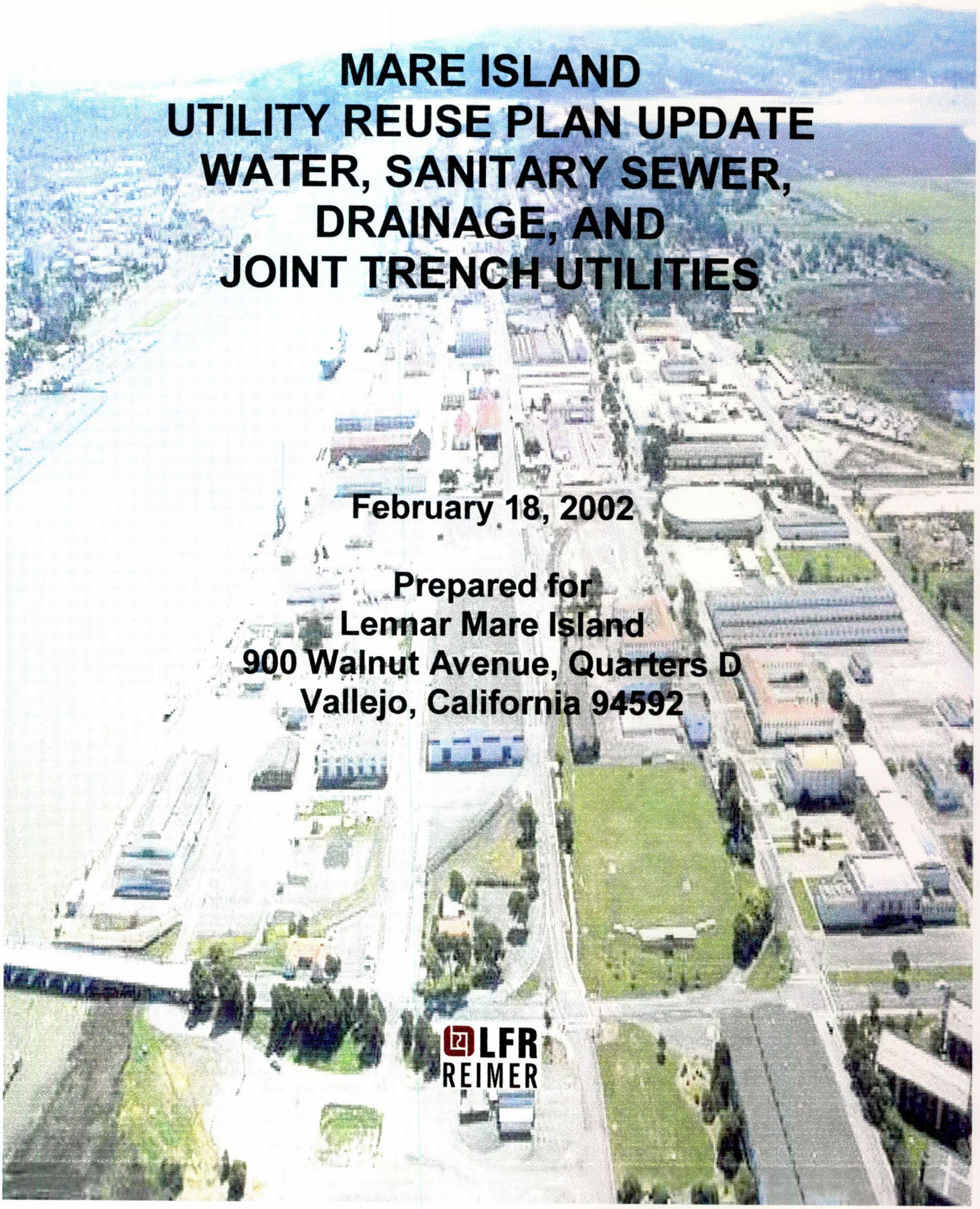


MARE ISLAND
UTILITY REUSE PLAN UPDATE
WATER, SANITARY SEWER, DRAINAGE, AND JOINT TRENCH UTILITIES

February 18, 2002

Prepared for
Lennar Mare Island
900 Walnut Avenue, Quarters D
Vallejo, California 94592

LFR REIMER

CONTENTS

FIGURES

APPENDIX

ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
Cal/EPA	California Environmental Protection Agency
City	City of Vallejo
Design Standards	Vallejo Sanitation and Flood Control District Guide to Existing Policies and Engineering Design Standards (August 1988)
DOM	domestic pump station
DTSC	Department of Toxic Substances Control
gpm	gallons per minute
HDPE	high-density polyethylene
I&I	inflow and infiltration
kV	kilovolt
MIRIS	Mare Island Reuse Infrastructure Study
MIUD	Mare Island Utility District
O&M	operation and maintenance
psig	pounds per square inch gauge
PVC	polyvinyl chloride
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SGWMP	Soil and Groundwater Management Plan
Update	City of Vallejo Water System Master Plan Update (April 1996)
URPU	Utility Reuse Plan Update
VFD	variable frequency drive
VSFCD	Vallejo Sanitation and Flood Control District

EXECUTIVE SUMMARY AND CONCLUSIONS

LFR Reimer prepared the "Mare Island Utilities, Operations, Maintenance and Capital Improvement Plan," dated July 1997, for the City of Vallejo ("the City"). This plan evaluated the existing conditions and capacities of the water, sewer, and storm drainage systems on Mare Island. Recommendations for these utility system capital improvements were made based upon the City's specified reuse plan for Mare Island. Commonly referred to as the "Mare Island Reuse Infrastructure Study," it is hereinafter referred to as MIRIS in this Utility Reuse Plan Update (URPU).

The policy of the City of Vallejo in the 1999 Mare Island Specific Plan and the related MIRIS is for the maximum beneficial reuse of existing facilities and infrastructure in the redevelopment of Mare Island. This policy continues to apply in the Mare Island Specific Plan (as amended and restated) and this related URPU. Because of difficulties related to reuse, existing utility systems, infrastructure, and facilities may vary from those of standards established for new construction by the City of Vallejo Public Works Department and the Vallejo Sanitation and Flood Control District (VSFCD). Capacity calculations, however, do follow their Design Standards.

MIRIS is the major antecedent component of this URPU and is incorporated by reference. The following sections of this URPU are exceptions to MIRIS. This particular format has been chosen as appropriate for the URPU because the amendment has been developed from MIRIS with respect to infrastructure system modifications to be identified for city review. Where necessary, changed conditions, new information, and upgraded facilities since publication of MIRIS have been incorporated in the utility system delineations.

Water Distribution System

The City of Vallejo provides water service to Mare Island through two transmission mains crossing Mare Island Strait. The system has one active and newly constructed 5.7-million-gallon water storage tank. Criteria for sizing new lines and determining the adequacy of the existing lines are based upon the demands outlined in the "City of Vallejo Regulations and Standard Specifications for Public Improvement," dated August 1992. LFR Reimer developed a model using "WaterCAD" pressure network analysis software (Haestad Methods), which is the basis for recommended improvements.

Conclusion: Recommendations for improvement are shown on Figure 1: "Proposed Water Backbone Improvement Plan." A combination of existing 8", 10", 12", and 20" water mains will remain and will be supplemented with new 10", 12", 16", and 20" lines. In Reuse Area 10, at the southern end of the Lennar Mare Island development area, the existing polyvinyl chloride (PVC) saltwater fire mains are to be converted to potable water use. Some of the existing and proposed lines are outside proposed

right-of-way (ROW) areas and will require public utility easements through private property.

