6/2003	2.45	0.467		0.038	0.181			0.923	0.000	0.420	0.421
3/7/2003	2.25	0.615		0.030	0.524			1.123	0.000	0.000	-0.042
3/8/2003	2.07	0.408		0.024	0.555			0.000	0.000	0.000	1.083
3/9/2003	2.05	0.463		0.052	0.054			0.000	0.000	0.000	1.481
3/10/2003	2.44	0.370		0.037	0.107			0.000	0.000	0.000	1.926
3/11/2003	2.95	0.534		0.025	0.232			0.000	0.000	1.382	0.777
3/12/2003	2.43	0.436		0.087	0.677			0.000	0.000	0.000	1.230
3/13/2003	2.57	0.569		0.046	0.503			0.804	0.000	0.000	0.648
3/14/2003	2.64	0.594		0.000	0.209			0.000	0.000	1.323	0.514
3/15/2003	3.09	0.776		0.026	0.000			0.000	0.000	0.000	2.288
3/16/2003	2.73	0.532		0.022	0.209			0.000	0.000	0.000	1.967
3/17/2003	2.93	0.515		0.040	1.508			0.000	0.368	0.000	0.499
3/18/2003	2.91	0.640		0.024	0.203			0.000	0.377	0.940	0.726
3/19/2003	2.86	0.560		0.067	0.176			0.773	0.345	0.000	0.939
3/20/2003	2.77	0.600		0.040	0.506			0.328	0.000	0.000	1.296
3/21/2003	2.81	0.592		0.000	0.375			0.796	0.350	0.000	0.697
3/22/2003	2.94	0.600		0.024	0.467			0.234	0.000	0.000	1.615
3/23/2003	2.60	0.533		0.054	0.474			0.000	0.000	0.000	1.539
3/24/2003	2.45	0.523		0.040	0.468			0.000	0.000	0.000	1.419
3/25/2003	2.55	0.609		0.021	0.313			0.796	0.383	0.000	0.428

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
3/26/2003	2.45	0.588		0.062	0.430			0.115	0.464	0.151	0.640
3/27/2003	2.63	0.618		0.040	0.006			0.634	0.000	0.000	1.332
3/28/2003	3.04	0.658		0.002	1.502			0.000	0.000	0.000	0.878
3/29/2003	1.96	0.628		0.036	0.657			0.000	0.000	0.000	0.639
3/30/2003	2.14	0.602		0.054	0.400			0.000	0.000	0.000	1.084
3/31/2003	2.46	0.495		0.040	0.261			0.000	0.000	0.000	1.664
4/1/2003	2.34	0.675		0.000	0.506			1.316	0.000	0.000	-0.157
4/2/2003	3.45	0.612		0.040	0.587			0.000	0.000	0.994	1.217
4/3/2003	2.45	0.801		0.043	0.635			0.685	0.000	0.000	0.286
4/4/2003	2.20	0.825		0.000	0.738			0.000	0.000	0.248	0.389
4/5/2003	2.06	0.764		0.039	0.955			0.000	0.000	0.000	0.302
4/6/2003	1.82	0.449		0.066	0.631			0.000	0.000	0.000	0.674
4/7/2003	2.26	0.613		0.052	0.569			0.000	0.000	0.000	1.026
4/8/2003	2.13	0.810		0.024	0.814			0.000	0.000	0.000	0.482
4/9/2003	2.15	0.733		0.075	0.933			0.000	0.000	0.000	0.409
4/10/2003	2.15	0.713		0.054	0.523			0.000	0.000	0.000	0.860
4/11/2003	2.40	0.876		0.000	0.591			0.640	0.000	0.000	0.293
4/12/2003	3.26	0.960		0.017	0.412			0.000	0.000	0.000	1.871
4/13/2003	3.83	0.631		0.067	0.161			0.000	0.000	0.000	2.971
4/14/2003	2.72	0.717		0.044	0.781			0.000	0.301	0.000	0.877
4/15/2003	2.40	0.827		0.010	0.403			0.000	0.000	0.386	0.774
4/16/2003	3.49	0.479		0.000	0.460			0.792	0.000	0.000	1.759
4/17/2003	2.34	0.766		0.000	0.168			0.000	0.344	0.436	0.626
4/18/2003	2.48	0.875		0.000	0.427			0.000	0.350	0.775	0.053
4/19/2003	2.95	1.000		0.025	0.473			0.000	0.000	0.311	1.141
4/20/2003	2.95	0.728		0.077	0.549			0.000	0.000	0.000	1.596
4/21/2003	3.08	0.625		0.075	0.789			0.000	0.000	0.000	1.591
4/22/2003	2.52	0.764		0.021	0.929			0.000	0.000	0.000	0.806
4/23/2003	2.45	1.033		0.009	0.824			0.000	0.000	0.000	0.584
4/24/2003	2.57	1.156		0.000	0.750			0.000	0.000	0.000	0.664
4/25/2003	2.72	1.224		0.000	0.866			0.000	0.000	0.000	0.630
4/26/2003	2.75	0.912		0.000	1.039			0.000	0.000	0.000	0.799
4/27/2003	2.63	0.622		0.087	0.526			0.000	0.000	0.000	1.395
4/28/2003	2.71	0.784		0.117	0.839			0.192	0.000	0.000	0.778
4/29/2003	2.64	0.775		0.003	0.923			0.000	0.000	0.000	0.939
4/30/2003	2.67	1.200		0.183	0.807			0.000	0.000	0.000	0.480
5/1/2003	2.74	1.280		0.133	0.798			0.000	0.000	0.000	0.529
5/2/2003	2.71	1.064		0.000	1.125			0.000	0.000	0.000	0.521
5/3/2003	2.66	1.171		0.019	1.152			0.000	0.000	0.000	0.318
5/4/2003	2.79	0.812		0.039	0.986			0.000	0.000	0.000	0.953
5/5/2003	2.67	0.961		0.009	0.973			0.000	0.000	0.000	0.727
5/6/2003	2.88	1.126		0.042	0.656			0.000	0.000	0.000	1.056

Alamogordo WRF

1/1/2003 TO 12/31/2003

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
5/7/2003	2.99	1.164		0.078	0.808			0.000	0.000	0.000	0.940
5/8/2003	2.87	1.283		0.105	1.017			0.000	0.000	0.000	0.465
5/9/2003	2.81	1.200		0.010	0.962			0.000	0.000	0.000	0.638
5/10/2003	2.75	1.320		0.030	0.979			0.000	0.000	0.000	0.421
5/11/2003	2.56	0.974		0.134	1.230			0.000	0.000	0.000	0.222
5/12/2003	2.65	1.137		0.157	1.180			0.000	0.000	0.000	0.176
5/13/2003	2.60	1.180		0.028	0.196			0.000	0.000	0.000	1.196
5/14/2003	2.78	0.961		0.140	0.707			0.000	0.000	0.000	0.972
5/15/2003	2.74	1.023		0.097	1.272			0.000	0.000	0.000	0.348
5/16/2003	2.72	1.057		0.024	0.813			0.000	0.000	0.000	0.826
5/17/2003	2.56	1.167		0.042	0.667			0.000	0.000	0.000	0.684
5/18/2003	2.80	1.212		0.064	1.026			0.000	0.000	0.000	0.498
5/19/2003	2.66	1.220		0.091	0.907			0.000	0.000	0.000	0.442
5/20/2003	2.85	1.226		0.023	0.660			0.000	0.000	0.000	0.941
5/21/2003	2.68	1.247		0.167	0.773			0.000	0.000	0.000	0.493
5/22/2003	2.90	1.660		0.181	0.818			0.000	0.000	0.000	0.241
5/23/2003	2.83	1.120		0.018	1.781			0.000	0.000	0.000	-0.089
5/24/2003	2.99	1.440		0.012	0.849			0.000	0.000	0.000	0.689
5/25/2003	2.69	0.998		0.015	0.308			0.000	0.000	0.000	1.369
5/26/2003	2.68	1.016		0.185	0.268			0.000	0.000	0.000	1.211
5/27/2003	3.00	1.174		0.018	0.554			0.000	0.000	0.000	1.254
5/28/2003	2.90	1.040		0.169	1.105			0.000	0.000	0.000	0.586
5/29/2003	2.95	1.491		0.190	1.014			0.000	0.000	0.000	0.255
5/30/2003	2.82	1.520		0.000	0.812			0.000	0.000	0.000	0.488
5/31/2003	2.95	1.880		0.122	1.000			0.000	0.000	0.000	-0.052
6/1/2003	2.62	1.544		0.160	1.092			0.000	0.000	0.000	-0.176
6/2/2003	2.65	1.110		0.182	0.695			0.000	0.000	0.000	0.663
6/3/2003	2.84	1.422		0.019	0.898			0.000	0.000	0.000	0.501
6/4/2003	2.85	1.420		0.175	1.049			0.000	0.000	0.000	0.206
6/5/2003	2.85	1.543		0.171	1.076			0.000	0.000	0.000	0.060
6/6/2003	3.25	1.405		0.000	0.403			0.000	0.000	0.000	1.442
6/7/2003	3.02	1.624		0.158	1.430			0.000	0.000	0.000	-0.192
6/8/2003	2.90	1.270		0.057	0.257			0.000	0.000	0.000	1.316
6/9/2003	3.09	1.050		0.174	0.799			0.000	0.000	0.000	1.067
6/10/2003	2.81	1.382		0.000	1.074			0.000	0.000	0.000	0.354
6/11/2003	2.62	1.402		0.204	1.024			0.000	0.000	0.000	-0.010
6/12/2003	2.63	1.320		0.200	1.038			0.000	0.000	0.000	0.072
6/13/2003	2.73	1.160		0.000	0.916			0.000	0.000	0.000	0.654
6/14/2003	2.74	0.929		0.012	1.044			0.000	0.000	0.000	0.755
6/15/2003	2.69	0.734		0.160	0.396			0.000	0.000	0.000	1.400
6/16/2003	2.56	0.737		0.019	0.261			0.000	0.000	0.000	1.543
6/17/2003	2.89	1.343		0.000	0.964			0.000	0.000	0.000	0.583

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
6/18/2003	2.89	1.540		0.098	1.090			0.000	0.000	0.000	0.162
6/19/2003	3.18	1.500		0.197	1.124			0.000	0.000	0.000	0.359
6/20/2003	2.50	1.231		0.000	1.053			0.000	0.000	0.000	0.216
6/21/2003	3.15	0.680		0.000	1.404			0.000	0.000	0.000	1.066
6/22/2003	2.68	0.000		0.077	2.168			0.000	0.000	0.000	0.435
6/23/2003	2.61	0.000		0.184	0.313			0.000	0.000	0.000	2.113
6/24/2003	2.75	1.350		0.003	0.801			0.000	0.000	0.000	0.596
6/25/2003	2.55	1.670		0.188	0.766			0.000	0.000	0.000	-0.074
6/26/2003	2.61	1.810		0.189	0.842			0.000	0.000	0.000	-0.231
6/27/2003	2.65	1.740		0.000	0.813			0.000	0.000	0.000	0.097
6/28/2003	2.69	1.630		0.073	0.694			0.000	0.000	0.000	0.293
6/29/2003	2.60	1.400		0.000	1.138			0.000	0.000	0.000	0.062
6/30/2003	2.61	1.280		0.000	0.945			0.000	0.000	0.000	0.385
7/1/2003	2.75	1.875		0.002	0.932			0.000	0.000	0.000	-0.059
7/2/2003	2.65	1.650		0.112	0.902			0.000	0.000	0.000	-0.014
7/3/2003	2.65	1.200		0.176	0.782			0.000	0.000	0.000	0.492
7/4/2003	2.68	1.330		0.024	0.000			0.000	0.000	0.000	1.326
7/5/2003	2.68	1.330		0.024	0.837			0.000	0.000	0.000	0.489
7/6/2003	2.56	1.240		0.168	0.838			0.000	0.000	0.000	0.314
7/7/2003	3.77	1.060		0.136	0.374			0.000	0.000	0.000	2.200
7/8/2003	2.41	1.301		0.152	1.195			0.000	0.000	0.000	-0.238
7/9/2003	2.61	1.081		0.125	1.140			0.000	0.000	0.000	0.264
7/10/2003	3.00	1.240		0.125	1.450			0.000	0.000	0.000	0.185
7/11/2003	2.91	0.740		0.135	1.860			0.000	0.000	0.000	0.175
7/12/2003	2.86	0.913		0.125	0.500			0.000	0.000	0.000	1.322
7/13/2003	3.00	0.770		0.000	0.951			0.000	0.000	0.000	1.279
7/14/2003	2.95	0.753		0.105	0.848			0.000	0.000	0.000	1.244
7/15/2003	3.01	0.964		0.105	0.888			0.000	0.000	0.000	1.053
7/16/2003	2.73	1.040		0.162	0.978			0.000	0.000	0.000	0.550
7/17/2003	2.99	1.060		0.017	0.937			0.000	0.000	0.000	0.976
7/18/2003	2.88	1.180		0.239	0.822			0.000	0.000	0.000	0.639
7/19/2003	3.03	1.700		0.280	1.053			0.000	0.000	0.000	-0.003
7/20/2003	2.79	1.160		0.214	0.966			0.000	0.000	0.000	0.450
7/21/2003	2.81	1.150		0.245	1.034			0.000	0.000	0.000	0.381
7/22/2003	2.82	1.220		0.039	0.657			0.000	0.000	0.000	0.904
7/23/2003	2.88	1.200		0.174	1.369			0.000	0.000	0.000	0.137
7/24/2003	2.83	1.470		0.242	1.001			0.000	0.000	0.000	0.117
7/25/2003	3.00	1.730		0.151	0.816			0.000	0.000	0.000	0.303
7/26/2003	2.90	1.810		0.138	0.955			0.000	0.000	0.000	-0.003
7/27/2003	2.80	1.400		0.213	0.882			0.000	0.000	0.000	0.305
7/28/2003	2.88	1.400		0.235	0.868			0.000	0.000	0.000	0.377
7/29/2003	3.06	1.715		0.044	1.028			0.000	0.000	0.000	0.273

