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Southport Sanitary Sewer – Master Plan (2003)

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Executive Summary

Executive Summary

The sanitary sewer system shown in this Southport Sanitary Sewer Master Plan serves land to be developed in the Southport area of the City of West Sacramento. This April 2003 master plan revises the February 2002 master plan to reflect recent development and Lower Northwest Interceptor (LNWI) decisions. The Southport area includes the land area bounded by the Sacramento River and the Port of Sacramento Deep Water Ship Channel. The planned land uses include commercial, industrial, and residential. Residential uses include rural estates, rural residential, low-density to high-density residential and mixed use. No sewer service was included in the Master Plan for rural estate land uses. Because of the large land areas per tract in the rural estate area, onsite systems, such as septic tanks and drain fields, would be used for sanitary waste disposal.

Most of the Southport area is currently used for farming and is undeveloped. Existing City sewers serve residential developments along Linden Road and service streets connecting to Linden Road, new residential developments along Gateway Boulevard and Lake Washington Boulevard and within the Southport Industrial Park and Bridgeway Island. The wastewater generated from these areas is conveyed to the Southport Pump Station, which pumps to the City's existing WWTP. The existing sewage collection system is incorporated into this Master Plan.

Existing and proposed sewer mains were located on the basis of the existing highway and street locations and expected patterns of development. The Master Plan shows the sewer mains, but does not include the lateral system. Lateral sewers would extend off of the main sewers to serve smaller areas. The sewer system was also developed to minimize the number of pump stations and deep sewers. However, because of the relatively flat terrain, deep sewers and a minimum number of pump stations could not be avoided.

This Master Plan should be considered a guide to the development of the wastewater collection system. As plans for new subdivisions are completed, the sanitary sewer system serving the subdivision should be reviewed and modifications made to improve service to the subdivision and future service areas beyond the subdivision. Pump stations are generally located to limit the depths of the sewers. The sizing, configuration, and components of the pump station also need to be determined during design.

Average sanitary sewer flows were estimated from planned land use and densities and unit flow rates provided by the City Planning. These average flows were then peaked using a peaking factor to account for the diurnal flow patterns normally experienced in sewage collection systems. Pipes were then sized according to a conservative roughness coefficient to carry the peak dry weather flow at one-half of the full capacity of the pipe.

The sizing of the pipe to carry the peak sanitary flow at one-half of the pipe capacity allows for peak infiltration and inflow (I/I), which is undesired, but is a component in all wastewater collection systems, especially those in wet ground conditions similar to the Southport area. Infiltration is generally defined as groundwater that leaks into the pipes and manholes through joints or defects. Inflow is generally defined as surface water that enters the system through a number of sources including down spouts, area drains, tops of manholes, etc. Tight standards and aggressive and continuous monitoring and inspection will help to minimize infiltration and inflow, but it is nearly impossible to avoid. The pump stations were sized on peak wet weather flow using the peak wet weather flow estimates plus an I/I allowance. The pump stations are assumed to be constructed in stages so that specific projections of ultimate peak pumping capacity can be adjusted over time.

In most cases, because of the flat terrain, the sewers were sized on the basis of the minimum slope necessary to convey the peak sanitary flow at a velocity of 2 feet per second or greater. This is the minimum self-cleaning velocity considered necessary to keep solids from settling out of the wastewater flow. For the larger-diameter pipes, sizes over 24 inches, the minimum slope was limited to 0.8 foot in 1,000 (0.0008) feet because the ability to accurately construct sewers at flatter grades is limited.

The City will eventually be incorporated into the Sacramento Regional Community Sanitation District (SRCSD). All wastewater generated within the City (including the Southport Area) would be conveyed to a new interceptor system flowing south to the Sacramento Regional Wastewater Treatment Plant. This interceptor is currently under design and is called the Lower Northwest Interceptor (LNWI). These regional facilities are expected to be constructed over the next 5 to 10 years.

As a result of the future regional facilities, this Master Plan describes wastewater facilities required for interim service (prior to the LNWI) as well as ultimate facilities (conveying flows to the LNWI). On an interim basis, the City would continue to use the existing Southport Pump Station to convey flows to the existing City WWTP. After construction of the LNWI, the Southport Pump Station, the Bridgeway Island Pump Station, a new pump station serving the southwest area (the Largo Pump Station) and a new pump station serving the southeast area (the Parlin Pump Station) would pump flows into the LNWI. In addition, part of the southeast area of Southport would flow by gravity directly into the 120-inch diameter section of the LNWI. The cost of these permanent facilities are summarized in Table ES-1.

TABLE ES-1
ESTIMATED COSTS FOR NEW SEWER FACILITIES AND CONNECTION TO THE LNWI

Item	Cost (M $)[a]
New Collection Systems in Southport	11.5
Largo Pump Station (Buildout)	2.0
Parlin Pump Station (Buildout)	1.9
Construction Subtotal	**15.4**

[a] Based on an ENRCCI of 6,700.

The cost of any interim facilities (temporary pump stations, forcemains to the Southport Pump Station) have not been included within this Master Plan. The degree to which these facilities are required will depend on future Southport development and the LNWI construction progress.

The Master Plan includes an area-by-area description of the sanitary sewer system. The Appendices include detailed land use tables, segment-by-segment hydraulic and physical pipe data, and detailed cost opinions for pipelines and pump stations.

Section 1

Introduction

SECTION 1

Introduction

This Southport Sanitary Sewer Master Plan 2003 (Master Plan) was developed to reflect recent Southport development and the future connection to the Lower Northwest Interceptor (LNWI) which will eventually convey West Sacramento's wastewater to the Sacramento Regional Wastewater Treatment Plant. This Master Plan describes major sewers, pump stations, forcemains, and the general configuration of various sewer sub-basins required to support development in the Southport Area. This Master Plan replaces the City's 1989-1999 Southport Sanitary Sewer Master Plan. Specific Sewer Plan developed by Dewante and Stowell and reflects the sewer needs of the Southport Framework Plan.

1.1 ASSUMPTIONS

The following assumptions were used for the development of this Master Plan:

- Land use designations, quantities, and flow development were provided by the City and were used as the basis for this Master Plan. The projected flows from Southport, sewer design criteria, and cost estimating assumptions were adapted directly from the City's 1999 Master Plan. As with the City's last master plan for Southport in 1999, no sanitary sewer service is assumed for areas designated as rural estates (RE).
- Ground elevations were based on interpretation of contours shown on a map provided by the City. The source and accuracy of these ground elevations are unknown.
- The City provided physical data for existing sewers.
- The pipeline alignments are conceptual. The exact alignment and specific locations will be determined during preliminary and final design.
- Only regional collection system pipelines are shown in the Master Plan.
- Pipelines are mostly routed on existing or proposed streets
- The alignment and other physical data related to the LNWI was provided by the SRCSD in preliminary design drawings dated August 2001.
- The Master Plan primarily addresses facilities required after construction of the LNWI. A general discussion of interim service requirements for development prior to the LNWI is provided. The costs for interim facilities (such as temporary pump stations and forcemains) would be in addition to the costs presented within this report.

1.2 BACKGROUND

The Southport area of the City of West Sacramento is mostly undeveloped. The City's last update to its General Plan (dated June 14, 2000) plans for a combination of industrial, residential, and commercial projects within the Southport area.

The City has conducted several previous studies related to providing sewer service in Southport. In 1989, the Southport Specific Sewer Plan was developed to address future development.
A recommendation was made for a sanitary sewage collection system that transported flows to a new WWTP in the Southport area. The 1989 plan provided for expansion of the WWTP in Southport as growth occurred. The City later abandoned the concept of locating a new WWTP in the Southport area and instead planned to expand its existing WWTP on South River Road. With this change, the Southport Specific Sewer plan became obsolete. The City then adopted its 1999 Master Plan which planned for conveying wastewater flows north to the existing WWTP using an expanded Southport Pump Station and a new pump station on Jefferson Blvd. Since the 1999 Master Plan, the City has entered into an agreement to join with the SRCSD and connect into the LNWI. Therefore, the City initiated this Master Plan to plan for the connection of the Southport area into the LNWI and reflect development changes occurring since 1999.

1.3 GENERAL DESCRIPTION OF THE STUDY AREA

LOCATION

The area to be served by the Southport sanitary sewer system is shown on Figure 1. The Southport area is located in the southern portion of the City between the Sacramento River and the Port of Sacramento Deep Water Ship Channel.

EXISTING SYSTEM

An existing sewage collection system, shown on Figure 1 and Figure 2, serves residential developments primarily along Linden Road and along service streets connecting to Linden Road, the developing Southport Industrial Park (SIP) and Bridgeway Island, and new developments along Gateway Blvd, and Lake Washington Blvd. These sewers convey sewage to the Southport Pump Station where the sewage is pumped through forcemains to the WWTP located on South River Road.

Wastewater from the SIP and Bridgeway Island areas flow to the Bridgeway Island Pump station. This pump station was built in 2001 and is a Smith-Loveless packaged underground dry pit pump station. The station is equipped with two Smith Loveless 8D4C pumps and variable speed drives. The pump station has a current reliable pumping capacity of 2.3 mgd, assuming one of the two pumps is out of service. In the future, the pump station is designed to include a third pump, bringing its reliable capacity up to 4.5 mgd. Two 12-inch forcemains convey flows from the Bridgeway Island Pump Station to a manhole upstream of the Southport Pump Station.

The Southport Pump Station was expanded in 1999. The Station is also a Smith-Loveless packaged dry pit type pump station. The station is equipped with two Smith Loveless pumps, with 150 horsepower motors and variable speed drives. The pump station has a current reliable pumping capacity of 5.2 mgd, assuming one of the two pumps is out of service. In the future, the pump station is designed to include a second and third duty pump, bringing its reliable capacity up to 8.4 mgd and 10.4 mgd, respectively. Parallel 12-inch and 16-inch forcemains convey flows north to the City's existing WWTP.

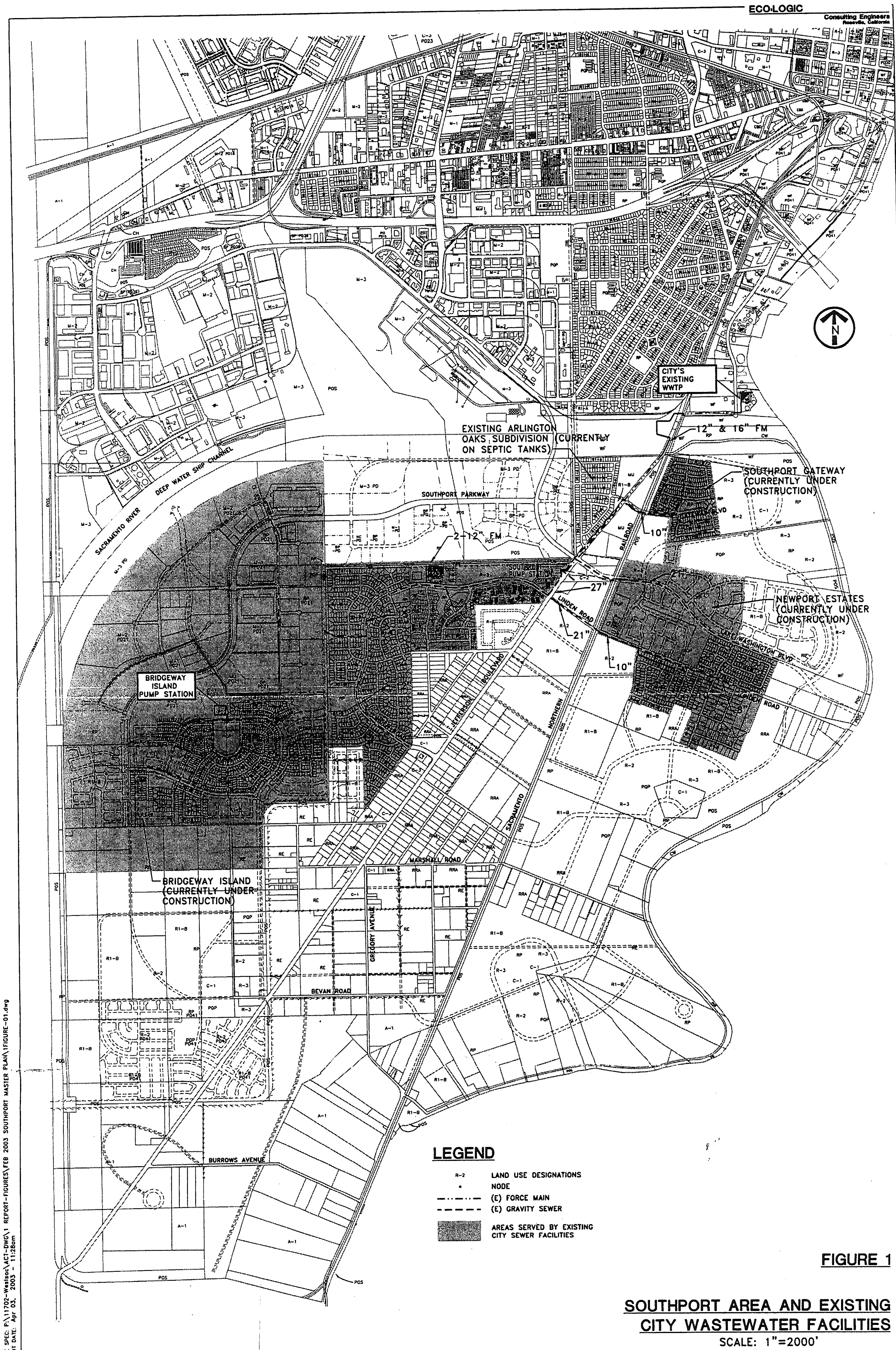
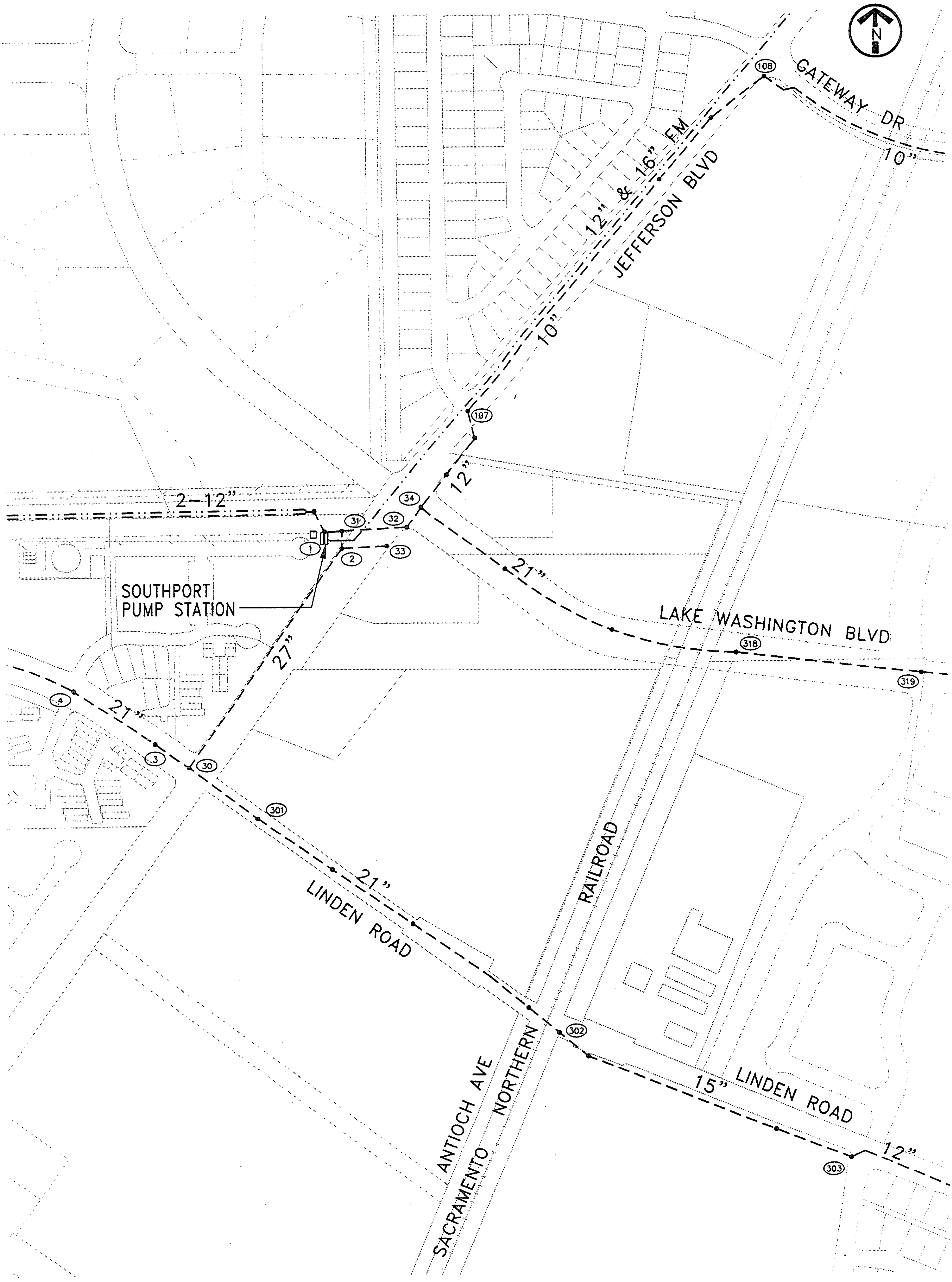


FIGURE 1

SOUTHPORT AREA AND EXISTING CITY WASTEWATER FACILITIES

SCALE: 1"=2000'

ECO:LOGIC
Consulting Engineers
Roseville, California



LEGEND

• MANHOLE (302) EXISTING MASTER PLAN NODE NO.

— · · — · · — (E) FORCE MAIN

— — — — — (E) GRAVITY SEWER

FIGURE 2

EXISTING SEWER NEAR SOUTHPORT PUMP STATION

SCALE: 1"=150'

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Section 2

Land Use and Flow Development

SECTION 2

Land Use and Flow Development

To evaluate the sanitary sewer system required to support development in the Southport area, the distribution of land uses to each node was used as the basis for the development of system flows. Nodes represent specific points in the system where pipes join, change direction, or change grade. System flows are used to determine the preliminary sizes of pipes required for future development.

Land use was distributed to the nodes in the proposed sanitary sewage collection systems. Spreadsheet hydraulic analysis for each pipe segment was developed and built on the land use designated for each node and specific criteria for pipeline design.

2.1 LAND USE

Most of the Southport area is currently used for farming and is undeveloped. Jefferson Boulevard, a State Highway, bisects the study area, entering the area near the northeast corner and exiting near the southwest corner. Railroad tracks are located next to Jefferson Boulevard on the north end of the Southport area. They diverge from Jefferson Boulevard exiting on the south end of the study area near its center. The ground elevation in the Southport area is mostly below the water elevation of the Sacramento River. The land within this area is protected by levees.

The delineation of land use was based on an overall land use map provided by the City and specific development information added from plans provided to the City by developers.

As with the 1999 Master Plan, no sewer service is assumed for RE land uses. The parcels are large, and if service were provided to these properties, it would require long, deep sewers, or public lift stations. These areas will be served by onsite systems such as septic tank-drain field systems.

Figure 1 provides a map of the existing Southport area, existing developments and wastewater facilities, and land uses planned by the City's General Plan. A detailed distribution of the land use by node is presented in Appendix A. Figure 3 shows proposed future developments in the Southport area.

2.2 CRITERIA

The criteria used for this Master Plan are summarized below and provided in more detail in the appendices referenced for each category.

LAND USE

The zoning designations and densities (dwelling units/acre) meet the requirements of the City of West Sacramento Planning Division. Zoning designations were assigned by the City's Planning Division and these limit the type of land use that may occur within specific zones. The Master Plan used the zoning and land use designations provided by the City. These are summarized in Table 2-1.

TABLE 2-1
SUMMARY OF ZONING DESIGNATIONS AND DENSITIES

Zoning Designation	Description	Density (dwelling units/acre)
RE	Rural Estate	N/A
RR	Rural Residential	0.8
LR	Low Density Residential	4.0
MR	Medium Density Residential	7.0
HR	High Density Residential	18.0
MU	Mixed Use	4.2

N/A: Not applicable because RE was eliminated from consideration for the development of flows.

To determine projected residential dwelling units and commercial and industrial acreage, the City tabulated existing levels of development and then added land use information from recent specific plans proposed within Southport. A detailed listing of the land uses and assigned values for each node in the system is provided in Appendix A. Node values are based, in many cases, on current land use, densities, and development patterns and need to be confirmed or modified according to actual development plans. Development names shown on Figure 3 were used to identify the specific areas in the Southport area.

Land use designations form the basis of the determination of system flows. Once land use is assigned to specific nodes in the system, land use densities and unit flow factors are applied to the land use area to determine average flow at each node.

FLOW ESTIMATES

Sanitary sewer pipelines and pump stations were sized on peak flows. Sanitary sewer pipelines were sized to convey the estimated peak wet weather flow (PWWF) from the service area with the pipe flowing partially full (at a d/D ratio of less than 1). The d/D ratio is a measure of the relative capacity of the sewer used to convey peak sanitary sewage flows with respect to the overall diameter of the pipe. PWWF is equal to the average sanitary flow (ASF) multiplied by the PWWF peaking factor. ECO:LOGIC sized the pipes in the Master Plan to convey the estimated PWWF with the depth of flow in the pipe at one-half of the pipe diameter, d/D ratio equal to 0.5. The remaining one-half of the full pipe capacity allows for additional rainfall dependent inflow and infiltration (I/I). This is a change to the City's criteria of sizing the pipe to convey the estimated total peak flows at a d/D ratio equal to 0.7.

There were two concerns with using the City's standard criteria of d/D ratio equal to 0.7. First, under this criterion, estimating the I/I depends on the size and length of the completed upstream system. In an undeveloped area, the size and length of the upstream system are difficult to estimate. The density of pipes is dependent on the development pattern and would need to be assumed which would make the calculations very inaccurate. Secondly, if I/I flows are estimated and added to the peak sanitary flows, then a d/D ratio equal to 0.7 may be overly conservative (estimates pipe sizes larger than needed). A d/D ratio of 0.5 should provide adequate capacity for base flows and unquantified I/I flows.

Required pump stations, however, were sized using peak hourly wet weather flow (PHWWF). Estimated PHWWF is equal to PWWF plus peak I/I. The following describes how the average sanitary flow, PWWF, and PHWWF are estimated.

AVERAGE SANITARY FLOW

Per-acre and per-unit flow estimates considered the City of West Sacramento planning standards, Engineering Division standards, and current engineering practices. Unit flow rates are developed by the Community Development Department as a tool for developers and sewer system designers to estimate flows from new development. The unit flow rates are average dry weather flows. The unit flow rates are applied to the number of units to calculate average flows based on land use. As part of previous master planning efforts, planning and engineering unit flow rates were compared to develop the unit flow rates for the Master Plan. Actual acreage and dwelling units were used from the City of West Sacramento's 1987 Master Plan to develop total flows for the system. These flows were then compared to the existing South River Road WWTP records from 1997 and unit flow rates were adjusted accordingly. The resulting values were close to the unit flow rates used by planning and were therefore used in this master plan. These planning values are summarized in Table 2-2.

TABLE 2-2
SUMMARY OF UNIT FLOW RATES

City of West Sacramento Planning Standards
(From Southport Framework Plan)

Zoning	Flow / Unit
Commercial	1,500 gallons per day per acre
Industrial	2,000 gallons per day per acre
Residential	100 gallons per day per person
Rural Estate	N/A
Rural Residential	
Low-Density	300 gallons per day per dwelling unit
Medium Density	250 gallons per day per dwelling unit
High Density / Mixed Use	225 gallons per day per dwelling unit

The unit flow values are based on City Planning Division standards for calculating the amount of flow expected from specific categories of land uses.

Using these unit flow rates, average sanitary flow was estimated for each node according to the land use assigned to each node as shown in Appendix A, Table A-1. Upstream flows were collected and routed downstream through each area system in a spreadsheet model. The average sanitary flow was maximized using a peaking factor. These factors were based on population equivalents presented in standard texts for wastewater engineering.

PEAK WET WEATHER FLOW (PWWF)

Sanitary flow is characterized by a diurnal curve, whereby flow is low during early morning hours and at a maximum value sometime in the morning and again in the afternoon/ evening hours. Additionally, sewer flows will increase during wet weather periods as groundwater and/or rainwater leaks into the sewer. To translate average sanitary flows into a peak flow expected in the pipe, the sanitary flow is multiplied by a peaking factor. The peaking factors are listed in Table 2-3. The (PWWF) includes peak daily sanitary flow and inflow and infiltration (I/I). I/I is the extraneous water that enters a sewer system through lateral and pipeline defects such as open joints, offset joints, holes, cracks, holes in manhole covers, defects in manholes, or illegal area drains. These flows are more significant during rain events when rainwater enters the system through percolation through soils or overland runoff to area drains or manhole covers. In Southport where high groundwater exists and pipes may be located below the groundwater table, groundwater enters the sewer system through defects in the pipe and is a relatively constant contribution to the base flow. Even new systems will have I/I after some period of use because of defects that develop in the system over time. The pipes are sized on the basis of the PWWF daily rate expected so that overflows do not occur. The flow is then accumulated and routed downstream toward a pump station or the treatment plant to determine pipe sizes needed to convey the flow. These pipe sizes are summarized in Appendix B, Table B-1. Land uses, densities, and unit flow factors are consistent with the City's planning values.

TABLE 2-3
SUMMARY OF PEAKING FACTORS

Average Flow (mgd)	Peaking Factor
< 0.75	3.0
0.75 – 1.20	2.9
1.20 – 1.75	2.8
1.75 – 2.50	2.7
2.50 – 3.75	2.6
> 3.75	2.5

Peaking factors are based on current engineering practices.

The peaking factor was applied to the total average flows developed for each node (including upstream contributions) to obtain a peak flow at each node. A summary of the peak sanitary flow for each node is provided in Appendix B, Table B-1.

PEAK HOURLY WET WEATHER FLOW (PHWWF) – USED TO ESTIMATE FUTURE PUMP STATION CAPACITY

While pipes have been sized on PWWF flowing under half-full conditions, the pump stations must be sized for ultimate peak hourly flows which occur during significant wet weather events. The peak hourly wet weather flow (PHWWF) represents PWWF plus a peak I/I allowance. I/I allowance was established at 600 gpd per acre based on what other communities in the area experience during large storm events.

DESIGN STANDARDS

The selection of a pipe diameter to adequately convey peak flows is based on the pipe slope and d/D criteria. Minimum slopes were calculated from a comparison of the City's actual construction slopes, the City's recommended minimum slopes, and published recommended minimum slopes. A comparison of the minimum slope recommendations from various sources is provided in Appendix B, Table B-2.

A slope of 0.0008 is considered the minimum practical slope for construction. Flatter slopes are difficult to accurately construct. Table 2-4 presents the minimum slopes that were used for this Master Plan.

TABLE 2-4
RECOMMENDED MINIMUM PIPE SLOPES

Pipe Diameter (inches)	Minimum Slope (feet/feet)
8	0.0035
10	0.0030
12	0.0022
15	0.0015
18	0.0012
21	0.0010
24	0.00080
27	0.00080
30	0.00080
33	0.00080
36	0.00080
39	0.00080
42	0.00080

Recommended pipe slopes are based on current engineering practices.

A minimum pipe size of 8 inches in diameter was used for all collector sewers in this Master Plan. Six-inch-diameter pipes are allowed by City standards at the extreme upper ends of the systems.

A pipe diameter was selected for each sewer segment based on the flow estimates for that segment. A summary of the pipe sizes selected for each sewer segment is provided in Appendix B, Table B-1. It should be noted that flow in many of the upstream segments is so low that a self-cleaning minimum velocity of 2.0 feet per second will not be achieved in an 8-inch-diameter pipe. Because 8 inches is the smallest diameter allowed by the City for the main collector sewers, flushing may be required in these pipes to flush out deposits that settle at low velocities and to avoid septic conditions.

Table 2-5 provides a summary of the allowable flows by City standards for each pipe diameter based on a d/D ratio of 0.5, and minimum pipe slopes.

Flushing the system on a regular basis (once or twice a year, especially during low-flow periods) requires a water source from a local hydrant, or a water storage truck, and running the water through the system at a high volume to flush debris and settled solids through the system to the treatment facility. A vacuum truck could be used to remove solids at a downstream location should they build up and become lodged in a manhole during flushing.

TABLE 2-5
SUMMARY OF MAXIMUM PEAK FLOWS BY PIPE DIAMETER AT A MINIMUM SLOPE

Pipe Diameter (inches)	Minimum Slope (feet/feet)	Peak Flow [a] 50% full (mgd)	Peak Velocity [b] 50% full (feet/second)
8	0.0035	0.231	2.05
10	0.003	0.389	2.19
12	0.0022	0.541	2.13
15	0.0015	0.810	2.04
18	0.0012	1.178	2.06
21	0.001	1.622	2.08
24	0.00080	2.071	2.16
27	0.00080	2.836	2.20
30	0.00080	3.756	2.36
33	0.00080	4.843	2.52
36	0.00080	6.107	2.67
39	0.00080	7.561	2.82
42	0.00080	9.213	2.96

[a] Peak flow (Q_{PEAK}) computed from Manning's equation, assuming a roughness coefficient "n" = 0.013 and d/D = 0.5.

[b] Peak velocity (V_{PEAK}) computed from $V_{PEAK} = Q_{PEAK}/a$ where d/D = 0.5, a = cross-sectional area of the pipe.