Sanitary Sewer System

The Mare Island Utility District (MIUD) provides sanitary sewer service to the island. The sanitary sewer system is in very poor condition with significant inflow and infiltration problems. Criteria for sizing new lines and determining the adequacy of the existing lines are based upon the "Vallejo Sanitation and Flood Control District Guide to Existing Policies and Engineering Design Standards," dated August 1988 ("Design Standards"). LFR Reimer developed a spreadsheet for the Mare Island sanitary sewer system calculations based on ultimate build-out, which is the basis for the recommended improvements. In recent years, the City has repaired and upgraded a significant number of the existing domestic (DOM) sewage pump stations.

Conclusion: Recommendations for improvement are shown on Figure 2: "Proposed Sanitary Sewer Backbone Improvement Plan." To reduce the amount of infiltration, new high-density polyethylene (HDPE) storm drain pipe will replace existing pipes or be slip lined into existing larger-diameter pipes. Pipes with less infiltration problems that work with the model will be left unchanged. New 8", 10", and 12" pipes will comprise most of the proposed system.

Some of the existing and proposed lines are outside proposed ROW areas and will require public utility easements through private property.

Storm Drainage System

The MIUD maintains the existing storm drainage system on Mare Island. Criteria for sizing new lines and determining the adequacy of the existing lines are based on the "Vallejo Sanitation and Flood Control District Guide to Existing Policies and Engineering Design Standards," dated August 1988. The drainage areas were analyzed using StormCAD analysis software (Haestad Methods). The existing storm drainage collection system on Mare Island is undersized and does not meet the VSFCD criteria. To meet these criteria, many of the existing lines will need to be replaced with larger-diameter pipes. The storm drainage improvements for the three housing subdivision areas will be designed with the subdivision improvements.

Conclusion: Recommendations for improvements are shown on Figure 3: "Proposed Storm Drain Backbone Improvement Plan." With a few exceptions, most of the existing storm drainage system on Mare Island will require replacement because of inadequate capacity. Some of the existing and proposed lines are outside proposed ROW areas and will require public utility easements through private property.

Joint Trench Utilities

There are numerous proposed joint trench utilities for Mare Island: electrical, gas, cable television, and telecommunications systems. Figure 4 shows the proposed location of a new joint trench in support of the URPU. In general, the proposed joint trench follows the street framework plan. Not all joint trench locations will include all systems. The intent is to allow for new facilities in each joint trench in support of new development or more modern systems (specifically, telecommunications). Not all systems require a new joint trench. Existing systems will remain in place if they are adequate to service the existing and new facilities and are not in conflict with the proposed redevelopment plan.

There is a section for each of the joint trench utilities in this URPU except cable television, because the provider has not been determined.

The overall condition of the electrical distribution system is very good. The primary electrical distribution system has proven to be a very reliable network and has experienced relatively few failures in recent past. Much of the present distribution system has been upgraded as recently as 1975.

Island Energy (the Mare Island electrical service provider) is in the process of completing a formal master plan. Planned electrical system upgrades in support of the new development plan are not known.

The gas distribution piping system throughout Mare Island appears to be in generally good condition. In general, the existing system can support the proposed land uses. Existing mains and facilities may need to be relocated to allow for the new development areas. New service connections will be installed at all new facilities and existing ones as they are occupied. Island Energy is in the process of completing a formal master plan. Planned gas system upgrades in support of the new development plan are not known.

The existing telecommunications system was built in the early 1990s and is in excellent condition. The existing Mare Island telecommunications system was owned by GST Telecom, which is bankrupt. The current provider is Pacific Bell.

General for Water, Sewer, and Storm Drainage Systems

Three categories of utility system improvements have been carried over from MIRIS nomenclature: Long Term, Ultimate Term, and Life Cycle. For purposes of consistency with MIRIS, the same phasing designations have been continued.

LFR Reimer updated the utility system demands based on the URPU. This demand information, which supercedes the calculations in MIRIS, is the basis of determining the adequacy of the existing utility increments as well as the sizing of the proposed utility systems.

Lennar Mare Island, through the early transfer process with the Navy, will be responsible for the environmental cleanup on its development portion of the island. It has hired a private corporation, CH2MHill, to perform the cleanup effort. During the excavation for utility systems, contaminated areas will be encountered. CH2MHill has prepared a Soil and Groundwater Management Plan (SGWMP) outlining the necessary procedures to be used when encountering subsurface contamination.

Utility system calculations were prepared in support of proposed water, sanitary sewer, and storm drain systems. These calculations replace those prepared previously for MIRIS, Appendix D, System Modeling Results.

Existing Conditions

MIRIS Sections 2 (Potable Water), 3 (Sanitary Sewer), and 4 (Storm Drainage) discuss existing conditions, system operation, operation and maintenance (O&M) requirements, maintenance and repair cost projections, demands, and system improvements.

Currently, the water, sewer, and storm drainage systems are owned by the U.S. Navy ("the Navy") and are maintained under a Caretaker agreement with the City. Through this agreement, the City and the MIUD have assumed maintenance responsibility for (but not ownership of) the existing systems. At the end of or soon after the redevelopment, systems ownership and responsibility will be transferred to the City and the VSFCD.

Proposed System Improvements

Figures 1, 2, and 3 show the proposed water, sewer and storm drainage main line sizes and locations (existing to remain and proposed). The proposed lines were sized based upon the calculations described in this URPU. The improvements shown in the figures are revisions to MIRIS recommendations, and respond to the proposed development plan in this URPU.

The recommendations are discussed for water, sanitary sewer, and storm drainage and are shown on Figures 1, 2, and 3. The recommendations are part of this URPU and are described only on these figures.

Figures 1, 2, and 3 show all proposed major collectors and trunk lines. These lines are to be within public works ROWs or easements and are ultimately to be owned and maintained by the City or the VSFCD.

Changes in MIRIS Recommended Improvements

Sections 2.4, 3.3, and 4.3 of MIRIS present lists of recommended system improvements for water, sewer, and storm drainage systems, respectively. These improvements are considered a part of this URPU unless noted differently in this

URPU. Each of the MIRIS recommended system improvements were labeled with a W, WW, or SD designation number (such as W-3, WW-3, or SD-3).

In each section of this URPU, the MIRIS recommendations within the Lennar Mare Island development area are listed by designation. Portions that no longer apply are ~~struck out~~ and replaced with a revised designation.

1.0 WATER DISTRIBUTION SYSTEM

The City of Vallejo provides water service to the island through two transmission mains: one that crosses the southern end of Mare Island Strait and one under the Causeway. The system has one active and newly constructed 5.7-million-gallon water storage tank located near the southern end of Club Drive at the northern end of the golf course. The new tank effectively replaces a number of smaller water storage reservoirs previously employed by the Navy. The layout of the existing water distribution system is shown on Figure 1.

The proposed water distribution system improvements are summarized in this section as revisions to the Mare Island Reuse Infrastructure Study (MIRIS). The results of the improvements and revisions are shown on Figure 1. This figure shows the proposed water mains and sizes and the locations of existing lines to remain that are necessary to support the use plan in this Utility Reuse Plan Update (URPU).

1.1 Basis of Design and Calculations

The following criteria for sizing new lines and determining the adequacy of the existing lines are based upon the demands outlined in the "City of Vallejo Regulations and Standard Specifications for Public Improvement," dated August 1992.

- Fire flow at no less than 25 pounds per square inch gauge (psig) residual pressure shall be available within 1,000 feet of any structure. One half of fire flow shall be available within 300 feet of any structure.

  The fire flow is based upon the requirements outlined in the "City of Vallejo Water System Master Plan Update," dated April 1996, prepared by Brown and Caldwell Consultants ("the Update"). A copy of Table 3-3 from the Update is included with the water system calculations (Appendix A).

- The residential demands are based upon 2.77 persons per unit and 152 gallons per capita per day.
- The peak hourly factor used in the Update is 1.6 (see page 3.3 of the Update).
- The commercial and industrial area populations are based upon 15 persons per acre.