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
7/30/2003	3.27	1.740		0.215	0.945			0.000	0.000	0.000	0.370
7/31/2003	3.10	1.550		0.204	0.849			0.000	0.000	0.000	0.497
8/1/2003	3.19	0.678		0.005	0.578			0.000	0.000	0.000	1.929
8/2/2003	2.97	1.460		0.148	0.814			0.000	0.000	0.000	0.548
8/3/2003	3.07	1.490		0.234	0.610			0.000	0.000	0.000	0.736
8/4/2003	3.08	1.240		0.233	0.705			0.000	0.000	0.000	0.902
8/5/2003	3.15	1.230		0.037	0.414			0.000	0.000	0.000	1.469
8/6/2003	2.96	1.630		0.143	0.358			0.000	0.000	0.000	0.829
8/7/2003	2.86	1.670		0.197	0.878			0.000	0.000	0.000	0.115
8/8/2003	3.10	1.220		0.051	0.735			0.000	0.000	0.000	1.094
8/9/2003	3.13	1.680		0.171	1.124			0.000	0.000	0.000	0.155
8/10/2003	2.81	1.400		0.220	1.288			0.000	0.000	0.000	-0.098
8/11/2003	2.94	1.335		0.234	1.028			0.000	0.000	0.000	0.343
8/12/2003	3.03	1.800		0.024	1.132			0.000	0.000	0.000	0.074
8/13/2003	3.14	1.700		0.222	0.972			0.000	0.000	0.000	0.246
8/14/2003	3.07	1.700		0.249	1.291			0.000	0.000	0.000	-0.170
8/15/2003	3.22	1.080		0.014	0.707			0.000	0.000	0.000	1.419
8/16/2003	3.08	1.460		0.159	0.591			0.000	0.000	0.000	0.870
8/17/2003	3.01	1.530		0.214	0.420			0.000	0.000	0.000	0.846
8/18/2003	2.78	1.610		0.222	0.756			0.000	0.000	0.000	0.192
8/19/2003	3.28	1.540		0.021	0.845			0.000	0.000	0.000	0.874
8/20/2003	2.97	1.170		0.138	1.150			0.000	0.000	0.000	0.512
8/21/2003	2.93	1.400		0.163	1.170			0.000	0.000	0.000	0.197
8/22/2003	3.10	1.100		0.158	0.843			0.000	0.000	0.000	0.999
8/23/2003	3.10	1.330		0.140	0.907			0.000	0.000	0.000	0.723
8/24/2003	3.11	1.400		0.116	1.160			0.000	0.000	0.000	0.434
8/25/2003	3.10	1.190		0.169	1.140			0.000	0.000	0.000	0.601
8/26/2003	2.93	1.441		0.028	0.401			0.000	0.000	0.000	1.060
8/27/2003	3.35	1.350		0.059	0.731			0.000	0.000	0.000	1.210
8/28/2003	2.50	1.180		0.038	0.838			0.000	0.000	0.000	0.444
8/29/2003	2.96	1.070		0.005	0.406			0.000	0.000	0.000	1.479
8/30/2003	3.21	1.930		0.175	0.429			0.000	0.000	0.000	0.676
8/31/2003	3.22	1.190		0.120	0.643			0.000	0.000	0.000	1.267
9/1/2003	2.64	0.923		0.153	0.594			0.000	0.000	0.000	0.970
9/2/2003	2.96	1.750		0.085	0.517			0.000	0.000	0.000	0.608
9/3/2003	2.68	1.120		0.000	0.597			0.000	0.000	0.000	0.963
9/4/2003	2.51	0.920		0.000	0.452			0.000	0.000	0.000	1.138
9/5/2003	2.79	0.762		0.000	0.751			0.000	0.000	0.000	1.277
9/6/2003	2.83	1.570		0.077	0.758			0.000	0.000	0.000	0.425
9/7/2003	2.83	1.570		0.077	0.758			0.000	0.000	0.000	0.425
9/8/2003	2.82	1.170		0.148	0.760			0.000	0.000	0.000	0.742
9/9/2003	2.96	1.340		0.092	1.037			0.000	0.000	0.000	0.491

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
9/10/2003	2.84	1.150		0.214	0.650			0.000	0.000	0.000	0.826
9/11/2003	2.82	1.080		0.202	0.261			0.000	0.000	0.000	1.277
9/12/2003	2.71	0.731		0.000	0.446			0.000	0.000	0.000	1.533
9/13/2003	2.86	1.330		0.075	0.560			0.000	0.000	0.000	0.895
9/14/2003	2.65	1.570		0.075	0.333			0.000	0.000	0.000	0.672
9/15/2003	2.64	1.350		0.074	0.000			0.000	0.000	0.000	1.216
9/16/2003	2.95	1.800		0.000	0.511			0.000	0.000	0.000	0.639
9/17/2003	2.74	1.300		0.000	0.647			0.000	0.000	0.000	0.793
9/18/2003	2.60	1.153		0.000	1.026			0.000	0.000	0.000	0.421
9/19/2003	2.75	0.957		0.000	1.602			0.000	0.000	0.000	0.191
9/20/2003	2.74	0.974		0.076	0.340			0.000	0.000	0.000	1.350
9/21/2003	2.69	1.067		0.075	0.262			0.000	0.000	0.000	1.286
9/22/2003	2.12	0.935		0.075	0.628			0.000	0.000	0.000	0.482
9/23/2003	3.27	1.393		0.000	0.797			0.000	0.000	0.000	1.080
9/24/2003	2.40	1.420		0.309	0.340			0.000	0.000	0.000	0.331
9/25/2003	2.71	1.267		0.200	1.029			0.000	0.000	0.000	0.214
9/26/2003	2.71	0.892		0.004	1.890			0.000	0.000	0.000	-0.076
9/27/2003	2.63	0.664		0.132	0.007			0.000	0.000	0.000	1.827
9/28/2003	2.57	0.657		0.073	0.002			0.000	0.000	0.000	1.838
9/29/2003	2.69	0.612		0.072	0.005			0.000	0.000	0.000	2.001
9/30/2003	2.80	1.200		0.000	0.993			0.000	0.000	0.000	0.607
10/1/2003	2.70	1.410		0.072	1.130			0.000	0.000	0.000	0.088
10/2/2003	2.69	1.330		0.050	1.120			0.000	0.000	0.000	0.190
10/3/2003	2.76	0.779		0.000	0.412			0.000	0.000	0.000	1.569
10/4/2003	2.91	1.310		0.169	0.899			0.000	0.000	0.000	0.532
10/5/2003	2.67	1.280		0.172	0.622			0.000	0.000	0.000	0.596
10/6/2003	2.70	0.891		0.179	0.935			0.000	0.000	0.000	0.695
10/7/2003	3.03	0.978		0.006	1.011			0.000	0.000	0.000	1.035
10/8/2003	3.10	0.901		0.195	1.171			0.000	0.000	0.000	0.833
10/9/2003	2.86	0.905		0.163	0.203			0.000	0.000	0.000	1.589
10/10/2003	2.87	0.678		0.000	0.103			0.000	0.000	0.000	2.089
10/11/2003	2.74	1.060		0.047	0.275			0.000	0.000	0.000	1.358
10/12/2003	2.80	1.190		0.000	0.385			0.000	0.000	0.000	1.225
10/13/2003	2.69	0.896		0.025	0.049			0.000	0.000	0.000	1.720
10/14/2003	3.02	1.801		0.001	0.317			0.000	0.000	0.000	0.901
10/15/2003	2.73	0.910		0.000	0.409			0.000	0.000	0.000	1.411
10/16/2003	2.24	1.520		0.024	0.789			0.000	0.000	0.000	-0.093
10/17/2003	2.72	0.758		0.029	0.478			0.000	0.000	0.000	1.455
10/18/2003	2.65	1.100		0.080	0.663			0.000	0.000	0.000	0.807
10/19/2003	2.73	1.240		0.091	1.160			0.000	0.000	0.000	0.239
10/20/2003	2.63	1.000		0.094	0.757			0.000	0.000	0.000	0.779
10/21/2003	2.52	1.260		0.029	0.433			0.000	0.000	0.000	0.798

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
10/22/2003	2.61	1.040		0.143	0.370			0.000	0.000	0.000	1.057
10/23/2003	2.80	1.200		0.074	0.868			0.000	0.000	0.000	0.658
10/24/2003	2.84	0.659		0.003	1.030			0.000	0.000	0.000	1.148
10/25/2003	2.64	0.871		0.016	0.821			0.000	0.000	0.000	0.932
10/26/2003	2.69	0.948		0.012	0.071			0.000	0.000	0.000	1.659
10/27/2003	2.25	0.798		0.000	0.655			0.000	0.000	0.000	0.797
10/28/2003	2.57	1.160		0.003	0.546			0.000	0.000	0.000	0.861
10/29/2003	2.39	1.020		0.000	0.550			0.000	0.000	0.000	0.820
10/30/2003	2.35	1.020		0.096	0.959			0.000	0.000	0.000	0.275
10/31/2003	2.53	0.470		0.000	0.799			0.000	0.000	0.000	1.261
11/1/2003	2.36	0.907		0.059	0.757			0.000	0.000	0.000	0.637
11/2/2003	2.32	1.040		0.072	0.604			0.000	0.000	0.000	0.604
11/3/2003	2.28	0.628		0.095	0.594			0.000	0.000	0.000	0.963
11/4/2003	2.50	0.929		0.000	0.840			0.000	0.000	0.000	0.731
11/5/2003	2.35	0.805		0.081	0.736			0.000	0.000	0.000	0.728
11/6/2003	2.65	0.997		0.164	0.128			0.000	0.000	0.000	1.361
11/7/2003	2.68	0.668		0.009	0.340			0.000	0.000	0.000	1.663
11/8/2003	2.91	0.947		0.042	0.654			0.000	0.000	0.000	1.267
11/9/2003	2.66	0.999		0.071	0.269			0.000	0.000	0.000	1.321
11/10/2003	1.38	0.890		0.000	0.321			0.000	0.000	0.000	0.169
11/11/2003	2.97	0.045		0.002	0.692			0.000	0.000	0.000	2.231
11/12/2003	2.63	0.000		0.047	1.650			0.000	0.000	0.000	0.933
11/13/2003	2.48	0.000		0.001	1.030			0.000	0.000	0.000	1.449
11/14/2003	2.29	0.000		0.000	0.770			0.000	0.000	0.000	1.520
11/15/2003	2.40	0.000		0.019	0.807			0.000	0.000	0.000	1.574
11/16/2003	2.11	0.000		0.002	0.766			0.000	0.000	0.000	1.342
11/17/2003	2.46	0.000		0.003	0.805			0.000	0.000	0.000	1.652
11/18/2003	2.64	0.000		0.000	0.481			0.000	0.000	0.000	2.159
11/19/2003	2.49	0.000		0.091	0.607			0.000	0.000	0.000	1.792
11/20/2003	2.11	0.000		0.094	0.791			0.000	0.000	0.974	0.251
11/21/2003	2.02	0.000		0.000	1.129			1.120	0.000	0.000	-0.229
11/22/2003	2.16	0.000		0.042	0.354			0.000	0.000	0.000	1.764
11/23/2003	2.06	0.000		0.077	0.195			0.000	0.000	0.000	1.788
11/24/2003	1.99	0.000		0.068	0.191			0.000	0.000	0.000	1.731
11/25/2003	2.53	0.000		0.000	0.167			0.000	0.000	0.000	2.363
11/26/2003	2.36	0.000		0.091	0.218			0.000	0.000	0.000	2.051
11/27/2003	2.41	0.000		0.090	0.359			0.000	0.000	0.000	1.961
11/28/2003	1.80	0.000		0.000	0.470			0.000	0.000	0.000	1.330
11/29/2003	1.89	0.000		0.042	0.420			1.250	0.000	1.210	-1.032
11/30/2003	1.71	0.000		0.076	0.348			0.000	0.000	1.480	-0.194
12/1/2003	1.85	0.000		0.066	0.459			0.000	0.000	0.000	1.325
12/2/2003	1.19	0.786		0.001	0.432			0.000	0.000	1.070	-1.099