PIPE MATERIALS

PVC pipe should meet the requirements of ASTM D 3034 for pipe and fittings up to 15 inches in diameter and the requirements of F679 for pipe diameters from 18 inches through 24 inches. The recommended standard dimension ratio (SDR) of the PVC pipe up to 15-inch-diameter is either 35 to 26, depending on the depth of bury. SDR 35 is recommended for PVC pipe with up to a 12-foot depth of cover; SDR 26 is recommended for pipe with greater than a 12-foot depth of cover. The SDR is a measure of the thickness of the pipe compared to the pipe diameter and indicates the ability of the pipe to resist forces from static and live loads. Reinforced concrete pipe, ASTM C-76, with a PVC lining for sulfide corrosion resistance is recommended for pipes larger than 24 inches in diameter. Other pipe materials, such as clay, high-density polyethylene (HDPE), or large-diameter PVC pipe, could also be considered. Allowable materials will be dictated by the most current version of the City Design Standards.

ROUGHNESS COEFFICIENT

The roughness coefficient, or Manning's "n" value, used to calculate pipe capacity, was n equal to 0.013. This value is somewhat conservative if PVC pipe is used. An "n" value of 0.011 may be more appropriate for PVC. An "n" value of 0.013 is a commonly used value that assumes a buildup of a slime layer in any pipe material after many years of service and is consistent with City standards. By using this value, pipe sizes selected are not restricted to one material type.

Minimum Depth to Invert

The City's standard minimum depth to invert is 3 feet for service laterals and 4 feet for public sewer lines in the street or in public easements. Because the pipe alignments shown on Figure 3 do not reflect the end of the system, an attempt was made to determine an anticipated minimum depth at the end node shown on the Master Plan to allow for expected future extensions. This was done by extending the pipe to the foreseeable end of the system and calculating an invert at the node shown on the drawing. It was assumed that the extended pipe was 8 inches in diameter at a minimum slope of S=0.0035, with a minimum manhole depth of 4 feet at the end of the potential expanded system. Starting invert elevations were estimated from an incomplete topographic map. These need to be refined when grading plans are developed.

WEST SACRAMENTO
MAJOR DEVELOPMENTS

Russian Baptist Church and Community Center
- 2 story, 44,000 square foot building
- Multi-purpose room for community use
- 428 parking spaces
- 5.6 acres

Capitol Place
- 9 acres
- 176 multifamily residential units

Metro Place
- 3 acres
- 44 single family homes
- 10 live/work units
- 4 apartments

Lighthouse Development
- 265-acre mixed-use development
- 110 acres of residential use
- 763 single-family and multi-family units
- 9.8 acres/246,000 square feet of retail commercial
- 6.3 acres/50,000 square feet of marine commercial
- 5.1 acres/200,000 square feet of business professional office
- 18-hole golf course
- 29 acres for riverfront parkway, public access, landscape corridors

East Riverfront Property
- 43 acres riverfront property
- Mixed-use development opportunity

Washington Specific Plan
- 190 acres
- Focal point of West Sacramento's riverfront development

Washington Firehouse
- 2-Story, 4,800 square foot building
- Allowable uses include cafe, restaurant, office, retail and quasi-public

One Riverfront Plaza
- 7.24-acre mixed-use planned development
- 530,000 square feet of office
- 27,000 square feet of retail
- 25,000 square feet of restaurant space
- 170 apartment units
- 2,300 parking spaces

Raley's Landing
- 25.2-acre mixed-use planned development
- 945,000 square feet of office space
- 46,000 square feet of retail space
- 428-room hotel with convention and recreation facilities
- 218 apartment units

River Walk Park
- River Walk Promenade
- Grand Staircase/Amphitheatre
- Recreation access to west bank of Sacramento River

State Route 275 Improvements
- Conversion of a portion of State Route 275 to city arterial street.

Triangle Specific Plan
- 180 acres on the riverfront
- Up to 7,000,000 square foot of office and commercial
- Up to 5,000 high density residential units
- Riverfront park with amphitheater

Southport Gateway
- 76.3-acre residential subdivision
- 357 single family units

Parella Subdivision
- 92 acres
- 177 single family homes
- 11 acre elementary school
- Lots from 4,500 to 6,000 sq. ft.

Newport Estates Subdivision
- 270-acre mixed use project
- 866 single-family lots
- 14.3 acres medium-density residential
- 16.1 acres high-density residential
- 17 acres riverfront mixed use
- 5.6 acre neighborhood park

River Ranch
- 27 acres medium-density residential subdivision
- 176 single-family lots

Linden West 2 & 3
- 18.5 acres
- 81 single-family units
- Lots from 6,000 to 8,000 sq. ft.

Parlin Ranch Subdivision
- 76 acres
- 341 single-family homes
- Lots from 4,500 to 6,000 sq. ft.

Riverpoint Plaza
- 8 acres
- 6 highway commercial lots

Riverpoint Retail
- 82 acres commercially zoned

Riverside Centre
- 173.3 acre office/light industrial park
- 60.6 acres professional office zoning (including Cal Fed Bank)
- 26.0 acres business park zoning
- 76.0 acres light industrial zoning
- 10.7 acres community commercial zoning

City Hall / Civic Center
- City Administrative Offices
- Galleria and Council Chambers
- Meeting facilities
- Community rooms
- Completed November, 2002

Freeway Interchange Improvements
- Enterprise/I-80 reconstruction
- Completion scheduled 2002

Seaway International Trade Center
- 258 acres of water-related industrial zoning
- 73 acres of business park zoning
- 58 acres of open space zoning
- 42 acres of recreation and parks zoning
- 16 acres of light industrial zoning
- A vesting tentative map and planned development standards have been approved.

Southport Business Park
- 672 acres mixed industrial use
- Approved development agreement
- Approved zone text
- Water-related industrial area
- Heavy industrial area
- Light industrial area
- Recreational buffer area
- High density residential
- 12 acres of commercial

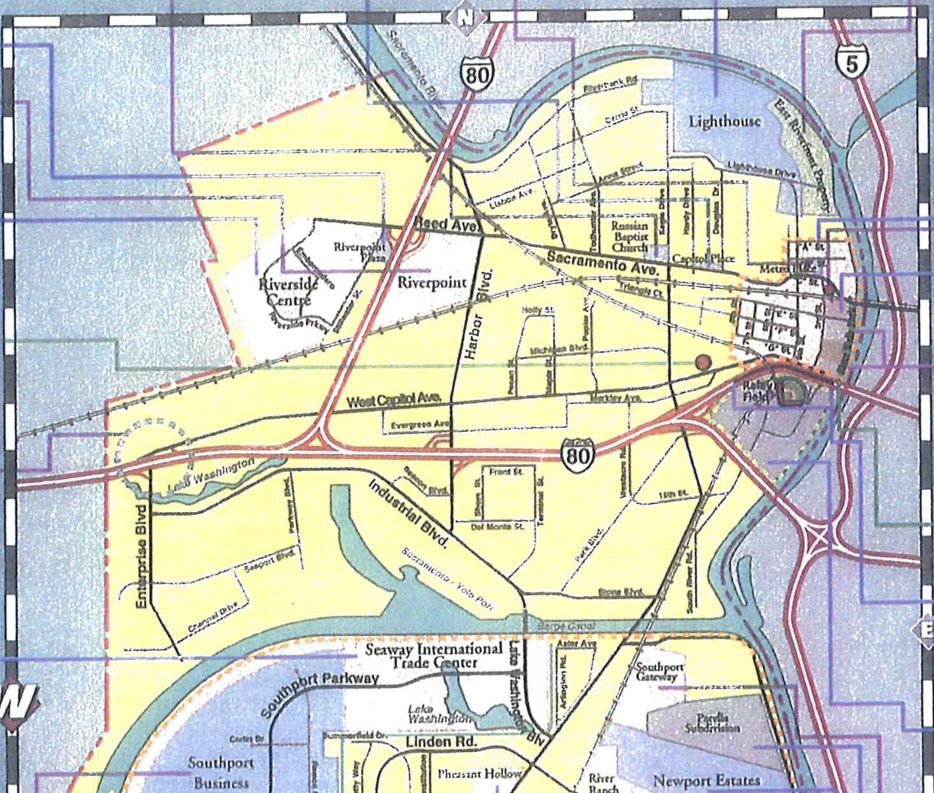
The Classics
- 329 residential lots
- 70.2 acres

Bridgeway Island
- 310 acres
- 1,277 single-family units
- Lot sizes ranging from 4,050 to 10,000 square feet
- 8 acre elementary school site

Bridgeway Lakes
- 217 acres
- 610 single-family homes
- Lot sizes ranging from 4,500 to 7,000 square feet

Rivermont Subdivison
- 29.77 acres
- 122 residential lots

Pheasant Hollow Subdivison
- 40 acre mixed use project
- 134 Single-Family units
- 8.5 acres Commercial



Southport Framework Plan
- 7,120 acres
- Village oriented, mixed-use development
- 14,050 residential dwelling units
- 1,720,000 square feet of commercial
- 2,114,400 square feet of industrial
- 544 acres of public/quasi public
- 915 acres of parks and open space

This map indicates major projects in the planning, permitting, or development phase in West Sacramento as of August 2002.

FIGURE 3

MAP Major Proj 02.AI

Section 3

Connection to the Sacramento Regional Sanitation System

SECTION 3

Connection to the Sacramento Regional Sanitation System

As part of the City and SRCSD's Principals of Agreement, wastewater flows from the City would combine into the LNWI and be conveyed to the Sacramento Regional Wastewater Treatment Plant. The LNWI is currently planned to include a forcemain system through the northern portions of the City, a transition structure directly south of Linden Road in Southport, and a 120-inch gravity sewer through the remainder of Southport. The City may enter the LNWI either through dedicated forcemains to the transition structure or through three gravity connections directly into the 120-inch sewer. The LNWI is currently under design. It is expected that the system will be constructed and become operational over the next 5 to 10 years.

The general alignment of the LNWI, gravity connection locations, and the Southport sewer sub-basins are shown in Figure 4. The LNWI alignment was adapted from SRCSD preliminary design information developed in August 2001. Section 4 of this report provides a detailed description of each of the sewer sub-basins.

3.1 LNWI FORCEMAIN CONFIGURATION

The LNWI is planned to include dual 60-inch forcemains from SCRSD, a 30-inch City forcemain conveying flows originating north of the Barge Canal, and a 24-inch City forcemain for pumped flows in the northern portions of Southport. The 30-inch and 24-inch would combine into a 36-inch forcemain near the Southport Pump Station. The forcemain configuration near the Southport Pump Station and transition structure are provided in Figures 5 and 6. As shown, flows from the Bridgeway Island Pump Station and Southport Pump Station would be directed through the new 24-inch forcemain into the 36-inch forcemain.

3.2 GRAVITY CONNECTIONS TO THE LNWI

At the transition structure, the forcemains would converge into a 120-inch gravity sewer. The sewer would flow south through the remainder of Southport. The City would have three connection locations in this pipe. As shown in Figure 4, the City's connection points include:

- No 1. Near Davis Road, connection from the eastern side of the LNWI. This connection location provides the City a middle connection point within the Southport area. This location would serve the lower section of Area 4, by gravity. Flows from the northern part of Area 4 would be pumped to the connection point.
- No 2. South of Bevan Road, connection from the west and east side of the LNWI. This location would receive pumped flows from the Largo pump station to the west and gravity flows from the east.

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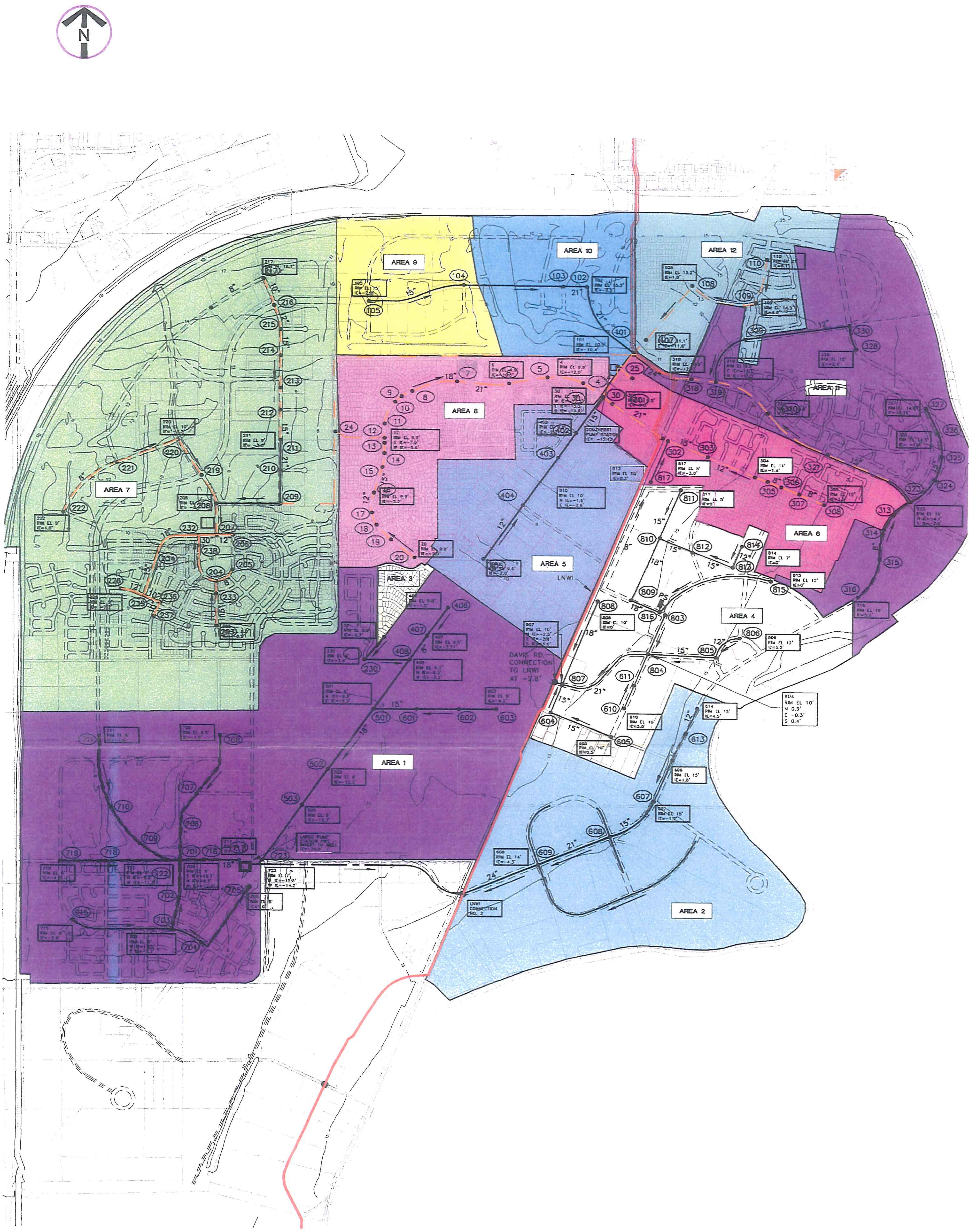
Rocklin, California



LEGEND

EXISTING FORCE MAIN
EXISTING GRAVITY SEWER
PROPOSED FORCE MAIN
PROPOSED GRAVITY SEWER

FIGURE 4

SOUTHPORT AREA AND PROPOSED CITY WASTEWATER FACILITIES

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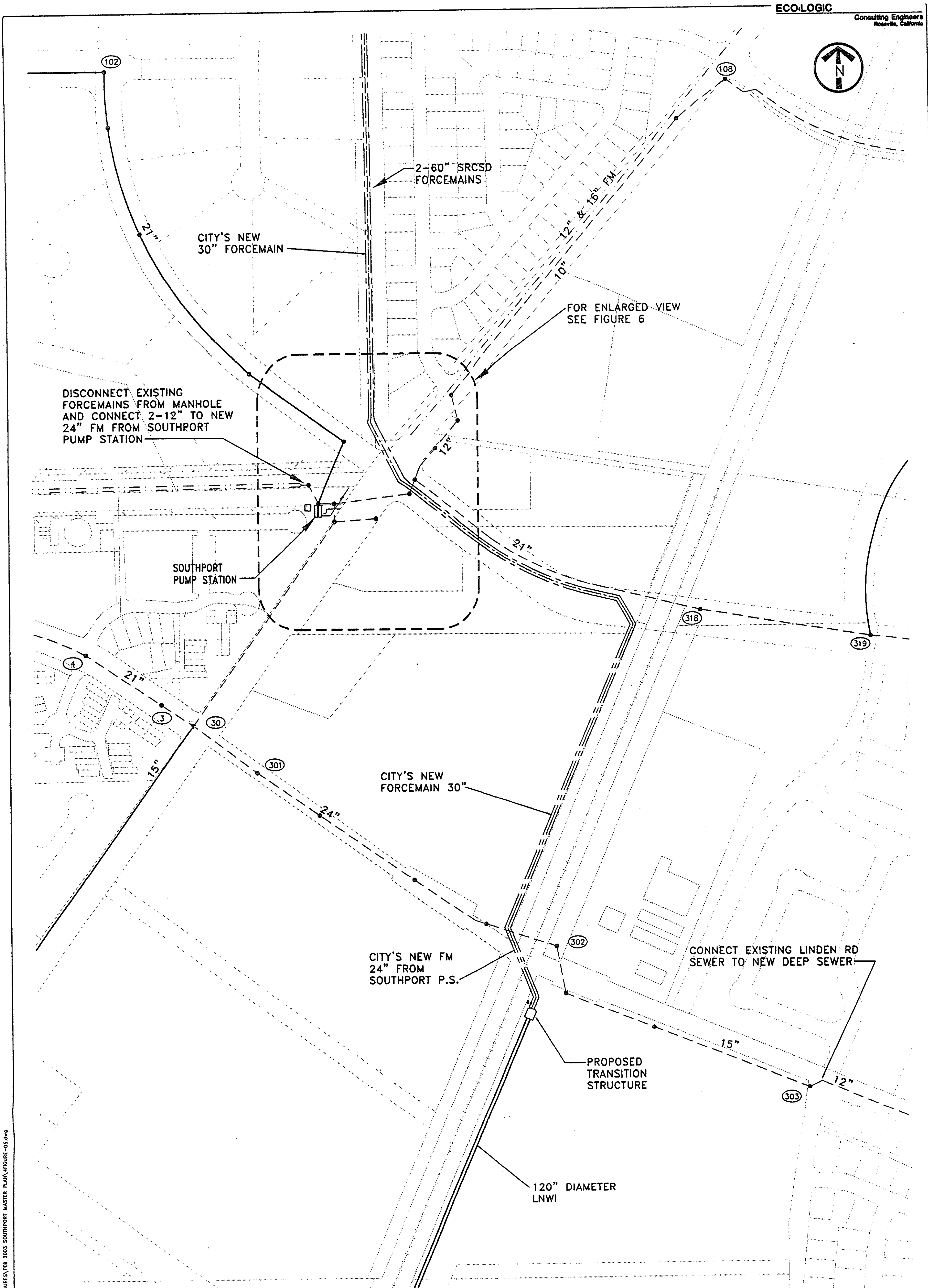
Roseville, California



LEGEND

•	MANHOLE
— · — · —	(E) FORCE MAIN
— — — —	(E) GRAVITY SEWER
——— — ———	PROPOSED FORCE MAIN
————	PROPOSED GRAVITY SEWER

FIGURE 5

PROPOSED CHANGES NEAR SOUTHPORT PUMP STATION AFTER LNWI

SCALE: 1"=300'

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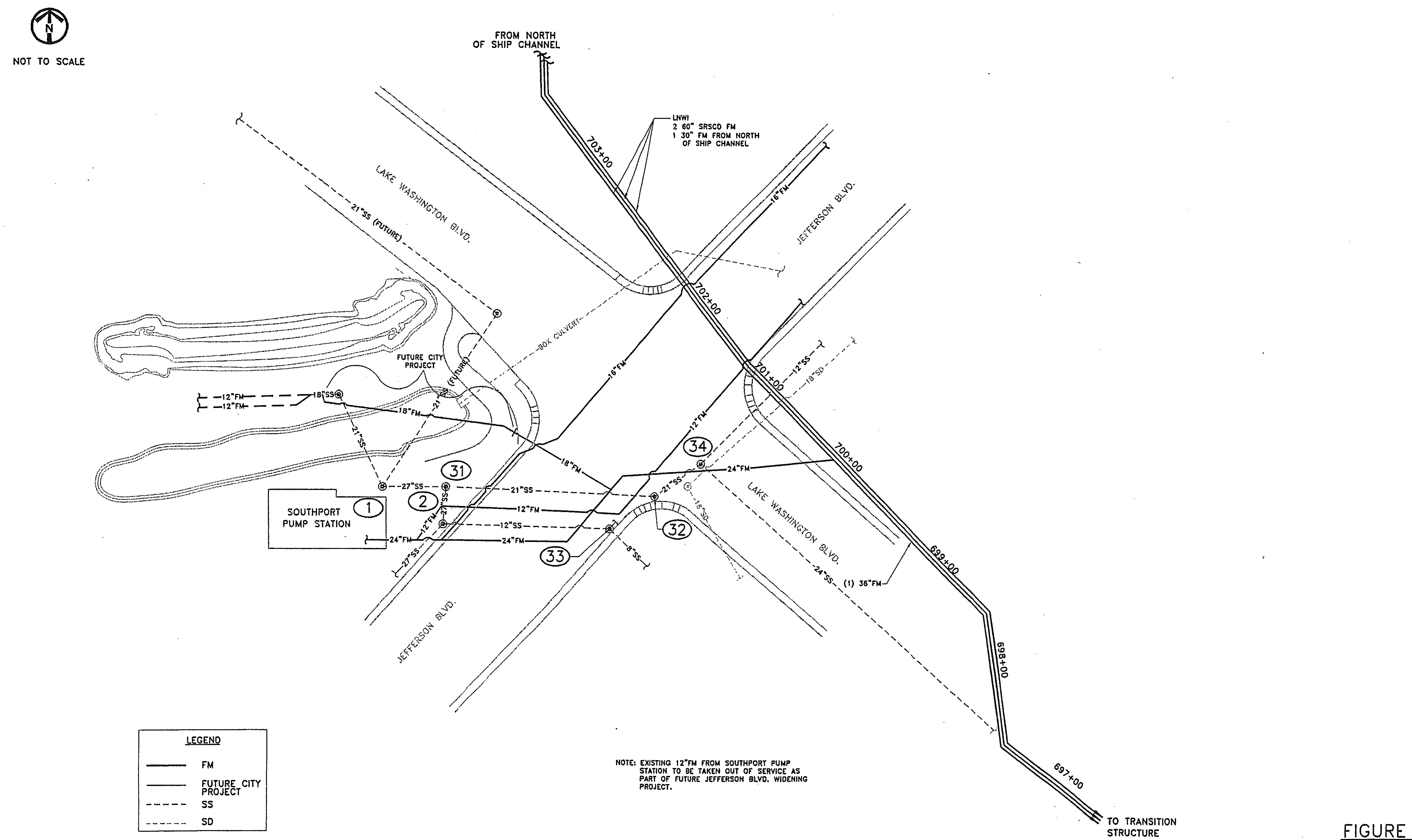


FIGURE 6

ENLARGED VIEW
PROPOSED CHANGES NEAR SOUTHPORT PUMP STATION

- No 3. Near Burrows Road, connection from the western side of the LNWI. This location is reserved for future development from the City south of Bevan Road.

A schematic of these three connection points are shown in Figure 7. Sewer depths shown in Figure 7 are based on preliminary sewer inverts provide by the SRCSD in August 2001. It is assumed that specific locations of the connection manholes will be conducted with the City and SRCSD as part of final design activities.

PROJECTED FLOWS AND PUMPING CONFIGURATION AFTER THE LNWI

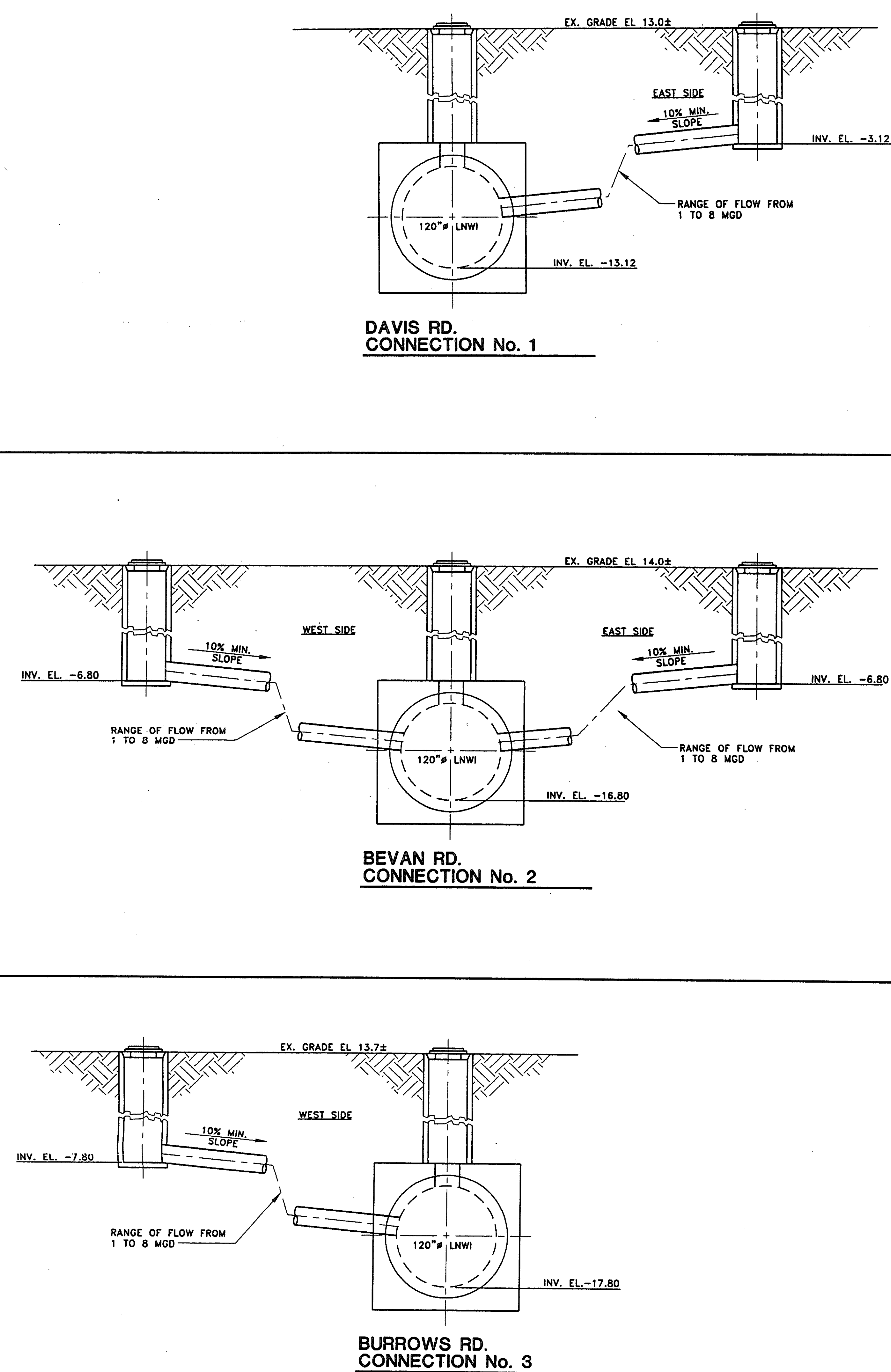
Three pump stations will be required to convey flows into the LNWI. These pump stations are the Southport Pump Station, Bridgeway Island Pump Station, and the Largo Pump Station. A lift station in Area 4 will convey the sewage into a gravity system connected to the LNWI near Davis Road. The projected distribution of flows is shown in Table 3-1.

TABLE 3-1
PROJECTED AVERAGE AND PEAK FLOWS IN SOUTHPORT

	For Pipelines		For Pump Stations	
	ADWF (mgd)	PWWF (mgd)	I/I[c] (mgd)	PHWWF (mgd)
Subbasins Tributary to the Southport Pump Station				
Area 5	0.16	0.47	0.20	0.67
Area 6	0.25	0.74	0.17	0.90
Area 8	0.43	1.30	0.20	1.50
Area 9	0.26	0.79	0.12	0.91
Area 10	0.50	1.50	0.13	1.63
Area 11	0.87	2.54	0.35	2.89
Area 12	0.22	0.68	0.14	0.82
Southport P.S Total	**2.7**	**8.0**[a]	**1.3**	**9.3**
Bridgeway Island Pump Station (Area 7)	1.6	4.5[a]	0.8	5.2
Area 1	0.79	2.29	0.78	3.07
Area 3	0.08	0.25	0.01	0.26
Largo P.S Total	**0.9**	**2.6 a**	**0.8**	**3.4**
Gravity to LNWI				
Area 2	0.6	1.8 a	0.4	2.3
Area 4	0.6	1.7	0.2	1.8
Gravity to LNWI Total	**1.2**	**3.5**	**0.6**	**4.1**
SOUTHPORT PROJECTED TOTAL	**6.4**	**18.6**	**3.5**	**22.0**

[a] The PWWF was calculated by using an appropriate peaking factor (Table 2.3) multiplied by the total ADWF from each sub-basin.
[b] The PHWWF was calculated by adding the PWWF to the I/I.
[c] I/I represents the additional inflow and infiltration expected on a peak hourly basis. It has been estimated by applying 600 gal./acre/day I/I allowance to the tributary areas.

As shown, flows to the Southport Pump Station are projected to be 2.7 mgd on average and as high as 9.3 mgd during peak hourly flow events. The Bridgeway Island Pump Station would pump 1.6 mgd on average and 5.2 mgd during peak hourly flow events. Both these pump stations would pump into a new 24-inch forcemain that connects to the 36-inch City forcemain near Lake Washington Boulevard. The Largo Pump Station serving the southwest portion of Southport would receive 0.9 mgd of average flows and up to 3.4 mgd during peak hourly flow events. The southeast corner of Southport (Area 2) will flow by gravity directly into the LNWI. These flows are projected to be 0.6 mgd (average) and as high as 2.3 mgd (peak hourly). Area 4 will flow by a lift station and by gravity directly into the LNWI at 0.6 mgd (average) and as high as 1.8 mgd (peak hourly).