LFR Reimer developed a model using "WaterCAD" pressure network analysis software (Haestad Methods). Because of the nature of the reuse plan, most of the proposed uses are near planned shopping and service (CP), planned development commercial (PDC), or planned development industrial (PDI) areas, all of which have fire flow requirements of 4,500 gallons per minute (gpm). Therefore, the entire model is based upon each of the nodes having a 4,500-gpm fire demand and the peak potable water demand for the proposed use. The model assumed that the line crossing the Mare Island Strait at the southern end of the island and the line under the Causeway were

closed, as if the existing 5.7-million-gallon tank comprised the only water supply to the system on Mare Island.

Output from this analysis is included in Appendix A.

1.2 Changes in Existing Conditions Since Completion of MIRIS

Since completion of MIRIS, a 5.7-million-gallon storage tank has been constructed at the southern end of Club Road, on the northern side of the Mare Island Golf Course. All other water storage tanks on the base have been removed from service or demolished. Two 20" water mains connecting to the existing system were constructed with the new water tank (Figure 1). These lines, shown as existing lines to remain, will require public works easements through private property.

1.3 Changes in Long Term Improvements of MIRIS

All struck out text in this section is from MIRIS and is replaced by the immediately following section.

1.3.1 System Upgrades to Correct Deficiencies

~~**W-1: New 5.7 MG Storage Tank** - This tank is required to provide adequate water storage for domestic (maximum day) and maximum fire demands. Due to the size and location of the base (at the end of the city's Grid Zone), the island's water system must be capable of sustaining these demands separately from the City's main water system. In addition, present storage tanks are located at elevations too low to provide adequate pressure in peak demand situations. Key factors in the siting and sizing of this tank are its outlet (top of tank) elevation, domestic and fire storage requirements and equalization storage (see Appendix A-2).~~

~~Equalization storage is the additional storage required to keep the top of tank at the peak system grade line (208' City elevation) while providing the necessary operating storage during a day of maximum demand when the overall hydraulic grade line of the system is reduced. Assuming a 35 foot high tank and adding in the City's requirement for 5 feet of surficial soil removal prior to placing the base of a tank results in tank location in an area with ground elevation between 170 and 175 feet (NGVD). The site shown on Figure 2-3 meets this elevation criteria, requires the shortest pipeline connection, involves the least earthwork for site preparation, provides adequate area for the tank and service area around the tank, and is not currently planned for other development. If these conditions change, alternate locations are available, at a higher construction cost, in a band of similar elevations around the hills south of the golf course in Reuse Area 12 now planned as a regional park. Existing storage tanks provide marginal volumetric coverage for current reuse demands while further redevelopment will require additional water storage capacity (Appendix A-2). Due to this impending water storage deficiency as well as the low elevation of existing tanks,~~

~~the new storage tank will be needed by 2000. This schedule allows time for funding, design and site preparation. These are preliminary steps toward tank construction which should be started immediately.~~

W-1: New 5.7-Million-Gallon Storage Tank: The 5.7-million-gallon water storage tank was installed and is operating in the location described.

~~**W-2: 20" Water Line Extension to Tank** - This line is required to connect the new 5.7 MG tank to the 20" southern feeder and the Base water distribution system near Tank 188B. Costs for this line assume construction through open area (golf course); both the length and the unit cost will increase if an alternate tank location is selected at a later date. Timing for this line is the same as for the storage tank.~~

W-2: Two 20" water mains were installed with the 5.7-million-gallon storage tank.

1.3.2 Capital Improvements for Redevelopment

~~**W-3: Replace Existing Main with 20" Water Main** - This improvement replaces 600 feet of an existing 12" Cast Iron and Transite Water Main with a 20 inch Cast Iron line. Hydrants are not included since they presently exist and should be reconnected to the new line. This improvement removes a system constriction between the 20 inch Southern Feeder and a 16 inch service line to Tank 774 and to the Base Housing Areas. This constriction reduces pressures to the west side of the island and impacts the next phase of redevelopment after Area 1 by dropping available water pressure in the housing areas as domestic water demands increase. Current fire flow requirements in the housing area are marginally available at present demand rates. Consequently, any increase above 1997 domestic water demands anywhere on the base will drop fire flows below acceptable levels. Timing for this improvement is immediate to allow continued redevelopment and is recommended for 1998.~~

W-3: Based on the water modeling for the proposed reuse of this URPU, this line does not require replacement to meet the fire flow and peak potable water demand described in Section 1.1.

~~**W-4: Replace Existing Main with 12" Water Main and Hydrants** - This improvement replaces 1600 feet of existing 8 inch Cast Iron and Asbestos Cement Water Line with a 12 inch High Density Polyethylene (HDPE) line from the North Gate west to Cedar Ave. along a proposed roadway improvement to Reuse Area 1. It is required to provide adequate service pressures and fire flow to existing and proposed new facilities along Cedar Ave. and Acacia St. Material selection for this improvement is based on the unstable (large settlement potential) and highly corrosive soil conditions in the area. Hydrants are included since current fire protection is primarily provided through the phased out Salt Water System. Phasing for this improvement is concurrent with new construction along Cedar Ave. and with expansion/improvement of Acacia St., currently planned for 1999.~~

W-4: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 1.***

~~**W-5: Replace Existing Main with 12" Water Main and Hydrants** – This improvement replaces 1300 feet of existing 8 inch Cast Iron and Water Line with a 12 inch HDPE Line from the north gate southeast along Walnut Ave. to provide adequate service pressures and fire flow for existing and proposed new facilities along Walnut Ave. Material selection for this improvement is based on the unstable (large settlement potential) and highly corrosive soil conditions in the area. Hydrants are included since current fire protection is primarily provided through the existing Salt Water system. Phasing for this improvement is based on new construction along Walnut Ave., currently planned for 2001.~~

W-5: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 1.***~~**W-6: Replace Existing Main with 12" Water Main and Hydrants** – This improvement replaces 850 feet of existing 8 inch Cast Iron Water Line with a 12 inch HDPE~~Error! Bookmark not defined.~~ Line from the North Gate southeast along Railroad Ave. to provide adequate service pressures and fire flow for existing and proposed new facilities along Railroad Ave. Material selection for this improvement is based on the unstable (large settlement potential) and highly corrosive soil conditions throughout the area. Hydrants are included since current fire protection is primarily provided through the existing Salt Water system. Phasing for this improvement reflects new facility construction and proposed expansion of Railroad Ave. currently planned for 2000.~~

W-6: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 1.***

~~**W-7: New 20" Water Main and Hydrants** – This improvement, 2800 feet of 20 inch Cast Iron Main, provides a new secondary connection from the proposed 5.7 MG water storage tank to the distribution network. This line follows Mesa Road around the west side of the island to the Coral Sea Housing Area. Operationally, it will stabilize water pressures throughout the central portion of the base and, along with improvements W-11 and W-12, alleviate pressure losses throughout the higher housing areas. Hydrants are included since fire protection is not currently provided in this area. Phasing for this improvement is based on completion of the new Water Storage Tank as well as occupancy in the Coral Sea housing area and increased domestic water demands in Reuse Areas 2 through 9 in 2001.~~

W-7: Two 20" water mains were installed with the 5.7-million-gallon water storage tank.