City of Alamogordo WWTP Effluent Discharges

Alamogordo WRF

1/1/2003 TO 12/31/2003

Date	Q Eff MGD	LaV MG MG	Stl MG MG	Hs MG MG	Glf MG MG	Piv Hyd MG	SunCit Hyd MG	P 1 MG MG	P 2 MG MG	P 3 MG MG	Eff Bal MG
12/3/2003	2.50	0.780		0.086	0.049			0.000	0.000	0.000	1.585
12/4/2003	1.53	1.302		0.044	0.178			0.000	0.000	0.000	0.006
12/5/2003	1.58	0.470		0.000	0.929			0.868	0.000	0.000	-0.687
12/6/2003	1.78	0.787		0.020	0.101			0.000	0.000	1.000	-0.128
12/7/2003	2.61	0.719		0.038	0.000			0.738	0.000	0.000	1.115
12/8/2003	2.83	0.600		0.033	0.000			0.000	0.000	1.000	1.197
12/9/2003	2.84	0.799		0.000	0.835			0.748	0.000	0.000	0.458
12/10/2003	2.71	0.635		0.044	0.155			0.000	0.000	0.963	0.913
12/11/2003	2.56	0.833		0.046	0.512			0.000	1.348	0.962	-1.141
12/12/2003	2.48	0.680		0.000	0.432			1.120	0.000	0.000	0.248
12/13/2003	2.63	0.561		0.021	0.571			0.000	0.000	0.936	0.541
12/14/2003	2.56	0.644		0.037	0.544			0.000	0.743	0.000	0.592
12/15/2003	2.42	0.460		0.033	0.329			1.941	0.000	0.000	-0.343
12/16/2003	2.68	0.749		0.000	0.356			0.000	0.000	1.008	0.567
12/17/2003	2.45	0.398		0.045	0.301			0.000	1.152	0.000	0.554
12/18/2003	2.45	0.532		0.049	0.300			0.754	0.000	0.000	0.815
12/19/2003	2.61	0.552		0.000	0.224			0.000	0.000	1.398	0.436
12/20/2003	2.88	0.529		0.021	0.447			0.000	0.000	0.815	1.068
12/21/2003	2.88	0.568		0.038	0.298			0.000	1.190	0.000	0.786
12/22/2003	2.49	0.446		0.034	0.251			1.050	0.000	0.000	0.709
12/23/2003	2.72	0.545		0.000	0.293			0.000	0.000	1.060	0.822
12/24/2003	2.82	0.467		0.047	0.336			0.000	0.900	0.000	1.070
12/25/2003	2.62	0.452		0.047	0.233			0.000	0.000	0.892	0.996
12/26/2003	2.45	0.501		0.000	0.437			0.725	0.000	0.000	0.787
12/27/2003	2.68	0.547		0.021	0.308			0.000	0.000	1.014	0.790
12/28/2003	2.60	0.363		0.038	0.301			0.000	0.552	0.000	1.346
12/29/2003	2.57	0.682		0.034	0.412			0.845	0.000	0.000	0.597
12/30/2003	2.94	0.377		0.000	0.350			0.000	0.000	1.434	0.779
12/31/2003	3.13	0.331		0.047	0.317			0.840	0.000	0.000	1.595
Total	974.22	315.733	0.000	22.785	218.776	0.000	0.000	35.285	17.914	42.514	321.213
Average	2.67	0.865		0.062	0.599			0.097	0.049	0.116	0.880
Minimum	1.19	0.000		0.000	0.000			0.000	0.000	0.000	-1.141
Maximum	3.83	1.930		0.309	2.168			1.941	1.348	1.839	2.971

Appendix H

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 166 REHABILITATION
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 50,000.00	$ 50,000.00
Cured in Place Pipe	LF	3,500	$ 40.00	$ 140,000.00
Services	EA	20	$ 200.00	$ 4,000.00
Manhole Rehab	EA	52	$ 1,600.00	$ 83,200.00
Cleaning	LF	3,500	$ 1.50	$ 5,250.00
Pre TV	LF	3,500	$ 1.00	$ 3,500.00
Post TV	LF	3,500	$ 1.50	$ 5,250.00
Pavement R & R	SY	500	$ 40.00	$ 20,000.00
Undefined Elements	LS	1	$ 40,000.00	$ 40,000.00
Subtotal				$ 351,200.00
Engineering				$ 27,000.00
Testing/Inspection				$ 22,000.00
Contingencies				$ 50,000.00
NMGRT				$ 27,800.00
Total				**$ 478,000.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 158 Replacement
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
8" Sewer Line	LF	2,600	$ 20.00	$ 52,000.00
Services	EA	10	$ 150.00	$ 1,500.00
Manholes	EA	8	$ 1,600.00	$ 12,800.00
Traffic Control	LF	1	$ 10,000.00	$ 10,000.00
Pavement R & R	SY	200	$ 40.00	$ 8,000.00
Undefined Elements	LS	1	$ 10,000.00	$ 10,000.00
Subtotal				$ 109,300.00
Engineering				$ 8,500.00
SurveyTesting/Inspection				$ 6,500.00
Contingencies				$ 12,000.00
NMGRT				$ 9,500.00
Total				**$ 145,800.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 200
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
12" Sewer Line	LF	5,000	$ 24.00	$ 120,000.00
Services	EA	25	$ 150.00	$ 3,750.00
Manholes	EA	15	$ 1,600.00	$ 24,000.00
Traffic Control	LF	1	$ 18,000.00	$ 18,000.00
Highway Crossing	LS	1	$ 15,000.00	$ 15,000.00
Pavement R & R	SY	5,000	$ 30.00	$ 150,000.00
Undefined Elements	LS	1	$ 35,000.00	$ 35,000.00
Subtotal				$ 380,750.00
Engineering				$ 28,000.00
SurveyTesting/Inspection				$ 6,000.00
Contingencies				$ 50,000.00
NMGRT				$ 32,000.00
Total				**$ 496,750.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 201
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
12" Sewer Line	LF	7,500	$ 24.00	$ 180,000.00
Services	EA	40	$ 150.00	$ 6,000.00
Manholes	EA	21	$ 1,600.00	$ 33,600.00
Traffic Control	LF	1	$ 20,000.00	$ 20,000.00
Pavement R & R	SY	15,000	$ 25.00	$ 375,000.00
Undefined Elements	LS	1	$ 60,000.00	$ 60,000.00
Subtotal				$ 689,600.00
Engineering				$ 48,000.00
SurveyTesting/Inspection				$ 24,000.00
Contingencies				$ 80,000.00
NMGRT				$ 58,400.00
Total				**$ 900,000.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 202
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
12" Sewer Line	LF	10,600	$ 24.00	$ 254,400.00
Services	EA	50	$ 150.00	$ 7,500.00
Manholes	EA	30	$ 1,600.00	$ 48,000.00
Traffic Control	LF	1	$ 25,000.00	$ 25,000.00
Pavement R & R	SY	21,000	$ 25.00	$ 525,000.00
Undefined Elements	LS	1	$ 80,000.00	$ 80,000.00
Subtotal				$ 954,900.00
Engineering				$ 75,000.00
SurveyTesting/Inspection				$ 32,000.00
Contingencies				$ 100,000.00
NMGRT				$ 80,000.00
Total				**$ 1,241,900.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 208
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
12" Sewer Line	LF	10,500	$ 24.00	$ 252,000.00
Services	EA	50	$ 150.00	$ 7,500.00
Manholes	EA	30	$ 1,600.00	$ 48,000.00
Traffic Control	LF	1	$ 25,000.00	$ 25,000.00
Highway Crossing	LS	1	$ 15,000.00	$ 15,000.00
Pavement R & R	SY	2,500	$ 30.00	$ 75,000.00
Undefined Elements	LS	1	$ 50,000.00	$ 50,000.00
Subtotal				$ 487,500.00
Engineering				$ 38,000.00
SurveyTesting/Inspection				$ 26,000.00
Contingencies				$ 60,000.00
NMGRT				$ 42,000.00
Total				**$ 653,500.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 210
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
12" Sewer Line	LF	5,600	$ 24.00	$ 134,400.00
Services	EA	25	$ 150.00	$ 3,750.00
Manholes	EA	15	$ 1,600.00	$ 24,000.00
Traffic Control	LF	1	$ 18,000.00	$ 18,000.00
Pavement R & R	SY	5,000	$ 30.00	$ 150,000.00
Undefined Elements	LS	1	$ 35,000.00	$ 35,000.00
Subtotal				$ 380,150.00
Engineering				$ 28,000.00
SurveyTesting/Inspection				$ 6,000.00
Contingencies				$ 50,000.00
NMGRT				$ 32,000.00
Total				**$ 496,150.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 212
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
12" Sewer Line	LF	6,200	$ 24.00	$ 148,800.00
Services	EA	40	$ 150.00	$ 6,000.00
Manholes	EA	25	$ 1,600.00	$ 40,000.00
Traffic Control	LF	1	$ 25,000.00	$ 25,000.00
Highway Crossing	LS	1	$ 15,000.00	$ 15,000.00
Pavement R & R	SY	8,000	$ 25.00	$ 200,000.00
Undefined Elements	LS	1	$ 50,000.00	$ 50,000.00
Subtotal				$ 499,800.00
Engineering				$ 30,000.00
SurveyTesting/Inspection				$ 18,000.00
Contingencies				$ 600,000.00
NMGRT				$ 80,000.00
Total				**$ 1,227,800.00**

ALAMOGORDO WASTEWATER MASTER PLAN
INTERCEPTOR 214
Engineer's Opinion of Probable Construction Cost

Description	Unit	Quantity	Unit Price	Amount
Mobilization	LS	1	$ 15,000.00	$ 15,000.00
12" Sewer Line	LF	5,000	$ 24.00	$ 120,000.00
Services	EA	50	$ 150.00	$ 7,500.00
Manholes	EA	30	$ 1,600.00	$ 48,000.00
Traffic Control	LF	1	$ 25,000.00	$ 25,000.00
Highway Crossing	LS	1	$ 15,000.00	$ 15,000.00
Pavement R & R	SY	2,000	$ 30.00	$ 60,000.00
Undefined Elements	LS	1	$ 30,000.00	$ 30,000.00
Subtotal				$ 320,500.00
Engineering				$ 28,000.00
SurveyTesting/Inspection				$ 12,000.00
Contingencies				$ 50,000.00
NMGRT				$ 28,000.00
Total				**$ 438,500.00**

Appendix I

Appendix H
Alamogordo Wastewater Master Plan
CAPITAL IMPROVEMENT BUDGET

Interceptor	Estimated Cost
Interceptor No. 158	$ 145,800
Interceptor No. 166	$ 478,000
Interceptor No. 200	$ 496,750
Interceptor No. 201	$ 900,000
Interceptor No. 202	$ 1,241,900
Interceptor No. 208	$ 653,500
Interceptor No. 210	$ 496,150
Interceptor No. 212	$ 1,227,800
Interceptor No. 214	$ 438,500
TOTAL	$ 6,078,400
5 Year Average	$ 1,519,600
Annual Average	$ 303,920

Appendix J

State of New Mexico
ENVIRONMENT DEPARTMENT
Ground Water Quality Bureau
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2918 phone
(505) 827-2965 fax

GARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
SECRETARY

PAUL RITZMA
DEPUTY SECRETARY

PERMIT EXPIRING
APRIL 21, 2005

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

April 21, 2000

APR 2000
RECEIVED
P.W.

Jose Miramontes, Public Works Director
City of Alamogordo Wastewater Treatment Plant
1376 East Ninth
Alamogordo, NM 88310

RE: Discharge Plan Renewal and Modification, DP-220, City of Alamogordo Wastewater Treatment Plant (WWTP)

Dear Mr. Miramontes:

Pursuant to Water Quality Control Commission (WQCC) Regulation 3109, the discharge plan modification and renewal for DP-220, submitted by Terry Nelson for the discharge of up to 5 million gallons per day (mgd) of domestic waste from the City of Alamogordo WWTP is hereby approved, subject to the conditions listed below. The facility is located in Alamogordo in Section 15, T17S, R9E, Otero County. In approving this discharge plan, the New Mexico Environment Department (NMED) has determined that the requirements of WQCC Regulation 3109.C have been met.