PIPE INVERTS BASED ON PRELIMINARY PROFILE DATA FROM SRCSD, AUGUST 2001

FIGURE 7 - GENERAL CONFIGURATION OF THE CITY OF WEST SACRAMENTO'S GRAVITY CONNECTIONS TO THE LNWI

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Section 4

Detailed Evaluation of Sewer Basins

SECTION 4

Detailed Evaluation of Sewer Basins

The affect of installing the LNWI on the Southport wastewater collection system was evaluated for the following twelve areas. Figure 4 depicts the overall view of the 12 areas.

4.1 AREA 1: BRIDGEWAY LAKES AND JEFFERSON BOULEVARD

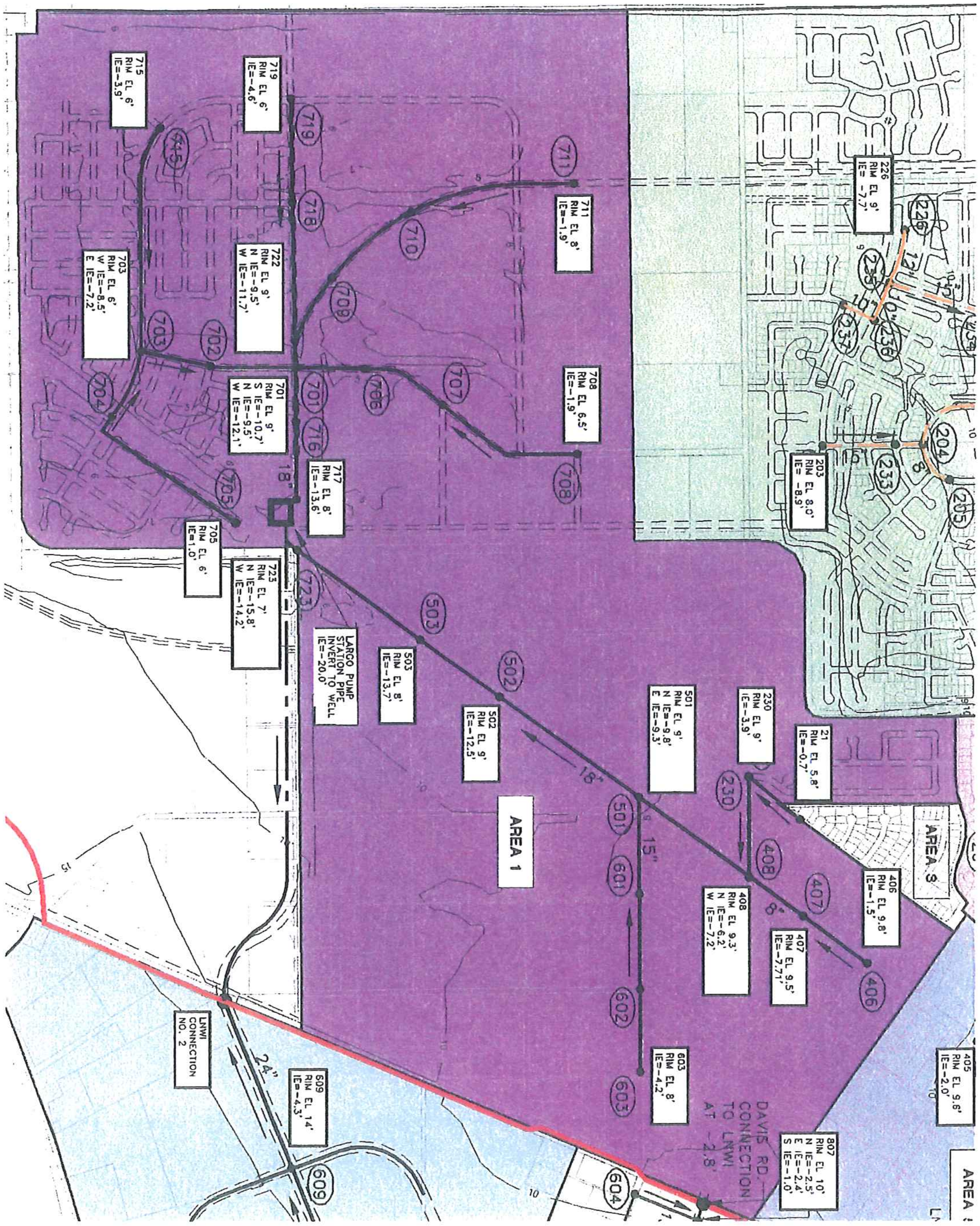
The Bridgeway Lakes subarea is located in the southwest corner of the study area. Figure 8 depicts the Nodes in Area 1. Area 1 is characterized by low elevations and is very flat. Ground elevations range from 5 to 9 feet. The area is planned for a mix of low-, medium- and high-density residential development. A Bridgeway Lakes residential development is planned for the southern end of this area and a preliminary street layout has been submitted. The north end of the system starts south of Marshall Road. Because of the flat ground elevations and the small flows, the sewers very quickly become deep because of the slope of 8-inch-diameter pipes. To limit the depth of new sewers, a new flow pump station (Largo Pump Station) is proposed in the vicinity of Node 723 near Jefferson Boulevard and Bevan Road.

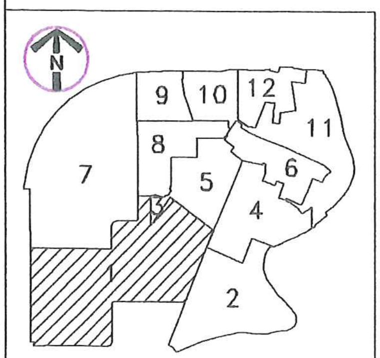
On the basis of the planned land use and the flow criteria presented in this Master Plan, this pump station should be sized for average flows at 0.9 mgd and peak hourly flows up to 3.4 mgd. These estimates are shown in Table 3-1. Flow would be pumped through a force main and discharged into the LNWI at Bevan Road.

The force main will also convey flows from a proposed gravity sewer along Jefferson Boulevard from around Linden Road's southern intersection with Jefferson Boulevard near node 406 south to the intersection of Bevan Road with Jefferson Boulevard. The planned development along this portion of Jefferson Boulevard is rural residential and rural estates (no flow). The ground elevation along this entire reach is about 10 feet.

4.2 AREA 2: DAVIS ROAD

Area 2 is located in the Southeast corner of the study area. Figure 9 depicts the Nodes in Area 2. More variance in ground elevation occurs in the Davis Road service area than in other areas. The ground elevations range from 15 to 9 feet. Planned land use includes a mixture of rural and low-, medium-, and high-density residential development. The area serves from Nodes 614 to 609 following the 15-foot contour line to maximize the amount of wastewater served by gravity. Specific development patterns have not been established. Sewage from this area would be conveyed in a gravity pipeline southwesterly along a proposed unnamed road to the LNWI Bevan connection point.





KEY MAP

LEGEND

- EXISTING FORCE MAIN
- EXISTING GRAVITY SEWER
- PROPOSED FORCE MAIN
- PROPOSED GRAVITY SEWER
- DIRECTION OF FLOW

FIGURE 8

AREAS 1 AND 3

SCALE: 1"=1600'

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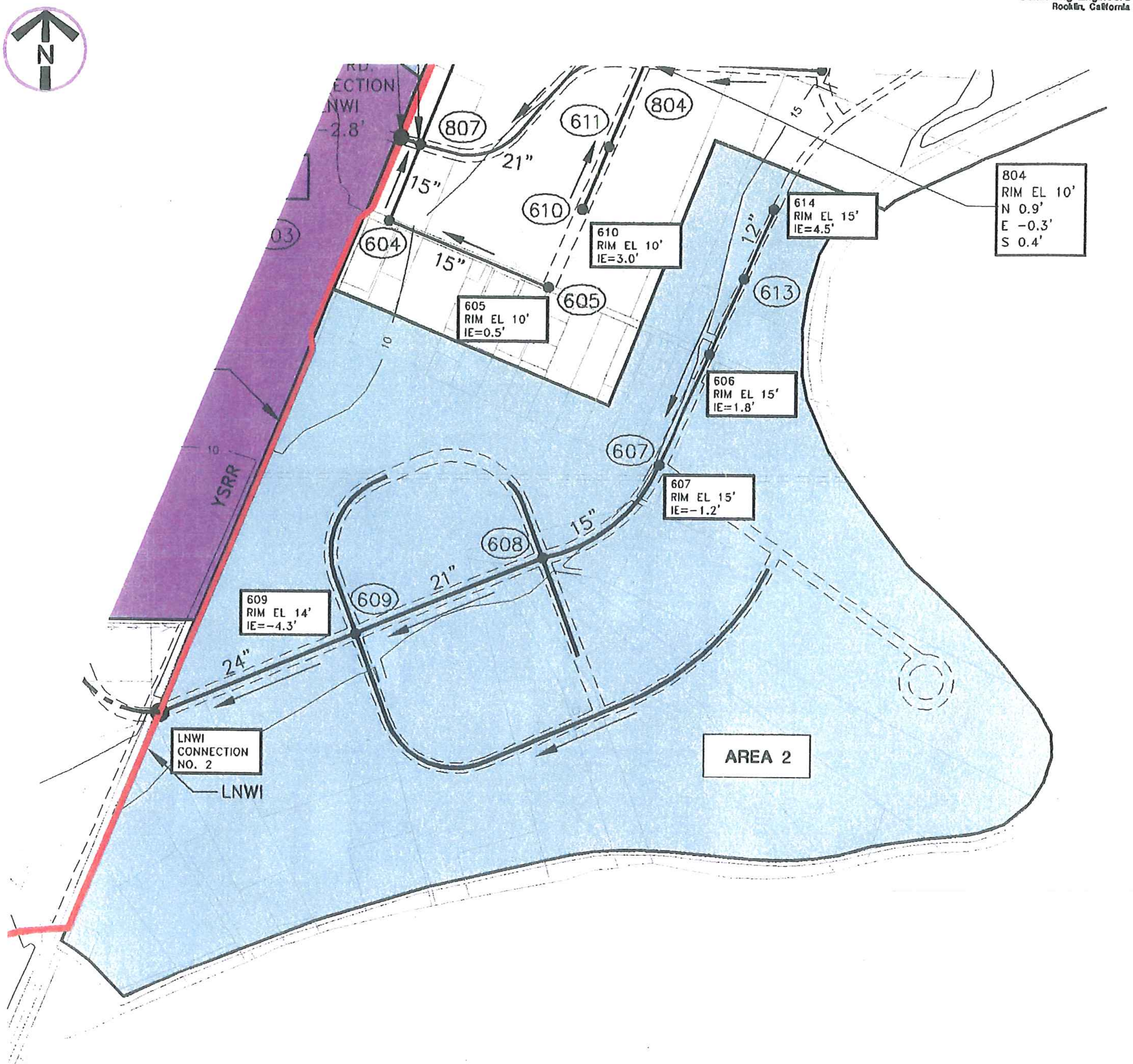
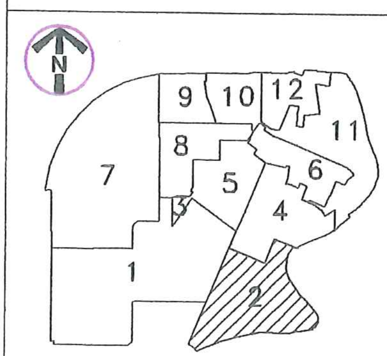
Rocklin, California





KEY MAP

LEGEND

EXISTING FORCE MAIN
EXISTING GRAVITY SEWER
PROPOSED FORCE MAIN
PROPOSED GRAVITY SEWER
DIRECTION OF FLOW

FIGURE 9

AREA 2
SCALE: 1"=1200'

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4.3 AREA 3: RIVERMONT

The Rivermont service area includes mostly rural residential but also includes some low-density residential development. Figure 8 depicts the Nodes in Area 3. The existing Allen Avenue pump station will be eliminated by intercepting the flow from Node 21 at Node 230. The wastewater will be conveyed to a new sewer alongside Jefferson Boulevard in Area 1. This will avoid the crossing of a major storm drainage channel. The proposed sewer in Jefferson Boulevard is deep enough to serve this area by gravity. The invert elevation at Node 230 (Elevation-3.91 or 12.9 feet deep) was set to allow the diversion of flow from Allen Avenue to provide for the flexibility of routing flows in the area at some future time.

4.4 AREA 4: AREA SOUTH OF LINDEN ROAD AND EAST OF JEFFERSON BOULEVARD

The southern section of Area 4 can flow by gravity because of the slight elevation differences from east to west. Elevations vary from 15.5 to 8.4 feet. The northern area would be pumped by a lift station into the gravity system. Planned land uses include a combination of rural residential, mixed use, and low- to high-density residential. The general distribution of Area 4 flows that would have to be pumped and flows that can be conveyed by gravity are provided in Table 4-1.

TABLE 4-1
AREA 4 FLOWS

	Gravity Flow (mgd)	Pump Station Flow (mgd)	Total Flow (mgd)
ADWF	0.2116	0.3393	0.5509
PWWF	0.6348	1.0178	1.6527
PHWWF	0.7284	1.1541	1.8159

Figure 10 depicts the Nodes in Area 4. A new sewer will collect wastewater from Node 604, which has been moved to the eastern side of the LNWI and convey flow to Node 807. Node 807 also combines flow from the east (Node 804) and the north (Node 808). Flow from Node 807 was routed to the LNWI Connection No. 1.

4.5 AREA 5: JEFFERSON BOULEVARD FROM LINDEN (SOUTH TO SOUTHPORT PUMP STATION

This area receives flow from the southern Linden Ave. intersection with Jefferson Boulevard near Node 405 to the northern intersection of Linden Ave. with Jefferson Boulevard near Node 402. Figure 11 depicts the Nodes in Area 5. Future land uses include rural residential and low-density residential. The pipe alignment conveys flow north in a proposed interceptor along Jefferson Boulevard to the Southport Pump Station.

4.6 AREA 6: NEWPORT ESTATES, VILLAGE 1 AND LINDEN ROAD

Ground elevations in this area range from 17 to 9. Figure 12 depicts the Nodes in Area 6. New development within this area is expected from rural residential and low- and medium-density residential. There is an existing sewer line from modes 307 to 301. The existing sewer from Nodes

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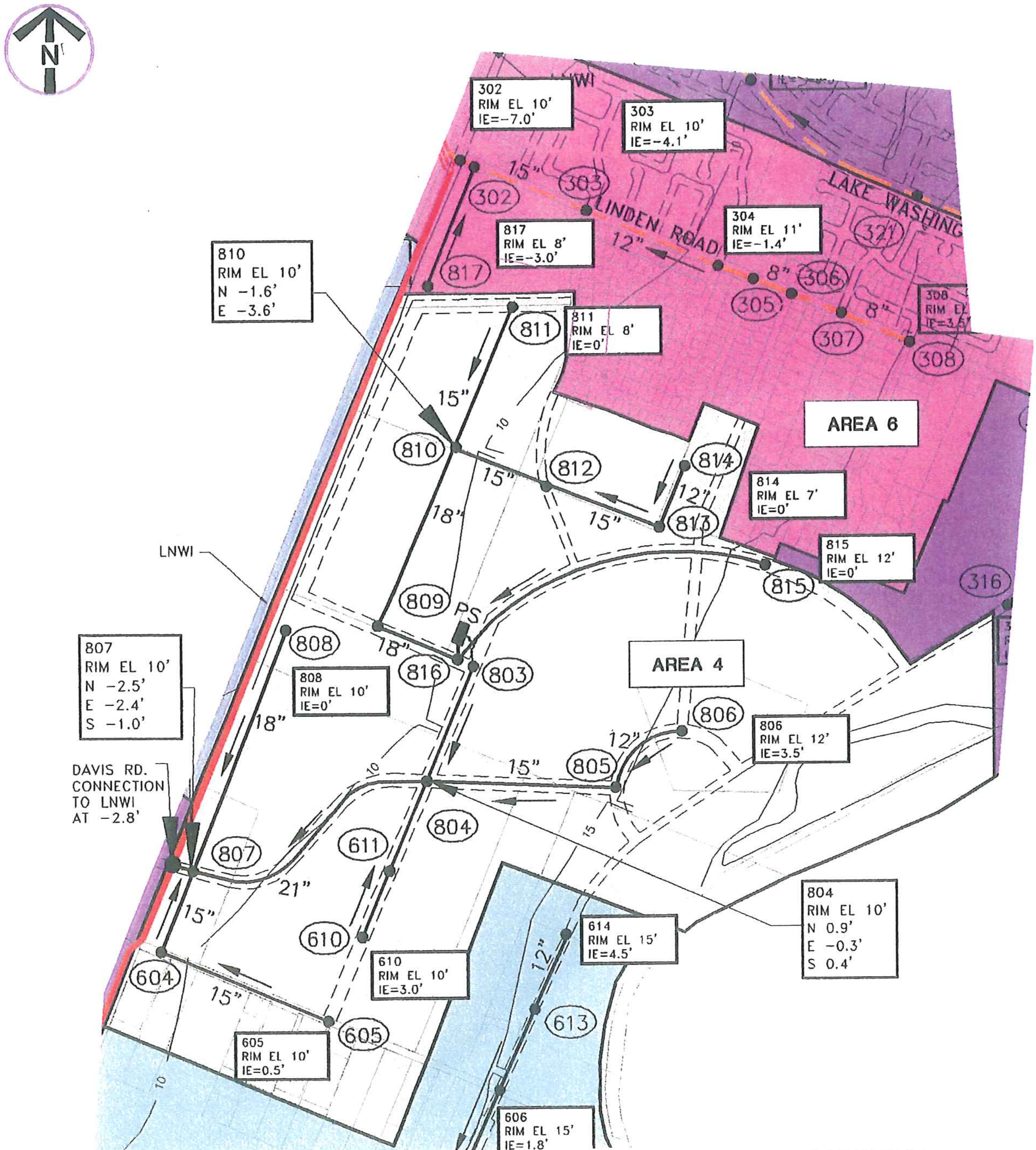
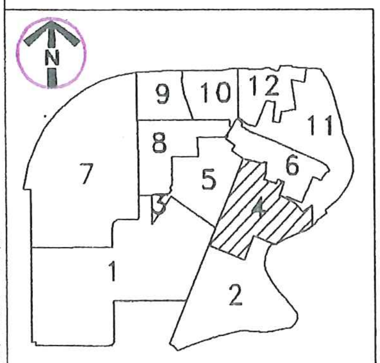


LEGEND

EXISTING FORCE MAIN
EXISTING GRAVITY SEWER
PROPOSED FORCE MAIN
PROPOSED GRAVITY SEWER
DIRECTION OF FLOW



KEY MAP

FIGURE 10

AREA 4
SCALE: 1"=1200'

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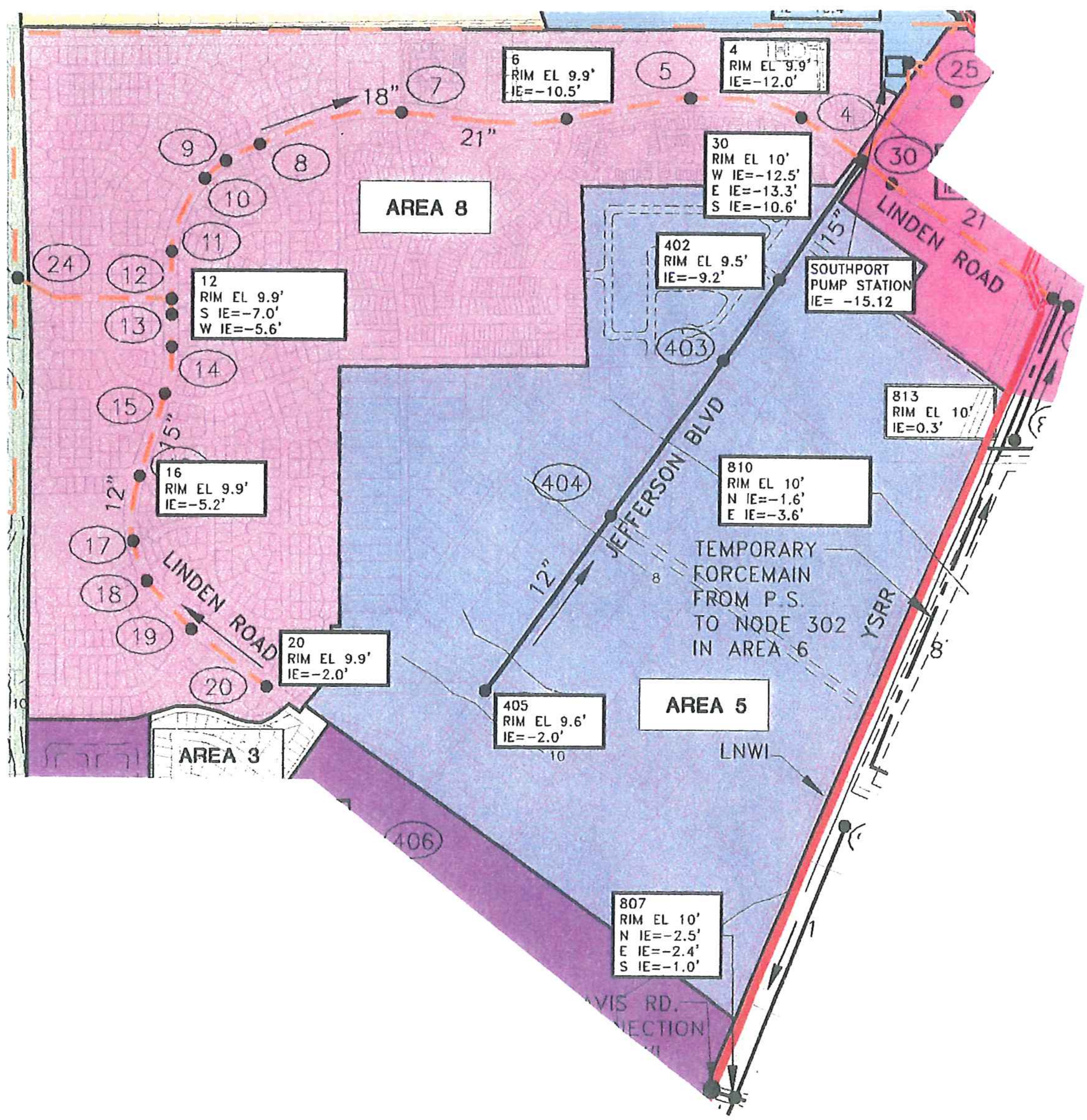
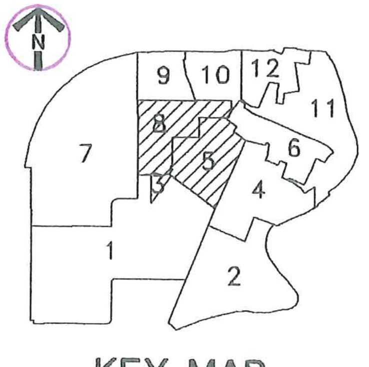


LEGEND

EXISTING FORCE MAIN
EXISTING GRAVITY SEWER
PROPOSED FORCE MAIN
PROPOSED GRAVITY SEWER
DIRECTION OF FLOW



KEY MAP

FIGURE 11

AREAS 5 AND 8

SCALE: 1"=1200'

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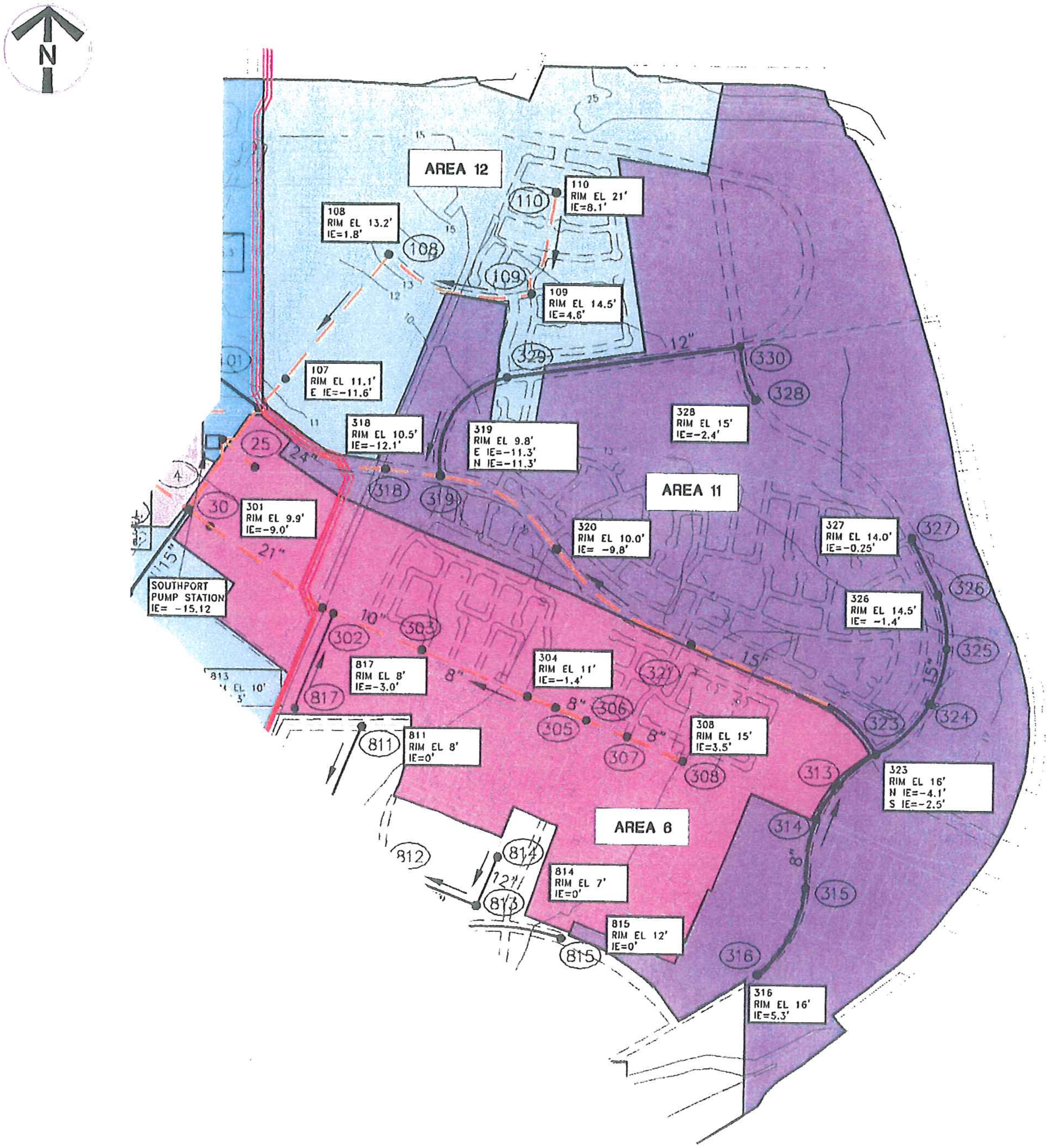
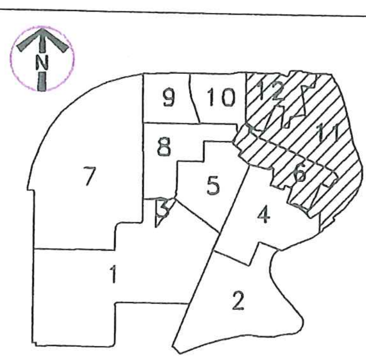


LEGEND

- EXISTING FORCE MAIN
- EXISTING GRAVITY SEWER
- PROPOSED FORCE MAIN
- PROPOSED GRAVITY SEWER
- DIRECTION OF FLOW



KEY MAP

FIGURE 12

AREAS 6, 11 AND 12

SCALE: 1"=1500'

307 to 301 has two segments with less than minimum slope: Nodes 306 to 305, and Nodes 305 to 304. Also, the new d/D criteria are not met in four of the manhole-to-manhole segments from Nodes 303 to 302, Nodes 303 to 304, Nodes 305 to 306, and Nodes 306 to 307. In the future, flow monitoring should be conducted to confirm sufficient capacity exists within this sewer.

4.7 AREA 7: BRIDGEWAY ISLAND AND SIP

The northerly portion of this service area, including the SIP, is planned for commercial and industrial use. The middle portion, which is the Bridgeway Island Subdivision, is planned for low- to medium-density residential, and the southern portion is planned for RE land uses. Sanitary service is not included for RE land use. Figure 13 depicts the Nodes in Area 7. Flow is routed south from the SIP and north from Bridgeway Island to a new 4.5-mgd PDWF pump station (Bridgeway Island Pump Station) at Rembrandt Street. Two 12-inch-diameter force mains connects to Node 1 near the Southport Pump Station.