~~**W-10: Replace Existing Main with 12" Water Main** – This improvement replaces 3400 feet of 6 inch Cast Iron and Ductile Iron and 8 inch Transite Pipes with 12 inch HDPE pipe along Cedar Ave. and C St. This project will remove another system constriction affecting fire flows within Reuse Areas 2 and 3 and will serve redevelopment along Cedar Ave. south of E St. Unit prices include trenching through~~

~~asphalt. Material selection for this improvement is based on the corrosive soil conditions along Cedar Ave. near the dredge ponds and wetlands; hydrants are excluded since fire protection is currently provided and existing hydrants only need to be reconnected to the new main. Phasing for this improvement is correlated with redevelopment in Reuse Areas 2 and 3 between A and E St. and along Cedar Ave in Reuse Area 2, currently planned for 2005.~~

W-10: Replace Existing Main with 12" Water Main: This improvement replaces 3,600 feet of 6" cast iron and ductile iron and 8" transite pipes with 12" polyvinyl chloride (PVC) pipe along Cedar Avenue. This project will remove system constrictions affecting fire flows within Reuse Areas 2 and 3 and will serve redevelopment along Cedar Avenue. Material selection for this improvement is based on the corrosive soil conditions along Cedar Avenue near the dredge ponds and wetlands; hydrants are excluded because fire protection is currently provided and existing hydrants need only to be reconnected to the new main. Phasing for this improvement is correlated with redevelopment in Reuse Areas 2 and 3 between A Street and E Street and along Cedar Avenue in Reuse Area 2.

~~**W-11: New 10" Water Main & Hydrants** – This improvement, 450 feet of 10 inch HDPE Main, provides a new secondary connection within the Coral Sea Housing Area. This line will run along the west side of Mesa Rd. between two segments of the Coral Sea Housing stabilizing water pressures within these segments and, along with improvements W-7 and W-12, alleviating pressure losses throughout the higher housing areas. Material selection for this improvement is based on the corrosive soil conditions in the area near the dredge ponds and wetlands; hydrants are included since fire protection is not currently provided in this area. Phasing for this improvement is based on completion of improvements W-7 and W-12 and increased occupancy in the Coral Sea housing area, currently projected for 2007.~~

W-11: Not applicable; removed. This area will be reconstructed with a new residential subdivision as shown in this URPU.

~~**W-12: New 10" Water Main & Hydrants** – This improvement, 1700 feet of 10 inch HDPE Main, provides a new secondary connection between the Farragut Village and Coral Sea Housing Areas. This line will run along the west side of the Island, through Reuse Area 7, stabilizing water pressures and, along with improvements W-7 and W-11, alleviating pressure losses throughout the housing areas. Material selection for this improvement is based on the corrosive soil conditions in the area near the dredge ponds and wetlands; hydrants are included since fire protection is not currently provided in this area. Phasing for this improvement is linked to completion of improvement W-7 as well as to increased occupancy in the Farragut Village and Coral Sea housing areas, currently projected for 2005.~~

W-12: Not applicable; removed. This area will be reconstructed with a new residential subdivision as shown in this URPU.

~~**W-13: Replace Existing Main with 10" Water Main** – This improvement replaces 680 feet of 6 and 8 inch pipes with 10 inch HDPE Pipe between California Ave. and Waterfront Ave. in Reuse Area 5. This project will remove a local constriction affecting fire flows near the waterfront in Reuse Area 5. Unit prices include trenching through asphalt and there is an additional line item for excavation and construction costs due to the structural, reinforced concrete slab between California Ave. and the seawall. Material selection for this improvement is based on the corrosive soil conditions along the waterfront; hydrants are excluded since fire hydrants are currently provided and only need to be reconnected to the new main. Time phasing for this improvement is based on reuse of existing facilities along the waterfront in Reuse Area 5, currently planned for 1998-1999.~~

W-13: This improvement is part of a proposed private development, not the public water backbone system.

~~**W-14: Replace Existing Main with 10" Water Main & Hydrants** – This improvement, 1100 feet of 10 inch HDPE Main, provides a new secondary connection within the Farragut Village Housing Area. This line will run along the north side of Farragut Village, stabilizing water pressures in the western end of the housing area. Material selection for this improvement is based on the corrosive soil conditions in the area near the dredge ponds and wetlands; hydrants are included since fire protection is not currently provided along this corridor. Need for this improvement is driven by increased occupancy and absorption of the Farragut Village housing area, currently projected for 2007.~~

W-14: Not applicable; removed. This area will be reconstructed with a new residential subdivision as shown in this URPU.

W-16: Install New Backflow Devices (8" and under): This improvement will provide correction of existing, undocumented cross connections between the potable water system and industrial operations. Although no definitive number can be assigned to the number of missing backflow devices, calculations assumed that one unprotected connection would be discovered each year for the first six years as additional facilities are reopened for new tenants.

W-17: Remove Booster Pump Stations: This improvement will remove the existing booster pump stations on the potable water system. This project is the culmination of the replacement of existing inadequate storage tanks with a 5.7-million-gallon tank (W-1) which, along with pipe upgrades will provide adequate gravity service throughout the island, eliminating the need for most booster pumps. Use of existing booster pumps at 880 and A-295 will continue to provide adequate pressure to upper pressure zones in Reuse Areas 9 and 12 above elevation 190.

1.3.3 Operation and Maintenance (O&M) Cost Reduction Upgrades

No specific cost reduction upgrades have been identified. However, deficiencies corrected by upgrades W-1, W-2, and W-17 will simplify and reduce operating requirements and costs through the replacement of downstream mechanical controls and pump stations with a gravity operated system controlled at the main reservoir outlet.

1.4 Ultimate Improvements

The improvements discussed above correct the majority of systemic water distribution constraints. From 2007 to ultimate development, the remaining improvements focus on correcting localized blockages and constrictions to provide adequate fire flow for smaller redevelopment areas, and on providing service to Reuse Area 10. Life cycle costs, although listed under ultimate development, should accrue on a straight line basis from 1997 through the entire assumed 20-year period to 2017.

All struck out text in this section is from MIRIS and is replaced by the immediately following section.

1.4.1 Capital Improvements for Ultimate Redevelopment

~~**W-8: Replace Existing Main with 10" Water Main** - This improvement replaces 460 feet of 8 inch cast iron and pipes with 10 inch HDPE pipe between California Ave. and Waterfront Ave. in Reuse Area 3. This project, in conjunction with W-9, will remove a local constriction affecting fire flows along the waterfront in Reuse Area 3. Unit prices include trenching through asphalt and there is an additional line item for excavation and construction costs since structural, reinforced concrete is encountered between California Ave. and the seawall. Material selection for this improvement is based on the corrosive soil conditions along the waterfront; hydrants are excluded since fire hydrants are currently provided and only need to be reconnected to the new main. Time phasing for this improvement is based on reuse of existing facilities along the waterfront in Reuse Area 3, currently planned for 2009.~~

W-8: This improvement is part of proposed private development, not the public water backbone system.

~~**W-9: Replace Existing Main with 10" Water Main** - This improvement replaces 580 feet of 4 inch Cast Iron Pipe with 10 inch HDPE Pipe along B St. between California Ave. and Waterfront Ave. in Reuse Area 3. This project, in conjunction with W-8, will remove a local constriction affecting fire flows along the waterfront in Reuse Area 3. Unit prices include trenching through asphalt. There is an additional line item for excavation and construction costs since structural, reinforced concrete is encountered between California Ave. and the seawall. Material selection for this improvement is based on the corrosive soil conditions along the waterfront; hydrants are excluded since fire hydrants are currently provided and only need to be reconnected to the new main.~~

~~Time phasing for this improvement is correlated with reuse of existing facilities along the waterfront in Reuse Area 3, currently planned for 2009.~~

W-9: This improvement is part of proposed private development, not the public water backbone system.