The approved City of Alamogordo WWTP treatment and disposal system is briefly described as follows:

Up to 5 mgd of municipal wastewater is treated at the City of Alamogordo WWTP via modified extended aeration activated sludge, secondary clarification, and disinfection with sodium hypochlorite. After disinfection treated effluent is land applied via an effluent reuse system which includes a synthetically lined effluent holding pond, clay lined golf course holding ponds, a pumping and distribution system, and a surplus effluent application site. Treated effluent will be land applied at the following sites: 11.5 acres at the Cemetery Ball Fields, Section 29, T16S, R10E; 40 acres at

1 copy to Terry Nelson
1 copy to Doug Green 5-3-00

the Soccerplex/Cemetery, Section 29, T16S, R10E; 100 acres at the Municipal Golf Course, Section 12, T17S, R9E and Section 10, T17S, R10E; 280 acres at the Stallberg Farm, Sections 25, 26, and 35, T16S, R9E; 300 acres at the Municipal Airport, Sections 14 and 23, T17S, R9E; 12 acres at Hooser Park, Section 1, T16S, R9E; 10 acres at Sacramento High School, Section 20, T16S, R10E, 50 acres at Washington/Oregon Parks, Section 20, T16S, R10E; 80 acres at Hobby Park, Section 8, T16S, R10E, 5 acres at Indian Wells Strip, Sections 17 and 18, T16S, R10E; 20 acres at Alameda Park, Sections 18 and 19, T16S, R10E; and 400 acres at the Plant Surplus Site, Section 16, T17S, R9E. The modification is to increase the maximum discharge from 3.41 mgd to 5 mgd, to implement more stringent disinfection levels, and to add Hooser Park, Hobby Park, Indian Wells Strip, and Alameda Park as designated discharge land application areas. Solids are processed by aerobic digestion, sand bed or centrifuge dewatering, and composting. Solids handling and disposal are covered under discharge plan DP-806. Ground water below the sites ranges in depth from approximately 20 to 200 feet and has a total dissolved solids concentration ranging from approximately 1,600 to over 20,000 milligrams per liter.

The approved discharge plan renewal and modification consists of the materials submitted by Terry Nelson of U. S. Filter dated December 21, 1999 and March 13, 2000. In addition, the discharge plan includes information and materials submitted as part of the original discharge plan approved on May 24, 1982, and the materials for renewal and/or modification dated December 20, 1985, March 27, 1987, June 26, 1987, December 23, 1991, and March 10, 1995. The discharge shall be managed in accordance with the approved plan and is subject to the conditions listed below.

However, approval of this discharge plan does not relieve you of your responsibility to comply with any conditions or requirements of the previously approved discharge plan, DP-220, the New Mexico Water Quality Act, WQCC Regulations, any other applicable federal, state and/or local laws and regulations, such as zoning requirements and nuisance ordinances.

CONDITIONS FOR APPROVAL

This discharge plan approval is subject to the following conditions for the following reasons:

1. Treated effluent discharged from the City of Alamogordo WWTP shall not exceed a monthly average of 20 mg/L total nitrogen (nitrate as nitrogen + total Kjeldahl nitrogen).

   The reason for this condition is to comply with WQCC Regulation 3107.

2. In addition to the contingency plan outlined in Specific Requirement # 6 below, the City of Alamogordo shall implement the following contingency measures:

   A. In the event that total nitrogen in the Alamogordo WWTP effluent exceeds 20 mg/L total nitrogen (NO_3-N + TKN) for any one monthly average, the City of Alamogordo shall submit to NMED, within 30 days of receipt of the

analysis indicating the exceedence, a corrective action plan which includes provisions to increase the level of treatment such that the effluent limitation can be met.

The reason for this condition is to comply with WQCC Regulation 3107.

B. In the event that a spill occurs, the City of Alamogordo shall comply with WQCC Regulation 1203. This includes corrective actions to contain or mitigate the damage as soon as possible, notification of NMED within 24 hours, and submittal of a corrective action plan for NMED approval within 15 days.

The reason for this condition is to comply with WQCC Regulation 1203.

C. Review of ground water monitoring data submitted to NMED between 1997 and 2000 indicates exceedence of the WQCC standard for nitrate in wells downgradient of areas which have received treated effluent from the Alamogordo WWTP. Specific wells of concern include ground water monitoring wells # 10, # 11, and # 12. The City of Alamogordo shall conduct a site investigation to determine the source of contamination impacting the referenced monitor wells. Results of the investigation shall be submitted to NMED within 180 days of discharge plan approval. Upon review of the results of the site investigation findings, NMED will determine whether further action is required.

The reason for this condition is to comply with WQCC Regulation 3109.

D. Future exceedences of WQCC standards, other than those addressed in Condition 2.C. above, shall be subject to the following contingency plan:

If WQCC Regulation 3103 ground water standards are exceeded during the term of the discharge permit as a result of operations at Alamogordo WWTP, the City of Alamogordo shall collect a confirmation sample from the monitor well which indicates exceedence within 15 days to confirm the initial sample results. Upon confirmation of ground water contamination, the City of Alamogordo shall submit a corrective action plan to NMED. The corrective action plan shall include a site investigation to define the source, nature and extent of ground water contamination and a proposed abatement option. The site investigation and abatement option shall be consistent with the requirements and provisions of sections 4101, 4103, 4106.E, 4107 and 4112 of the WQCC Regulations. The corrective action plan shall be submitted to NMED for approval within 30 days of confirmation of ground water contamination, and shall be initiated within 30 days of NMED approval.

The reason for this condition is to comply with WQCC Regulations 3106, 3107, and 3109.

3. In addition to the closure plan outlined in Specific Requirement #6 below, the City of Alamogordo shall implement the following closure measures:

   A. If any portions of the effluent treatment and/or distribution system are taken out of service, the City of Alamogordo shall cap and plug all lines which convey effluent. All impoundments shall be drained of effluent, sludge disposed of in accordance with all local, state, and federal regulations, and the impoundments backfilled with clean material to insure positive drainage.

   B. Upon determination from NMED that post closure monitoring may cease, the City of Alamogordo shall plug and abandon the monitor wells according to NMED Monitor Well Construction and Abandonment Guidelines (copy enclosed).

   The reason for this condition is to comply with WQCC Regulation 3107.11.

SPECIFIC REQUIREMENTS

The terms and conditions of this approval contain specific requirements which are summarized below.

1. The City of Alamogordo WWTP will receive and treat up to 5 mgd of municipal wastewater via modified extended aeration activated sludge, secondary clarification, and disinfection with sodium hypochlorite. After disinfection treated effluent is land applied via an effluent reuse system which includes a synthetically lined effluent holding pond, clay lined golf course holding ponds, a pumping and distribution system, and a surplus effluent application site.

2. Fecal coliform levels in the treated effluent discharged from the City of Alamogordo WWTP will not exceed 2.2 MPN as a geometric mean of the last seven weekly samples.

3. Treated and disinfected effluent will be land applied based on the following criteria:

   A. The treated and disinfected effluent will be land applied at the locations indicated in Section 7 of the discharge plan renewal application dated December 21, 2000.

   B. Land application of treated effluent will occur at times when public exposure

is minimized.

C. Water lines, fittings, and equipment containing treated effluent will be clearly marked and identified as non-potable water.

D. Systems containing treated effluent will be physically separated from potable water systems.

E. Postings indicating the use of non-potable water will be made at all application sites.

F. As long as the fecal coliform limits as outlined in Specific Requirement #2 are met, effluent may be land applied without setback limitations.

G. Treated effluent used for dust control or other construction uses will be allowed. These uses are subject to metering and reporting as described in Specific Requirement #5.D below.

H. Land application of treated effluent to areas not outlined in Section 7 of the discharge plan renewal application dated December 21, 2000 will be subject to NMED approval. Prior to such discharges, the City of Alamogordo will submit to NMED for approval the location and size of the area to be added as a designated effluent disposal site.

4. Sludge from the City of Alamogordo WWTP will be processed by aerobic digestion, sand bed or centrifuge dewatering, and composting. Solids handling and disposal are covered under discharge plan DP-806.

5. The City of Alamogordo will implement the following monitoring plan:

A. Treated effluent from the City of Alamogordo WWTP will be sampled and analyzed on a weekly basis for nitrate as nitrogen (NO_3-N) and total Kjeldahl nitrogen (TKN). Weekly results will be summarized and submitted to NMED on a quarterly basis. Quarterly monitoring reports will be submitted no later than April 30, July 31, October 31, and January 31 of each year.

B. Land application data sheets for the areas designated in Section 7 of the discharge plan renewal application dated December 21, 2000 will be submitted to NMED on a quarterly basis. Land application data sheets will include the monthly volume of effluent discharged to each land application site and the total monthly volume of effluent discharged from the WWTP. Quarterly monitoring reports will be submitted to NMED no later than April 30, July 31, October 31, and January 31 of each year.

C. Groundwater monitoring wells MW-3, MW-4, MW-8, MW-10, MW-11, MW-12, and Stallberg will be sampled and analyzed for NO_3-N, TKN, chloride, and total dissolved solids (TDS) on a quarterly basis. Quarterly monitoring reports will be submitted to NMED no later than April 30, July 31, October 31, and January 31 of each year.

D. Small, erratic discharges for uses such as dust control and construction will be metered and summarized as they occur. Metering and summaries will be reported to NMED on a quarterly basis. Quarterly monitoring reports will be submitted to NMED no later than April 30, July 31, October 31, and January 31 of each year.

E. An updated map showing the location of any new land application sites will be submitted with quarterly monitoring reports. Quarterly monitoring reports will be submitted to NMED no later than April 30, July 31, October 31, and January 31 of each year.

F. Treated effluent from the City of Alamogordo WWTP will be analyzed on an annual basis for all constituents listed in WQCC Regulation 3103.A-C, with the exception of uranium. Annual effluent analysis will be submitted with the January 31 quarterly monitoring report.

6. The City of Alamogordo will implement the following contingency plan:

A. In the event that effluent exceeds standards for reuse as outlined in Condition # 1 and Specific Requirement # 2 above, disposal of effluent will be accomplished at the Plant Surplus Site until a corrective action plan has been initiated which brings the effluent into compliance with the aforementioned standards.

B. In the event of a spill, seep, or bypass involving treated or untreated effluent, the City of Alamogordo will follow the steps outlined in Attachment #3 of the discharge plan renewal application dated December 21, 2000.

7. The City of Alamogordo will implement the following closure plan:

Upon cessation of effluent land application at any of the designated sites, the city of Alamogordo will conduct post closure monitoring for a period of one year for the parameters and frequencies outlined in Specific Requirement #5. If this monitoring indicates no impact to groundwater as a result of treated effluent land application, the monitoring frequency will be reduced to once per year for an additional four years. If contamination attributable to effluent application is detected, the City of Alamogordo will continue monitoring for the parameters and frequencies outlined in Specific Requirement #5 until contamination cease to be detectable, or an

approved corrective action plan replaces operation in accordance with discharge plan DP-220.

GENERAL DISCHARGE PLAN REQUIREMENTS

In addition to any other requirements provided by law, approval of discharge plan, DP-220, is subject to the following general requirements:

Monitoring and Reporting

Monitoring and reporting shall be as specified in the discharge plan and supplements thereto. These requirements are summarized on the attached sheet(s). Any inadvertent omissions from this summary of a discharge plan monitoring or reporting requirement shall not relieve you of responsibility for compliance with that requirement.

Record Keeping

1. The discharger shall maintain at the facility, a written record of ground water and wastewater quality analyses.

The following information shall be recorded and shall be made available to the NMED upon request.

a. The dates, exact place and times of sampling or field measurements.

b. The name and job title of the individuals who performed the sampling or measurements.

c. The dates the analyses were performed.

d. The name and job title of the individuals who performed the analyses.

e. The analytical techniques or methods used.

f. The results of such analyses, and

g. The results of any split sampling, spikes or repeat sampling.

2. The discharger shall maintain a written record of any spills, seeps, and/or leaks of effluent, leachate and/or process fluids not authorized by this discharge plan.

3. The discharger shall maintain a written record of the operation, maintenance and repair of facilities/equipment used to treat, store and/or dispose of wastewater; to measure flow rates; and/or to monitor water quality. This will include repairs, replacement or calibration of any monitoring

equipment and repairs or replacement of any equipment used in the City of Alamogordo's waste or wastewater treatment and disposal system.

Inspection and Entry

In accordance with § 74-6-9.B & E NMSA 1978 and WQCC Regulation 3107.D., the discharger shall allow the Secretary or his authorized representative, upon the presentation of credentials, to:

1. Enter at regular business hours or at other reasonable times upon the discharger's premises or where records must be kept under the conditions of this discharge plan.

2. Inspect and copy, during regular business hours or at other reasonable times, any records required to be kept under the conditions of the discharge plan.

3. Inspect, at regular business hours or at other reasonable times, any facility, equipment (including monitoring and control equipment), practices or operations regulated or required under this discharge plan.

4. Sample or monitor, at reasonable times for the purpose of assuring discharge plan compliance or as otherwise authorized by the New Mexico Water Quality Act, any effluent at any location before or after discharge.

Duty to Provide Information

In accordance with § 74-6-9.B NMSA 1978 and WQCC Regulation 3107.D., the discharger shall furnish to the NMED, within a reasonable time, any relevant information which it may request to determine whether cause exists for modifying, terminating and/or renewing this discharge plan or to determine compliance with this plan. The discharger shall furnish to the NMED, upon request, copies of records required to be kept by this discharge plan.

Spills, Leaks and Other Unauthorized Discharges

This approval authorizes only those discharges specified in the discharge plan. Any unauthorized discharges violate WQCC Regulation 3104, and must be reported to the NMED and remediated as required by WQCC Regulation 1203. This requirement applies to all seeps, spills, and/or leaks discovered from the City of Alamogordo's municipal wastewater collection, treatment, and treated effluent distribution system..

Retention of Records

The discharger shall retain records of all monitoring information, including all calibration and maintenance records, copies of all reports required by this discharge plan, and records of all data

used to complete the application for this discharge plan, for a period of at least five years from the date of the sample collection, measurement, report or application. This period may be extended by request of the Secretary at any time.