Some of the existing sewers between Nodes 217 and 212 do not meet the criteria for d/D ratio of 0.5. Because they have already been installed, they should not be replaced on the basis of the d/D criteria unless flow monitoring indicates flow capacity problems. The following sewers should be monitored for surcharging problems:

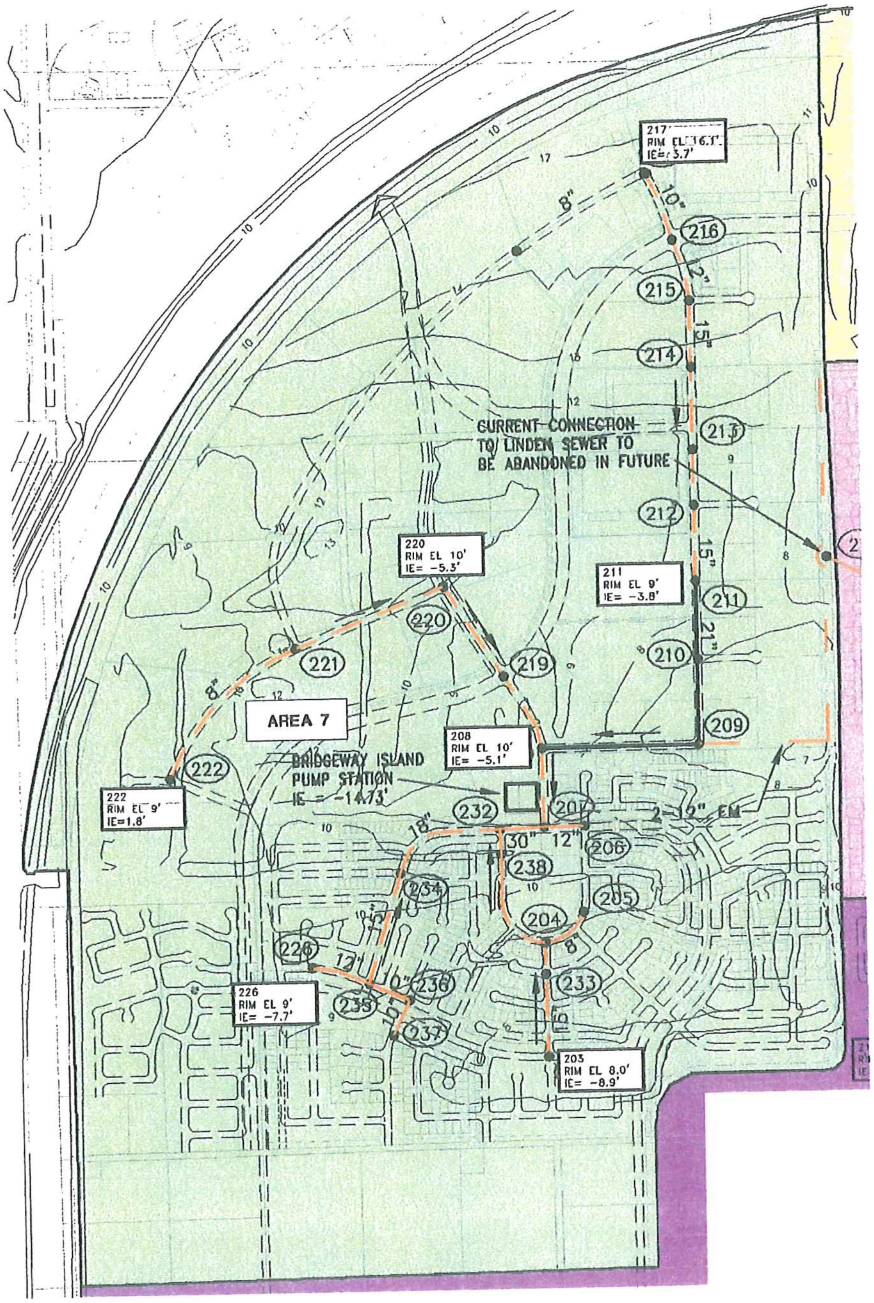
Upstream Node	Downstream Node	Existing Diameter (inches)	Diameter (inches) using d/D = 0.5 criteria
217	216	10	12
216	215	10	15
214	213	15	18
213	212	15	18

The existing sewer ranges from 8 to 15 inches in diameter, but the existing slopes are less than the minimum recommended slopes for the following segments:

Upstream Node	Downstream Node	Diameter	Existing Slope	Minimum Recommended Slope
216	215	12	0.002	0.0022
213	212	15	0.0008	0.0015

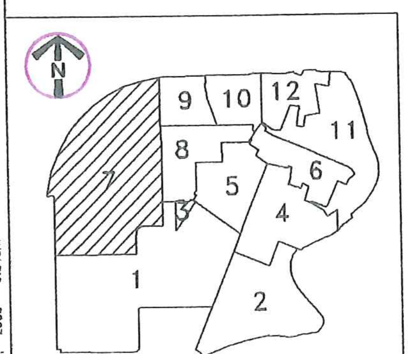
4.8 AREA 8: LINDEN ROAD

This area includes existing sewers from Node 20 to Node 2 along Linden Road, combined with flow from Area 6 at Node 30, which contribute flow to the Southport Pump Station. Figure 11 depicts the Nodes in Area 8. The existing sewer along Linden Road ranges from 8 to 21 inches in diameter, but the existing slopes are less than the minimum recommended slopes for the following segments:



LEGEND

- EXISTING FORCE MAIN
- EXISTING GRAVITY SEWER
- PROPOSED FORCE MAIN
- PROPOSED GRAVITY SEWER
- DIRECTION OF FLOW



KEY MAP

FIGURE 13

AREA 7

SCALE: 1"=1600'

Upstream Node	Downstream Node	Diameter	Existing Slope	Minimum Recommended Slope
20	19	12	0.002	0.0022
19	18	12	0.002	0.0022
18	17	12	0.0021	0.0022
16	15	15	0.0012	0.0015
15	14	15	0.0012	0.0015
14	13	15	0.0012	0.0015
13	12	15	0.0012	0.0015
12	11	15	0.0009	0.0015
11	10	15	0.0009	0.0015
10	9	15	0.0012	0.0015
9	8	15	0.0012	0.0015
8	7	15	0.0012	0.0015

Because the slopes of these existing sewers are below the recognized minimum slopes required, they should be routinely cleaned to maintain self-cleaning velocities to avoid odor and septic problems.

4.9 AREA 9: YOLO PORT DISTRICT (WEST)

The Yolo Port District is planned for industrial use. Figure 14 depicts the Nodes in Area 9. A proposed gravity sewer will collect flow along Southport parkway, which will contribute flow to Southport Pump Station. The area contributing flow to Node 105 in the northwest section of Area 9 can be served for a distance of only 2,000 feet. Areas beyond the 2,000-foot limitation in the most northerly end of the service area would need to be served by individual private lift stations.

4.10 AREA 10: YOLO PORT DISTRICT (EAST)

The Yolo Port District contributes flow to the Southport Pump Station. Figure 14 depicts the Nodes in Area 10. Development in this area is expected from commercial use in the port area and a mixture of commercial and residential in the eastern portion of the area. Flow from this area can be accommodated by gravity to the Southport Pump Station connecting at Node 1.

These sewers have been configured based on USGS maps of the area. If detailed topographic surveying of the area indicates higher-grade elevations, these sewers may be reconfigured. It may also be possible to connect new development between the Barge Canal and Newport Estates into this sewer. This may be desired depending on the timing of the development along Southport Parkway.

4.11 AREA 11: NEWPORT ESTATES, VILLAGE 2

The Newport Estates area is located in the northeast corner of the study area. Figure 12 depicts the Nodes in Area 11. Ground elevations range from 15 to 11. Planned development in this area is low, medium, and high density residential and rural residential.

The sewers along Lake Washington Boulevard prior to the Master Plan finalization were designed using a d/D criteria of 0.7 for PDWF rather than 0.5 used elsewhere as described in the following.

Upstream Node	Downstream Node	Existing Diameter (inches)	Diameter (inches) using d/D = 0.5 criteria
323	321	15	21
321	320	15	24
320	319	18	24
319	318	21	27

As development occurs, flow monitoring is suggested to determine if the existing pipes contain sufficient capacity.

4.12 AREA 12: SOUTHPORT GATEWAY AND ARLINGTON OAKS

Southport gateway is located along Gateway Boulevard in the northeast corner of the study area. Arlington Oaks is an existing housing area located along the western side of Jefferson Boulevard. Figure 12 depicts the Nodes in Area 12. The new development on the east side of Jefferson is currently served by a temporary pump station near Node 108, and pumps into the force main connected to the existing WWTP. A pipeline is currently under construction that would direct flow from Southport Gateway to the Southport Pump Station wet well, which would remove the need for the temporary pump station. Arlington Oaks is currently served by septic tanks, and will eventually be connected to a sewer system that would join in at Node 107.

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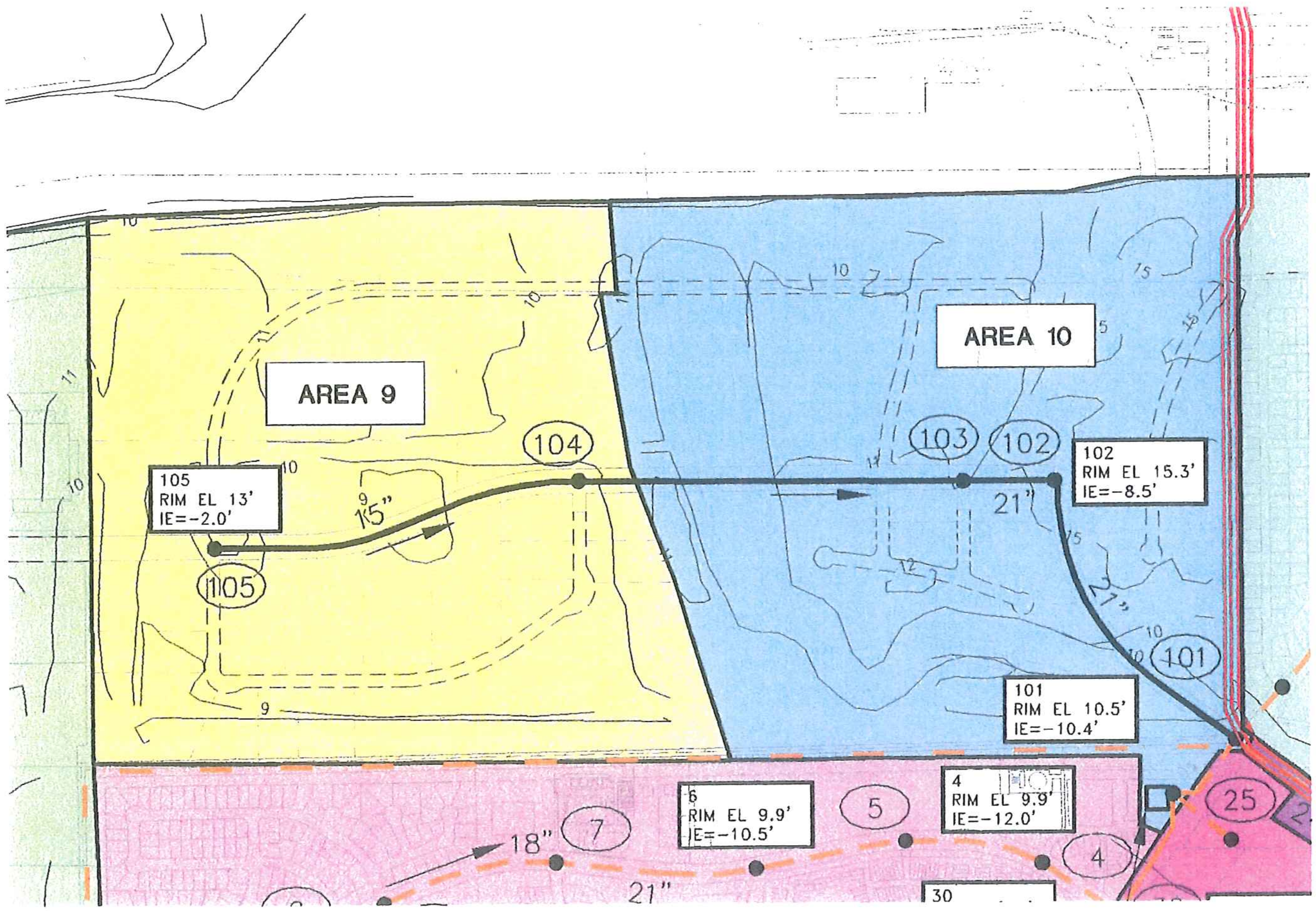
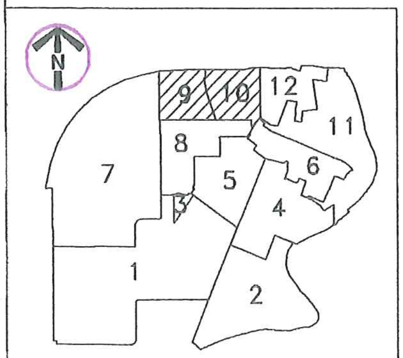


LEGEND

EXISTING FORCE MAIN
EXISTING GRAVITY SEWER
PROPOSED FORCE MAIN
PROPOSED GRAVITY SEWER
DIRECTION OF FLOW



KEY MAP

FIGURE 14

AREAS 9 AND 10

SCALE: 1"=1000'

Section 5

Interim Service Plan

SECTION 5

Interim Service Plan

Until the LNWI is constructed, the existing Southport Pump Station will be used to convey all wastewater in Southport to the City's existing WWTP. In general, areas in the northern portion of Southport (intended to go to the Southport or Bridgeway Island Pump Station) will be unchanged before and after the LNWI connection. The Southport Pump Station will be used to convey flows to the existing WWTP. Southern areas will require an interim service plan to convey flows north to the Southport Pump Station. In the Southern areas, the gravity sewers should be constructed as per Master Plan recommendations. Depending on the rate and location of development, temporary pump stations and force mains could be used to pump flows to the Southport Pump Station. Interim measures will require City review on a case-by-case basis to confirm sufficient capacity within downstream existing sewers. The following are the interim service plans recommended for each area in Southport.

5.1 AREA 1: BRIDGEWAY LAKES AND JEFFERSON BOULEVARD

Wastewater will be collected from Area 1 by gravity pipelines as recommended in the Master Plan. The wastewater will be pumped from the Largo Pump Station through a temporary force main to the two 12-inch Bridgeway Island forcemains.

5.2 AREA 2: DAVIS ROAD

Assuming the city continues to grow contiguously no interim plan is needed for this area.

5.3 AREA 3: RIVERMONT

An existing subdivision along Allen Avenue is already served by sewers. Sewers in this subdivision convey flow to a pump station located at the south end of Allen Avenue. Sewage will continue to be pumped from the pump station to the existing sewer along Linden road, by connecting at Node 20.

5.4 AREA 4: AREA SOUTH OF LINDEN ROAD AND EAST OF JEFFERSON BOULEVARD

Wastewater will be collected from Area 4 by gravity pipelines as recommended in the Master Plan. Sewage from the Parlin Pump Station will be conveyed through a temporary forcemain to Node 302 in Area 6.

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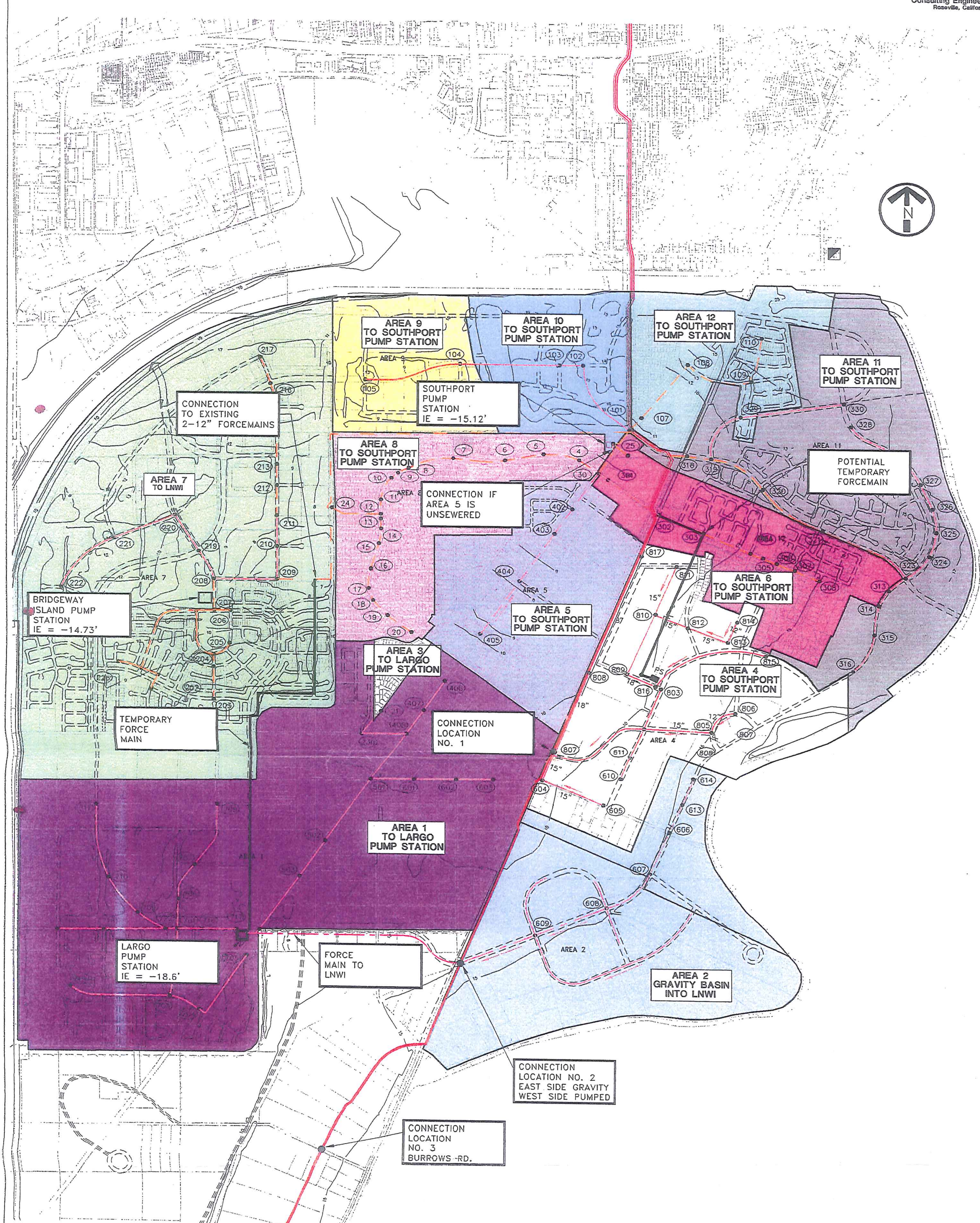


LEGEND

- EXISTING FORCE MAIN
- EXISTING GRAVITY SEWER
- PROPOSED FORCE MAIN
- PROPOSED GRAVITY SEWER

FIGURE 15

INTERIM SERVICE PLAN

5.5 AREA 5: JEFFERSON BOULEVARD FROM LINDEN (SOUTH) TO SOUTHPORT PUMP STATION

No interim service plan is needed for this area. Wastewater will flow to the Southport Pump Station and be conveyed to the existing City WWTP through an existing force main.

5.6 AREA 6: NEWPORT ESTATES, VILLAGE 1 AND LINDEN ROAD

No interim service plan is needed for this area. Wastewater will flow to the Southport Pump Station and be conveyed to the existing City WWTP through an existing force main.

5.7 AREA 7: BRIDGEWAY ISLAND AND SIP

Currently, two 12-inch-diameter force mains from Bridgeway Island Pump Station connect to Node 1 near the Southport Pump Station. Wastewater will be pumped through the Bridgeway Island pump station to the existing City WWTP through an existing force main. If Areas 1, 2, 4, 5, 6, 9, 10, and 11 all develop prior to the LNWI, Node 1 will become a bottleneck and the flow layout at Southport Pump Station will need to be modified. Specific changes to how the Southport Pump Station would be modified for the interim plan would need to be developed at a later date.

5.8 AREA 8: LINDEN ROAD

No interim service plan needed for this area. Wastewater will flow to the Southport Pump Station and be conveyed to the existing City WWTP through an existing force main.

5.9 AREA 9: YOLO PORT DISTRICT (WEST)

No interim service plan needed for this area. Wastewater will flow to the Southport Pump Station and be conveyed to the existing City WWTP through an existing force main.

5.10 AREA 10: YOLO PORT DISTRICT (EAST)

No interim service plan is needed for this area. Wastewater will flow to the Southport Pump Station and be conveyed to the existing City WWTP through an existing force main.

5.11 AREA 11: NEWPORT ESTATES, VILLAGE 2

No interim service plan is needed for this area. Wastewater will flow to the Southport Pump Station and be conveyed to the existing City WWTP through an existing force main.

5.12 AREA 12: SOUTHPORT GATEWAY AND ARLINGTON OAKS

No interim service plan is needed for this area. Wastewater will flow to the Southport Pump Station and be conveyed to the existing City WWTP through an existing force main.

Section 6

Preliminary Construction Cost Opinions

SECTION 6

Preliminary Construction Cost Opinions

The level of estimate used for these opinions is an "order-of-magnitude" estimate as defined by the American Association of Cost Engineers. For this type of cost estimate, estimated costs can be expected to range from 50 percent (+50 percent) more than, to 30 percent (-30%) less than, the actual construction costs.

Construction costs provided in this Master Plan represent costs to extend the existing system to meet future development as shown in the Master Plan. Only the costs to construct main, trunk, and interceptor sewers are included. Lateral sewers and service connections from the sewer in the street or public easements are not included. Engineering, construction management, legal, rights-of-way acquisition, and contractor's contingencies are not included. These contingencies add about 25 to 30 percent to the costs.

6.1 PIPELINE CONSTRUCTION COSTS

Pipeline material and unit costs of installation were developed for excavation, trench spoil removal, material costs (PVC and reinforced concrete as described in the criteria section), lined manholes, compaction, earthwork, dewatering, shoring, installation, and paving.

Costs for backfill were estimated according to select onsite material. Pipeline construction costs will be higher if onsite material is not suitable for pipe zone or backfill. Costs for hauling spoils and importing suitable material are not included in the costs. Select backfill requirements would vary depending on the material selected. Generally, the most stringent requirement is included in construction documents where flexible and rigid pipe materials are allowed for the same project.

In some areas, such as state highways, native material may not be allowed for backfill material. In areas where the select onsite material is not appropriate for backfill, imported backfill will be required. Bedding and pipe zone material should be imported crushed rock. This material is necessary to properly support pipe in a trench. Where the bottom of the trench is soft, spongy, or otherwise unsuitable, the trench should be overexcavated and foundation stabilization material installed. This material is typically 3-inch minus river rock or crushed rock. No allowance for foundation material is included in the estimate as these are unknown quantities and may not be needed. Geotechnical investigations conducted during design of the projects usually determine the need for foundation materials.

Backfill material above the pipe zone should consist of maximum particle sizes of 3 inches, free of roots, organics, debris, or other deleterious material, with 90 percent compaction. State highway standards may require 95 percent compaction.

Surface restoration or improvements used were based on previous City projects for the paving of City roads.

The pipeline costs also include the cost for lined manholes. A $5,000 manhole was assumed every 300 feet at an approximate cost of $15 per foot of pipe.

Detailed tables summarizing these costs are included in Appendix C. A summary of the basis of these costs is also provided in Appendix C. Table C-17 provides a summary of the total unit cost by depth and diameter.

A listing of the total installed cost for each pipe segment is provided in Appendix C, Table C-1. The total estimated cost for pipeline construction is approximately $11.5 million. These costs do not include smaller service laterals within specific developments.

6.2 PUMP STATION COSTS

A new pump station, the Largo Pump Station, will be required to serve Area 2. The pump station cost was estimated to be $1,800,000 in the Largo Wastewater Pump Station Engineer's Opinion of Probable Construction (February 2003). The cost of the force main is included in the pipeline cost estimate. The expanded Largo Pump Station for buildout is expected to cost $2,000,000.

A new pump station will also be required to serve Area 4. The pump station costs were based on actual construction costs of the existing Bridgeway Island, Southport, Jefferson, Northport and Industrial pump stations adjusted to 2003 costs. The cost of forcemain is not included because it is temporary until the LNWI is built. An estimated cost breakdown for the pump station is provided in Table 6-1. Similar to other City pump station construction projects, this project could be constructed in phases.

TABLE 6-1
ESTIMATED PUMP STATION CONSTRUCTION COST FOR THE PARLIN PUMP STATION

Item	Estimated Construction Cost[a]
Factory Built Package Pumping Station	550,000
Excavation and Backfilling	116,000
Shoring and Sheeting	273,000
Wet Well Pipe	87,000
Wet Well and Pump Station Foundation	15,000
Dewatering	44,000
Site Work	212,000
Site Piping	94,000
Surge Control	4,000
Odor Control	54,000
Electrical Building	78,000
Electrical and Instrumentation	167,000
Instrumentation	52,000
Emergency Generator	125,000
Total	**1,900,000**

[a] Based on a projected PHWWF at 1.2 mgd

Appendix A

Land Use

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
1	NW		0		0		0		0		0		0	0	0	-	0.0000	0.0000
2	NW		0		0		0		0		0		0	0	0	-	0.0000	0.0000
3	NW		0		0		0		0		123		0	0	0	27,675	0.0277	0.0429
4	NW		0		0		0		0		52		0	0	0	11,700	0.0117	0.0181
5	NW		0		0		0		0		71		0	0	0	15,975	0.0160	0.0248
6	NW		0		0		0		173		391		0	0	0	131,225	0.1312	0.2030
7	NW		0		0		0		107		0		0	0	0	26,750	0.0268	0.0415
8	NW		0		0		170		0		30		0	0	0	57,750	0.0578	0.0894
9	NW		0		0		43		0		0		0	0	0	12,900	0.0129	0.0200
10	NW		0		0		58		0		0		0	0	0	17,400	0.0174	0.0269
11	NW		0		0		23		0		0		0	0	0	6,900	0.0069	0.0107
12	NW		0		0		10		0		0		0	0	0	3,000	0.0030	0.0046
13	NW		0		0		50		0		0		0	0	0	15,000	0.0150	0.0232
14	NW		0		0		22		0		0		0	0	0	6,600	0.0066	0.0102
15	NW		0		0		87		0		0		0	0	0	26,100	0.0261	0.0404
16	NW		0		0		63		0		0		0	0	0	18,900	0.0189	0.0292
17	NW		0		0		12		0		0		0	0	0	3,600	0.0036	0.0056
18	NW		0		0		47		0		0		0	0	0	14,100	0.0141	0.0218
19	NW		0		0		66		0		0		0	0	0	19,800	0.0198	0.0306
20	NW		0		0		43		0		0		0	0	0	12,900	0.0129	0.0200
21	NW		0		14		267		0		0		0	0	0	84,300	0.0843	0.1304
24	NW		0		0		13		0		0		0	0	0	3,900	0.0039	0.0060
25	NE		0		0		0		0		0		0	5	0	7,500	0.0075	0.0116
1-25																**523,975**	**0.5241**	**0.8108**

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
101	NW		0		0		0		0		0		0	4.1	0	6,150	0.0062	0.0096
102	NW		0		0		0		0		0		0	24.5	0	36,750	0.0368	0.0569
103	NW		0		0		0		0		0		0	26.5	80.5	200,750	0.2008	0.3106
104	NW		0		0		0		0		0		0	14.8	18.5	59,200	0.0592	0.0916
105	NW		0		0		0		0		0		0	33.8	77.5	205,700	0.2057	0.3182
106	NW		0		0		0		0		0		0	0	0	-	0.0000	0.0000
107	NE		0		0		153		0		0	18.7	79	0	0	63,675	0.0637	0.0985
108	NE		0		0	0.8	72		0		0	30.7	129	0	0	50,625	0.0506	0.0783
109	NE		0		0		172		27		0		0	0	0	58,350	0.0584	0.0903
110	NE		0		0		0		134		0		0	15.2	0	56,300	0.0563	0.0871
101-110																**737,500**	**0.7377**	**1.1412**
201	NW		0		0		129		0		0		0	0	0	38,700	0.0387	0.0599
201	SW	16.1	0		0		0		0		0		0	0	0	-	0.0000	0.0000
201	TOT															-	0.0387	0.0599
202	NW		0		0		36		111		0		0	0	0	38,550	0.0386	0.0597
203	NW		0		0		74		0		0		0	0	0	22,200	0.0222	0.0343
204	NW		0		0		22		100		0		0	0	0	31,600	0.0316	0.0489
205	NW		0		0		241		75		0		0	0	0	91,050	0.0911	0.1409
206	NW		0		0		0		218		0		0	0	0	54,500	0.0545	0.0843
207	NW		0		0		0		0		0		0	1	0	1,500	0.0015	0.0023
208	NW		0		0		0		0		0		0	8	0	12,000	0.0120	0.0186
209	NW		0		0		0		0		0		0	10.9	0	16,350	0.0164	0.0254
210	NW		0		0		0		0		0		0	40.6	0	60,900	0.0609	0.0942
211	NW		0		0		0		0		0		0	23.3	0	34,950	0.0350	0.0541
212	NW		0		0		0		0		0		0	42.1	0	63,150	0.0632	0.0978
213	NW		0		0		0		0		0		0	21	0	31,500	0.0315	0.0487
214	NW		0		0		0		0		0		0	13.1	0	19,650	0.0197	0.0305
215	NW		0		0		0		0		0		0	28.2	0	42,300	0.0423	0.0654

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
216	NW		0		0		0		0		0		0	0	17.6	35,200	0.0352	0.0545
217	NW		0		0		0		0		0		0	0	39.3	78,600	0.0786	0.1216
218	NW		0		0		0		0		0		0	0	50.2	100,400	0.1004	0.1553
219	NW		0		0		0		0		0		0	12.2	0	18,300	0.0183	0.0283
220	NW		0		0		0		0		0		0	0	51	102,000	0.1020	0.1578
221	NW		0		0		0		0	28.7	516		0	0	150.4	416,900	0.4169	0.6449
222	NW		0		0		0		0		0		0	0	36.3	72,600	0.0726	0.1123
223	SW	12.8	0		0		0		0		0		0	0	0	-	0.0000	0.0000
224	NW		0		0		36		0		0		0	0	0	10,800	0.0108	0.0167
224	SW	13	0		0		0		0		0		0	0	0	-	0.0000	0.0000
224	TOT															10,800	0.0108	0.0167
225	NW		0		0	9.4	254		0		0		0	0	0	76,200	0.0762	0.1179
225	SW	27.9	0		0		0		0		0		0	0	0	-	0.0000	0.0000
225	TOT															76,200	0.0762	0.1179
226	NW		0		0		111		208		0		0	0	0	85,300	0.0853	0.1320
227	NW	6.7	0		0		8.5		0		0		0	0	0	2,550	0.0026	0.0040
227	SW	11.8	0		0		0		0		0		0	0	0	-	0.0000	0.0000
227	TOT															2,550	0.0026	0.0040
228	SW	12.4	0		0		0		0		0		0	0	0	5,100	0.0051	0.0079
229	NW		0		0		98		0		0		0	0	0	29,400	0.0294	0.0455
229	SW	20.1	0		0		0		0		0		0	0	0	-	0.0000	0.0000
229	TOT															29,400	0.0294	0.0455
230	NW	9.8	0		0		132		0		0		0	0	0	39,600	0.0396	0.0613
230	SW	35.5	0	10.4	9		0		0		0		0	0	0	2,700	0.0027	0.0042
230	TOT															42,300	0.0423	0.0654
231	SW		0		0		8.5		0		0		0	0	0	2,550	0.0026	0.0040
201-231																**1,637,100**	**1.6375**	**2.5332**