~~**W-15: Replace Existing Mains with 12" Water Main and Hydrants** – This improvement replaces 4900 feet of existing 4 and 6 inch Cast Iron and Water Lines throughout Reuse Area 10 with a 12 inch HDPE loop. This complete replacement is required to provide adequate service pressures and fire flow for proposed new facilities between Railroad Ave. and the waterfront. Material selection for this improvement is based on the unstable (large settlement potential) and highly corrosive soil conditions throughout the area. Hydrants are included since current fire protection is primarily provided through the existing Salt Water system scheduled for abandonment Phasing for this improvement is based on new construction within Reuse Area 10, currently planned for ultimate buildout in 20XX.~~

W-15: Replace Existing Mains with Existing PVC Saltwater Mains: This improvement replaces 4,900 feet of existing 4" and 6" cast iron and water lines throughout Reuse Area 10 with existing 10" and 12" PVC saltwater mains. These mains are relatively new (built in the early 1990s) and will be super chlorinated to allow reuse as potable water mains. Hydrants are included because current fire protection is primarily provided through the existing saltwater system. Phasing for this improvement is based on new construction within Reuse Area 10.

1.4.2 Life Cycle Repair and Replacement

W-18: Replace 6" Water Mains: These replacements are based on the age, material, and condition of 30,300 feet of 6" mains currently located on the island. Of these pipes, 73% are cast iron and 19% are transite. Based on the pipes' average date of installation, locations relative to highly corrosive soils (excluding water lines in Reuse Area 10 which will require complete replacement), and estimated remaining lifespan, an estimated 15% will need to be replaced because of corrosion, deposition, or rupturing during the period from 1997 to 2017.

W-19: Replace 8" Water Mains: These replacements are based on the age, material, and condition of 55,100 feet of 8" mains currently located on the island. Pipes in this category are primarily cast iron and transite (51% and 45%, respectively). Based on the pipes' average date of installation, locations relative to highly corrosive soils and anticipated remaining lifespan, 15% will need to be replaced because of corrosion, deposition, or rupturing during the period from 1997 to 2017.

W-20: Replace 10" Water Mains: These replacements are based on the age, material, and condition of 38,000 feet of 10" mains currently located on the island. Of these pipes, 58% are PVC lines used on the southern saltwater system. However, the remainder of lines are cast iron and transite (29% and 13%, respectively); many of

them were laid in the 1940s. Based on the pipes' average date of installation, the locations of metal pipes relative to highly corrosive soils, and estimated remaining lifespan, 10% will need to be replaced because of corrosion, deposition, or rupturing during the period from 1997 to 2017.

W-21: Replace 12" Water Mains: These replacements are based on the age, material, and condition of 33,700 feet of 12" mains currently located on the island. Of these pipes, 62% are cast iron and 32% are PVC (converted saltwater system). Only 5% of the pipes in this category are transite. Based on the pipes' average date of installation, locations relative to highly corrosive soils, and estimated remaining lifespan, 10% will need to be replaced because of corrosion, deposition, or rupturing during the period from 1997 to 2017.

W-22: Replace 14" Water Mains: These replacements are based on the age, material, and condition of 10,500 feet of 14" mains currently located on the island. Of these pipes, 74% are cast iron or steel (32% and 42%, respectively) and 26% of these lines are transite. Based on the pipes' average date of installation, the locations of metal pipes relative to highly corrosive soils, the effectiveness of cathodic protection, and estimated remaining lifespan, 15% will need to be replaced because of corrosion, deposition, or rupturing during the period from 1997 to 2017.

W-23: Replace 16" Water Mains: These replacements are based on the age, material, and condition of nearly 3,000 feet of 16" mains currently located on the island. Of these pipes, 85% are transite (installed in the 1940s) and the remaining 15% are steel. Based on the pipes' average date of installation, the locations of metal pipes relative to highly corrosive soils, and estimated remaining lifespan, 10% will need to be replaced because of corrosion, deposition, or rupturing during the period from 1997 to 2017.

W-24: Replace 20" Water Mains: These replacements are based on the age, material, and condition of 10,000 feet of 20" cast iron mains currently located on the island. Based on the pipes' average date of installation, the condition of the pipes, the effectiveness of cathodic protection, locations of metal pipes relative to highly corrosive soils, and estimated remaining lifespan, 5% will need to be replaced because of corrosion, deposition, or rupturing during the period from 1997 to 2017.

W-25: Replace Gate Valves (10" and under): A total of 871 smaller gate valves (10" and under) located throughout the backbone of the system will be replaced. Based on failure rates noted during field inspections, an overall failure and replacement rate of 15% was assessed until 2017 (the same as for W-26); this equals an effective replacement rate of 0.75% per year for annual budgeting.

W-26: Replace Gate Valves (12" and over): This replacement is for 218 larger gate valves (12" and over) located throughout the backbone of the system. Based on failure rates noted during field inspections, an overall failure and replacement rate of 15% was assessed until 2017 (the same as for W-25); this equals an effective replacement rate of 0.75% per year for annual budgeting.

W-27: Install Backflow Devices for Common Irrigation: This replacement program will provide taps and backflow protection at irrigation connections currently tied to fire hydrants. Although no definitive number was assigned, LFR Reimer assumed that for each common area there would be two improper irrigation connections discovered over the next 20 years, resulting in a total of 46 new taps.

2.0 SANITARY SEWER COLLECTION SYSTEM

The Mare Island Utility District (MIUD) provides sanitary sewer service to the island. The wastewater is not treated on site. It is collected by gravity sewers and lifts stations throughout the island and pumped through a main that runs along the Causeway to the Vallejo Sanitation and Flood Control District (VSFCD) north interceptor to the wastewater treatment plant, located on Ryder Street in southern Vallejo.

Although the sanitary sewer system is currently functional, it is in very poor condition with significant inflow and infiltration (I&I) problems, which will require substantial replacement of the system. These improvements will largely be driven by the phased transition of the island to private market uses.

The proposed sanitary sewer collection system improvements are summarized in this section as revisions to MIRIS. The results of the improvements and revisions are shown on Figure 2. This figure shows the proposed sewer lines and sizes and the locations of existing lines to remain that are necessary to support the use plan in this URPU.

2.1 Basis of Design and Calculations

Criteria for sizing new lines and determining the adequacy of the existing lines are based on the URPU. The reuse area flows are shown in the Waste Water System Analysis tables on pages WW-1 through WW-9.

In accordance with the "Vallejo Sanitation and Flood Control District Guide to Existing Policies and Engineering Design Standards," dated August 1988 ("Design Standards"), the residential demands were based upon 80 gallons per person per day, 2.7 persons per unit. All other demands for Non-Residential and Civic/Recreation/Open Space were based on the URPU.

The peak factor used in the analysis is based upon the equations shown on page 5-9 of the Design Standards.

The model accumulates peak flows down through the system. Pipeline flow capacities are computed using Manning's equation. The roughness coefficient for Manning's equation computations is based on the VSFCD requirement of an "n" value of .013 for all pipes.

In accordance with the Design Standards, infiltration allowances were based upon 600 gallons per day per acre for new developments and 4,000 gallons per day per acre for areas sewered as of January 1970.

As a part of this URPU, LFR Reimer developed a spreadsheet for the sanitary sewer system on Mare Island. The model was run for the ultimate build-out land use scenario. The model has been developed only for the backbone pipeline systems shown on Figure 2. On this figure, the pipes are labeled with a numbering system that corresponds to the pipe numbers in the spreadsheet. A printout of the spreadsheet is included in Appendix A.

2.2 Changes In Existing Conditions Since Completion of MIRIS

In recent years, the City of Vallejo ("the City") has repaired and upgraded a significant number of the existing DOM sewage pump stations. The repairs are summarized as follows:

Station ID	Repair Performed
DOM-2	Replaced pumps, valves, and check valves
DOM-3	Replaced valves, check valves, overhauled pumps, rerouted electrical service
DOM-4	Motor repairs, overhauled pumps, replaced variable frequency drive (VFD) units
DOM-5	Rerouted electrical service. Replaced pumps, valves, and check valves. Replaced VFD units with fixed speed motors
DOM-6	Replaced pumps, valves and check valves. Replaced VFD units with fixed speed motors
DOM-7	Replaced pumps, valves, and check valves. Replaced VFD units with fixed speed motors
DOM-8	Replaced pumps, valves, and check valves
DOM-9	Replaced pumps, valves, and check valves

2.3 Changes In Long Term Improvements of MIRIS

All struck out text in this section is from MIRIS and is replaced by the immediately following section.