Enforcement

Failure to grant the Secretary or his authorized representative access to the records required to be kept by this discharge plan or to allow an inspection of the discharge facilities or to the collection of samples is a violation of this discharge plan and the WQCC Regulations. Such violations as well as other violations of the discharge plan, may subject the discharger to a compliance order, a compliance order assessing a civil penalty or an action in district court pursuant to § 74-6-10 NMSA 1978, and/or modification or termination of this discharge plan pursuant to § 74-6-5.L NMSA 1978. Penalties assessed as part of a compliance order shall not exceed $15,000 per day for violations of the terms of this permit or the requirements of § 74-6-5 NMSA 1978, and shall not exceed $10,000 per day for violations of other sections of the Water Quality Act.

Modifications and/or Amendments

The discharger shall notify NMED, pursuant to WQCC Regs. 3107.C, of any modifications or additions to the City of Alamogordo's wastewater disposal system, including any increase in wastewater flow rate or wastewater storage and disposal management changes to the system as approved under this discharge plan. The discharger shall obtain NMED's approval, as a discharge plan modification, prior to any increase in the quantity or concentration of constituents in the leachate above those approved in this plan. Please note that WQCC Regs. 3109.E and F provide for possible future amendment of the plan.

Other Requirements

Please be advised that the approval of this plan does not relieve the City of Alamogordo of liability should your operation result in actual pollution of surface or ground water which may be actionable under other laws and/or regulations.

RIGHT TO APPEAL

If the City of Alamogordo is dissatisfied with this action taken by NMED, the City of Alamogordo may file a petition for hearing before the WQCC. This petition shall be in writing to the Water Quality Control Commission within thirty (30) days of the receipt of this letter. Unless a timely request for hearing is made, the decision of the NMED shall be final.

TRANSFER OF DISCHARGE PLAN

Pursuant to WQCC Regulation 3111, prior to any transfer of ownership, the discharger shall provide the transferee a copy of the discharge plan, including a copy of this approval letter and shall document such to the NMED.

PERIOD OF APPROVAL

Pursuant to WQCC Reg. 3109.G.4., this discharge plan approval is for a period of five years. This approval will expire April 21, 2005, and you must submit an application for renewal at least 120 days before that date.

Sincerely,

Marcy Leavitt, Chief
Ground Water Quality Bureau

ML:KV

Enclosures: NMED Monitor Well Construction and Abandonment Guidelines
Discharge Plan Summary

xc: Ken Smith, Dist. Manager, NMED Dist. 3
NMED Alamogordo Field Office
Paul Saavedra, Office of the State Engineer

N M ENVIRONM DEPARTMENT - GROUND WATER CTION
MONITOR WELL CONSTRUCTION AND ABANDONMENT GUIDELINES

Purpose: These guidelines provide minimum construction and abandonment standards for drilled monitor wells which are to be sampled for general chemistry analyses. There may be additional requirements if hydrocarbons or other chemicals are involved. Also different guidelines may apply for other types of well construction such as driven wells.

General Drilling Specifications

1. The bore hole shall be drilled a minimum of 4 inches larger than the casing diameter to allow for the emplacement of sand and sealant.
2. No contaminants shall be present in the drilling mud.
3. All drill bits, drill rods, and down-hole tools shall be thoroughly cleaned prior to the start of drilling.
4. After completing the well casing installation, the well shall be developed so that formation water flows freely through the screen and is not turbid, and all sediment has been removed from the well.

Well Specifications (Refer to figure on reverse side.)

1. Use Schedule 40 or heavier PVC pipe, not less than 2 inches ID, as casing. The casing shall extend from the top of the screen to at least one foot above ground surface. The top of the casing must be protected by a cap, and the exposed casing must be protected by a locking shroud. The shroud shall be large enough in diameter to allow easy access for removal of the plastic cap on the PVC casing.
2. Use a minimum 20-foot section of machine slotted or other manufactured screen. A slot size of 0.010-inch generally is adequate for most installations. (No on-site, hack-saw slotting.)
3. The top of the screen shall be 5 feet above the water table, allowing for seasonal fluctuations.
4. The screen section should have centralizers at the top and bottom.
5. The annular space from the bottom of the screen (2 feet below the bottom of the screen if a blank section of casing is placed below the screen) to 2 feet above the screen shall be packed with sand. Clean, medium to coarse sand is recommended. The sand pack should be properly sized to prevent fines in the formation from entering the well. For deeper wells the sand shall be placed by a tremmie pipe.
6. The annular space above the gravel pack shall be grouted or sealed. Pressure grouting with bentonite or cement using a tremmie pipe is preferred. The alternative is to form a bentonite seal by placing bentonite pellets (1/4 or 1/2 inch in size) for at least 2 feet above the gravel pack and proceding in accordance with Item 7 below.
7. The annular space above the bentonite seal can be filled with drill cuttings, or clean sandy clay or tighter soil to within 10 feet of the ground surface. The remaining 10 feet must be sealed with a bentonite-cement grout seal (two to eight percent bentonite by weight).
8. A two-foot minimum radius, four inch minimum thickness concrete pad shall be poured around the shroud. The concrete shall be sloped that rainfall and runoff flows away from the shroud.

Abandonment: Monitor wells no longer in use shall be plugged in such a manner as to preclude migration of surface runoff or ground water along the length of the well. Where possible, this shall be accomplished by removing the well casing and pumping expanding cement from the bottom to the top of the well using a tremmie pipe. If the casing cannot be removed, the casing shall be ripped or perforated along its entire length if possible, and grouted. Filling with bentonite pellets from the bottom to the top is an acceptable alternative to pressure grouting.

Variances: Requests for variances from these guidelines shall be in writing to the Program Manager, NMED Ground Water Section, 1190 St. Francis Drive, P. O. Box 26110, Santa Fe, NM 87502. Each request shall explain in detail the evidence supporting the request. The GWS approval also shall be in writing.

Signed: _____ Date: 8/15/92

Ernest C. Rebuck, Program Manager, Ground Water Section

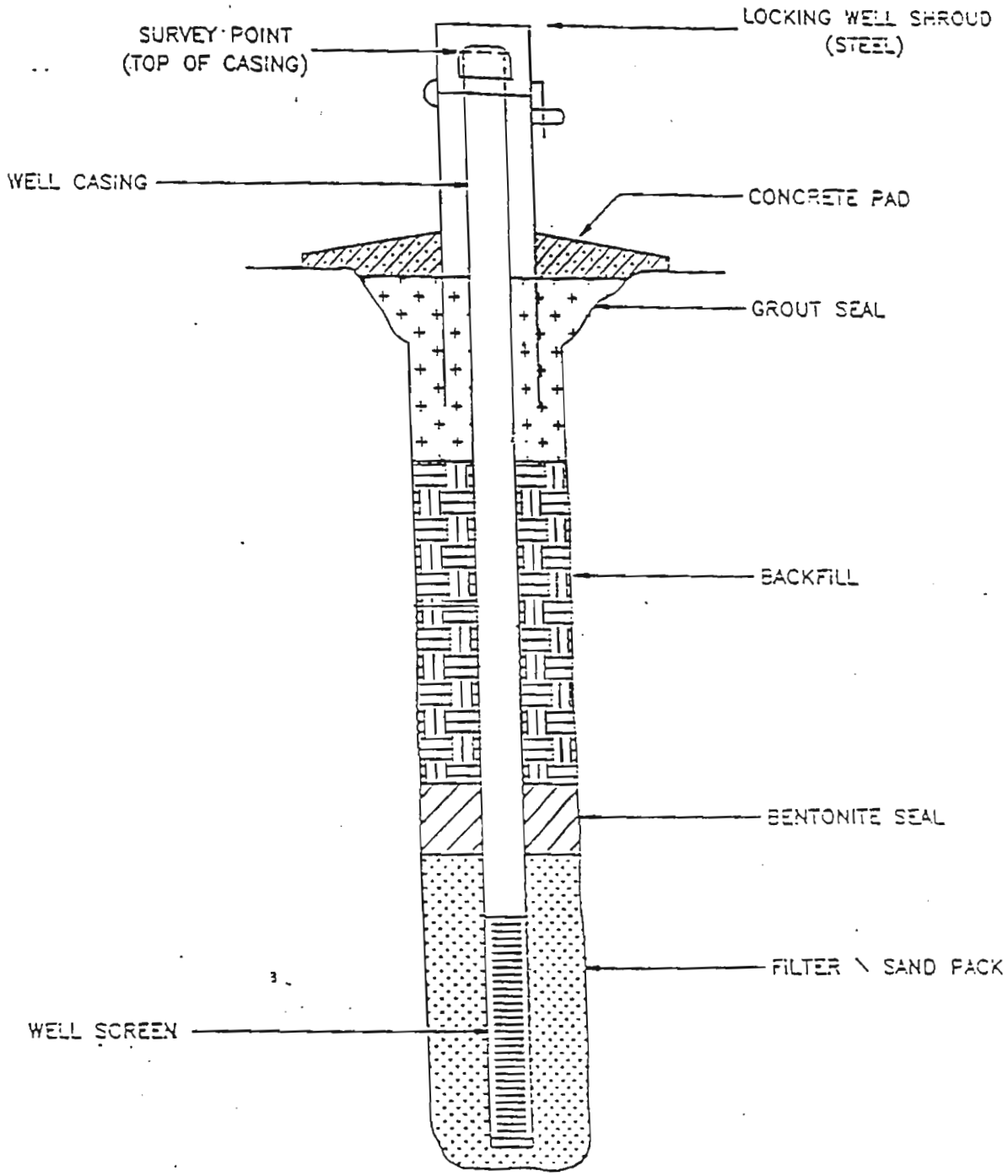
NMED, GROUND WATER SECTION, DISCHARGE PLAN SUMMARY

Discharge Plan Number	DP-220
Date Report Generated	March 13, 2000
Staff Reviewer	Kurt Vollbrecht
Legally Responsible Party	Jose Miramontes
Owner	City of Alamogordo 1376 East Ninth Alamogordo, NM 88310
Facility	Alamogordo WWTP
Primary Waste Type	Domestic Waste
Treatment	WWTP
Discharge	Land Application
Discharge Location	
Application Received	December 21, 1999
Public Notice Published	February 11, 2000
Discharge Plan Approved	April 1, 2000
Discharge Plan Expires	April 1, 2005
Discharge Volume	5 million gallons per day
Depth to Ground Water	20-200 feet
TDS	1,660 to 20,000 mg/L

Monitoring Reports due APR 30, JUL 31, OCT 31, JAN 31

Annual Frequency	No. of Sites	Sampling Description
4	1	Sample and analyze WWTP effleunt for nitrate as nitrogen and total Kjeldahl nitrogen on a weekly basis, submit quarterly.
4	12	Land application data sheets
4	7	Sample and analyze groundwater samples from MW-3, MW-4, MW-8, MW-10, MW-11, MW-12, and Stallberg for nitrate as nitrogen, total Kjeldahl nitrogen, chloride, and total dissolved solids and submit to NMED on a quarterly basis.
4	variable	Submit volume, location, and duration of any small discharges such as dust control and construction.
1	1	Sample and analyze WWTP effluent for all constituents listed in WQCC Regulation 3103.A-C, with the exception of Uranium.

Send all monitoring reports and correspondence to: Kurt Vollbrecht
Ground Water Pollution Prevention Section
P.O. Box 26110
Santa Fe, New Mexico 87502
(505)827-2900



GENERALIZED MONITORING WELL SCHEMATIC

(Not To Scale)

APPENDIX K

Environmental Information Document Instructions
For Wastewater and Drinking Water Projects

The National Environmental Policy Act (NEPA) applies to the special appropriations projects (SPAPs). The NEPA regulations that apply to the SPAPs are the Council of Environmental Quality's implementing regulations at 40 CFR Parts 1500-1508 and EPA's NEPA regulations at 40 CRF Part 6, Subparts A through D. In January 1995, EPA issued two memorandums describing how the NEPA requirements and the intergovernmental review regulations at 40 CFR Part 29 apply to special appropriations projects that were authorized in fiscal year (FY) 1995. The requirements found in those memorandums also apply to the SPAPs authorized by the EPA Appropriations Acts for FY 1996 through FY 2002.

EPA reviews all SPAPs to assure compliance with NEPA and other environmental laws and regulations, such as the Endangered Species Act. For all projects that are not eligible for a Categorical Exclusion (CE), each grantee must complete an Environmental Information Document (EID). A suggested outline with descriptions is provided below. An EID describes and evaluates the environmental impacts of the feasible alternatives, including the 'No Action' alternative. The scope of the EID should be commensurate with the size and significance of the proposed project.

Prior to preparation of the EID, the applicant should obtain concurrence for the proposed project from the crosscutters, such as the State's Historical Commission, the US Fish and Wildlife Service, the US Army Corps of Engineers (wetlands, Section 404 permits, dredge and fill, structures placed in navigable waterways).