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
301	NE		0		0		0	12.9	90		0		0	23.4	0	57,600	0.0576	0.0891
302	NE		0		0		0	5.6	39		0		0	0	0	9,750	0.0098	0.0152
303	NE		0		0		41		101		0		0	0	0	37,550	0.0376	0.0582
304	NE		0		0		27		61		0		0	0	0	23,350	0.0234	0.0362
305	NE		0		0		32		0		0		0	0	0	9,600	0.0096	0.0149
306	NE		0	11.7	9		166		51		0		0	0	0	65,250	0.0653	0.1010
307	NE		0		0		74		54		0		0	0	0	35,700	0.0357	0.0552
308	NE		0	9.4	8		22		28		0		0	0	0	16,000	0.0160	0.0248
313	NE		0		0	17.5	70		0		0	2.7	12	0	0	23,700	0.0237	0.0367
314	NE		0	20	16		0		0		0		0	0	0	4,800	0.0048	0.0074
315	NE		0	21.3	17		0		0		0		0	0	0	5,100	0.0051	0.0079
316	NE		0	25.6	21	12.75	51		0		0		0	4.1	0	27,750	0.0278	0.0430
317	NE		0		0		0		0		0		0	0	0	-	0.0000	0.0000
318	NE		0		0		0		0	2.7	49		0	0	0	11,025	0.0110	0.0170
319	NE		0		0		0		0	2.8	51		0	0	0	11,475	0.0115	0.0178
320	NE		0		0		91		0		0		0	0	0	27,300	0.0273	0.0422
321	NE		0		0		385		0		0		0	0	0	115,500	0.1155	0.1787
322	NE		0		0		350		33		0		0	0	0	113,250	0.1133	0.1753
323	NE		0		0	7.7	45		171		0	15	63	41	0	131,925	0.1319	0.2040
324	NE		0		0		0		0		0	15	63	0	0	14,175	0.0142	0.0220
325	NE		0		0		0	4.7	33		0		0	0	0	8,250	0.0083	0.0128
326	NE		0		0		0	6.9	49		0		0	0	0	12,250	0.0123	0.0190
327	NE		0		0		46	5.2	37		0		0	0	0	23,050	0.0231	0.0357
328	NE		0		0		83	23	161	22.2	400		0	0	0	155,150	0.1552	0.2401
329	NE		0		0		0	26.4	185		0		0	0	0	46,250	0.0463	0.0716
330	NE		0		0		0	12.8	90	14.8	266		0	42	0	145,350	0.1454	0.2249
301-330																**1,131,100**	**1.1317**	**1.7507**

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
401	NE		0		0		0		0		0		0	0	0	-	0.0000	0.0000
401	NW		0		0		0		0		0		0	0	0	-	0.0000	0.0000
401	TOT															-	0.0000	0.0000
402	NE		0		0	30.7	123	6.4	45		0		0	0	0	48,150	0.0482	0.0746
402	NW		0		0		0		55		0		0	0	0	13,750	0.0138	0.0213
402	TOT															61,900	0.0620	0.0959
403	NE		0	28	23		0		0		0		0	0	0	6,900	0.0069	0.0107
403	NW		0	35.8	42		0		38		0		0	8.8	0	35,300	0.0353	0.0546
403	TOT															42,200	0.0422	0.0653
404	NE		0	54	44		0		0		0		0	0	0	13,200	0.0132	0.0204
404	NW		0	9.1	11		0		0		0		0	0	0	3,300	0.0033	0.0051
404	TOT															16,500	0.0165	0.0255
405	NE		0	70.6	57		0		0		0		0	0	0	17,100	0.0171	0.0265
405	NW		0	36.3	37		0		0		0		0	5.5	0	19,350	0.0194	0.0300
405	TOT															36,450	0.0365	0.0565
406	NE		0	74.8	60		0		0		0		0	0	0	18,000	0.0180	0.0278
406	NW		0	9.1	8		0		0		0		0	0	0	2,400	0.0024	0.0037
406	TOT															20,400	0.0204	0.0316
407	NE		0	6.7	6		0		0		0		0	0	0	1,800	0.0018	0.0028
407	NW		0	3.1	6		0		0		0		0	0	0	1,800	0.0018	0.0028
407	TOT															3,600	0.0036	0.0056
408	NE		0	10.1	8		0		0		0		0	0	0	2,400	0.0024	0.0037
408	NW		0		10		0		0		0		0	8	0	15,000	0.0150	0.0232
408	SW		0	4.8	4		0		0		0		0	1.3	0	3,150	0.0032	0.0050
408	TOT															20,550	0.0206	0.0318
401-408																**201,600**	**0.2016**	**0.3119**

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
501	NE		0	2.5	2		0		0		0		0	0	0	600	0.0006	0.0009
501	SW	16.4	0	15	12		0		0		0		0	3.7	0	9,150	0.0092	0.0142
501	TOT															9,750	0.0098	0.0151
502	SW	84.1	0		0		0		0		0		0	0	0	-	0.0000	0.0000
503	SW	35.4	0		0		0		0		0		0	0	0	-	0.0000	0.0000
501-503																**9,750**	**0.0098**	**0.0152**
601	SW	55.7	0	4.1	4		0		0		0		0	1.2	0	3,000	0.0030	0.0046
601	NE		0	18.5	19		0		0		0		0	0	0	5,700	0.0057	0.0088
601	TOT															8,700	0.0087	0.0135
602	SW	61.1	0	4.8	4		0		0		0		0	0	0	1,200	0.0012	0.0019
602	NE		0	14.1	12		0		0		0		0	0	0	3,600	0.0036	0.0056
602	TOT															4,800	0.0048	0.0074
603	SW	25.9	0	4.6	4		0		0		0		0	0	0	1,200	0.0012	0.0019
603	NE		0	10.1	8		0		0		0		0	0	0	2,400	0.0024	0.0037
603	TOT															3,600	0.0036	0.0056
604	SW		0	1.7	2		0		0		0		0	0	0	600	0.0006	0.0009
604	SE		0	20	16		0		0		0		0	0	0	4,800	0.0048	0.0074
604	NE		0	13.9	12		0		0		0		0	0	0	3,600	0.0036	0.0056
604	TOT															9,000	0.0090	0.0139
605	SE		0	29.4	24		0		0		0		0	0	0	7,200	0.0072	0.0111
605	NE		0	21.5	18		0		0		0		0	0	0	5,400	0.0054	0.0084
605	TOT															12,600	0.0126	0.0195
606	SE	22.1	0	7.7	7		0		0		0		0	0	0	2,100	0.0021	0.0032
606	NE		0	5.4	5	4.2	17		0		0		0	0	0	6,600	0.0066	0.0102
606	TOT															8,700	0.0087	0.0135
607	SE	22.1	0	7.6	6	56.3	226		0		0		0	0	0	69,600	0.0696	0.1077
608	SE		0		0	115.7	810	14.8	104	10	180		0	0	0	309,500	0.3095	0.4788
609	SE		0		0	144.5	578	15.1	106	10	180		0	0	0	240,400	0.2404	0.3719
610	NE		0		0	17.4	70		0		0		0	0	0	21,000	0.0210	0.0325
611	NE		0		0	29.1	117		0		0		0	0	0	35,100	0.0351	0.0543
613	NE		0	5.4	5	4.3	18		0		0		0	0	0	6,900	0.0069	0.0107
614	NE		0		0	7.3	30		0		0		0	0	0	9,000	0.0090	0.0139
601-615																**738,900**	**0.7389**	**1.1431**

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
701	SW		0		0		0		0		0		0	6.7	0	10,050	0.0101	0.0156
702	SW		0		0		0		107		0		0	0	0	26,750	0.0268	0.0415
703	SW		0		0		150		27		0		0	0	0	51,750	0.0518	0.0801
704	SW		0		0		107		0		0		0	0	0	32,100	0.0321	0.0497
705	SW		0		0		84		0		0		0	0	0	25,200	0.0252	0.0390
706	SW		0		0		0	21.7	152		0		0	0	0	38,000	0.0380	0.0588
707	SW		0		0	4.8	20	5.1	36		0		0	0	0	15,000	0.0150	0.0232
708	SW	17.1	0		0	6.1	25		0		0		0	0	0	7,500	0.0075	0.0116
709	SW		0		0		0	15.1	106		0		0	0	0	26,500	0.0265	0.0410
710	SW		0		0	33.2	133	11.2	79		0		0	0	0	59,650	0.0597	0.0924
711	SW	33.5	0		0	56.6	227		0		0		0	0	0	68,100	0.0681	0.1054
712	SW	31.7	0		0		0		0		0		0	0	0	-	0.0000	0.0000
713	SW	25.6	0		0		0		0		0		0	0	0	-	0.0000	0.0000
715	SW		0		0	30.3	290		183		0		0	0	0	132,750	0.1328	0.2054
716	SW		0		0		0		0	8	144		0	6.7	0	42,450	0.0425	0.0657
717	SW		0		0		0		0	14.4	260		0	0	0	58,500	0.0585	0.0905
718	SW		0		0	12	48		124		0		0	0	0	45,400	0.0454	0.0702
719	SW		0		0	30.9	124		0		0		0	0	0	37,200	0.0372	0.0575
723	SW	61.2	0		0		0		0		0		0	0	0	-	0.0000	0.0000
701-719																676,900	0.6772	1.0476

TABLE A-1

SUMMARY OF LAND USE BY NODE (AVERAGE DRY WEATHER FLOW)

Pipe Node	Quad	RE Acres	RE units	RR Acres	RR units	LR Acres	LR units	MR Acres	MR units	HR Acres	HR units	MU Acres	MU units	Comm Acres	Ind Acres	Total gpd	Total mgd	Total cfs
For Nodes 803-817 see Table A-2																		
1-719		658	0	627.1	570	631.6	7201	186.9	3498	113.6	2713	82.1	346	476.7	521.3	5,656,825	5.6585	8.7537

Note: Zoning designations and densities (units/acre) were provided by the City of West Sacramento Planning Division.

RE = Rural Estate
RR = Rural Residential
LR = Low-Density Residential
MR = Medium-Density Residential
HR = High-Density Residential
MU = Mixed Use (combination of Commercial and Medium Density Residential)
gpd = gallons per day
mgd = million gallons per day
cfs = cubic feet per second

TABLE A-2
AREA 4 LAND USE (NODES 803-817)

Land Use	Total Land Use (acres)	Dwelling Units Per Acre[a]	Persons Per Dwelling Unit[a]	Total People	Number of Dwelling Units	Gallons Per Person	Gallons Per Acre[b]	Total Gallons Per Day	Total mgd Per Day
RRA Rural Residential	10	0.8	3.00	24	8	100	N/A	2,400	0.0024
R1-A Residential - One Family (A)	100	4	3.00	1,200	400	100	N/A	120,000	0.1200
R1-B Residential - One Family (B)[c]	120	4	3.00	1,440	480	100	N/A	144,000	0.1440
R-2 Residential - One Family or Multi Family[d]	120	7	2.50	2,100	840	100	N/A	210,000	0.2100
WF/MU Waterfront/Mixed Use	0	4.2	2.25	0	0	100	N/A	0	0.0000
Total Residential	**350**			**4,764**				**476,400**	**0.4764**
C-1 Commercial - Neighborhood	20	N/A	N/A	N/A	N/A	N/A	1500	30,000	0.0300
Total Commercial	**20**							**30,000**	**0.0300**
PQP Public/Quasi Public	38	N/A	N/A	N/A	N/A	N/A	1,620	61,560	0.0616
RP Recreation - Parks	20	N/A	N/A	N/A	N/A	N/A	0	0	0.0000
POS Public Open Space	63	N/A	N/A	N/A	N/A	N/A	0	0	0
Total Public/Park/School	**121**							**61,560**	**0.0616**
Grand Totals	**491**			**4,764**				**567,960**	**0.5680**

a Source: Southport Sanitary Sewer Master Plan, July 1999, pg.2-4
b Source: Southport Sanitary Sewer Master Plan, July 1999, pg. 2-3
c Includes Parlin Ranch development at 312 units.
d Includes Linden South Development at 133 units.

TABLE A-3
FLOW ESTIMATES FOR PROPOSED DEVELOPMENTS

Zoning	Dwelling Units/ Acre[a]	Persons per Dwelling Unit	Flow/Acre (gallons/day)[b]	Flow/Unit (gallons/unit)[c]	Actual (gallons/unit)[d]
RE	0.4	3	-----	300	279
RR	0.8	3	-----	300	279
LR	4.0	3	-----	300	279
MR	7.0	2.5	-----	250	232
HR	18.0	2.25	-----	225	209
MU	4.2	2.5	-----	250	232
Commercial	-	-	1,500	-----	1,394
Industrial	-	-	2,000	-----	1,858

a Values taken from 1998 TM.
b Estimate excludes groundwater infiltration.
c Estimate excludes groundwater infiltration.
d Actual computed from existing acreage's, sewered population and flowrates for the City of West Sacramento in 1997.

Appendix B

Flow Summary

TABLE B-1

SYSTEM HYDRAULICS AND FLOW DEVELOPMENT SUMMARY

(1) Node Upstr	(2) Rim Elev. Upstr	(3) MH IE Upstr	(4) Node Dnstr	(5) MH IE Dnstr	(6) Street	(7) Diameter (In.)	(8) Length (ft)	(9) Slope (ft/ft)	(10) Node Q (mgd)	(11) Upstr Q (mgd)	(12) Avg Q (mgd)	(13) Factor Peak	(14) Peak Q[a] (mgd)	(15) Capacity 0.5 d/D (mgd)	(16) Full Pipe Capacity (mgd)
1	11.6	-15.3	SPPS	-15.1	Jefferson Blvd	30	5	0.001	0.0000	2.2299	2.2299	2.7	6.0207	4.20	8.40
2	12.1	-14.7	31	-14.7	Jefferson Blvd	27	35.41	0.001	0.0000	0.8520	0.8520	2.9	2.4708	3.17	6.35
3	9.9	-12.5	30	-12.5	Jefferson Blvd	27	75	0.0008	0.0277	0.4046	0.4323	3.0	1.2969	2.84	5.68
4	9.9	-12.0	3	-12.5	Linden Rd	21	432	0.001	0.0117	0.3929	0.4046	3.0	1.2138	1.62	3.25
5	9.9	-11.3	4	-12.0	Linden Rd	21	755	0.001	0.0160	0.3769	0.3929	3.0	1.1787	1.62	3.25
6	9.9	-10.5	5	-11.3	Linden Rd	21	818	0.001	0.1312	0.2457	0.3769	3.0	1.1307	1.62	3.25
7	9.9	-9.4	6	-10.5	Linden Rd	21	1057	0.001	0.0268	0.2189	0.2457	3.0	0.7371	1.62	3.25
8	9.9	-8.3	7	-9.4	Linden Rd	18	921	0.0012	0.0578	0.1611	0.2189	3.0	0.6567	1.18	2.36
9	9.9	-8.0	8	-8.3	Linden Rd	15	269	0.0012	0.0129	0.1482	0.1611	3.0	0.4833	0.72	1.45
10	9.9	-7.8	9	-8.0	Linden Rd	15	175	0.0012	0.0174	0.1308	0.1482	3.0	0.4446	0.72	1.45
11	9.9	-7.3	10	-7.8	Linden Rd	15	509	0.0009	0.0069	0.1239	0.1308	3.0	0.3924	0.63	1.26
12	9.9	-7.0	11	-7.3	Linden Rd	15	402	0.0009	0.0030	0.1209	0.1239	3.0	0.3717	0.63	1.26
13	9.9	-6.9	12	-7.0	Linden Rd	15	73	0.0012	0.0150	0.1020	0.1170	3.0	0.3510	0.72	1.45
14	9.9	-6.6	13	-6.9	Linden Rd	15	232	0.0012	0.0066	0.0954	0.1020	3.0	0.3060	0.72	1.45
15	9.9	-6.1	14	-6.6	Linden Rd	15	327	0.0015	0.0261	0.0693	0.0954	3.0	0.2862	0.81	1.62
16	9.9	-5.2	15	-6.1	Linden Rd	15	632	0.0015	0.0189	0.0504	0.0693	3.0	0.2079	0.81	1.62
17	9.9	-4.4	16	-5.2	Linden Rd	12	361	0.002	0.0036	0.0468	0.0504	3.0	0.1512	0.52	1.03
18	9.9	-4.1	17	-4.4	Linden Rd	12	270	0.0013	0.0141	0.0327	0.0468	3.0	0.1404	0.42	0.83
19	9.9	-3.2	18	-4.1	Linden Rd	12	415	0.002	0.0198	0.0129	0.0327	3.0	0.0981	0.52	1.03
20	9.9	-2.0	19	-3.2	Linden Rd	12	614	0.002	0.0129	0.0000	0.0129	3.0	0.0387	0.52	1.03
21	5.8	-0.7	230	-1.9	Linden Rd	10	400	0.003	0.0843	0.0000	0.0843	3.0	0.2529	0.39	0.78
24	7.0	-4.1	12	-5.6	Renee Ct.	15	1000	0.0015	0.0039	0.0000	0.0039	3.0	0.0117	0.81	1.62
30	10.0	-13.3	2	-13.4	Jefferson Blvd	27	100	0.0008	0.0000	1.2230	0.8445	2.9	2.4491	2.84	5.68
31	12.1	-15.1	1	-15.3	Jefferson Blvd	27	60	0.003	0.0000	2.1072	1.7212	2.8	4.8194	5.50	10.99
32	9.4	-14.0	31	-14.9	Jefferson Blvd	21	200	0.004	0.0000	0.8767	0.8767	2.9	2.5424	3.25	6.49
33	9.4		2		Jefferson Blvd	12			0.0075	0.0000	0.0075	3.0	0.0225		
34	9.4	-13.3	32	-14.0	Jefferson Blvd	21	57	0.002	0.0000	0.8767	0.8767	2.9	2.5424	2.30	4.59
101	10.5	-10.4	1	-10.7	Jefferson Blvd	21	400	0.0008	0.0062	0.5025	0.5087	3.0	1.5260	1.45	2.90
102	15.3	-8.5	101	-10.0	Lake Washington	21	1850	0.0008	0.0368	0.4657	0.5025	3.0	1.5075	1.45	2.90
103	11.0	-8.0	102	-8.5	Southport Pkwy	21	500	0.001	0.2008	0.2649	0.4657	3.0	1.3971	1.62	3.25
104	9.9	-5.0	103	-8.0	unknown	15	2020	0.0015	0.0592	0.2057	0.2649	3.0	0.7947	0.81	1.62
105	13.0	-2.0	104	-5.0	unknown	15	2000	0.0015	0.2057	0.0000	0.2057	3.0	0.6171	0.81	1.62
107	10.0	-11.6	34	-12.4	Jefferson Blvd	12	361	0.0022	0.0637	0.1653	0.2290	3.0	0.6870	0.54	1.08
108	9.5	1.8	107	-2.5	Jefferson Blvd	10	1429	0.003	0.0506	0.1147	0.1653	3.0	0.4959	0.39	0.78
109	14.5	4.6	108	1.8	Gateway Blvd	10	1400	0.002	0.0584	0.0563	0.1147	3.0	0.3441	0.32	0.63
110	21.0	8.1	109	4.6	Sansome St.	8	1000	0.0035	0.0563	0.0000	0.0563	3.0	0.1689	0.23	0.46
203	8	-8.9	233	-9.3	Enterprise Blvd	15	258	0.001473	0.2211	0.0000	0.2211	3.0	0.6633	0.80	1.61
204	9	-10.4	238	-11.5	Half Moon Bay Cir.	15	502	0.002271	0.0316	0.3122	0.3438	3.0	1.0314	1.00	1.99

TABLE B-1

SYSTEM HYDRAULICS AND FLOW DEVELOPMENT SUMMARY

(1) Node Upstr	(2) Rim Elev. Upstr	(3) MH IE Upstr	(4) Node Dnstr	(5) MH IE Dnstr	(6) Street	(7) Diameter (In.)	(8) Length (ft)	(9) Slope (ft/ft)	(10) Node Q (mgd)	(11) Upstr Q (mgd)	(12) Avg Q (mgd)	(13) Factor Peak	(14) Peak Q[a] (mgd)	(15) Capacity 0.5 d/D (mgd)	(16) Full Pipe Capacity (mgd)
205	9	1.1	204	-0.2	Half Moon Bay Cir.	8	184	0.007011	0.0911	0.0000	0.0911	3.0	0.2733	0.33	0.66
206	9	-12.1	207	-12.8	Rembrandt	12	320	0.002125	0.0545	0.0000	0.0545	3.0	0.1635	0.53	1.06
207	9	-12.8	232	-14.3	Golden Gate Dr.	30	400	0.00375	0.0015	1.1595	1.1610	2.9	3.3669	8.14	16.27
208	10	-6.6	207	-7.1	Enterprise Blvd	30	650	0.0008	0.0120	1.0930	1.1050	2.9	3.2045	3.76	7.52
209	8	-5.1	208	-6.4	Ramco	21	1300	0.001	0.0164	0.4668	0.4832	3.0	1.4496	1.62	3.25
210	10	-4.4	209	-5.1	Ramco	21	700	0.001	0.0609	0.4059	0.4668	3.0	1.4004	1.62	3.25
211	9	-3.7	210	-4.4	Ramco	21	638	0.001	0.0350	0.3709	0.4059	3.0	1.2177	1.62	3.25
212	9	-2.8	211	-3.7	Ramco	15	615	0.0015	0.0632	0.3077	0.3709	3.0	1.1127	1.62	3.25
213	9	-1.5	212	-2.8	Ramco	15	870	0.0015	0.0315	0.2762	0.3077	3.0	0.9231	0.81	1.62
214	12.6	-0.3	213	-1.5	Ramco	15	818	0.0015	0.0197	0.2565	0.2762	3.0	0.8286	0.81	1.62
215	13.6	0.2	214	-0.3	Ramco	15	307	0.0015	0.0423	0.2142	0.2565	3.0	0.7695	0.81	1.62
216	15	1.9	215	0.2	Ramco	12	780	0.0022	0.0352	0.1790	0.2142	3.0	0.6426	0.54	1.08
217	16	3.7	216	1.9	Ramco	10	600	0.003	0.1790	0.0000	0.1790	3.0	0.5370	0.39	0.78
219	9.5	-6.1	208	-6.6	Ramos Dr	24	650	0.0008	0.0183	0.5915	0.6098	3.0	1.8294	2.07	4.15
220	10	-5.3	219	-6.1	Ramos Dr	24	900	0.0008	0.1020	0.4895	0.5915	3.0	1.7745	2.07	4.15
221	14	-4.0	220	-5.3	Oates Dr	21	1350	0.001	0.4169	0.0726	0.4895	3.0	1.4685	1.62	3.25
222	9	1.8	221	-4.0	Oates Ct	8	1650	0.0035	0.0726	0.0000	0.0726	3.0	0.2178	0.23	0.46
226	9	-7.7	235	-8.6	Southport Pkwy	12	392	0.002423	0.0284	0.0000	0.0284	3.0	0.0853	0.57	1.14
230	9.0	-3.9	408	-7.2	Marshall Rd	8	950	0.0035	0.0423	0.0843	0.1266	3.0	0.3798	0.23	0.46
232	9	-14.4	239	-10.0	unknown	30	60	0.0725	0.0000	1.5901	1.5901	2.8	4.4523	35.78	71.56
233	8.5	-9.3	204	-9.9	unknown	15	460	0.001391	0.0000	0.2211	0.2211	3.0	0.6633	0.78	1.56
234	9	-11.0	232	-14.4	Golden Gate Dr.	18	774	0.004367	0.0000	0.0853	0.0853	3.0	0.2559	2.25	4.50
235	9	-8.9	234	-11.0	Oakland Bay Dr.	15	621	0.003382	0.0000	0.0853	0.0853	3.0	0.2559	1.22	2.43
236	9	-5.2	235	-8.5	Golden Gate Dr.	10	330	0.01	0.0284	0.0284	0.0569	3.0	0.1706	0.71	1.42
237	9	-4.6	236	-5.1	unknown	10	173	0.002486	0.0284	0.0000	0.0284	3.0	0.0853	0.35	0.71
238	9	-11.5	232	-13.1	Half Moon Bay Cir.	15	174	0.008851	0.0000	0.3438	0.3438	3.0	1.0314	1.97	3.94
239	9	-14.7	1	-15.3	unknown	2-12" FM	10355	n/a	0.0000	1.5901	1.5901	2.8	4.4523		
301	9.9	-9.0	30	-13.6	Linden Rd	21	285	0.0162	0.0576	0.1974	0.255	3.0	0.7650	6.53	13.07
302	10	-7.0	301	-9.0	Linden Rd.	21	1275	0.0016	0.0098	0.1876	0.1974	3.0	0.5922	2.05	4.11
303	10	-4.1	302	-7.0	Linden Rd.	10	1000	0.0029	0.0376	0.15	0.1876	3.0	0.5628	0.38	0.76
304	11	-1.4	303	-4.1	Linden Rd.	8	1050	0.0025	0.0234	0.1266	0.15	3.0	0.4500	0.20	0.39
305	12.0	-0.7	304	-1.4	Linden Rd.	8	300	0.0024	0.0096	0.1170	0.1266	3.0	0.3798	0.19	0.38
306	13.0	0.0	305	-0.7	Linden Rd.	8	300	0.0024	0.0653	0.0517	0.1170	3.0	0.3510	0.19	0.38
307	15.0	1.6	306	0.0	Linden Rd.	8	400	0.0035	0.0357	0.0160	0.0517	3.0	0.1551	0.23	0.46
308	15.0	3.5	307	1.6	Linden Rd.	8	550	0.0035	0.0160	0.0000	0.0160	3.0	0.0480	0.23	0.46
313	15.5	-2.5	323	-4.1	Village Pkwy	8	450	0.0035	0.0237	0.0377	0.0614	3.0	0.1842	0.23	0.46
314	16.0	-1.1	313	-2.5	Village Pkwy	8	400	0.0035	0.0048	0.0329	0.0377	3.0	0.1131	0.23	0.46
315	16.0	1.4	314	-1.1	Village Pkwy	8	700	0.0035	0.0051	0.0278	0.0329	3.0	0.0987	0.23	0.46