2.3.1 System Upgrades to Correct Deficiencies

~~**WW-1: Isolation and Removal of DOM-1** - This upgrade, in conjunction with WW-8, eliminates one lift station at the far north end of the, island replacing it with a gravity main from the northwest corner of the Base directly into DOM-2. Phasing for this upgrade is based on completion of WW-8 recommended for 1998.~~

WW-1: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-2: Replace Pump at DOM-2** - This upgrade corrects a deficiency within DOM-2. According to records and as confirmed by field inspection, the sump pump at this lift station is severely degraded and in urgent need of replacement in order to prevent flooding of the drywell and ensure the operation of this critical lift station serving almost all of Reuse Area 1. Timing of this upgrade is urgent and should be accomplished in 1997.~~

WW-2: ***The DOM 2 pumps have been recently replaced by City of Vallejo maintenance activities.***

WW-3: Repair Electrical Distribution System at SPS-3 - This upgrade, along with WW-4, corrects deficiencies at SPS-3 providing service to the northeast corner of the Base. Field inspection confirms that the electrical connections are exposed and severely corroded and in need of replacement. Timing for this upgrade is based on reuse of the North Pier and the area surrounding it, currently projected for 2001.

WW-4: Replace Controllers at SPS-3 - This upgrade, along with WW-3, corrects deficiencies at SPS-3 providing service to the northeast corner of the base. According to field inspection reports, the controllers are corroded and appear to be inoperative. Timing for this upgrade is driven by reuse of the North Pier and completion of WW-6 and WW-7, currently projected for 2001.

WW-5: Isolation and Removal of SPS-1 and SPS-2 - This upgrade removes and salvages equipment at SPS-1 and SPS-2 on the North Pier. Based on projected reuse as a public pier for recreation, only minimal facilities (restroom and cleaning station) are needed and these can be provided by STS-3 at the corner of the pier. Removal of SPS-1&2 in 1998 will eliminate a maintenance problem (confined space access) and permit the possible salvage of existing equipment for reuse in other lift stations.

WW-6: Install Transformer on Pad at SPS-4 - This upgrade, along with WW-7, will allow this existing Pump Station to be reactivated and provide service to the area leading to the North Pier. At present the transformer and switchgear are set on the same pad as the pumphouse shelter, which is subject to flooding and currently protected by a series of sandbags. Timing for this upgrade is responds to occupancy and use of the northeast corner of Reuse Area 1 projected for 2000.

WW-7: Raise Equipment at SPS-4 - This upgrade, along with WW-6, will allow this Pump Station to be reactivated, providing service to the area leading to the North Pier. At present the pumphouse shelter and pumps are set on a pad which is protected from local flooding by sandbags. Timing for this upgrade is based on occupancy and use of the northeast corner of Reuse Area 1 projected for 2000.

~~**WW-8: Install New Sewer Main** - This upgrade, installation of 900 feet of 12 inch High Density Polyethylene (HDPE) Sewer Line, will isolate an area of high inflow and infiltration (I&I) and permit removal of a lift station, DOM-1 under WW-1. Due to the current occupancy of facilities served by this line, and the high I&I experienced, this project is recommended for immediate construction in 1997.~~

WW-8: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-9: Replace 21" Sewer Main** - This upgrade replaces 1200 feet of an existing 21 inch gravity sewer leading to DOM-2 with a 21" welded seam High Density Polyethylene (HDPE) pipeline. This section of sewer is submerged and subject to constant hydrostatic pressures contributing to high I&I rates. Unit prices for this upgrade are based on asphalt construction; (trenching through existing pavement) however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this upgrade corresponds to development of the north end of Reuse Area 1 and reconstruction of Railroad Ave. in 1998.~~

WW-9: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-10: Replace 12" Sewer Main** - This upgrade replaces 1000 feet of an existing 12 inch gravity sewer leading to DOM-2 with a 12" welded seam HDPE pipeline. This section of sewer is tidally influenced (submerged during high tide) and subject to variable hydrostatic pressures contributing to a high I&I rate. Unit prices for this upgrade reflect trenching through existing pavement, however they also assume major earthwork will be done in conjunction with planned roadway improvements along I St. Phasing for this upgrade is based on development of the central portion of Reuse Area 1 and upgrade of I St. in 1999.~~

WW-10: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-11: Replace 12" Sewer Main** - This upgrade replaces 700 feet of an existing 12 inch gravity sewer leading to Railroad Ave. with a 12" welded seam HDPE pipeline. This section of sewer is submerged and subject to constant hydrostatic pressures contributing to high I&I rates. Unit prices for this upgrade include trenching through pavement, however they also assume major earthwork will be done in conjunction with planned roadway improvements along L St. Timing for this upgrade corresponds to reuse of the north end of Reuse Area 1 and reconstruction of L St. in 2000.~~

WW-11: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-12: Replace 10" Sewer Main** - This upgrade replaces 1000 feet of an existing 10 inch gravity sewer serving the northwest corner of Reuse Area 1 with a 10" welded seam HDPE pipeline. This section of sewer is tidally influenced (submerged during high tide) and subject to variable hydrostatic pressures contributing to a high I&I rate. Unit prices for this upgrade are based on trenching through pavement, however they also assume major earthwork will be done in conjunction with planned roadway improvements along I St. Phasing for this upgrade is based on reuse of the north-central portion of Reuse Area 1 along Cedar Ave. in 2000.~~

WW-12: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-13: Replace 21" Sewer Main** - This upgrade replaces 1000 feet of an existing 21 inch gravity sewer leading from DOM 2 with a 21" welded seam HDPE pipeline. This section of sewer is subject to differential settlement of unstable soils which can cause invert and slope problems in less flexible pipes. Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this upgrade is driven by expanded redevelopment of Reuse Area 1 and reconstruction of Railroad Ave. in 2001.~~

WW-13: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-14: Replace 18" Sewer Main** - This upgrade replaces 900 feet of an existing 18 inch gravity sewer leading to DOM 2 with a 18" welded seam HDPE pipeline. This section of sewer is submerged and subject to constant hydrostatic pressures contributing to high I&I rates. Unit prices for this upgrade are based on trenching through asphalt, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this upgrade is based on development of the north end of Reuse Area 1 and reconstruction of Railroad Ave. in 2001.~~

WW-14: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

~~**WW-15: Replace 15" Sewer Main** - This upgrade replaces 400 feet of an existing 15 inch gravity sewer from SPS 4 to, and along, Railroad Ave. with a 15" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to a high I&I rate. In addition, differential settlement has created negative slope in the existing section of pipe. Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements along Railroad Ave.~~

~~Phasing for this upgrade reflects final redevelopment of the north end of Reuse Area 1 in 2007.~~

WW-15: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 2.***

2.3.2 Capital Improvements for Redevelopment

~~**WW-18: Replace 21" Sewer Main** – This improvement replaces 790 feet of an existing 21 inch gravity sewer leading from DOM-2 to DOM-4 with a 21" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade reflect trenching through asphalt, however they also assume major earthwork will be done in conjunction with any planned roadway improvements. Timing for this improvement is based on expanded redevelopment of Reuse Areas 1, 2 and 3 and possible reconstruction or expansion of Railroad Ave. in 2004.~~

WW-18: Slip Line Existing 21" Sewer Main with 12" High-Density Polyethylene (HDPE) Main: This improvement lines 790 feet of an existing 21" gravity sewer leading from DOM-2 to DOM-4 with a 12" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Timing for this improvement is based on expanded redevelopment of Reuse Areas 1, 2, and 3 and possible reconstruction or expansion of Railroad Avenue.