The EPA reviews the EID and makes a determination as to the environmental affects of the proposed project. If the project is found to have no significant effect, then EPA documents their findings with the preparation of an Environmental Assessment (EA) and issues a Finding of No Significant Impact (FNSI) for a 30-day comment period. Completion of the 30-day comment period without significant adverse opposition will complete the environmental review process. If the EPA cannot support a FNSI, the applicant will be required to take part in an Environmental Impact Statement.

Public participation should be included in the project planning process culminating in a public meeting or hearing that presents the proposed project to the public and includes discussion of both environmental and financial impacts. A record of the public meeting/hearing and proof of advertising should be included in the EID.

Environmental Information Document (EID) Outline
for Wastewater and Drinking Water Projects

A. Proposed Project and Funding Status

This section should include a description of the project, the need for the project, and the cost of the project.

The project description should include the project name, owner and operator of the facilities, location of the facilities, and the planning area description. List all facilities and actions proposed by the facilities plan/engineering report. Functionally separate major components should be listed as separate items. For example, a treatment plant is an item, an interceptor line is an item, a new pump station is an item, etc. Sewer rehabilitation is an example of an "action."

The need for the facility should be briefly stated, such as: to solve a water quality or water quantity problem; to solve a public health concern; to correct inadequate systems or system components; to increase treatment due to more stringent effluent limits; or for some other reason. If the effluent limits have changed, include the existing effluent limits and the proposed limits. More information for the need for the project will be presented in section D.

Relevant design parameters should include a description of major unit processes, flow diagram, sewer/water pipe lengths, sizes, and locations, and basic design criteria.

Include maps and figures no larger than 8.5 X 11 inches. Include a copy of a United States Geological Survey (USGS) 7.5" topographical map showing the existing and proposed facilities associated with the project and the overall project area. The location of major project components should be clearly identified, such as treatment works, sewers, water lines, pump station, storage facilities, etc.

Project costs should include proposed total project costs and all funding sources for the entire project.

B. Existing Environment

This section should describe aspects of the natural environment of the planning area that affected the alternative selection process or could be affected by implementing the plan. For example, for surface water discharge, it is not necessary to describe soil conditions in detail; however, any selected alternative using soil for treatment (septic tanks, spray irrigation, overland flow), should include a thorough description of soil conditions.

A description of surface waters and their quality is needed in every case, along with any public health problems due to water quality. The classification of the surface waters should

be stated, and a statement made to indicate if the waters are meeting the required water quality standards for that classification. Water quality sampling data can be presented, if available. There should be a qualitative statement at a minimum.

If the project impacts groundwater quality or quantity, a discussion of the existing groundwater quality should be included. For example, if ground water quality is being degraded by existing wastewater disposal methods and the proposed project will reduce or eliminate that impairment, a discussion of that issue should be included. The basis of establishing the groundwater impairment should also be discussed, including ground water sampling or other data sources. This information may also be given in Section D, Need for Proposed Facilities.

Describe briefly any special or sensitive environmental areas such as wetlands; air quality non-attainment areas; endangered or threatened species; prime or unique agricultural lands; areas of recognized scenic, recreational, archeological or historic value; valuable floral or faunal communities; wild or scenic rivers; drinking water (surface or groundwater) sources; floodplains; recreational or commercial uses of potential receiving streams; and parkland or other public lands.

Include environmental justice information. In preparing the EID, the grantee must identify any minority populations and low-income populations which exist within the overall planning area or which may otherwise be impacted by the project (e.g. downstream or downwind communities). Native American communities, including their traditional resource areas are included. If these areas would be affected by an alternative under consideration, more detail should be provided.

For those special environments not found in the planning area, make a statement such as "No wetlands, wildlife preserves, prime agricultural lands, or other environments of special interest are located where they could be impacted by implementation of the recommended facilities."

C. Existing Wastewater Facilities/Drinking Water System

This section should begin with a general description of the wastewater collection and treatment system for the planning area for both wastewater and drinking water projects. Describe existing collection, transport, treatment and sludge facilities. The service area(s) of these facilities should be described briefly and shown on an attached figure. Mention the condition of the facilities, especially as it affects alternative selection. For existing treatment plants, state: 1) original design capacity and effluent limits; 2) existing permit limits; and 3) actual performance over a recent period.

For wastewater projects, include wastewater flows (average, peak, and wet weather), influent characteristics, major industrial users, and infiltration and inflow. Sewered and unsewered areas should be mentioned and shown on the figure.

Where septic tanks are prevalent in all or part of the service planning area, their performance should be described. Explain any problems. It is not sufficient merely to state that malfunctioning septic tanks are causing a problem. Some documentation of the problem should be cited, and details given about the location and severity of the problems.

For drinking water projects, include a description of the existing treatment and distribution system, water demand (average and peak), surface water sources including intake locations and permitted and actual withdrawal, groundwater sources, location of wells and well fields, water storage, raw water characteristics, residual and backwash disposal and the service area.

Include existing system performance for all facilities.

D. Need for Proposed Facilities and Actions

This section should provide a summary of the need for wastewater or water facilities or actions, emphasizing existing public health or water quality problems. These problems typically include water quality violations or problems, documented public health hazards, National Pollutant Discharge Elimination System (NPDES) permit non-compliance, existing facility overload, insufficient capacity for projected demand, failing on-site systems, insufficient pressure, etc.

For wastewater projects effluent limits are to be stated, and their derivation explained. Describe different limits for different potential receiving streams.

If sewer rehabilitation is a proposed action, it should be justified by a brief quantitative summary of the inflow/infiltration (I/I) problem. Location of the severe I/I areas should be stated and shown on a figure if needed to identify significant project tasks.

Other special situations may justify proposed facilities.

Include the planning period for the project. The planning period should justify the capacity of the system with its projected population. Population projections should be based on U.S. Census projections or some recognized source of demographic data. Existing and projected flows should be presented. Include land use projections, and the future environment without the project.

E. Alternative Analysis

All alternatives analyzed should be described. The development of alternatives should include the no-action alternative (the environment without the project), optimum utilization of existing facilities including flow reduction and water conservation, and new construction alternatives.

An explanation should be given for rejecting or selecting alternatives. The explanation should include present worth or equivalent annual cost comparisons; reliability of the alternatives; complexity of the alternatives; significant environmental effects; and legal or institutional constraints.

F. Environmental Consequences; Mitigative Measures

Identify which reasonable alternative has been selected, and state the reasons why this alternative has been chosen.

Describe and document the environmental effects of the selected alternative on each of the different environmental aspects listed in this section. Address the direct, indirect, and cumulative effects for each aspect.

Direct effects are changes directly related to the project activity. Indirect effects are changes that occur later in time or are removed in distance which are reasonable foreseeable, such as community growth, population density, land use, and natural environment. Cumulative effects are the total changes to the environment resulting from the effect of the selected alternative when added to the effect of other past, present, or reasonable foreseeable future actions. Discuss any mitigation measures necessary to avoid or minimize any adverse impact.

One important secondary impact of a project could be the development/growth that would be encouraged or enabled by the construction of the project. The impact of that growth must be addressed, including potable water demands, wastewater produced, land use changes, impact on natural areas or wildlife, and other such concerns

This section should describe anticipated impacts on the environment and measures proposed to mitigate those adverse impacts. Discuss recommendations from the crosscutting agencies that implement environmental laws and include agency approval/sign-off letters in an appendix to the EID. For each of the laws that is not applicable, provide a comment stating that the law is not applicable.

Environmental laws that must be considered include:

Archeological and Historic Preservation Act of 1974, Pub. L. 86-523, as amended;
Coordinate with the State Historic Preservation Officer.

Clean Air Act, Pub. L. 84-159, as amended;
Address any impacts on air quality. If construction activities will generate dust emissions that need to be controlled, indicate what methods will be used to minimum these emissions. Address any potential sources of odor emissions that may be generated or eliminated through the implementation of the project.

Coastal Barrier Resources Act, Pub. L. 97-348;
Determine if the project is located on a coastal barrier island. If so, coordinate with the State Coastal Zone Management Agency.

Coastal Zone Management Act, Pub. L 92-583, as amended;
Determine whether the project is located in a coastal zone management area. If so, obtain comments from the Coastal Zone Management Program.

Endangered Species Act, Pub. L. 93-205, as amended;
Identify any federally endangered and/or federally protected species within the project area through coordination with the U.S. Fish and Wildlife Service

Environmental Justice, Executive Order 12898;
See Environmental Justice information in Section 19 of the SPAPs workbook.

Floodplain Management, Executive Order (EO) 11988 as amended by EO 12148;
Coordinate with Federal Emergency Management Agency (FEMA) if any part of the project is located in a floodplain.

Protection of Wetlands, Executive Order 11990;
Coordinate with United States Army Corps of Engineers if wetlands will be impacted by the project.

Farmland Protection Policy Act, Pub. L. 97-98;
Coordinate with the Natural Resource Conservation Service (NRCS) to protect significant/important agricultural land from irreversible conversion to uses which result in its loss as an environmental or essential food production resource.

National Historic Preservation Act of 1966, PL 89-665, as amended;
Coordinate with the State Historic Preservation Officer.

Fish and Wildlife Coordination Act, Pub. L. 85-665, as amended;
Coordinate with the US Fish and Wildlife Service

Safe Drinking Water Act, Pub. L 93-523, as amended;
Identify if the project will affect sole source aquifers. If so, contact your Region 4 project officer.

Wild and Scenic Rivers Act, Pub. L. 90-542, as amended;
Determine whether the project will have any effects on any river in the National Wild and Scenic Rivers system, the "Nationwide Rivers Inventory," or an American Heritage River. If the project is located within one mile of one of these designated streams, contact the National Park Service and the department of Conservation and National Resources for comments.

Most environmental impacts to be considered are the features described in Section B, Existing Environment (above). There may also be direct or indirect impacts on land use practices, neighborhood stability, air quality and noise levels. Any such impacts should be described.

It is not necessary to discuss special environmental areas (wetlands, etc.) that have been identified in Section B, Existing Environment, as not found in the project area. On the other hand, if any special environments are mentioned in Section B and are located in the project area, something must be said in this section about impacts of the project(s) on them.

All structural and nonstructural mitigative measures should be described. If the usual minimizing of erosion during construction is the only expected mitigative measure, this can be mentioned in one short sentence. Detailed description is needed only for more unusual mitigative measures that respond to some public or regulatory agency concern over a perceived threat to the environment or public health.

Include a discussion of necessary permits (NPDES, 404, etc.) issued or needed, as well as necessary inter-municipal agreements executed or pending.

G. Public-Participation; Sources Consulted

Summarize all public participation, including meetings and public hearings, noting any public objections. EPA Region 4 has identified minimum requirements for the public participation process in SPAPs grants. A description of these requirements can be found in Section 20 of the SPAPs Grant Procedures Workbook. For complex or controversial projects, a public hearing may be required. In addition, if there has been significant public objection based on an environmental concern, an Environmental Impact Statement may be necessary. Include documentation of the necessary public meeting, including the public meeting date, public meeting transcripts, audiotape or video, and proof of publication of the notice of the meeting in the local newspaper.

Although not required, we recommend presenting to the public the typical residential user charge estimated to result from implementation of the plan.

List all sources consulted for information and/or concurrence. The State Clearinghouse, for those states that have clearinghouses, should always be one of the entities consulted. If any comments have been offered opposing any aspect of the plan, explain how those comments have been resolved.