TABLE B-1

SYSTEM HYDRAULICS AND FLOW DEVELOPMENT SUMMARY

(1) Node Upstr	(2) Rim Elev. Upstr	(3) MH IE Upstr	(4) Node Dnstr	(5) MH IE Dnstr	(6) Street	(7) Diameter (In.)	(8) Length (ft)	(9) Slope (ft/ft)	(10) Node Q (mgd)	(11) Upstr Q (mgd)	(12) Avg Q (mgd)	(13) Factor Peak	(14) Peak Q[a] (mgd)	(15) Capacity 0.5 d/D (mgd)	(16) Full Pipe Capacity (mgd)
316	16.0	4.3	315	1.4	Village Pkwy	8	850	0.0035	0.0278	0.0000	0.0278	3.0	0.0834	0.23	0.46
318	**6.9**	**-12.1**	**34**	**-13.2**	**Lake Washington**	**21**	**1186**	**0.001**	**0.0110**	**0.8657**	**0.8767**	**2.9**	**2.5424**	**1.62**	**3.25**
319	7.9	-11.5	318	-12.1	Lake Washington	21	506	0.001	0.0115	0.8542	0.8657	2.9	2.5105	1.62	3.25
320	10.0	-9.8	319	-11.3	Lake Washington	18	1253	0.0012	0.0273	0.6352	0.6625	3.0	1.9875	1.18	2.36
321	12.2	-7.3	320	-9.5	Lake Washington	15	1515	0.0015	0.2288	0.4064	0.6352	3.0	1.9056	0.81	1.62
323	16.0	-4.1	321	-7.3	Lake Washington	15	2142	0.0015	0.1319	0.2745	0.4064	3.0	1.2192	0.81	1.62
324	16.0	-2.9	323	-4.1	Village Pkwy	15	740	0.0015	0.0142	0.1989	0.2131	3.0	0.6393	0.81	1.62
325	15.5	-2.2	324	-2.9	Village Pkwy	15	495	0.0015	0.0083	0.1906	0.1989	3.0	0.5967	0.81	1.62
326	14.5	-1.4	325	-2.2	Village Pkwy	15	550	0.0015	0.0123	0.1783	0.1906	3.0	0.5718	0.81	1.62
327	14.0	-0.3	326	-1.4	Village Pkwy	12	510	0.0022	0.0231	0.1552	0.1783	3.0	0.5349	0.54	1.08
328	15.0	-4.8	330	-6.2	Village Pkwy	12	600	0.0022	0.0776	0.0000	0.0776	3.0	0.2328	0.54	1.08
329	12.0	-9.4	319	-11.3	Stonegate Dr	15	1280	0.0015	0.0463	0.2230	0.2693	3.0	0.8079	0.81	1.62
330	15.0	-6.2	329	-9.4	Stonegate Dr	15	2150	0.0015	0.1454	0.0776	0.2230	3.0	0.6690	0.81	1.62
402	**9.5**	**-9.2**	**30**	**-10.6**	**Jefferson Blvd**	**15**	**900**	**0.0015**	**0.0620**	**0.0952**	**0.1572**	**3.0**	**0.4716**	**0.81**	**1.62**
403	9.3	-7.9	402	-9.2	Jefferson Blvd	12	600	0.0022	0.0422	0.0530	0.0952	3.0	0.2856	0.54	1.08
404	8.4	-5.1	403	-7.9	Jefferson Blvd	12	1275	0.0022	0.0165	0.0365	0.0530	3.0	0.1590	0.54	1.08
405	9.6	-2.0	404	-5.1	Jefferson Blvd	12	1400	0.0022	0.0365	0.0000	0.0365	3.0	0.1095	0.54	1.08
406	9.8	-1.5	407	-4.1	Jefferson Blvd	8	750	0.0035	0.0204	0.0000	0.0204	3.0	0.0612	0.23	0.46
407	9.5	-4.1	408	-6.2	Jefferson Blvd	8	600	0.0035	0.0036	0.0204	0.0240	3.0	0.0720	0.23	0.46
408	9.3	-7.2	501	-9.8	Jefferson Blvd	12	1150	0.0022	0.0206	0.1506	0.1712	3.0	0.5136	0.54	1.08
501	9.0	-9.8	502	-12.5	Jefferson Blvd	15	1800	0.0015	0.0098	0.1928	0.2026	3.0	0.6078	0.81	1.62
502	8.0	-12.5	503	-13.7	Jefferson Blvd	15	850	0.0015	0	0.2026	0.2026	3.0	0.6078	0.81	1.62
503	8.0	-13.7	723	-15.8	Jefferson Blvd	15	1400	0.0015	0	0.2026	0.2026	3.0	0.6078	0.81	1.62
601	9.0	-8.0	501	-9.3	Davis Rd	15	900	0.0015	0.0087	0.0129	0.0216	3.0	0.6078	0.81	1.62
602	9.0	-6.1	601	-8.0	Davis Rd	12	850	0.0022	0.0048	0.0081	0.0129	3.0	0.0387	0.54	1.08
603	8.0	-4.2	602	-6.1	Davis Rd	12	850	0.0022	0.0081	0.0000	0.0081	3.0	0.0243	0.54	1.08
604	10	-1.6	807	-2.7	unknown	15	700	0.0015	0.0400	0.0400	0.0800	3.0	0.2400	0.81	1.62
605	10	0.5	604	-1.6	unknown	15	1400	0.0015	0.0400	0.0000	0.0400	3.0	0.1200	0.81	1.62
606	15.0	1.8	605	-1.2	Davis Rd	12	1350	0.0022	0.0087	0.0159	0.0246	3.0	0.0738	0.54	1.08
607	15.0	-1.2	608	-2.7	Southport Pkwy	15	1200	0.0012	0.0696	0.0246	0.0942	3.0	0.2826	0.72	1.45
608	14.0	-2.7	609	-4.3	Southport Pkwy	21	1600	0.001	0.3095	0.0942	0.4037	3.0	1.2111	1.62	3.25
609	14.0	-4.3	LNWI	-5.6	Southport Pkwy	24	1650	0.0008	0.2404	0.4037	0.6441	3.0	1.9323		
610	10	3.0	611	1.9	unknown	12	500	0.0022	0.0308	0.0000	0.0308	3.0	0.0924	0.54	1.08
611	10	1.9	804	0.4		12	700	0.0022	0.0308	0.0308	0.0616	3.0	0.1848	0.54	1.08
613	15.0	3.2	606	1.8	Southport Pkwy	12	650	0.0022	0.0069	0.0090	0.0159	3.0	0.0477	0.54	1.08
614	15.0	4.5	613	3.2	Southport Pkwy	12	600	0.0022	0.0090	0.0000	0.0090	3.0	0.0270	0.54	1.08
701	9.0	-12.1	716	-12.7	Bevan/Jefferson	18	500	0.0012	0.0101	0.5661	0.5762	3.0	1.7286	1.18	2.36
702	5.7	-9.5	701	-10.7	Mercado Dr	15	800	0.0015	0.0268	0.2419	0.2687	3.0	0.8061	0.81	1.62

TABLE B-1

SYSTEM HYDRAULICS AND FLOW DEVELOPMENT SUMMARY

(1) Node Upstr	(2) Rim Elev. Upstr	(3) MH IE Upstr	(4) Node Dnstr	(5) MH IE Dnstr	(6) Street	(7) Diameter (In.)	(8) Length (ft)	(9) Slope (ft/ft)	(10) Node Q (mgd)	(11) Upstr Q (mgd)	(12) Avg Q (mgd)	(13) Factor Peak	(14) Peak Q[a] (mgd)	(15) Capacity 0.5 d/D (mgd)	(16) Full Pipe Capacity (mgd)
703	6.0	-8.5	702	-9.5	Mercado Dr	15	660	0.0015	0.0518	0.1901	0.2419	3.0	0.7257	0.81	1.62
704	5.0	-4.4	703	-7.2	Largo Dr	8	800	0.0035	0.0321	0.0252	0.0573	3.0	0.1719	0.23	0.46
705	6.0	1.0	704	-4.4	Jefferson Blvd	8	1530	0.0035	0.0252	0.0000	0.0252	3.0	0.0756	0.23	0.46
706	6.0	-7.3	701	-9.5	Mercado Dr	8	650	0.0035	0.0380	0.0225	0.0605	3.0	0.1815	0.23	0.46
707	5.5	-4.9	706	-7.3	Mercado Dr	8	680	0.0035	0.0150	0.0075	0.0225	3.0	0.0675	0.23	0.46
708	6.5	-1.9	707	-4.9	Mercado Dr	8	850	0.0035	0.0075	0.0000	0.0075	3.0	0.0225	0.23	0.46
709	7.0	-8.0	722	-9.5	Southport Pkwy	12	670	0.0022	0.0265	0.1278	0.1543	3.0	0.4629	0.54	1.08
710	7.0	-5.9	709	-8.0	Southport Pkwy	10	700	0.003	0.0597	0.0681	0.1278	3.0	0.3834	0.39	0.78
711	8.0	-1.9	710	-5.9	Southport Pkwy	8	1150	0.0035	0.0681	0.0000	0.0681	3.0	0.2043	0.23	0.46
715	6.0	-3.9	703	-8.5	Largo Dr	12	2100	0.0022	0.1328	0.0000	0.1328	3.0	0.3984	0.54	1.08
716	9.3	-12.7	717	-13.6	Bevan Rd	18	730	0.0012	0.0425	0.5762	0.6187	3.0	1.7942	1.18	2.36
717	8.4	-13.6	723	-14.2	Bevan Rd	18	500	0.0012	0.0585	0.6187	0.6772	3.0	1.8962	1.18	2.36
718	6.5	-7.9	722	-11.7	Bevan Rd	10	1250	0.003	0.0454	0.0372	0.0826	3.0	0.2478	0.39	0.78
719	6.0	-4.6	718	-7.9	Bevan Rd	8	950	0.0035	0.0372	0.0000	0.0372	3.0	0.1116	0.23	0.46
722	9.0	-11.7	701	-12.1	Bevan Rd	15	275	0.0015	0.0000	0.2369	0.2369	3.0	0.7107	0.81	1.62
723	7.0	-14.6	LNWI		Jefferson Blvd	FM	4200		0.0000	0.8798	0.8798	2.9	2.5514		
803	10	2.0	804	0.9	unknown	18	910	0.0012	0.0000	0.0000	0.0000	3.0	0.0000	1.18	2.36
804	10	-0.2	807	-2.3	unknown	21	2100	0.001	0.0000	0.0916	0.0916	3.0	0.2748	1.62	3.25
805	13	2.0	804	-0.2	unknown	15	1470	0.0015	0.0000	0.0300	0.0300	3.0	0.0900	0.81	1.62
806	12	3.5	805	2.0	unknown	12	700	0.0022	0.0300	0.0000	0.0300	3.0	0.0900	0.54	1.08
807	10	-2.7	LNWI	-2.8	unknown	21	100	0.001	0.0000	0.2116	0.2116	3.0	0.6348	1.62	3.25
808	10	0.0	807	-2.5	unknown	18	2100	0.0012	0.0400	0.0000	0.0400	3.0	0.1200	1.18	2.36
809	8	-5.2	816	-6.1	unknown	18	700	0.0012	0.0000	0.1293	0.1293	3.0	0.3878	1.18	2.36
810	8	-3.5	809	-5.2	unknown	18	1400	0.0012	0.0468	0.0825	0.1293	3.0	0.3878	1.18	2.36
811	8	0.0	810	-1.6	unknown	15	1050	0.0015	0.0468	0.0000	0.0468	3.0	0.1404	0.81	1.62
812	9	-2.4	810	-3.5	unknown	15	770	0.0015	0.0166	0.0190	0.0357	3.0	0.1070	0.81	1.62
813	7	-0.9	812	-2.4	unknown	15	980	0.0015	0.0166	0.0024	0.0190	3.0	0.0571	0.81	1.62
814	7	0.0	813	-0.9	unknown	12	420	0.0022	0.0024	0.0000	0.0024	3.0	0.0072	0.54	1.08
815	12	0.0	816	-4.2	unknown	15	2800	0.0015	0.2100	0.0000	0.2100	3.0	0.6300	0.81	1.62
816	12	-6.1	P.S.	-6.1	unknown	18	10	0.0012	0.0000	0.3393	0.3393	3.0	1.0178	1.18	2.36
817	8	-3.0	302	-5.9	unknown	10	980	0.003	0.035	0.0000	0.0350	3.0	0.1050	0.39	0.78

[a] Peak Q= Peak wet weather flow

Notes: All rows with bold lettering pertain to existing pipes

TABLE B-2
PIPE DIAMETERS ASSUMING MINIMUM SLOPES

Peak Q (mgd)	Diameter (inches)
<0.40	8
0.40 – 0.65	10
0.65 – 0.90	12
0.90 – 1.35	15
1.35 – 1.90	18
1.90 – 2.70	21
2.70 – 3.50	24
3.50 – 4.50	27
4.50 – 5.50	30
5.50 – 6.60	33
6.60 – 7.80	36
7.80 – 9.20	39
9.20 – 10.60	42

TABLE C-1

SUMMARY OF PIPE CONSTRUCTION COSTS

(1) Node Upstr	(2) Node Dnstr	(3) Street	(4) Diameter (in.)	(5) Length (ft)	(6) Depth	(7) Total Unit Cost ($/LF)	(8) Total Costs ($)
403	402	Jefferson Blvd	12	600	17.2	129	$77,400
404	403	Jefferson Blvd	12	1275	13.5	117	$149,175
405	404	Jefferson Blvd	12	1400	11.6	110	$154,000
406	407	Jefferson Blvd	8	750	11.3	100	$75,000
407	408	Jefferson Blvd	8	600	13.6	106	$63,600
408	501	Jefferson Blvd	12	1150	16.5	126	$144,900
501	502	Jefferson Blvd	15	1800	18.8	139	$250,200
502	503	Jefferson Blvd	15	850	20.5	146	$124,100
503	723	Jefferson Blvd	15	1400	21.7	149	$208,600
601	501	Davis Rd	15	900	17.0	136	$122,400
602	601	Davis Rd	12	850	15.1	123	$104,550
603	602	Davis Rd	12	850	12.2	113	$96,050
604	807		15	700	11.6	117	$81,900
605	604	unknown	15	1400	9.5	76	$106,400
606	605	Davis Rd	12	1350	13.3	117	$157,950
607	608	Southport Pkwy	15	1200	16.2	133	$159,600
608	609	Southport Pkwy	21	1600	16.7	158	$252,800
609	LNWI	Southport Pkwy	24	1650	18.3	181	$298,650
610	611	unknown	12	500	7.0	67	$33,500
611	804		12	700	8.1	67	$46,900
613	606	Southport Pkwy	12	650	11.8	110	$71,500
614	613	Southport Pkwy	12	600	10.5	107	$64,200
701	716	Bevan/Jefferson	18	500	21.1	159	$79,500
702	701	Mercado Dr	15	800	15.2	130	$104,000
703	702	Mercado Dr	15	660	14.5	127	$83,820
704	703	Largo Dr	8	800	9.4	59	$47,200
705	704	Jefferson Blvd	8	1530	5.0	57	$87,210
706	701	Mercado Dr	8	650	13.3	106	$68,900
707	706	Mercado Dr	8	680	10.4	97	$65,960
708	707	Mercado Dr	8	850	8.4	57	$48,450
709	722	Southport Pkwy	12	670	15.0	123	$82,410
710	709	Southport Pkwy	10	700	12.9	107	$74,900
711	710	Southport Pkwy	8	1150	9.9	59	$67,850
715	703	Largo Dr	12	2100	9.9	69	$144,900
716	717	Bevan Rd	18	730	22.0	159	$116,070
717	723	Bevan Rd	18	500	22.0	159	$79,500
718	722	Bevan Rd	10	1250	14.4	114	$142,500
719	718	Bevan Rd	8	950	10.6	97	$92,150
722	701	Bevan Rd	15	275	20.7	146	$40,150
723	LNWI	Jefferson Blvd	16"-FM	4200	21.6	80	$336,000
803	804		18	910	8.0	82	$74,620
804	807		21	2100	10.2	136	$285,600
805	804	unknown	15	1470	11.0	117	$171,990
806	805	unknown	12	700	8.5	67	$46,900
807	LNWI		21	100	12.7	142	$14,200

TABLE C-1

SUMMARY OF PIPE CONSTRUCTION COSTS

(1) Node Upstr	(2) Node Dnstr	(3) Street	(4) Diameter (in.)	(5) Length (ft)	(6) Depth	(7) Total Unit Cost ($/LF)	(8) Total Costs ($)
808	807		18	2100	10.0	123	$258,300
809	816		18	700	13.2	134	$93,800
810	809		18	1400	11.5	126	$176,400
811	810		15	1050	8.0	74	$77,700
812	810		15	770	11.4	117	$90,090
813	812		15	980	7.9	74	$72,520
814	813		12	420	7.0	67	$28,140
815	816		15	2800	12.0	120	$336,000
816	P.S.		18	10	18.1	149	$1,490
817	302		10	980	11.0	104	$101,920
		TOTAL COSTS					**11,500,000**

Note: Rows in bold pertain to existing pipes

[a] Improvements to forecmain after LNWI- Cost to be provided by SRSCSD

Note: Pipeline costs also include the cost for lined manholes. A $5,000 manhole was assumed every 300 feet at an approximate cost of $15 per foot of pipe.

TABLE C-1
SUMMARY OF PIPE CONSTRUCTION COSTS

(1) Node Upstr	(2) Node Dnstr	(3) Street	(4) Diameter (in.)	(5) Length (ft)	(6) Depth	(7) Total Unit Cost ($/LF)	(8) Total Costs ($)
1	SPPS	Jefferson Blvd	30	5	26.8		
2	31	Jefferson Blvd	27	35.41	26.8		
3	30	Jefferson Blvd	27	75	22.4		
4	3	Linden Rd	21	432	21.9		
5	4	Linden Rd	21	755	21.2		
6	5	Linden Rd	21	818	20.4		
7	6	Linden Rd	21	1057	19.3		
8	7	Linden Rd	18	921	18.2		
9	8	Linden Rd	15	269	17.9		
10	9	Linden Rd	15	175	17.7		
11	10	Linden Rd	15	509	17.2		
12	11	Linden Rd	15	402	16.9		
13	12	Linden Rd	15	73	16.8		
14	13	Linden Rd	15	232	16.5		
15	14	Linden Rd	15	327	16.0		
16	15	Linden Rd	15	632	15.1		
17	16	Linden Rd	12	361	14.3		
18	17	Linden Rd	12	270	14.0		
19	18	Linden Rd	12	415	13.1		
20	19	Linden Rd	12	614	11.9		
21	230	Linden Rd	10	400	6.5	61	$24,400
24	12	Renee Ct.	15	1000	11.1		
30	2	Jefferson Blvd	27	100	23.3		
31	1	Jefferson Blvd	27	60	27.3		
32	31	Jefferson Blvd	21	200	23.4		
33	2		12				
34	32	Jefferson	21	57	22.7		
101	1	Jefferson Blvd	21	400	20.9	171	$68,400
102	101	Lake Washington	21	1850	23.8	182	$336,700
103	102	Southport Pkwy	21	500	19.0	168	$84,000
104	103	unknown	15	2020	14.9	127	$256,540
105	104	unknown	15	2000	15.0	130	$260,000
107	34	Jefferson Blvd	12	361	21.6		
108	107	Jefferson Blvd	10	1429	7.7		
109	108	Gateway Blvd	10	1400	9.9		
110	109	Sansome St.	8	1000	12.9		
203	233	Enterprise Blvd	15	258	16.9	133	$34,314
204	238	Half Moon Bay Cir.	15	502	19.4		
205	204	Half Moon Bay Cir.	8	184	7.9		
206	207	Rembrandt	12	320	21.1	141	$45,120
207	232	Golden Gate Dr.	30	400	21.8	254	$101,600
208	207	Enterprise Blvd	30	650	16.6	233	$151,450
209	208	Ramco	21	1300	13.1	148	$192,400
210	209	Ramco	21	700	14.4	151	$105,700
211	210	Ramco	21	638	12.7	142	$90,596

TABLE C-1

SUMMARY OF PIPE CONSTRUCTION COSTS

(1) Node Upstr	(2) Node Dnstr	(3) Street	(4) Diameter (in.)	(5) Length (ft)	(6) Depth	(7) Total Unit Cost ($/LF)	(8) Total Costs ($)
212	**211**	**Ramco**	**15**	**615**	**11.8**		
213	**212**	**Ramco**	**15**	**870**	**10.5**		
214	**213**	**Ramco**	**15**	**818**	**12.9**		
215	**214**	**Ramco**	**15**	**307**	**13.4**		
216	**215**	**Ramco**	**12**	**780**	**13.1**		
217	**216**	**Ramco**	**10**	**600**	**12.3**		
219	208	Ramos Dr	24	650	15.6	171	$111,150
220	219	Ramos Dr	24	900	15.3	171	$153,900
221	220	Oates Dr	21	1350	18.0	161	$217,350
222	221	Oates Ct	8	1650	7.2	57	$94,050
226	235	Southport Pkwy	12	392	16.7	126	$49,392
230	408	Marshall Rd	8	950	12.9	102	$96,900
232	**239**	**unknown**	**30**	**60**	**23.4**		
233	204	unknown	15	460	17.8	136	$62,560
234	232	Golden Gate Dr.	18	774	20.0	156	$120,744
235	234	Oakland Bay Dr.	15	621	17.9	136	$84,456
236	**235**	**Golden Gate Dr.**	**10**	**330**	**14.2**		
237	236	unknown	10	173	13.6	111	$19,203
238	232	Half Moon Bay Cir.	15	174	20.5	146	$25,404
239	**1**	**unknown**	**2-12" FM**	**10355**	**23.7**		
301	**30**	**Linden Rd**	**21**	**285**	**23.0**		
302	**301**	**Linden Rd.**	**21**	**1275**	**22.1**		
303	**302**	**Linden Rd.**	**10**	**1000**	**21.3**		
304	**303**	**Linden Rd.**	**8**	**1050**	**12.6**		
305	**304**	**Linden Rd.**	**8**	**300**	**12.7**		
306	**305**	**Linden Rd.**	**8**	**300**	**12.8**		
307	**306**	**Linden Rd.**	**8**	**400**	**13.4**		
308	**307**	**Linden Rd.**	**8**	**550**	**11.5**		
313	323	Village Pkwy	8	450	18.0	117	$52,650
314	313	Village Pkwy	8	400	17.1	117	$46,800
315	314	Village Pkwy	8	700	14.6	109	$76,300
316	315	Village Pkwy	8	850	11.7	100	$85,000
318	34	Lake Washington	21	1186	19.0	164	$194,504
319	318	Lake Washington	21	506	19.4	168	$85,008
320	319	Lake Washington	18	1253	19.8	153	$191,709
321	320	Lake Washington	15	1515	19.4	143	$216,645
323	321	Lake Washington	15	2142	20.1	146	$312,732
324	323	Village Pkwy	15	740	18.9	139	$102,860
325	324	Village Pkwy	15	495	17.7	136	$67,320
326	325	Village Pkwy	15	550	15.9	130	$71,500
327	326	Village Pkwy	12	510	14.3	120	$61,200
328	**330**	**Village Pkwy**	**12**	**600**	**19.8**	**135**	**$81,000**
329	**319**	**Stonegate Dr**	**15**	**1280**	**21.4**	**149**	**$190,720**
330	**329**	**Stonegate Dr**	**15**	**2150**	**21.2**	**149**	**$320,350**
402	30	Jefferson Blvd	15	900	18.7	139	$125,100

TABLE C-2
PIPE MATERIAL SELECTION

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]
10	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]
12	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]
15	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[a]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]	PVC[b]
18	PVC[c]	PVC[c]	PVC[c]	PVC[c]	PVC[c]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]
21	PVC[c]	PVC[c]	PVC[c]	PVC[c]	PVC[c]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]
24	PVC[c]	PVC[c]	PVC[c]	PVC[c]	PVC[c]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]	PVC[d]
27	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]
30	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]
33	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]
36	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]
39	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]
42	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]	RCP[e]

a ASTM D3034, SDR 35

b ASTM D3034, SDR 26

c ASTM F679, SDR 35

d ASTM F679, SDR 26

e ASTM C76, with PVC liner for sulfide resistance

TABLE C-3
PIPE MATERIAL COSTS ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	2.70	2.70	2.70	2.70	2.70	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90
10	4.20	4.20	4.20	4.20	4.20	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60
12	6.00	6.00	6.00	6.00	6.00	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
15	9.60	9.60	9.60	9.60	9.60	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40
18	14.40	14.40	14.40	14.40	14.40	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
21	21.60	21.60	21.60	21.60	21.60	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
24	30.00	30.00	30.00	30.00	30.00	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50	34.50
27	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20	55.20
30	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
33	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20	67.20
36	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40	74.40
39	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20	91.20
42	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00	108.00

TABLE C-4
EXCAVATION VOLUMES (YD^3)

Diameter (in.)	Outside Diameter (inches)	Trench Width (inches)	Depth (ft)																						
			8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	8.40	24	0.94	1.08	1.23	1.39	1.56	1.73	1.90	2.08	2.27	2.47	2.67	2.87	3.09	3.31	3.53	3.76	4.00	4.24	4.49	4.75	5.01	5.28	5.56
10	10.50	27	1.01	1.17	1.33	1.49	1.67	1.85	2.03	2.22	2.42	2.62	2.83	3.05	3.27	3.50	3.73	3.98	4.22	4.48	4.73	5.00	5.27	5.55	5.83
12	12.50	30	1.09	1.25	1.42	1.60	1.78	1.97	2.16	2.36	2.57	2.78	3.00	3.23	3.46	3.69	3.94	4.19	4.44	4.71	4.98	5.25	5.53	5.82	6.11
15	15.30	33	1.16	1.33	1.51	1.70	1.89	2.09	2.29	2.50	2.72	2.94	3.17	3.40	3.64	3.89	4.14	4.40	4.67	4.94	5.22	5.50	5.79	6.09	6.39
18	18.70	36	1.23	1.42	1.60	1.80	2.00	2.21	2.42	2.64	2.86	3.10	3.33	3.58	3.83	4.08	4.35	4.61	4.89	5.17	5.46	5.75	6.05	6.35	6.67
21	22.05	42	1.38	1.58	1.79	2.00	2.22	2.45	2.68	2.92	3.16	3.41	3.67	3.93	4.20	4.47	4.75	5.04	5.33	5.63	5.94	6.25	6.57	6.89	7.22
24	24.80	48	1.53	1.75	1.98	2.21	2.44	2.69	2.94	3.19	3.46	3.73	4.00	4.28	4.57	4.86	5.16	5.47	5.78	6.10	6.42	6.75	7.09	7.43	7.78
27	32.25	66	1.98	2.25	2.53	2.82	3.11	3.41	3.72	4.03	4.35	4.67	5.00	5.34	5.68	6.03	6.38	6.74	7.11	7.48	7.86	8.25	8.64	9.04	9.44
30	35.50	78	2.27	2.58	2.90	3.23	3.56	3.89	4.23	4.58	4.94	5.30	5.67	6.04	6.42	6.81	7.20	7.60	8.00	8.41	8.83	9.25	9.68	10.11	10.56
33	38.75	90	2.57	2.92	3.27	3.63	4.00	4.37	4.75	5.14	5.53	5.93	6.33	6.74	7.16	7.58	8.01	8.45	8.89	9.34	9.79	10.25	10.72	11.19	11.67
36	42.50	93	2.64	3.00	3.36	3.73	4.11	4.49	4.88	5.28	5.68	6.09	6.50	6.92	7.35	7.78	8.22	8.66	9.11	9.57	10.03	10.50	10.98	11.46	11.94
39	46.00	96	2.72	3.08	3.46	3.84	4.22	4.61	5.01	5.42	5.83	6.24	6.67	7.10	7.53	7.97	8.42	8.87	9.33	9.80	10.27	10.75	11.23	11.73	12.22
42	49.50	102	2.86	3.25	3.64	4.04	4.44	4.85	5.27	5.69	6.12	6.56	7.00	7.45	7.90	8.36	8.83	9.30	9.78	10.26	10.75	11.25	11.75	12.26	12.78

TABLE C-5
EXCAVATION COSTS ($/LF)

Diameter (in.)	Depth (ft)																						
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
8	1.97	2.28	2.59	2.92	3.27	3.62	3.99	4.38	4.77	5.18	5.60	6.03	6.48	6.94	7.41	7.90	8.40	8.91	9.44	9.98	10.53	11.09	11.67
10	2.13	2.45	2.79	3.14	3.50	3.88	4.26	4.67	5.08	5.51	5.95	6.40	6.87	7.35	7.84	8.35	8.87	9.40	9.94	10.50	11.07	11.65	12.25
12	2.28	2.63	2.98	3.35	3.73	4.13	4.54	4.96	5.39	5.84	6.30	6.77	7.26	7.76	8.27	8.80	9.33	9.88	10.45	11.03	11.61	12.22	12.83
15	2.44	2.80	3.18	3.56	3.97	4.38	4.81	5.25	5.70	6.17	6.65	7.14	7.65	8.17	8.70	9.24	9.80	10.37	10.95	11.55	12.16	12.78	13.42
18	2.59	2.98	3.37	3.78	4.20	4.63	5.08	5.54	6.01	6.50	7.00	7.51	8.04	8.58	9.13	9.69	10.27	10.86	11.46	12.08	12.70	13.35	14.00
21	2.90	3.33	3.76	4.21	4.67	5.14	5.63	6.13	6.64	7.16	7.70	8.25	8.81	9.39	9.98	10.58	11.20	11.83	12.47	13.13	13.79	14.47	15.17
24	3.21	3.68	4.15	4.63	5.13	5.65	6.17	6.71	7.26	7.82	8.40	8.99	9.59	10.21	10.84	11.48	12.13	12.80	13.48	14.18	14.88	15.60	16.33
27	4.15	4.73	5.31	5.92	6.53	7.16	7.80	8.46	9.13	9.81	10.50	11.21	11.93	12.66	13.40	14.16	14.93	15.72	16.51	17.33	18.15	18.98	19.83
30	4.77	5.43	6.09	6.77	7.47	8.17	8.89	9.63	10.37	11.13	11.90	12.68	13.48	14.29	15.11	15.95	16.80	17.66	18.54	19.43	20.33	21.24	22.17
33	5.39	6.13	6.87	7.63	8.40	9.18	9.98	10.79	11.61	12.45	13.30	14.16	15.04	15.93	16.83	17.74	18.67	19.61	20.56	21.53	22.50	23.50	24.50
36	5.55	6.30	7.06	7.84	8.63	9.44	10.25	11.08	11.93	12.78	13.65	14.53	15.43	16.33	17.25	18.19	19.13	20.09	21.06	22.05	23.05	24.06	25.08
39	5.70	6.48	7.26	8.06	8.87	9.69	10.53	11.38	12.24	13.11	14.00	14.90	15.81	16.74	17.68	18.63	19.60	20.58	21.57	22.58	23.59	24.62	25.67
42	6.01	6.83	7.65	8.48	9.33	10.20	11.07	11.96	12.86	13.77	14.70	15.64	16.59	17.56	18.54	19.53	20.53	21.55	22.58	23.63	24.68	25.75	26.83

TABLE C-6
TRENCH SOIL VOLUMES (YD^3)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
10	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
12	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
15	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
18	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
21	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
24	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
27	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
30	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21
33	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47
36	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
39	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79
42	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01

TABLE C-7
TRENCH SOIL DISPOSAL COSTS ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
10	0.81	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
12	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
15	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
18	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
21	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78	1.78
24	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
27	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
30	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35
33	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31
36	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88
39	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44
42	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24

TABLE C-8
SELECTED MATERIAL VOLUMES (YD^3/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
10	0.20	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
12	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
15	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
21	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
24	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
27	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
30	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
33	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
36	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
39	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
42	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52

TABLE C-9
SELECTED MATERIAL COSTS ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33
10	3.95	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38
12	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59	4.59
15	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36	5.36
18	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23
21	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73
24	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30
27	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70
30	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58	18.58
33	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84	22.84
36	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72	24.72
39	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58	26.58
42	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54	29.54