WW-19: Replace 10" Sewer Main: This improvement replaces 300 feet of an existing 10" gravity sewer leading from Reuse Area 3 to Railroad Avenue with a 10" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Phasing for this improvement corresponds to expanded redevelopment of Reuse Area 3 and planned redevelopment along E Street in 2004.

WW-20: Replace 8" Sewer Main: This improvement replaces 620 feet of an existing 8" gravity sewer in Reuse Area 3 leading to DOM-3 with an 8" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Timing for this improvement is based on expanded redevelopment of Reuse Area 3 and planned redevelopment along E Street in 2006.

~~**WW-21: Replace 24" Sewer Main** – This improvement replaces 880 feet of an existing 24 inch gravity sewer, between Reuse Areas 2 and 3, leading to DOM-4 with a 24" welded seam HDPE pipeline. This section of sewer is tidally influenced and~~

~~subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade include trenching through existing pavement, however they also assume major earthwork will be done in conjunction with any planned roadway improvements. Phasing for this improvement reflects expanded redevelopment of Reuse Areas 1, 2 and 3 and possible reconstruction or expansion of Railroad Ave. in 2004.~~

WW-21: Slip Line Existing 24" Sewer Main with 12" HDPE Main: This improvement lines 880 feet of an existing 24" gravity sewer, between Reuse Areas 2 and 3, leading to DOM-4, with a 12" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Phasing for this improvement reflects expanded redevelopment of Reuse Areas 1, 2, and 3 and possible reconstruction or expansion of Railroad Avenue.

~~**WW-24: Replace 10" Sewer Main** This improvement replaces 1270 feet of an existing 10 inch gravity sewer in Reuse Area 3 leading to and from DOM-5 with a 10" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils which can cause invert and slope problems in less flexible pipes. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete encountered between California Ave. and the seawall. Phasing for this improvement is based on expanded redevelopment of Reuse Area 3 in 2002.~~

WW-24: Replace 10" Sewer Main with 10" HDPE Main: This improvement replaces 520 feet of an existing 10" gravity sewer in Reuse Area 3 leading to and from DOM-5 with a 10" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Phasing for this improvement is based on expanded redevelopment of Reuse Area 3.

~~**WW-26: Replace 27" Sewer Main** This improvement replaces 1100 feet of an existing 27 inch gravity sewer leading to DOM-4 with a 27" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade reflect trenching through existing paving, however they also assume major earthwork will be done in conjunction with any planned roadway improvements. Timing for this improvement is consistent with expanded redevelopment of Reuse Areas 3, 4, 5, and 9 and possible reconstruction or expansion of Railroad Ave. in 2004.~~

WW-26: Slip Line Existing 27" Gravity Sewer with 16" HDPE Main: This improvement lines 1,100 feet of an existing 27" gravity sewer leading to DOM-4 with a 16" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Timing for

this improvement is consistent with expanded redevelopment of Reuse Areas 3, 4, 5, and 9 and possible reconstruction or expansion of Railroad Avenue.

WW-27: Replace 12" Sewer Main: This improvement replaces 1,440 feet of an existing 12" gravity sewer in Reuse Area 3 leading to DOM-6 with a 12" welded-seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Timing for this improvement is based on high I&I flows through the lift station and planned reuse and redevelopment of Reuse Area 3 facilities around DOM-6.

~~**WW-31: Replace 27" Sewer Main** - This improvement replaces 710 feet of an existing 27 inch gravity sewer leading to DOM-7 with a 27" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with any planned roadway improvements. Phasing for this improvement reflects expanded redevelopment of Reuse Areas 5, 8 and 9 and possible reconstruction or expansion of Railroad Ave. around 2003.~~

WW-31: Slip Line Existing 27" Sewer Main with 12" HDPE Main: This improvement lines 710 feet of an existing 27" gravity sewer leading to DOM-7 with a 12" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Phasing for this improvement reflects expanded redevelopment of Reuse Areas 5, 8, and 9 and possible reconstruction or expansion of Railroad Avenue.

~~**WW-32: Replace 12" Sewer Main** - This improvement replaces 1800 feet of existing 12 inch gravity sewer in Reuse Area 5 leading to Railroad Ave. with a 12" welded seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the dry docks is subject to differential settlement of unstable soils which can cause invert and slope problems. Unit prices include trenching through existing pavement; however there is an additional line item for excavation and construction costs since structural, reinforced concrete encountered between California Ave. and the dry docks. Timing for this improvement is based on planned reuse of Reuse Area 5 facilities in 2001.~~

WW-32: Replace 12" Sewer Main with 8" HDPE Pipe Using Pipe Bursting Techniques: This improvement replaces 1,800 feet of existing 12" gravity sewer in Reuse Area 5 leading to Railroad Avenue with an 8" welded-seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the dry docks is subject to differential settlement of unstable soils, which can cause invert and slope problems. Timing for this improvement is based on planned reuse of Reuse Area 5 facilities.

~~**WW-33: Replace 21" Sewer Main** - This improvement replaces 1640 feet of an existing 21 inch gravity sewer leading to DOM-7 with a 21" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with any planned roadway improvements. Phasing for this improvement is driven by expanded redevelopment of Reuse Areas 5, 8 and 9 and possible reconstruction or expansion of Railroad Ave. around 2003.~~

WW-33: Slip Line Existing 21" Sewer Main with 12" HDPE Main: This improvement lines 1,640 feet of an existing 21" gravity sewer leading to DOM-7 with a 12" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Phasing for this improvement is driven by expanded redevelopment of Reuse Areas 5, 8, and 9 and possible reconstruction or expansion of Railroad Avenue.

2.4 Ultimate Improvements

The improvements discussed above correct the majority of systemic problems by upgrading lift stations and reducing I&I. From the 1997–2007 period to ultimate development, the remaining improvements focus on correcting localized infiltration and improvements to provide service to future redevelopment areas (i.e., Reuse Area 10). Costs for manhole construction have been included in the unit price for pipe replacement. Life cycle costs, although listed under ultimate development, should accrue on a straight line basis from 1997 through the entire assumed 20- year period to 2017.

All struck out text in this section is from MIRIS and is replaced by the immediately following section.

2.4.1 Capital Improvements for Ultimate Redevelopment

~~**WW-16: Replace Pumps at DOM-2** - This improvement, replacement of all mechanical and electrical equipment in DOM-2, in conjunction with WW-17, completely reconstructs DOM-2 as the central receiving and pump station for Reuse Area 1. These improvements will be needed by 2008, unless redevelopment plans in the area require earlier construction.~~

WW-16: *The pumps were recently replaced by the City of Vallejo Maintenance Department.*

~~**WW-17: Replace Pumphouse at DOM-2** - This improvement, in conjunction with WW-16, completely reconstructs DOM-2 as the central receiving and pump station for Reuse Area 1. This project provides a complete new pumphouse along with new wet and dry well structures. These improvements will be needed by 2008, unless redevelopment plans in the area permit earlier construction and cost sharing.~~

WW-17: ***DOM 2 will not be reconstructed.***

~~**WW-25: Replace Pumps at DOM-4** – This improvement involves removal and replacement of all 4 pumps and switchgear along with inspection and repair of wet and dry wells. Based on major pump overhauls planned in 1997, replacement of electrical controllers in 1997-1998 estimated remaining lifespan and the criticality of this station, timing for this replacement and upgrade is recommended for 2008.~~

WW-25: Replace Pumps at DOM-4: Pumps were overhauled and VFD units replaced in 1997 by the City. No further upgrades will be necessary until after 2008, when pumps will require maintenance, overhaul, or replacement because of the criticality of this station.

WW-22: Replace 10" Sewer Main: This improvement replaces 820 feet of an existing 10" gravity sewer in Reuse Area 3 leading to Railroad Avenue with a 10" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Phasing for this improvement is based on continued redevelopment of Reuse Area 3 and planned redevelopment along B Street and C Street in 2007.