Environmental Information Document Review Project Name:	Page (optional)	Adequate	Inadequate
A. Proposed Project and Funding Status			
1. Project Purpose and Need (select at least one)			
a. Water Quality /Water Quantity Problems			
b. Public Health Concerns			
c. Inadequate System or System Components			
d. More Stringent Effluent Limits **(WW only)**			
(1) Existing Effluent Limitations			
(2) Proposed Effluent Limitations			
e. Other (specify:)			
2. Project Description (including maps & figures)			
a. Project Name			
b. Owner and Operator of the Facilities			
c. Location of the Facilities			
d. Planning Area Description (including a map with facilities)			
3. Relevant Design Parameters			
a. Description of Major Unit Processes			
b. Flow Diagram			
c. Sewer/Water Pipe Lengths, Sizes, and Locations			
d. Basic Design Criteria			
4. Project Cost			
a. Proposed Total Project Cost			
b. Portion of Total Project Cost Funded by EPA			
c. Other Sources of Funding			
B. Existing Environment As Pertains to Project			
1. Public Health Problems Due to Water Quality			
2. Water Quality Problems, Fish Kills, etc.			
3. Surface & Groundwater Hydrology			
4. Drinking Water Sources and Supply			
5. Physiography, Topography, Geology & Soils			

Environmental Information Document Review Project Name:	Page (optional)	Adequate	Inadequate
6. Federally Endangered & Threatened Species			
7. Air Quality Non-attainment Area (Need State sign-off)			
8. Environmental Justice Information			
a. Conditions, Minority & Low Income Areas (include Median Family Income)			
b. Census Maps			
9. Land Use & Development			
C. Existing Wastewater/Drinking Water System			
1. General Description of Wastewater Collection & Treatment System			
2. Existing Wastewater System (**WW only**)			
a. Wastewater Flows: Average, Peak, Wet Weather			
b. Influent Characteristics			
c. Major Industrial Users			
d. Residuals (sludge) Disposal			
e. Service Area			
f. Infiltration and Inflow			
3. Existing Drinking Water System (**DW only**)			
a. Description of Treatment and Distribution System			
b. Water Demand: Average, Peak			
c. Surface Water Source (Intake Locations, Permitted and Actual Withdrawal)			
d. Groundwater Source (Wells & Well Fields)			
e. Water Storage			
f. Raw Water Characteristics			
g. Residuals (sludge) and Backwash Disposal			
h. Service Area			
4. Existing System Performance			
D. Need for Proposed Project			

Environmental Information Document Review Project Name:	Page (optional)	Adequate	Inadequate
1. Description of Need Identified in Section A.1.			
2. Planning Period (time frame)			
3. Land Use Projections			
4. Population Forecast			
5. Forecast of Flow and Wasteload			
6. Future Environment Without the Project			
E. Analysis of Alternatives			
1. Development of Alternatives			
a. No-action			
b. Optimum Utilization of existing facility			
(1) Flow Reduction			
(2) Water Conservation			
c. New Construction Alternatives			
2. Alternative Screening			
a. Present Worth or Equivalent Annual Cost			
b. Reliability			
c. Complexity			
d. Environmental Factors			
e. Feasibility			
3. Identification of Selected Alternative			
F. Environmental Consequences and Mitigative Measures for Selected Alternative			
1. Direct			
2. Indirect			
3. Mitigation			
4. Cross-Cutting Environmental Laws and Sources Consulted			
a. Archeological and Historic Preservation Act of 1974, Pub. L. 86-523, as amended			
b. Clean Air Act, Pub. L. 84-159, as amended			
c. Coastal Barrier Resources Act, Pub. L. 97-348			

Environmental Information Document Review Project Name:	Page (optional)	Adequate	Inadequate
d. Coastal Zone Management Act, Pub. L 92-583, as amended			
e. Endangered Species Act, Pub. L. 93-205, as amended			
f. Environmental Justice, Executive Order 12898			
g. Floodplain Management, Executive Order 11988 as amended by EO 12148			
h. Protection of Wetlands, Executive Order 11990			
i. Farmland Protection Policy Act, Pub. L 97-98			
j. Fish and Wildlife Coordination Act, Pub. L. 85-624, as amended			
k. National Historic Preservation Act of 1966, PL 89-665, as amended			
l. Safe Drinking Water Act, Pub. L 93-523, as amended			
m. Wild and Scenic Rivers Act, Pub. L. 90-542, as amended			
6. State Clearing House			
7. Necessary Permits (NPDES, 404, etc.) Issued			
8. Necessary Intermunicipal Agreements Executed			
G. Public Participation			
1. Summary of Public Participation			
2. Required Documentation			
a. Public Hearing Date			
b. Public Hearing Transcripts			
c. Proof of Publication / Notice in Newspaper of Hearing			

This Project is recommended for:

____ Additional Information and Revision of the EID
____ Categorical Exclusion
____ Finding of No Significant Impact
____ Environmental Impact Statement

Signature of Reviewer: _____ Date:_____

(Rev. 02/03)

CROSS-CUTTING FEDERAL AUTHORITIES

The followings are the list of crosscutting Federal laws and authorities for both the Clean Water and Drinking Water SRF programs and projects assisted under the Tribal Set-Aside programs and various EPA Appropriations Acts.

Environmental Authorities:

- **Archeological and Historic Preservation Act (AHPA) of 1974, P.L. 86-523 as amended**

  The AHPA provides for the preservation of cultural resources that may be damaged by Federal or Federally assisted construction activities. Therefore, the grantee/loanee **must** demonstrate that construction will not result in the loss of important historic or archeological artifacts/data.

  The Environmental Information Document (EID) **must** contain evidence of consultation with the State Historic Preservation Officer (SHPO), including a request for information about potential historic or archeological data or artifacts in the project area or concerns about possible impacts of the project. The EID **must** also include a recovery plan and record of disposition, if applicable, as well as other documentation regarding mitigation plans to minimize or avoid impacts. During construction, if potentially valuable archeological information is discovered, the grantee/loanee **must** contact the SHPO to determine the need for further study, develop a plan for recovery of materials, or revision of plans to minimize potentially adverse impacts.

  For SRF programs, EPA needs to be notified and involved only in instances where disputes cannot be resolved based on the Programmatic Agreement among EPA, the Advisory Council on Historic Preservation (Council), and the National Conference of State Historic Preservation Officers (NCSHPO). If, however, the State SRF Agency fails to work through the SHPO, EPA Region 6 and the Council may participate in the review of the individual SRF project and resolve the dispute in accordance with applicable regulations to ensure compliance with AHPA.

  http://www.cr.nps.gov/nr/

  http://www.cr.nps.gov/nhl/INDEX.htm

- **Clean Air Act, P.L. 84-159, as amended**

  The grantee/loanee **must** assure that population projections for the project will be consistent with those in the State Implementation Plan (SIP) developed under the Clean Air Act. This should reduce the potential for violations of air quality standards that could be caused by the growth induced by the construction of the project. The grantee/loanee **must** also assure that the proposed project is consistent with other criteria in the SIPs, including the New Source Performance Standards (NSPSs) which are industries specific and the National Emission Standards for Hazardous Air Pollutants (NESHAPs) which are pollutants specific).

  If the proposed project is not consistent with the SIPs, the grantee/loanee **must** identify and consider the project's direct and indirect emissions and impacts on air quality and incorporate this analysis into the EID. The EID **must** include evidence of coordination with the State air quality office and resolution of issues, such as negotiation with the State air quality office for either case-by-case emission offsets (i.e., variance) or the SIP revision, where the projected population growth inconsistency is beyond what the SIP can accommodate.

- **Coastal Barriers Resources Act (CBRA), P.L. 97-348**

  The purpose of the CBRA is to protect ecologically sensitive coastal barriers along the coasts of the U.S. The CBRA establishes the Coastal Barriers Resources System (CBRS) and, with certain exceptions, prohibits or restricts Federal financial assistance for projects that would encourage development within the CBRS and in adjacent wetlands, natural habitats and other ecosystems. During the planning phase of the project, the

grantee/loanee **must** consult with the State coastal zone management program office to determine if the project may have an effect on the coastal barrier resource system.

For communities located along the coastal areas in Louisiana and Texas, if applicable, the EID **must** indicate consultation with the State coastal zone office and, if appropriate, a description of project changes and mitigation measures. The EID **must** also include a State certification of no significant impact and documents of communication with the State coastal zone program office and the U.S. Fish and Wildlife Service (FWS). Any recommendations offered by the FWS or the coastal zone program office to further minimize the effect of the proposed project on the CBRS **must** be considered by the State SRF agency for integration in the project's design before it may proceed with the project.

http://www.fws.gov/cep/cbrtable.html

- **Coastal Zone Management Act (CZMA), P.L. 92-583, as amended**

The CZMA encourages the management of coastal zone areas. The Federal or Federally assisted activities must be consistent with the enforceable policies of the State coastal zone management program for the protection and enhancement of the nation's coastal zones. The coastal zone includes coastal waters extending to an outer limit of state submerged, adjacent shorelines and land extending inward to the extent necessary to control shorelines. The coastal zone includes islands, beaches, transitional and inter-tidal areas, salts marshes, etc.

The EID **must** document that the grantee/loanee has consulted with the State Coastal Zone program office (if applicable) to determine if the project is consistent with the State Coastal Zone management plan (if completed and approved). The State Coastal Zone agency is responsible for preparing a written consistency determination. If there are likely impacts, the BED indicates that consideration has been given to alternate facility sites or incorporation of mitigation measures into the project design.

Endangered Species Act (ESA), P.L. 93-206, as amended

The ESA requires that federal agencies prevent or modify any projects authorized, funded, or carried out by the agencies that are "likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitats of such species."

During facility planning, the grantee/loanee **must** determine if any species or related habitats in the project area are on the List of Endangered or Threatened Species. As appropriate, the grantee/loanee **must** consult with the U.S. Fish and Wildlife Service (USFWS) and, in coastal areas, the National Marine Fisheries Service (NMFS). If no listed species or related habitats are involved, the project may proceed as planned. However, if there is a potential effect, the EID **must** include an analysis of ESA impacts as well as a copy of the biological assessment. The EID **must** also document the consultation of the grantee/loanee with the appropriate State Agency, EPA, and the cognizant Federal Agency. Consultation should determine whether (1) alternatives **must** be considered, (2) mitigation is sufficient or (3) an exemption is justified.

The product of the formal consultation process is a biological opinion from the appropriate Service. The biological opinion may state that the project is not likely to jeopardize an endangered or threatened species or destroy or adversely modify a critical habitat. Conversely, the Service may find that the project cannot proceed as proposed because of the likelihood of endangerment unless adequate alternatives are pursued. "If the Service is unable to suggest adequate alternatives, the project may not proceed unless a formal exemption is granted.

http://endangered.fws.gov/wildlife.html#Species

- **Floodplain Management, Executive Order 11988, as amended by Executive Order 12148**

The Executive Orders require federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplains development wherever there is a practicable alternative. The proper floodplain management shall be able to reduce the risk of flood loss, to minimize the impacts of floods on human safety, health, and welfare,

and to restore and preserve the natural and beneficial values served by floodplains. In order to accomplish this objective, on January 12, 1982, EPA Region 6 issued a ***Construction Grants Program Floodplain Guidelines,*** (attachment)

The EPA Region 6 Guidelines may be used as the criteria to determine if the project may affect a floodplain. The EID must include a record of consultation and a determination of location or impacts on floodplains. If there is an impact, the EID must also include a copy of the grantee/loanee's plans for modification, mitigation, and if applicable, insurance coverage. The reviewing agency must submit a notice of the finding to the Federal Emergency Management Agency (FEMA), which may have other recommendations.

- **Protection of Wetlands, Executive Order 11990**

The purpose of the Executive Order is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." Therefore, the Federal and Federally assisted activities **must** consider alternatives to wetland sites and limit potential damage if such an activity affecting a wetland cannot be avoided.

The **EID must** document that the Grantee/Loanee has determined if the project may be located in or affect wetlands. If so, the grantee/loanee **must** consult with the State wetlands protection agency and the USFWS to identify alternate locations or, if no suitable alternate sites are available mitigating measures should be included into the design. The grantee/loanee **must** also provide a public notice explaining the location and potential effects. Where there may be destruction of natural wetlands, the grantee/loanee **must** prepare a plan to construct the substitute or "mitigation" wetlands. The reviewing agency **must** furnish the USFWS and EPA documentation that all alternative locations were considered, that the option selected was the only practicable one, and that adequate measures **shall** be taken to diminish damage. The reviewing agency is also responsible for responding to USFWS and EPA comments.

- **Farmland Protection Policy Act (PAP), P.L.97-98**

Based on the PAP, EPA established a policy to protect the nation's significant/important agricultural lands from conversions that are irreversible and result in the loss of an essential food or environmental resource. Therefore, the PAP requirement applies to those projects that impact prime or unique farmland, either as a direct impact or as a secondary (development) impact.

The EID should include documentation regarding consultation with the State conservationist seek guidance about potential effects of the project on prime or unique farmland. If potential impacts are identified, the BID must include an analysis of impacts, and a review of project modifications and mitigation measures. The BID must also include a copy of the notice to the State conservationist about the measures to be taken.

- **Fish and Wildlife Coordination Act (FWCA), P.L. 85-624, as amended**

The FWCA was enacted to protect fish and wildlife when Federal or Federally assisted actions result in the control or modification of a natural stream or body of water. The Act requires the water-related project to consider the effect on the fish and wildlife resources, to prevent loss or damage to these resources and to provide development and improvement of these resources. The following typical activities will result in the control or modification of a body of water and would fall under the jurisdiction of this Act:

- discharges of pollutants including industrial, mining, and municipal wastes or dredged and fill material into a body of water or wetlands;
- projects involving construction of dams, weirs, levees, impoundments, stream relocation, and water-diversion structures.

The EID **must** document that the grantee/loanee has consulted with FWS and/or National Marine Fisheries Service (NMFS), as appropriate and the State fish and wildlife agency(ies) in order to develop measures to

mitigate project-related losses offish and wildlife resources. The EH) **must** also include the recommendations of the FWS, and/or NMFS and applicable State agency(ies). Where possible, the facilities plan and BID **must** include these recommendations in the selected design alternative.

- **National Historic Preservation Act (NHPA) of 1966, P.L. 89-665 as amended**

The NHPA directs federal agencies to integrate historic preservation into all activities which either directly or indirectly involve land use decisions in order to preserve the prehistoric and historic resources of the United States.

The EID **must** document that the grantee/loanee has consulted with the State Historic Preservation Officer (SHPO) to determine whether there are prehistoric and/or historic properties in the project area which are listed (or eligible to be listed) on the National Register of Historic Places. Based on advice from the SHPO, the reviewing agency may require the grantee/loanee to conduct a special survey and study. The types of surveys and studies are located in 36CFR800 that implement the NHPA. These surveys and studies are further described in the Programmatic Agreement between EPA and the Advisory Council on Historic Preservation (ACHP). If there are potentially adverse effects on listed properties, the grantee or loanee **must** consult with the SHPO and the reviewing agency to identify alternative sites or mitigating measures. The reviewing State agency **must** submit a report to the SHPO and the ACHP regarding potential effects on listed properties and recommended project changes. The SHPO or ACHP may request more changes. The EID **must** also include documentation of proposed changes to the project and a record of consultation with the ACHP if the prehistoric and/or historic properties may be affected.