TABLE C-10
COMPACTION VOLUME (YD^3/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	0.89	1.06	1.23	1.42	1.61	1.81	2.02	2.23	2.45	2.68	2.92	3.16	3.41	3.67	3.94	4.21	4.49	4.77	5.07	5.37	5.68	5.99	6.32
10	0.93	1.11	1.30	1.49	1.70	1.91	2.12	2.35	2.58	2.82	3.07	3.32	3.58	3.85	4.13	4.41	4.70	5.00	5.31	5.62	5.94	6.26	6.60
12	0.96	1.16	1.36	1.56	1.78	2.00	2.23	2.46	2.71	2.96	3.22	3.48	3.75	4.03	4.32	4.61	4.91	5.22	5.54	5.86	6.19	6.53	6.88
15	0.99	1.19	1.40	1.62	1.84	2.08	2.32	2.56	2.82	3.08	3.35	3.62	3.91	4.20	4.49	4.80	5.11	5.43	5.76	6.09	6.43	6.78	7.14
18	0.99	1.21	1.43	1.66	1.89	2.14	2.39	2.65	2.91	3.18	3.46	3.75	4.04	4.34	4.65	4.97	5.29	5.62	5.96	6.31	6.66	7.02	7.38
21	1.04	1.28	1.52	1.77	2.03	2.30	2.57	2.85	3.14	3.43	3.73	4.04	4.36	4.68	5.01	5.35	5.69	6.04	6.40	6.77	7.15	7.53	7.91
24	1.09	1.35	1.62	1.89	2.17	2.46	2.75	3.05	3.36	3.68	4.00	4.33	4.67	5.01	5.36	5.72	6.09	6.46	6.85	7.23	7.63	8.03	8.44
27	1.19	1.51	1.84	2.18	2.53	2.88	3.24	3.60	3.98	4.36	4.75	5.14	5.55	5.96	6.37	6.80	7.23	7.67	8.12	8.57	9.03	9.50	9.98
30	1.25	1.62	1.99	2.37	2.76	3.16	3.56	3.97	4.39	4.81	5.25	5.69	6.13	6.59	7.05	7.52	7.99	8.47	8.96	9.46	9.97	10.48	11.00
33	1.29	1.70	2.11	2.54	2.97	3.41	3.86	4.31	4.77	5.24	5.72	6.20	6.69	7.19	7.69	8.20	8.72	9.25	9.78	10.32	10.87	11.43	11.99
36	1.19	1.61	2.04	2.47	2.92	3.37	3.82	4.29	4.76	5.24	5.73	6.22	6.72	7.23	7.75	8.27	8.80	9.34	9.88	10.43	10.99	11.56	12.13
39	1.09	1.52	1.96	2.41	2.86	3.32	3.79	4.27	4.75	5.24	5.74	6.24	6.75	7.27	7.80	8.33	8.87	9.42	9.98	10.54	11.11	11.69	12.27
42	1.01	1.46	1.92	2.39	2.86	3.35	3.84	4.33	4.84	5.35	5.87	6.40	6.93	7.47	8.02	8.58	9.14	9.71	10.29	10.87	11.46	12.06	12.67

TABLE C-11
COMPACTION COSTS ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	4.25	5.07	5.93	6.81	7.74	8.70	9.69	10.72	11.78	12.88	14.01	15.18	16.38	17.62	18.89	20.20	21.54	22.92	24.33	25.78	27.26	28.78	30.33
10	4.45	5.32	6.23	7.17	8.14	9.15	10.20	11.28	12.40	13.55	14.73	15.95	17.21	18.50	19.82	21.18	22.57	24.00	25.47	26.97	28.50	30.07	31.67
12	4.63	5.55	6.51	7.50	8.53	9.60	10.69	11.83	12.99	14.20	15.43	16.71	18.01	19.36	20.73	22.14	23.59	25.07	26.59	28.14	29.73	31.35	33.00
15	4.73	5.71	6.72	7.77	8.85	9.96	11.11	12.30	13.52	14.77	16.06	17.39	18.75	20.14	21.57	23.03	24.53	26.07	27.64	29.24	30.88	32.55	34.26
18	4.77	5.80	6.86	7.96	9.09	10.26	11.46	12.70	13.97	15.28	16.62	18.00	19.41	20.86	22.34	23.85	25.40	26.99	28.61	30.27	31.96	33.68	35.44
21	5.02	6.15	7.32	8.52	9.76	11.03	12.34	13.68	15.05	16.47	17.91	19.39	20.91	22.46	24.05	25.67	27.32	29.02	30.74	32.50	34.30	36.13	37.99
24	5.25	6.49	7.76	9.07	10.41	11.79	13.20	14.64	16.13	17.64	19.19	20.78	22.40	24.06	25.75	27.47	29.23	31.03	32.86	34.72	36.62	38.56	40.53
27	5.71	7.26	8.85	10.47	12.12	13.82	15.54	17.30	19.10	20.93	22.79	24.69	26.63	28.60	30.60	32.64	34.71	36.82	38.97	41.14	43.36	45.61	47.89
30	6.01	7.77	9.57	11.40	13.26	15.16	17.09	19.06	21.07	23.11	25.18	27.29	29.43	31.61	33.83	36.08	38.36	40.68	43.03	45.42	47.84	50.30	52.79
33	6.18	8.15	10.15	12.19	14.26	16.37	18.52	20.69	22.91	25.16	27.44	29.76	32.11	34.50	36.92	39.38	41.87	44.40	46.96	49.56	52.19	54.86	57.56
36	5.70	7.72	9.78	11.87	14.00	16.16	18.35	20.58	22.85	25.15	27.49	29.86	32.26	34.70	37.18	39.69	42.23	44.81	47.43	50.07	52.76	55.48	58.23
39	5.23	7.30	9.41	11.56	13.73	15.95	18.20	20.48	22.80	25.15	27.54	29.96	32.42	34.91	37.44	40.00	42.60	45.23	47.90	50.60	53.33	56.10	58.91
42	4.82	7.00	9.22	11.47	13.75	16.07	18.42	20.81	23.23	25.69	28.18	30.71	33.27	35.87	38.50	41.16	43.87	46.60	49.37	52.18	55.02	57.90	60.81

TABLE C-12
EARTHWORK COST ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	10.22	11.35	12.52	13.74	15.01	16.32	17.68	19.09	20.55	22.06	23.61	25.22	26.86	28.56	30.31	32.10	33.94	35.83	37.77	39.75	41.79	43.87	45.99
10	11.33	12.82	14.06	15.35	16.69	18.08	19.51	20.99	22.52	24.10	25.73	27.40	29.12	30.89	32.71	34.58	36.49	38.45	40.46	42.51	44.62	46.77	48.97
12	12.46	13.73	15.04	16.40	17.82	19.27	20.78	22.33	23.94	25.59	27.28	29.03	30.82	32.66	34.55	36.49	38.47	40.51	42.59	44.71	46.89	49.11	51.39
15	13.69	15.03	16.42	17.85	19.33	20.86	22.44	24.07	25.74	27.46	29.23	31.05	32.92	34.83	36.79	38.80	40.85	42.96	45.11	47.31	49.56	51.85	54.20
18	15.00	16.41	17.87	19.37	20.93	22.53	24.18	25.88	27.62	29.42	31.26	33.15	35.08	37.07	39.10	41.18	43.31	45.48	47.71	49.98	52.30	54.66	57.08
21	17.43	18.98	20.59	22.24	23.93	25.68	27.47	29.31	31.20	33.14	35.12	37.16	39.24	41.36	43.54	45.76	48.03	50.35	52.72	55.14	57.60	60.11	62.67
24	19.93	21.63	23.38	25.17	27.01	28.90	30.84	32.82	34.85	36.93	39.06	41.24	43.46	45.73	48.05	50.42	52.83	55.30	57.81	60.37	62.97	65.63	68.33
27	28.03	30.16	32.34	34.56	36.83	39.15	41.52	43.93	46.40	48.91	51.47	54.07	56.73	59.43	62.18	64.98	67.82	70.71	73.66	76.64	79.68	82.77	85.90
30	33.71	36.12	38.59	41.10	43.65	46.26	48.92	51.62	54.37	57.16	60.01	62.90	65.84	68.83	71.87	74.95	78.09	81.27	84.49	87.77	91.09	94.47	97.88
33	39.71	42.41	45.16	47.96	50.81	53.70	56.64	59.63	62.67	65.75	68.88	72.06	75.29	78.57	81.89	85.26	88.68	92.15	95.66	99.22	102.84	106.49	110.20
36	41.85	44.62	47.45	50.31	53.23	56.20	59.21	62.27	65.38	68.53	71.74	74.99	78.29	81.64	85.03	88.48	91.97	95.51	99.09	102.73	106.41	110.14	113.92
39	43.95	46.80	49.69	52.63	55.62	58.66	61.74	64.88	68.06	71.28	74.56	77.88	81.25	84.67	88.14	91.66	95.22	98.83	102.49	106.19	109.95	113.75	117.60
42	47.62	50.61	53.64	56.73	59.86	63.04	66.27	69.55	72.87	76.24	79.66	83.13	86.64	90.20	93.81	97.47	101.18	104.93	108.73	112.58	116.48	120.43	124.42

TABLE C-13
DEWATERING COST ($/LF)

Diameter (in.)	Depth (ft)																					
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
10	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
12	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
15	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
18	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
21	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
24	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
27	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
30	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
33	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
36	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
39	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00
42	0.00	0.00	36.00	36.50	37.00	37.50	38.00	38.50	39.00	39.50	40.00	40.50	41.00	41.50	42.00	42.50	43.00	43.50	44.00	44.50	45.00	45.50	46.00

TABLE C-14
PIPE INSTALLATION COST ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88
10	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18
12	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48	9.48
15	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08
18	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28
21	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88	11.88
24	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48	12.48
27	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08	13.08
30	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68	13.68
33	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58
36	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48	15.48
39	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
42	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28

TABLE C-15
PIPELINE SHORING COST ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
10	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
12	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
15	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
18	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
21	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
24	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
27	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
30	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
33	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
36	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
39	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
42	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40

TABLE C-16
PAVING COST ($/LF)

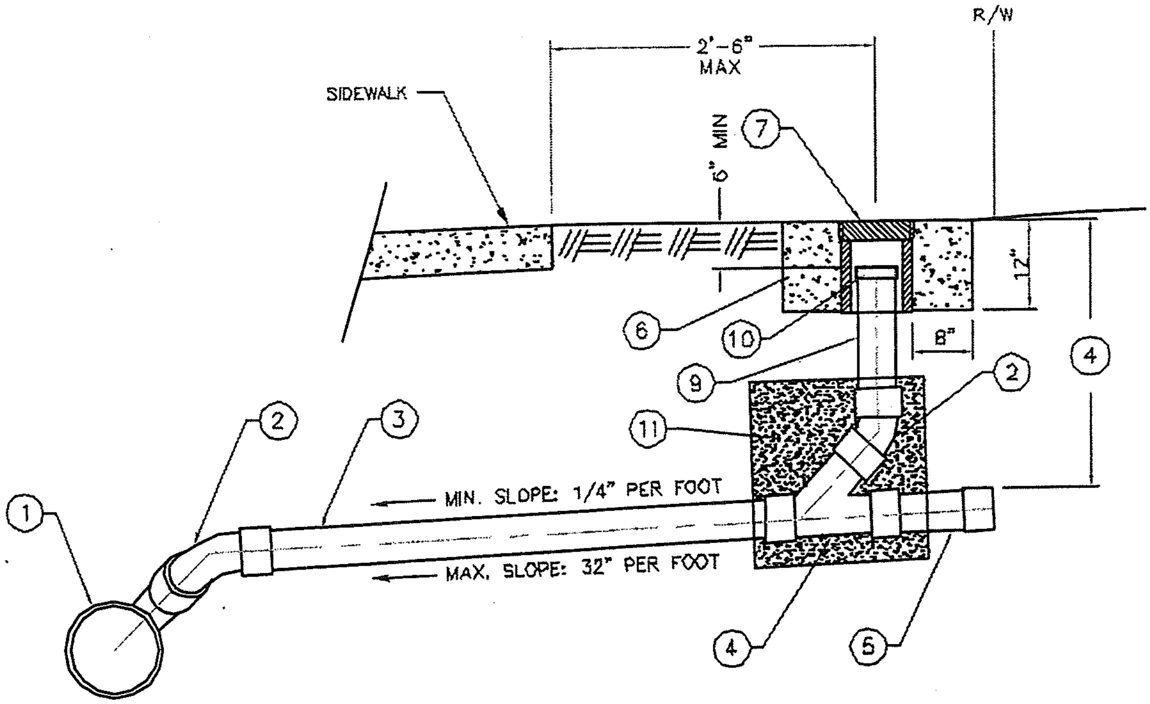
Diameter (in.)	Depth (ft)																						
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
8	19.17	20.00	20.83	21.67	22.50	23.33	24.17	25.00	25.83	26.67	27.50	28.33	29.17	30.00	30.83	31.67	32.50	33.33	34.17	35.00	35.83	36.67	37.50
10	20.42	21.25	22.08	22.92	23.75	24.58	25.42	26.25	27.08	27.92	28.75	29.58	30.42	31.25	32.08	32.92	33.75	34.58	35.42	36.25	37.08	37.92	38.75
12	21.67	22.50	23.33	24.17	25.00	25.83	26.67	27.50	28.33	29.17	30.00	30.83	31.67	32.50	33.33	34.17	35.00	35.83	36.67	37.50	38.33	39.17	40.00
15	22.92	23.75	24.58	25.42	26.25	27.08	27.92	28.75	29.58	30.42	31.25	32.08	32.92	33.75	34.58	35.42	36.25	37.08	37.92	38.75	39.58	40.42	41.25
18	24.17	25.00	25.83	26.67	27.50	28.33	29.17	30.00	30.83	31.67	32.50	33.33	34.17	35.00	35.83	36.67	37.50	38.33	39.17	40.00	40.83	41.67	42.50
21	26.67	27.50	28.33	29.17	30.00	30.83	31.67	32.50	33.33	34.17	35.00	35.83	36.67	37.50	38.33	39.17	40.00	40.83	41.67	42.50	43.33	44.17	45.00
24	29.17	30.00	30.83	31.67	32.50	33.33	34.17	35.00	35.83	36.67	37.50	38.33	39.17	40.00	40.83	41.67	42.50	43.33	44.17	45.00	45.83	46.67	47.50
27	36.67	37.50	38.33	39.17	40.00	40.83	41.67	42.50	43.33	44.17	45.00	45.83	46.67	47.50	48.33	49.17	50.00	50.83	51.67	52.50	53.33	54.17	55.00
30	41.67	42.50	43.33	44.17	45.00	45.83	46.67	47.50	48.33	49.17	50.00	50.83	51.67	52.50	53.33	54.17	55.00	55.83	56.67	57.50	58.33	59.17	60.00
33	46.67	47.50	48.33	49.17	50.00	50.83	51.67	52.50	53.33	54.17	55.00	55.83	56.67	57.50	58.33	59.17	60.00	60.83	61.67	62.50	63.33	64.17	65.00
36	47.92	48.75	49.58	50.42	51.25	52.08	52.92	53.75	54.58	55.42	56.25	57.08	57.92	58.75	59.58	60.42	61.25	62.08	62.92	63.75	64.58	65.42	66.25
39	49.17	50.00	50.83	51.67	52.50	53.33	54.17	55.00	55.83	56.67	57.50	58.33	59.17	60.00	60.83	61.67	62.50	63.33	64.17	65.00	65.83	66.67	67.50
42	51.67	52.50	53.33	54.17	55.00	55.83	56.67	57.50	58.33	59.17	60.00	60.83	61.67	62.50	63.33	64.17	65.00	65.83	66.67	67.50	68.33	69.17	70.00

TABLE C-17
TOTAL UNIT COST FOR PIPELINES ($/LF)

Diameter (in.)	Depth (ft)																						
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
8	42	44	82	85	87	91	94	97	99	102	105	108	111	114	117	120	123	127	130	133	137	140	143
10	46	49	87	89	92	96	99	102	105	107	110	113	117	120	123	126	129	133	136	139	143	146	150
12	52	54	92	95	98	102	105	108	111	114	117	120	123	126	129	133	136	139	143	146	150	153	157
15	59	61	99	102	105	109	112	115	118	121	124	128	131	134	137	141	144	147	151	154	158	162	165
18	67	69	108	111	114	119	122	125	128	131	134	138	141	144	148	151	154	158	162	165	169	173	176
21	80	82	121	124	127	133	136	140	143	146	149	153	156	160	163	167	170	174	178	181	185	189	193
24	94	97	135	138	141	149	152	156	159	162	166	169	173	177	180	184	188	192	195	199	203	207	211
27	135	138	177	181	185	188	192	196	199	203	207	211	215	219	223	227	232	236	240	244	249	253	258
30	151	155	194	198	202	206	210	214	218	222	226	230	235	239	243	248	252	257	261	266	271	275	280
33	171	174	214	218	222	226	230	235	239	244	248	253	257	262	266	271	276	281	286	290	295	300	305
36	182	186	225	230	234	238	242	247	251	256	260	265	269	274	279	284	288	293	298	303	308	313	318
39	203	207	247	251	255	259	264	268	273	277	282	287	291	296	301	306	311	316	321	326	331	336	341
42	227	231	271	275	280	284	289	293	298	303	307	312	317	322	327	332	337	342	347	352	357	363	368

Appendix D

Standard City Sanitary Sewer Details



(1) SEWER MAIN WITH SEWER SERVICE WYE AT 30-45 DEGREES.

(2) WYE BRANCH WITH 1/8 BENDS OR 4" ABS LONGSWEEP COMBO.

(3) SEWER SERVICE SHALL BE CONSTRUCTED WITH A STRAIGHT GRADE AND ALIGNMENT FROM THE MAIN TO THE RIGHT-OF-WAY UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER. SEWER SERVICES SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE (CLASS 52) OR POLYVINYL CHLORIDE SEWER PIPE (SDR 26) OR ABS.

(4) SEWER SERVICE SHALL HAVE A MINIMUM OF THIRTY SIX (36) INCHES OF COVER FROM FINISHED GRADE AT RIGHT-OF-WAY. SEWER SERVICES THAT HAVE LESS THAN THIRTY SIX (36) INCHES OF COVER, SHALL REQUIRE SPECIAL APPROVAL BY THE CITY ENGINEER.

(5) SERVICE TO BUILDING. IF NO BUILDING, PLACE TWELVE (12) INCH STUB (TO RIGHT-OF-WAY) WITH WATER TIGHT CAP.

(6) CLASS "A" CONCRETE EXCEPT IN RESIDENTIAL PLANTER OR LAWN AREAS.

(7) CLEANOUT BOX SHALL BE A CHRISTY G5 BOX WITH CAST IRON LID WHEN SUBJECT TO TRAFFIC LOADS. USE CARSON-BROOKS 1412-B BOX IN RESIDENTIAL LAWN AND PLANTER AREAS. ALL LIDS SHALL READ "SEWER C.O.".

(8) CURB, GUTTER, AND SIDEWALK WITH A TWO (2) INCH x TWO (2) INCH LETTER "S" STAMPED, CHISELED, ETC. ON TOP OF CURB LOCATED DIRECTLY ABOVE WHERE SEWER SERVICE CROSSES THE GUTTER FLOWLINE. METHOD TO BE APPROVED BY THE CITY ENGINEER.

(9) RISER. SAME MATERIAL AS SEWER SERVICE.

(10) RUBBER END CAP W/STAINLESS STEEL SHEAR BAND.

(11) BEDDING MATERIAL.

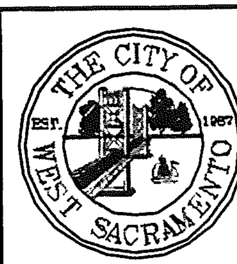
NOTES:

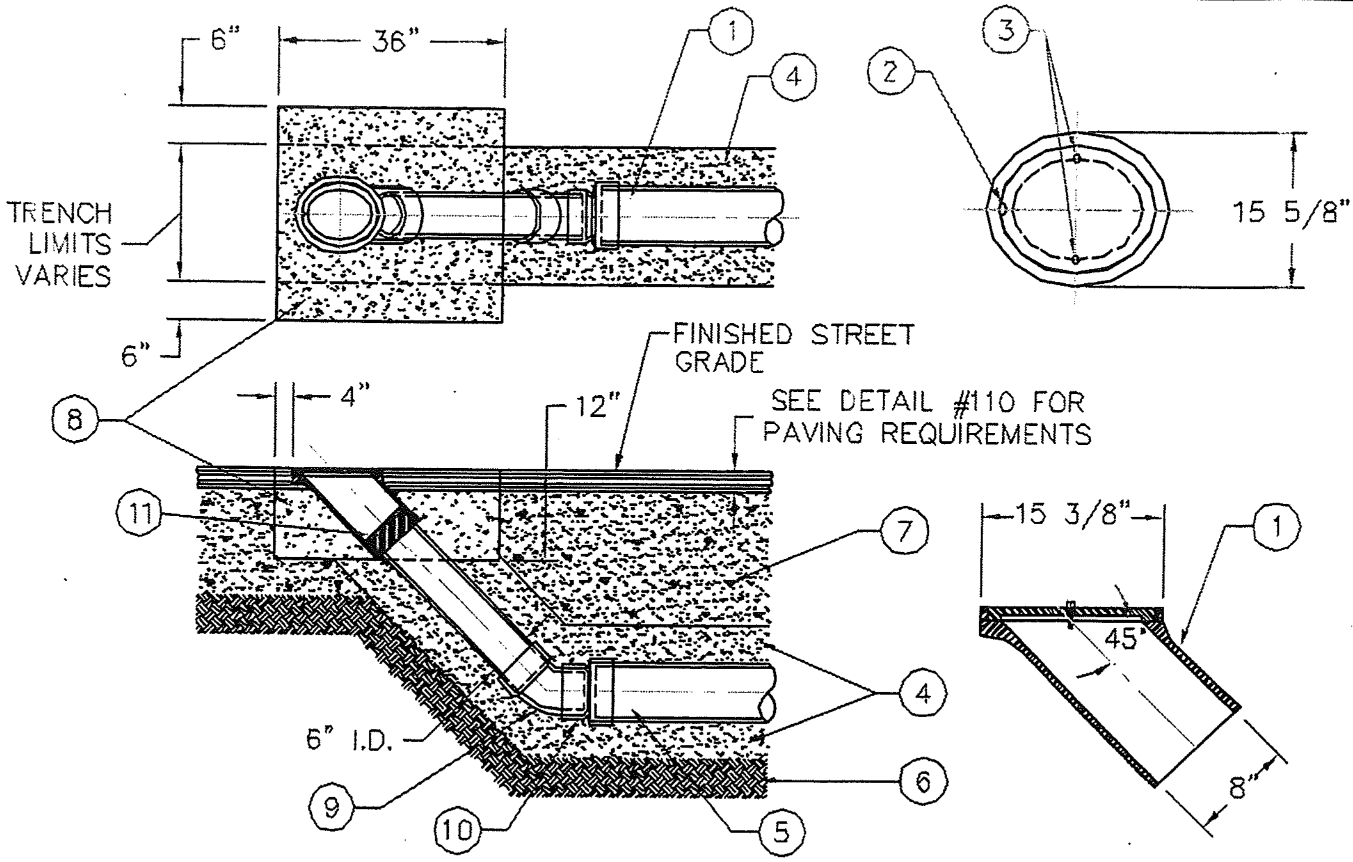
A. SEWER SERVICES SHALL BE RUN TO MANHOLES WHENEVER POSSIBLE.

B. SEWER CLEANOUTS SHALL LIE WITHIN CITY R/W OR A DEDICATED PUBLIC EASEMENT IN ALL CASES.

THE CITY OF WEST SACRAMENTO - STANDARD DETAIL

APPROVED BY: CITY ENGINEER	C-38733 P.E. NO.	3/31/05 DATE	TITLE: RESIDENTIAL SEWER SERVICE WITH CLEANOUT
REVISION:			
REVISION:			
REVISION:			STANDARD DETAIL #: 401
REVISION:			





1. CAST IRON FLUSHING INLET, FRAME AND COVER, D & L SUPPLY H-6530 OR APPROVED EQUAL W/C.O.
2. ONE HALF (1/2) INCH BY ONE (1) INCH PICK HOLE.
3. FIVE EIGHTHS (5/8) INCH BY ONE AND ONE HALF (1 1/2) INCH LONG, COURSE THREADED, BRASS HEX HEAD BOLTS TO BE INSTALLED WHEN RISER IS PLACED OUTSIDE PAVED AREA.
4. CRUSHED BEDDING; SEE DIVISION IV, SECTION 12.
5. PROPOSED SEWER MAIN.
6. UNDISTURBED SOIL.
7. AGGREGATE BASE; SEE DIVISION IV, SECTION 12.
8. CLASS "A" CONCRETE WITH 2" A.C.
9. ONE EIGHTH (1/8) BEND.
10. SIX (6) INCH BY EIGHT (8) INCH INCREASER (IF REQUIRED).
11. RUBBER END CAP WITH STAINLESS STEEL SHEAR BAND.

THE CITY OF WEST SACRAMENTO – STANDARD DETAIL

APPROVED BY: ______________ CITY ENGINEER | C-38733 P.E. NO. | 3/31/05 DATE

REVISION:

REVISION:

REVISION:

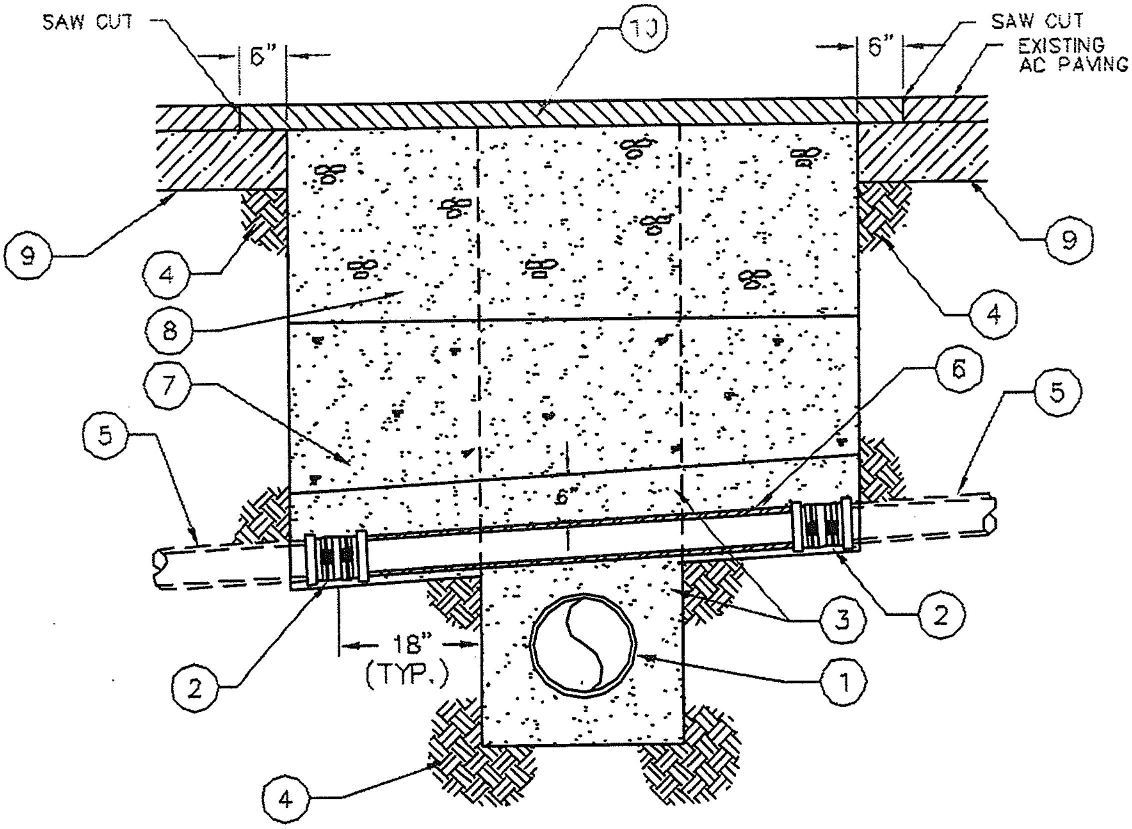
REVISION:

TITLE:

SEWER FLUSHING INLET

STANDARD DETAIL #: 402

THE CITY OF WEST SACRAMENTO EST. 1987



(1) NEW UTILITY (SEE DETAIL #409 FOR SEPARATION REQUIREMENTS).

(2) BANDED RUBBER COUPLING WITH STAINLESS STEEL SHEAR BANDS.

(3) INITIAL BACKFILL. (SEE DETAIL #110).

(4) UNDISTURBED SOIL.

(5) EXISTING SEWER SERVICE OR MAIN.

(6) ABS PIPE.

(7) SELECT BACKFILL. (SEE DETAIL #110).

(8) FINISH BACKFILL. (SEE DETAIL #110).

(9) EXISTING STRUCTURAL SECTION.

(10) THREE (3) INCHES MIN. OF ASPHALT CONCRETE PAVING OR MATCH EXISTING.

NOTE:

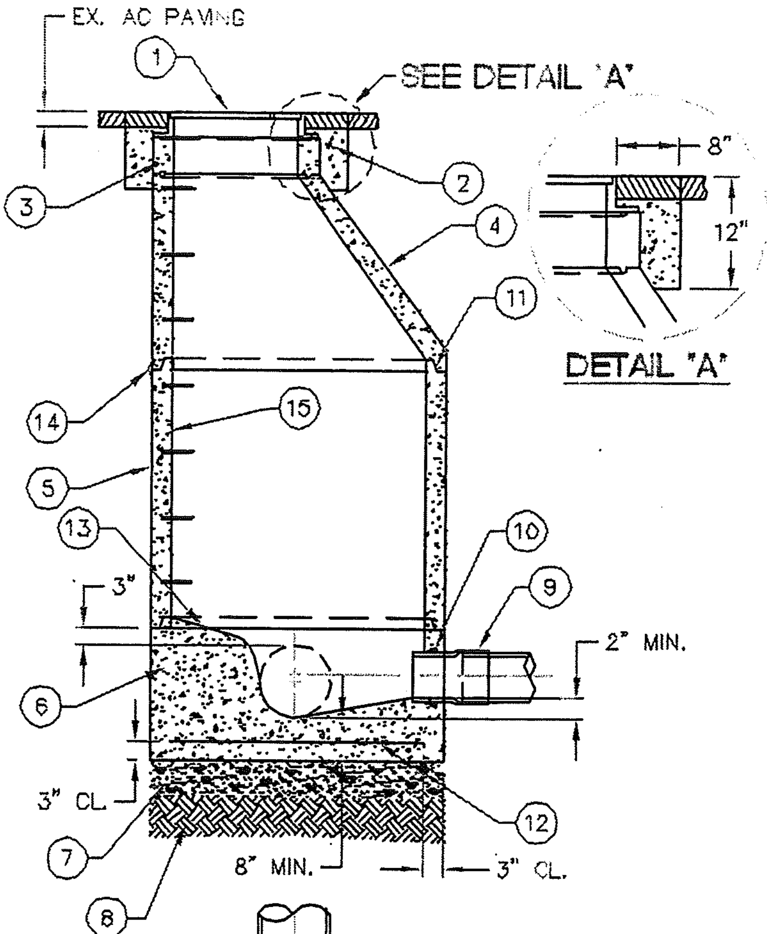
A. GAP BETWEEN THE EXISTING AND NEW PIPE AT COUPLINGS SHALL NOT EXCEED ONE QUARTER INCH (1/4").