If for SRF programs, there is a disagreement among the appropriate parties and the State SRF Agency cannot issue a determination that no historic or cultural resources exist in the project area or that resources do exist in the project area but will not be adversely affected, or that adequate mitigating measures will be taken to avoid adverse effects to resources in the project area, the State SRF Agency **must** notify the EPA Region 6 office. The Region 6 office will then enter into consultations with all parties to seek resolution of the dispute.

- **Safe Drinking Water Act, P.L. 93-523, as amended**

The EID **must** document that the grantee/loanee has consulted with the State groundwater program office or EPA Region 6, Office of Groundwater, to determine if there is an EPA-designated sole source aquifer in the vicinity of the project. If so, the grantee/loanee **must** prepare a project description and submit it to the EPA Region 6, Office of Ground Water for review. EPA may require additional information to verify that the project will not contaminate ground water. If EPA recommends additional control measures, the EID will indicate that the grantee/loanee has negotiated their incorporation into the selected alternative for the design and to satisfy the Office of Ground Water, EPA Region 6.

Sole source aquifers in Region 6 are the Chicot and Southern Hills Aquifers that underlay all or parts of 13 parishes in Southwestern Louisiana, the Arbuckle-Simpson Aquifer located around Pontotoc and adjacent counties in South-Central Oklahoma, and the Edwards Aquifer located in the Austin-San Antonio region of Texas, (attachment)

- **Wild and Scenic Rivers Act (WSRA), P.L. 90-542**

The purpose of the WSRA is to preserve the free-flowing state of rivers that are listed in the National Wild and Scenic Rivers System (System)(http://www.nps.gov/rivers/) or are under study for inclusion in the System because of their outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. Rivers in the system are classified as either wild river areas, scenic river areas, or recreational river areas.

During project planning, the grantee/loanee **must** consult with the reviewing agency and other appropriate State officials to determine if the project may have an effect on a wild and scenic river. If answer is yes, the grantee/loanee **must** conduct additional studies in consultation with State and Federal officials [National Park

Service (NPS) or U.S. Forest Service (FS)]. Alternatives that adversely affect wild and scenic rivers **must** be eliminated from consideration.

The **EID must** document the identification of wild and scenic rivers in the project area. If such rivers are identified, the EID **must** also include an analysis of the impacts and documentation of consultation with State and Federal officials.

http://www.nps.gov/rivers/

- **The Wilderness Act (WA), P.L. 88-577**

The WA establishes a system of National Wilderness areas and a policy for protecting and managing this system. With certain exceptions, the WA prohibits motorized equipment, structures, installations, roads, commercial enterprises, aircraft landings, and mechanical transport in the National Wilderness areas. The WA permits mining on valid claims, access to private lands, fire control, insect and disease control, grazing, water-resource structures (upon approval of the President), and visitor use.

In the planning phase, the grantee/loanee needs to contact appropriate federal agencies to determine if the project activity will affect a designated area. Typically, wilderness areas are located within either National Parks (administered by the NPS), National Wildlife Refuges (administered by FWS), National Forests (administered by the FS), or public lands (administered by the Bureau of Land Management). These contacts can assist the Federal agency in determining whether a proposed project falls among the activities prohibited in the wilderness areas; how proposed activities may be mitigated; and whether exemptions to the prohibitions are necessary and can be obtained.

The EID **must** document the contacts with Federal agencies. If proposed activities are identified to be located in the wilderness areas, the EID **must** also include an analysis of impacts, mitigation measures and exemptions to the prohibitions obtained from appropriate federal agencies.

http://www.wilderness.net/nwps/default.cfm

- **Environmental Justice, Executive Order 12898**

Evidence has been presented that minority and low-income communities are exposed to more hazardous substances and environmental pollutants than the general population. EPA incorporates the Environmental Justice goals into its NEPA process to ensure that disproportionately high and adverse human health or environmental effects on minority and low-income communities are identified and addressed. The EPA Region 6 Environmental Justice Index Methodology (EJIM) was developed for this purpose.

The methodology defines demographic criteria, applies basic principles of science, and requires environmental managers to use program specific data to identify communities of most concern. The methodology uses Geographic Information System (GIS) maps, census demographic data and the Human Risk Index (HRI) method to mathematically rank individual sites. The method is automated in GIS and currently analyzes 50 square miles and one square mile geographic areas (communities).

The grantee/loanee's environmental consultants or State reviewers may obtain the EJ Index maps by providing the Latitude and Longitude of the specific project site to the NEPA Coordinator of EPA Region 6 Water Division. The specific project site will generally have a facility, such as wastewater or drinking water treatment plants, pumping stations, water towers, etc, which produces environmental pollutants, unpleasant odor, high level noise, toxic substances, or creates hazardous condition. The grantee/loanee **must** include these EJ index maps in its EH) and incorporate them into parts of its public participation program.

Economic and Miscellaneous Authorities

- **Demonstration Cities and Metropolitan Development Act of 1966, P.L. 89-754, as amended, Executive Order 12372**

The grantee is responsible for obtaining a review and clearance from the designated clearinghouse pursuant to 40 CFR Part 29, which calls for reviews of consistency of Federally funded projects with local plans. The grantee **must** include a copy of the review and concurrence on the project by the appropriate State clearinghouse, such as the Office of the Single Point of Contact, in its grant application.

- **Procurement Prohibitions under Section 306 of the Clean Air Act and section 508 of the Clean Water Act, including Executive order 11738, Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans.**

  (Note: because of their comparability, these provisions will be discussed collectively.) For SRF programs, the State is responsible for assuring that loanees comply with these requirements, which are intended to prevent the expenditure of Federal funds to support violators of these environmental statutes (i.e., prohibits the purchase of goods or services from facilities in violation of the environmental statutes except to the extent that the assistance remedies the violation).

  EPA will not award any grant to the potential grantee if the grantee's facilities are in violation of the environmental statutes.

- **Uniform Relocation and Real Property Acquisition Policies Act, P.L. 91-646, as amended**

  Grantees/Loanees **must** pay just compensation to owners whose land is being acquired (e.g., adequate notification, good faith negotiation, fair offer price, use of professional appraisals, and payment of relocation expenses). For SRF equivalent projects, it is allowable only for the acquisition of the real property, including easement, right-of-way or leasehold, etc., to be used as an integral part of the treatment work process. Nevertheless, the expenses for the proper acquisition procedures, such as notification, negotiation, appraisal, etc., are allowable costs.

  The project file **must** note whether property was acquired as part of this project, such as land, easements, or right-of-ways for facilities (wastewater treatment plant, sewer and pumping station). If yes, the file **must** include copies of correspondence with property owners to demonstrate procedural compliance with Act, i.e., appraisal reports, notification to acquire letter, and purchase offer letters. Please refer to 49CFRPart 24 for more details.

- **Debarment and Suspension, executive order 12549**

  Grantees/Loanees **must** provide the reviewing agency a certification that it shall not knowingly enter into a contract with any persons that are ineligible to participate in the project under 40 CFR Part 32

  The project file **must** include a copy of the grantee/loanee's certification (EPA Form 5700-49) pursuant to 40 CFR Part 32. The grantee/loanee must similarly obtain certifications from its contractors to the same effect.

  http://epls.arnet.gov/

- **New Restrictions on Lobbying, Section 319 of P.L. 101-121**

  A grantee, including SRF capitalization grant recipient, receiving EPA funds exceeding $100,000, **must** certify, to the best of its knowledge and belief, that no Federal appropriated funds have been paid or will be paid, by or on behalf of the grantee, to any person for influencing or attempting to influence an officer or employee of EPA, a member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

  If any funds, other than Federal appropriated funds, have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the grantee **must**

complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

The grantee **must** require that the language of the certification regarding lobbying be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, loans, and cooperative agreements) and that all sub-recipients must certify and disclose accordingly.

Social Policy Authorities

- **Age Discrimination Act of 1975, P.L. 94-135**
- **Title VI of the Civil Rights Act of 1964, P.L. 88-352**
- **Section 504 of the Rehabilitation Act of 1973, P.L. 93-112 (including Executive Orders 11914 and 11250)**
- **Section 13 of the Federal Water Pollution Control Act Amendment of 1972, P.L. 92-500**

Because of their comparability in applicability, these provisions will be discussed collectively as follows: These authorities prohibit discrimination related to age, sex, race, color, national origin, and disability. The grantee/loanee **must** complete a Civil Rights Pre-award Compliance Review (Form 4700-4). The form includes information about lawsuits and complaints lodged against the grantee/loanee, compliance reviews conducted by Federal agencies, and population characteristics of the service area. For SRF projects, the SRF State agency **must** provide copies of these forms to EPA when the State reviews the loan application.

During the design and construction phases, the grantee/loanee **must** ensure that design, construction, or alterations of buildings are in conformance with sections 3-8 of the Uniform Federal Accessibility Standards (Appendix A to 41 CFR subpart 101-19.6).

- **The Drug-free Workplaces Act of 1988, P.L. 100-690**

A. The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will

(1) Abide by the terms of the statement; and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying EPA in writing, within ten calendar days after receiving notice under paragraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees

must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (d)(2), with respect to any employee who is so convicted

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employees to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

DATE .....

DATE .....

DATE .....

Check } if there are workplaces on file that are not identified here.

- **Equal Employment Opportunity, Executive Order 11246**

Construction contracts awarded by the grantee/loanee **must** include the seven equal employment opportunity clauses outlined at 41 CFR Part 60, relating to recruitment, hiring and training without regard to race, color, sex, religion and national origin. If the contract is for work to be performed in a metropolitan area, contractors and subcontractors **must** agree to undertake affirmative action steps (i.e., making jobs known and available to disadvantaged groups). The project file **must** include a copy of bidder's certifications on EEO and non-segregated facilities.

- **Minority and Women's Business Enterprise, Executive Orders 11625,12138, and 12432**

The grantee/SRF projects designated by the State, **must** take six affirmative steps to encourage the award of contracts and subcontracts to women-owned and minority-owned businesses. Such awards contribute toward the achievement of State negotiated fair share objective for MBE/WBE business participation.

- **Section 129 of the Small Business Administration Reauthorization and Amendment Act, P.L. 100-590**

The intent of this Act is to encourage the use of small businesses located in rural areas by contractors supported under federally funded programs (i.e., contracts awarded under grant or SRF loans in an amount equal to the capitalization grant). In practice, for SRF programs, State may identify a "fair share amount" comparable to MBE/WBE. In expectation of achieving the fair share amount, the State may select a group of projects that **must** undertake six affirmative steps to encourage the award of contracts and subcontracts to small business located in rural areas.

- **Sections 103 and 107 of the Contract Work Hours and Safety Standards Act**

OSHA regulations and minimum wage and overtime pay requirements are applicable to all construction projects. During the design phase, the State Reviewer **must** ensure that safety features recommended by OSHA rules are included, but not limited to:

- mechanical ventilation provided where required.
- railings for working platforms and/or machine guards
- nosings for each step in the stairway
- all weathers access road
- color coding of piping
- safety measures for trenching, adequate traffic control, and control of explosive material during construction
- gas detectors and gas masks to be provided in the critical areas
- lighting arresters for electric poles and tall structures and lighting (surge) protection for electrical and communication circuits
- back flow prevention devices on potable water lines
- consideration of seismic force (earthquakes) in the structure design for projects located in northeast Arkansas (New Madrid Fault Zone), the State of New Mexico, Panhandle of Oklahoma and Texas and West Texas.

During the construction phase, the State Inspector **must** ensure the OSHA safety rules are observed by the construction contractor and monitored by the grantee/loanee's inspector. Also, the grantee/loanee's representative should regularly review the contractor's payroll records and conduct on-site interviews to ensure that the contractor pays its employees proper wages.

References:

1. *Cross-Cutting Environmental Laws,* A Guide for Federal/State Project Officers, U.S. EPA, Federal Activities (A-104), 21E4001, January 1991
2. *Cross-Cutting Authority Handbook.* U.S. EPA, December 26, 1990
3. *Cumulative Questions and Answers for Title VI SRF Program,* U.S. EPA, July 1990
4. *Programmatic Agreement On Historic Preservation for the State Revolving Fund.* U.S. EPA, Advisory Council On Historic Preservation, National Council Of State Historic Preservation Officers, EPA 9004, March 1990
5. *Guidance for Utilization of Small, Minority and Women's Business Enterprises in Procurement Under Assistance Agreement.* U.S. EPA, July 1997
6. *Environmental Justice Index Methodology.* U.S. EPA Region 6, September 1996
7. *Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis.* U.S. EPA, April 1998
8. *Construction Project Safety.* Course CG-600, U.S. EPA, April 1989
9. 40 CFR Parts 7, 29, 31, 32, 34, and 35, 41 CFR Parts 60 and 101, and 49 CFR Part 24

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