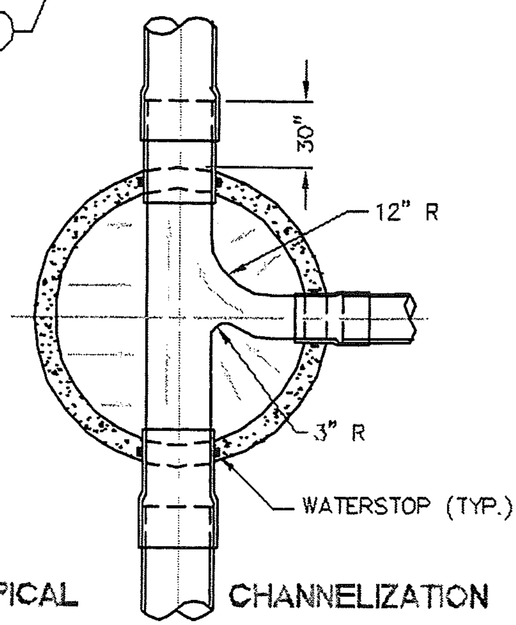
B. IF (1) IS A WATER PIPE, THAN (6) SHALL BE CAST IRON OR DUCTILE IRON PIPE FOR 10' EACH SIDE OF THE WATER PIPE.

THE CITY OF WEST SACRAMENTO – STANDARD DETAIL

APPROVED BY: CITY ENGINEER	C-38733 P.E. NO.	3/31/05 DATE	TITLE: SEWER REPAIR
REVISION:			
REVISION:			
REVISION:			STANDARD DETAIL #: 403
REVISION:			

THE CITY OF WEST SACRAMENTO EST. 1987





TYPICAL CHANNELIZATION

(1) FRAME AND COVER, D & L SUPPLY 1024 MARKED "SANITARY SEWER" WITH PICK HOLE.

(2) CLASS "A" CONCRETE COLLAR WITH 2" A.C.

(3) STANDARD TWENTY FOUR (24) INCH DIAMETER MANHOLE GRADE RINGS THREE (3) INCH MINIMUM, EIGHTEEN (18) INCH MAXIMUM NECK HEIGHT FROM CONE TO FINISH GRADE.

(4) STANDARD FORTY EIGHT (48) INCH ECCENTRIC MANHOLE REDUCER CONE. COPOLYMER POLYPROPYLENE STEPS REQUIRED FOR MANHOLES DEEPER THAN THREE (3) FEET.

(5) STANDARD FORTY EIGHT (48) INCH DIAMETER MANHOLE BARREL SECTION, CONFORMING TO ASTM C478 - LATEST REVISION WITH FOUR (4) INCH MINIMUM WALL THICKNESS. COPOLYMER POLYPROPYLENE STEPS REQUIRED FOR MANHOLES MORE THAN THREE (3) FEET DEEP.

(6) CLASS "A", CAST-IN-PLACE OR PRECAST CONCRETE BASE.

(7) SIX (6) INCHES MINIMUM, 3/4 INCH CRUSHED ROCK PER ASTM D448 #67.

(8) UNDISTURBED SOIL.

(9) PIPE SHALL HAVE AT LEAST ONE JOINT WITHIN TWO AND A HALF (2 1/2) FEET FROM MANHOLE WALL.

(10) CONNECTIONS TO MANHOLE SHALL BE MADE BY UTILIZING MANHOLE ADAPTERS OR ELASTOMERIC SEAL RINGS EMBEDDED IN THE CONCRETE.

(11) BARREL SECTION JOINTS SHALL BE SEALED BY PRE-FORMED PLASTIC SEALING GASKETS THAT CONFORM TO FEDERAL SPECIFICATION SS-S-00210.

(12) MANHOLES DEEPER THAN SEVEN (7) FEET (INVERT TO FINISHED GRADE) SHALL HAVE #4 REBAR TWELVE (12) INCHES ON CENTER, EACH WAY, IN MANHOLE BASE.

(13) FOUR (4) INCHES PER FOOT MINIMUM SLOPE.

(14) ALL JOINTS SHALL BE MORTARED INSIDE AND OUTSIDE OF MANHOLE.

(15) ALL SEWER MANHOLES ON TRUNK LINES 10" AND GREATER IN DIAMENTER SHALL BE LINED PER THE REQUIREMENTS SET FORTH IN DIVISION IV, SECTION 14.02G.

NOTES:

A. COUNTRY OF ORIGIN SHALL BE CLEARLY AND PERMANENTLY SHOWN ON TOP SURFACE OF THE FRAME AND COVER IN ACCORDANCE WITH THE TRADE AND TARIFF ACT OF 1984.

B. DATE OF MANUFACTURE SHALL BE CLEARLY AND PERMANENTLY INDICATED ON THE COVER AND THE TOP OF THE FRAME.

C. SEATING SURFACE SHALL BE CLOSELY MACHINED TO NOMINAL DIMENSIONS WITH TOLERANCES NOT TO EXCEED ±1/64 INCH.

D. THE WEIGHT OF THE FRAME SHALL BE 140lbs., ±10lbs.

E. THE WEIGHT OF THE COVER SHALL BE 130lbs., ±5lbs.

F. VACUUM TEST REQUIRED PER DIVISION IV, SECTION 14.03D.

G. SANITARY "SEWER" SHALL BE STAMPED CLEARLY AND PERMANENTLY ON THE COVER.

THE CITY OF WEST SACRAMENTO - STANDARD DETAIL

APPROVED BY: ______ CITY ENGINEER | C-38733 P.E. NO. | 3/31/05 DATE

REVISION:

REVISION:

REVISION:

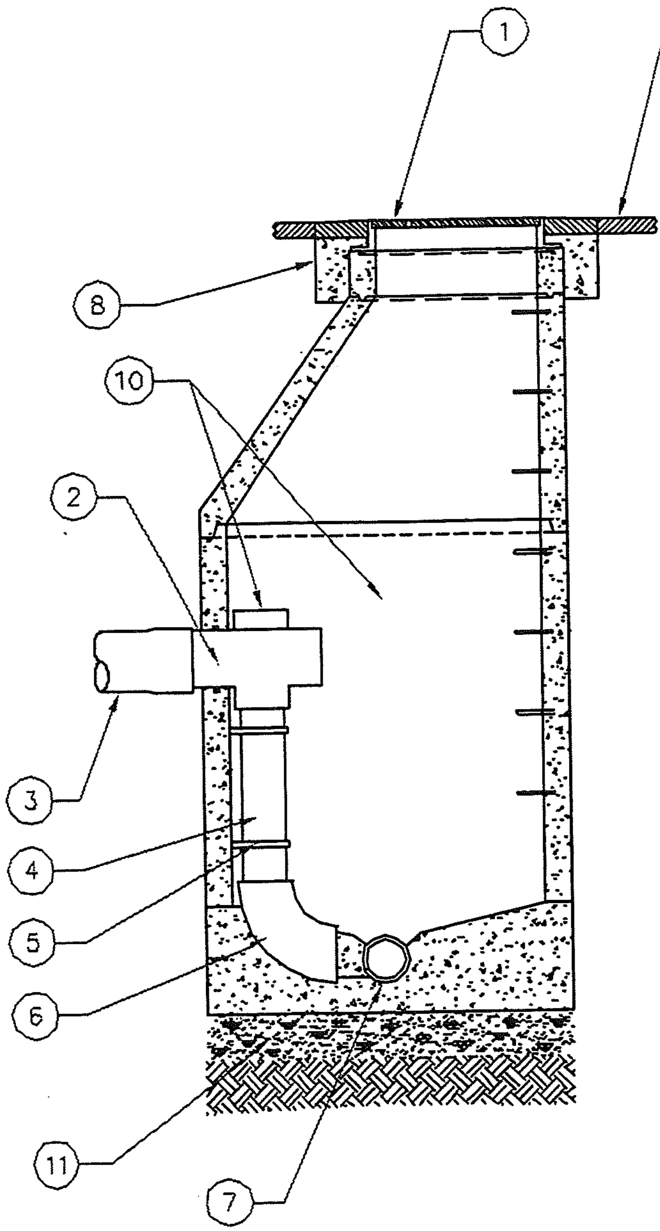
REVISION:

TITLE:

SEWER MANHOLE

STANDARD DETAIL #: 404

THE CITY OF WEST SACRAMENTO EST. 1987



1. FRAME AND COVER. SEE DETAIL #404.
2. SCHEDULE 40, PVC CROSS SOLVENT WELD (TYPICAL ALL DROP FITTINGS). CUT OFF INBOARD LEG OF TEE IF NECESSARY.
3. ADAPT TO MAIN.
4. DROP PIPE.
5. 3/32 INCH BY 2 INCH TYPE 316 STAINLESS STEEL STRAP ANCHORED TO MANHOLE WALL WITH 5/8 INCH, STAINLESS STEEL ANCHOR BOLTS. 3 FEET MAXIMUM SPACING 2 STRAPS MIN. PER DROP.
6. PVC ELBOW. CHIP OUT CHANNEL AS SHOWN. FILL VOIDS WITH NON-SHRINK GROUT.
7. SEWER MAIN (EXISTING OR TO BE CONSTRUCTED).
8. CLASS "A" CONCRETE COLLAR WITH 2" A.C.
9. STREET STRUCTURAL SECTION.
10. EPOXY OR COLD TAR COATING REQUIRED OVER INTERIOR DROP AND INTERIOR ON MANHOLE PER DIVISION IV, SECTION 14.02G.
11. MINUMUM SIX (6) INCHES OF 3/4 INCH CRUSHED ROCK PER ASTM D448 #67 COMPACTED TO 95% RELATIVE COMPACTION.

NOTE:

A. INSIDE DROP CONNECTIONS SHALL BE ALLOWED ONLY UPON PRIOR APPROVAL OF THE CITY ENGINEER.

THE CITY OF WEST SACRAMENTO – STANDARD DETAIL

APPROVED BY: ______ CITY ENGINEER	C-38733 P.E. NO.	3/31/05 DATE	TITLE: SEWER MANHOLE WITH INSIDE DROP CONNECTION — STANDARD DETAIL #: 405
REVISION:			
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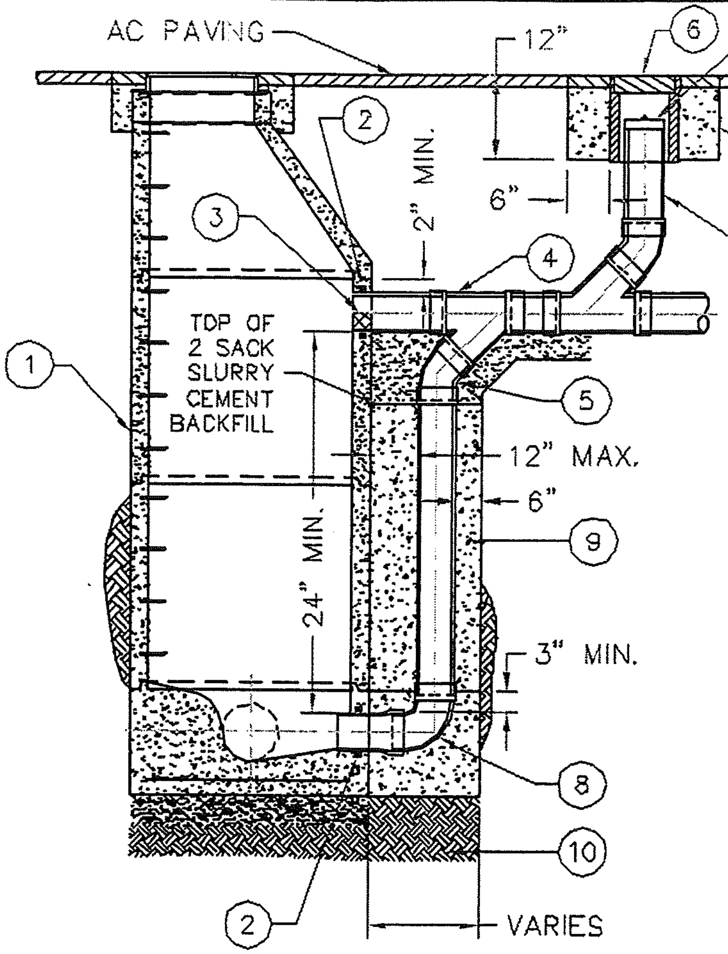
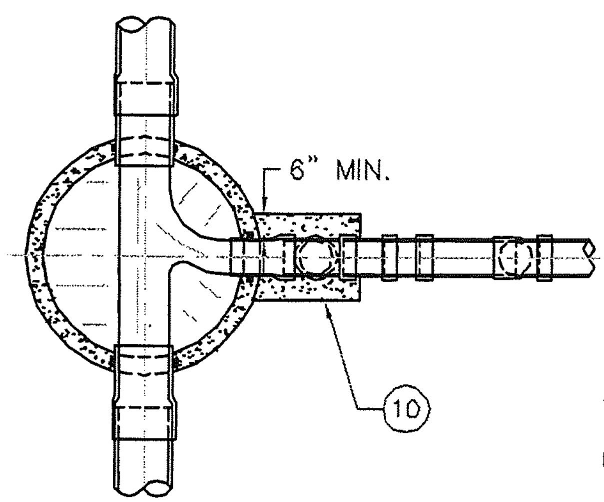
REVISION:			

THE CITY OF WEST SACRAMENTO EST. 1987



1. FRAME AND COVER, GRADE RINGS, CONE BARRELL SECTION SECTIONS AND MANHOLE BASE.
2. CONNECTION TO MANHOLE SHALL BE MADE BY UTILIZING MANHOLE ADAPTORS OR ELASTOMERIC SEAL RINGS EMBEDDED IN THE CONCRETE.
3. NON-SHRINK GROUT DAM SHALL HAVE A DEPTH OF ONE HALF (1/2) THE SIZE OF PIPE.
4. REVERSE WYE BRANCH.
5. 1/8 BEND.
6. CHRISTY G5 BOX WITH CAST IRON LID. (LID SHALL READ "SEWER").
7. WYE BRANCH AND CLEANOUT ASSEMBLY.
8. 1/4 BEND.
9. BACKFILL DROP CONNECTION WITH 2-SACK SLURRY CEMENT TO BOTTOM OF 1/8 BEND.
10. UNDISTURBED SOIL.
11. RUBBER END CAP WITH STAINLESS STEEL SHEAR BAND.



TYPICAL CHANNELIZATION

NOTES:

A. DROP CONNECTION PIPE AND FITTINGS SHALL BE THE SAME SIZE AND MATERIAL AS MAIN.

B. THIS TYPE OF MANHOLE SHALL BE USED WHERE DIFFERENCES IN INVERT ELEVATIONS AT MANHOLE EXCEEDS TWENTY FOUR (24) INCHES AND UPON PRIOR APPROVAL OF THE CITY ENGINEER.

THE CITY OF WEST SACRAMENTO – STANDARD DETAIL

APPROVED BY: ______ CITY ENGINEER | C-38733 P.E. NO. | 3/31/05 DATE

REVISION:

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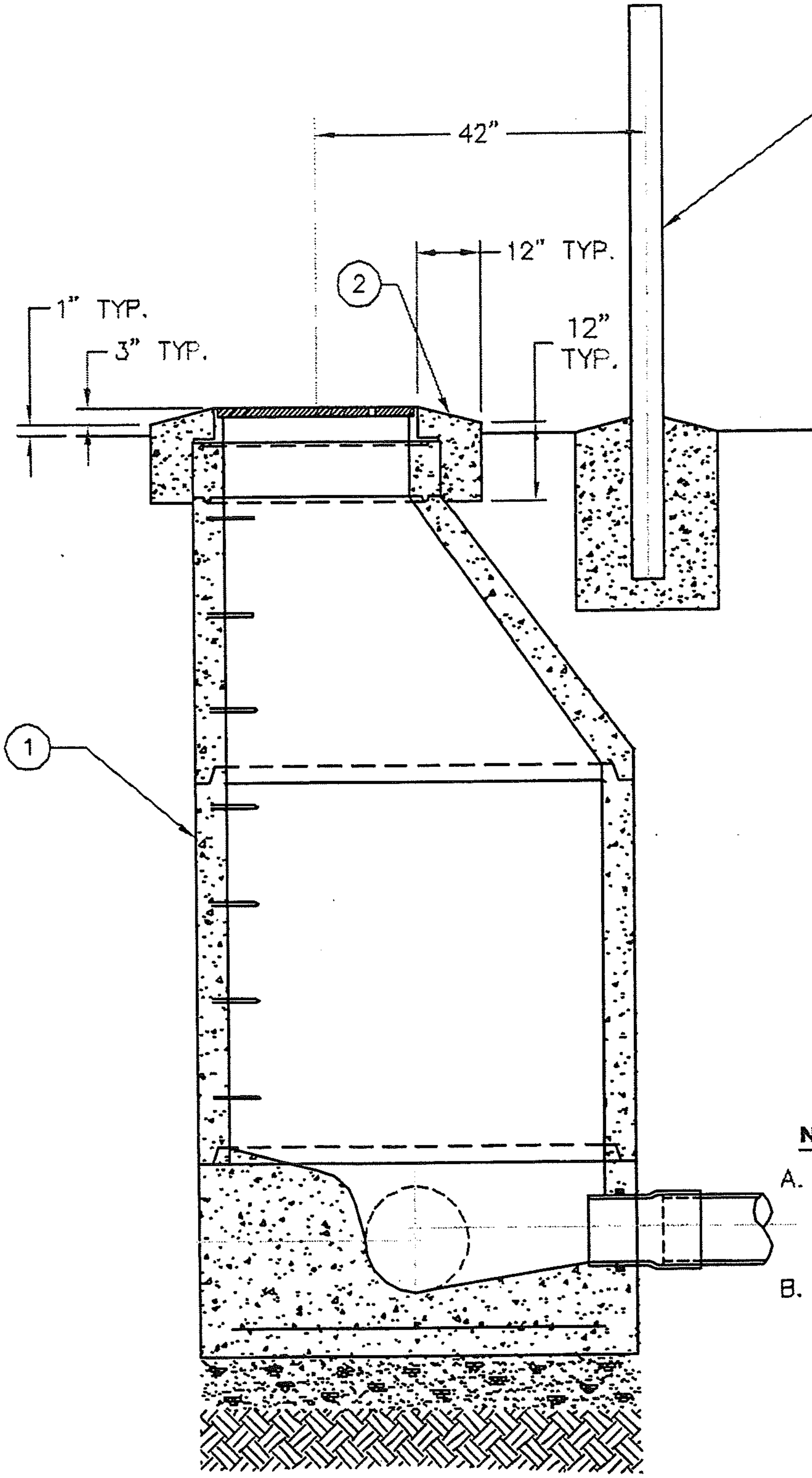
TITLE: **SEWER MANHOLE WITH OUTSIDE DROP CONNECTION**

STANDARD DETAIL #: 406

THE CITY OF WEST SACRAMENTO EST. 1987



(1) FRAME AND COVER, GRADE RINGS, CONE SECTION, BARREL SECTIONS, AND MANHOLE BASE.

(2) SLOPE CONCRETE THREE (3) INCHES TO GRADE.

(3) BOLLARD AND CONCRETE FOUNDATION SHALL CONFORM TO CITY STANDARD DETAIL #517. 4"x4" REDWOOD POST MAY BE SUBSTITUED FOR BOLLARD IN TEMPORARY INSTALLATIONS.

NOTES:

A. DUE TO VARYING DRAINAGE CONDITIONS, RIM ELEVATION ABOVE EXISTING GRADE MAY VARY.

B. CHIMNEY SEAL SHALL BE ADDED RIGHT BELOW THE COVER.

THE CITY OF WEST SACRAMENTO – STANDARD DETAIL

APPROVED BY: CITY ENGINEER	C-38733 P.E. NO.	3/31/05 DATE
REVISION:		
REVISION:		
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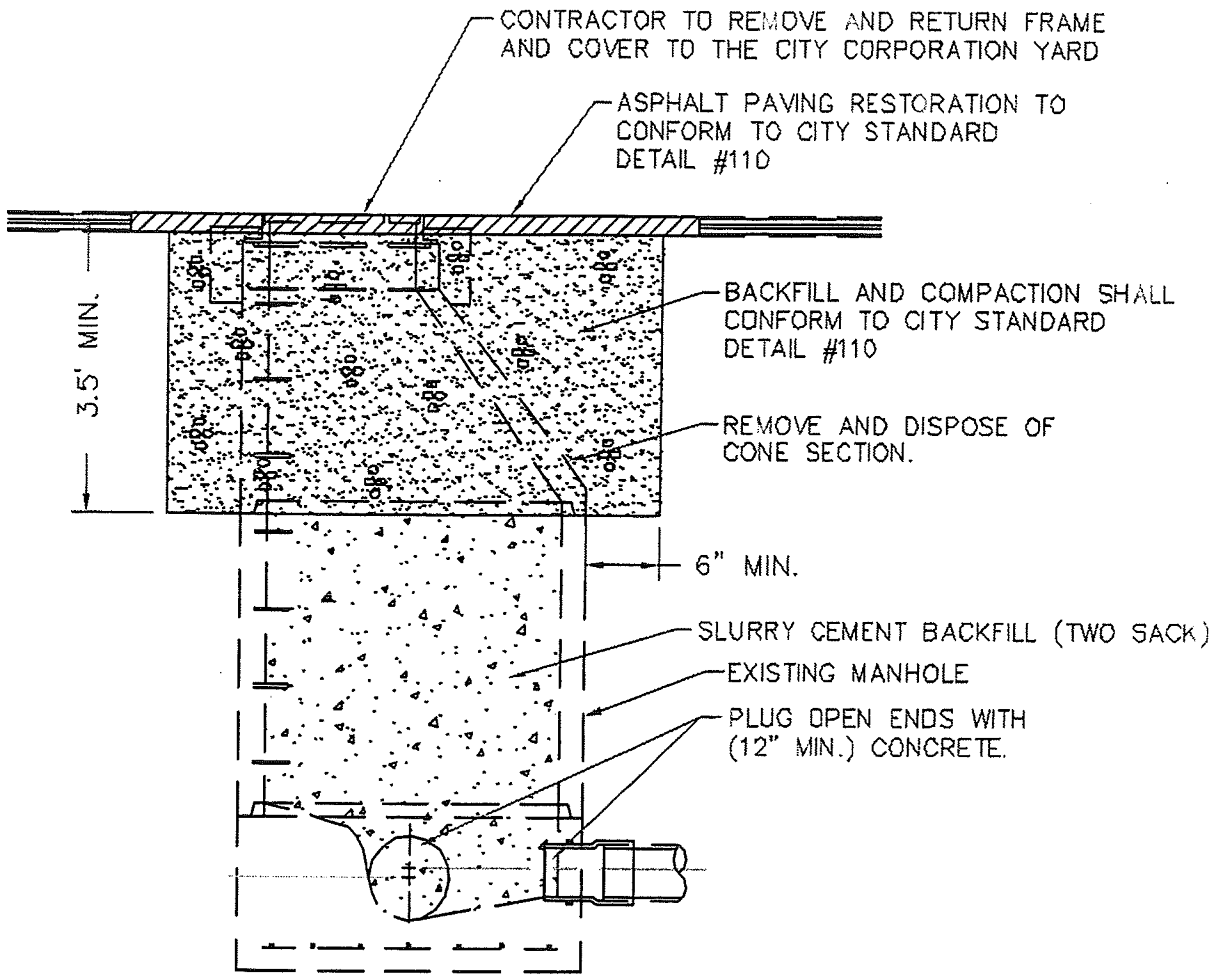
TITLE: **SEWER MANHOLE OUTSIDE PAVED AREA**

STANDARD DETAIL #: 407

THE CITY OF WEST SACRAMENTO EST. 1987



NOTE:

REMOVE CONE AND BARREL SECTION ON MANHOLES SHALLOWER THAN FIVE (5) FEET.

THE CITY OF WEST SACRAMENTO - STANDARD DETAIL

APPROVED BY: ______ CITY ENGINEER | C-38733 P.E. NO. | 3/31/05 DATE

REVISION:

REVISION:

REVISION:

REVISION:

TITLE:

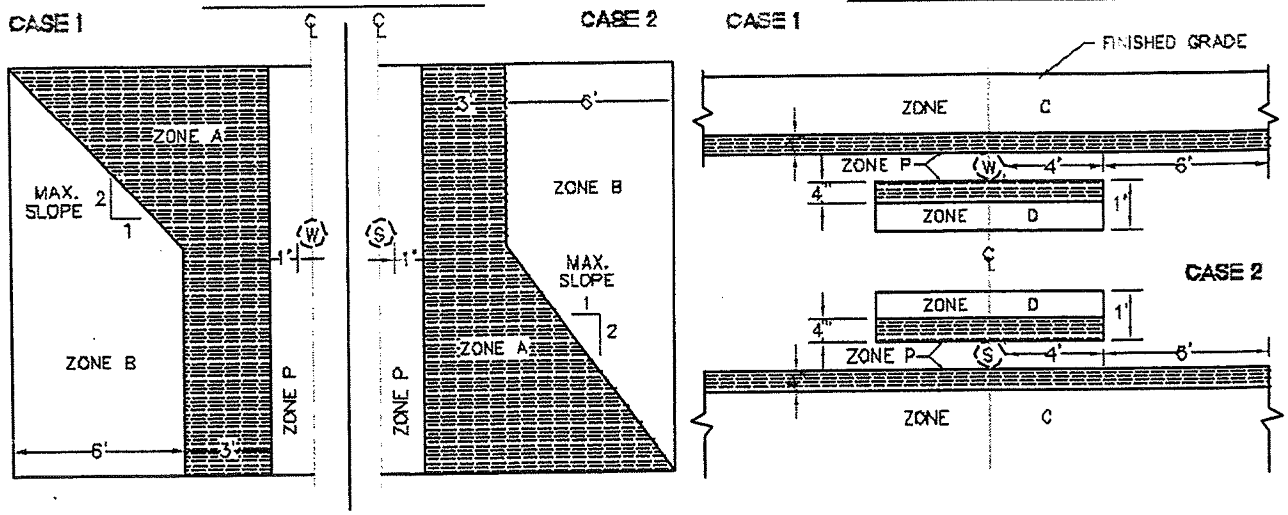
SEWER MANHOLE ABANDONMENT

STANDARD DETAIL #: 108

THE CITY OF WEST SACRAMENTO EST. 1987

PARALLEL CONSTRUCTION

PERPENDICULAR CONSTRUCTION



CASE 1: NEW SEWER BEING INSTALLED

ZONE A. SEWER LINES PARALLEL TO WATER MAINS SHALL NOT BE PERMITTED IN THIS ZONE WITHOUT APPROVAL FROM THE HEALTH DEPARTMENT AND THE WATER SUPPLIER.

ZONE B. THE SEWER LINE SHALL BE CONSTRUCTED OF:
1. POLYVINYL CHLORIDE SEWER PIPE (SDR 26) WITH RUBBER RING JOINTS (PER ASTM D3034).
2. DUCTILE IRON PIPE WITH COMPRESSION JOINTS.

ZONE C & D. THE SEWER LINE SHALL BE CONSTRUCTED OF:
1. A CONTINUOUS SLEEVE OF POLYVINYL CHLORIDE SEWER PIPE (SDR 26).
2. DUCTILE IRON PIPE WITH HOT BITUMINOUS COATING AND MECHANICAL JOINTS.

CASE 2: NEW WATER MAINS BEING INSTALLED

ZONE A. NO WATER MAINS PARALLEL TO SEWER LINES SHALL BE CONSTRUCTED WITHOUT APPROVAL FROM THE HEALTH DEPARTMENT.

ZONE B. THE WATER MAIN SHALL BE CONSTRUCTED OF:
1. POLYVINYL CHLORIDE CLASS 200 WATER PIPE (C-900 OR C-905).
2. DUCTILE IRON PIPE WITH HOT BITUMINOUS COATING.

ZONE C. THE WATER MAIN SHALL HAVE NO JOINTS IN ZONE C AND SHALL BE CONSTRUCTED OF:
1. POLYVINYL CHLORIDE CLASS 200 WATER PIPE (C-900 OR C-905).
2. DUCTILE IRON PIPE WITH HOT BITUMINOUS COATING.

ZONE D. THE WATER MAIN SHALL HAVE NO JOINTS WITHIN FOUR (4) FEET FROM EITHER SIDE OF THE SEWER AND SHALL BE CONSTRUCTED OF:
1. POLYVINYL CHLORIDE, CLASS 200 WATER PIPE (C-900 OR C-905).
2. DUCTILE IRON PIPE WITH HOT BITUMINOUS COATING.

NOTES:
A. ZONE P IS A PROHIBITED ZONE, SECTION 64630(e)(2) CAL. ADMINISTRATIVE CODE, TITLE 22.
B. SEWER LINES HEREIN PERTAIN TO MAINS & LATERALS.
C. ZONES ARE IDENTICAL ON EITHER SIDE OF CENTERLINES.

THE CITY OF WEST SACRAMENTO – STANDARD DETAIL

APPROVED BY: ______ CITY ENGINEER	C-36733 P.E. NO.	3/31/05 DATE	TITLE: SEWER/WATER SEPARATION REQUIREMENTS
REVISION:			STANDARD DETAIL #: 409
REVISION:			
REVISION:			
REVISION:			

THE CITY OF WEST SACRAMENTO EST. 1987