~~**WW-23: Replace 10" Sewer Main** – This improvement replaces 750 feet of an existing 10 inch gravity sewer in Reuse Area 3 leading to DOM-2 with a welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils which can cause invert and slope problems in less flexible pipes. Unit prices include through asphalt (construction); however there is an additional line item for excavation and construction costs since structural, reinforced concrete encountered between California Ave. and the seawall. Timing for this improvement correlates with buildout of redevelopment of Reuse Area 3 and redevelopment along A St. in 2010.~~

WW-23: Replace 10" Sewer Main with 8" HDPE: This improvement replaces 750 feet of an existing 10" gravity sewer in Reuse Area 3 leading to DOM-2 with a welded-seam 8" HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Timing for this improvement correlates with buildout of redevelopment of Reuse Area 3 and redevelopment along A Street.

~~**WW-28: Replace 12" Sewer Main** – This improvement replaces 1100 feet of an existing 12 inch gravity sewer in Reuse Area 4 leading to DOM-7 with a 12" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement which can cause invert~~

~~and slope problems in less flexible pipes. Unit prices reflect trenching through paving; however there is an additional line item for excavation and construction costs since structural, reinforced concrete encountered between California Ave. and the seawall. Phasing for this improvement is based on planned reuse and redevelopment of Reuse Area 4 facilities around DOM-7 after 2010.~~

WW-28: Replace 12" Sewer Main with 8" HDPE Main: This improvement replaces 520 feet of an existing 12" gravity sewer in Reuse Area 4 leading to DOM-7 with an 8" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement that can cause invert and slope problems in less flexible pipes. Phasing for this improvement is based on planned reuse and redevelopment of Reuse Area 4 facilities around DOM-7 after 2010.

~~**WW-29: Replace 15" Sewer Main** – This improvement replaces 450 feet of an existing 15 inch gravity sewer in Reuse Area 4 leading to DOM-7 with a 15" welded seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement which can cause invert and slope problems in less flexible pipes. Unit prices include trenching through existing pavement. Timing for this improvement reflects planned reuse of Reuse Area 4 facilities around DOM-7 in 2010.~~

WW-29: Replace 15" Sewer Main with 10" HPDE: This improvement replaces 450 feet of an existing 15" gravity sewer in Reuse Area 4 leading to DOM-7 with a 10" welded-seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement, which can cause invert and slope problems in less flexible pipes. Timing for this improvement reflects planned reuse of Reuse Area 4 facilities around DOM-7.

WW-30: Replace 12" Sewer Main: This improvement replaces 1,040 feet of existing 12" gravity sewer in Reuse Area 5 leading to Railroad Avenue with a 12" welded-seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Timing for this improvement is based on planned reuse of Reuse Area 5 facilities around DOM-7 in 2010.

~~**WW-34: Replace 12" Sewer Main** – This improvement replaces 2200 feet of existing 12 inch gravity sewer in Reuse Area 5 leading to and from DOM-8 with a 12" welded seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils which can cause invert and slope problems. Unit prices include trenching~~

~~through existing paving; however there is an additional line item for excavation and construction costs because of the structural, reinforced concrete encountered between California Ave. and the seawall. Cost savings are possible in conjunction with a water line improvement recommended for this area. Phasing for this corresponds to redevelopment of Reuse Area 5 around DOM-7 in 2008.~~

WW-34: Replace 12" Sewer Main with 8" HDPE Main: This improvement replaces 2,200 feet of existing 12" gravity sewer in Reuse Area 5 leading to and from DOM-8 with an 8" welded-seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems. Timing for this improvement corresponds to redevelopment of Reuse Area 5 around DOM-7.

WW-35: Replace 15" Sewer Main: This improvement replaces 580 feet of existing 15" gravity sewer in Reuse Area 5 leading to Railroad Avenue with a 18" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. In addition, this section of sewer near the waterfront is subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Timing for this improvement is based on planned reuse of Reuse Area 5, 8, and 9 facilities in 2012.

~~**WW-36: Replace 18" Sewer Main** - This improvement replaces 1440 feet of an existing 18 inch gravity sewer leading to DOM-7 with a 18" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade reflect trenching through existing paving, however they also assume major earthwork will be done in conjunction with any planned roadway improvements. Timing for this improvement reflects expanded reuse of facilities in Reuse Areas 5, 8 and 9 and possible expansion or reconstruction of Railroad Ave. in 2010.~~

WW-36: Replace 18" Sewer Main with 12" HDPE Main: This improvement replaces 1,440 feet of an existing 18" gravity sewer leading to DOM-7 with a 12" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Timing for this improvement reflects expanded reuse of facilities in Reuse Areas 5, 8, and 9 and possible expansion or reconstruction of Railroad Avenue.

~~**WW-37: Replace 15" Sewer Main** - This improvement replaces 1620 feet of an existing 15 inch gravity sewer leading from DOM-9 with a 15" welded seam HDPE pipeline. Portions of this section of sewer are tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade are based on trenching through existing paving, however they also assume major earthwork will be done in conjunction with any planned roadway improvements. Phasing for this improvement is based in preparation for redevelopment of Reuse Area 10 and possible expansion or reconstruction of Railroad Ave. in 2016.~~

WW-37: Replace 15" Sewer Main with 8" HDPE: This improvement replaces 1,620 feet of an existing 15" gravity sewer leading from DOM-9 with an 8" welded-seam HDPE pipeline. Portions of this section of sewer are tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Phasing for this improvement is based in preparation for redevelopment of Reuse Area 10 and possible expansion or reconstruction of Railroad Avenue.

~~**WW-39: Replace 15" Sewer Main** - This improvement replaces 1480 feet of an existing 15 inch gravity sewer leading to DOM-9 with a 15" welded seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. This section of sewer is also subject to differential settlement of unstable soils which can cause invert and slope problems in less flexible pipes. Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with any planned redevelopment. Timing for this improvement corresponds to preparation for redevelopment of Reuse Area 10 and possible expansion or reconstruction of Railroad Ave. after 2017.~~

WW-39: Replace 15" Sewer Main: This improvement replaces 1,480 feet of an existing 15" gravity sewer leading to DOM-9 with an 8" welded-seam HDPE pipeline. This section of sewer is submerged or tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. This section of sewer is also subject to differential settlement of unstable soils, which can cause invert and slope problems in less flexible pipes. Timing for this improvement corresponds to preparation for redevelopment of Reuse Area 10 and possible expansion or reconstruction of Railroad Avenue.

~~**WW-40: Replace 12" Sewer Main** - This improvement replaces 1240 feet of an existing 12 inch gravity sewer leading to DOM-9 with a 12" welded seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Unit prices for this upgrade reflect cost of trenching through existing paving, however they also assume major earthwork will be done in conjunction with any planned redevelopment. Phasing for this improvement is based on redevelopment of Reuse Area 10 in 20XX.~~

WW-40: Replace 12" Sewer Main: This improvement replaces 1,240 feet of an existing 12" gravity sewer leading to DOM-9 with a 12" welded-seam HDPE pipeline. This section of sewer is tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Phasing for this improvement is based on redevelopment of Reuse Area 10 in 20XX.

WW-41: Replace 8" Sewer Main: This improvement replaces 950 feet of an existing 8" gravity sewer leading from the southern portion of the island toward DOM-9 with an 8" welded-seam HDPE pipeline. Portions of this section of sewer are tidally influenced and subject to variable hydrostatic pressures contributing to increased I&I rates. Phasing for this improvement is based in preparation for redevelopment of Reuse Area 10 in 20XX.

2.4.2 Life Cycle Repair and Replacement

WW-54: Replace Pumps at SPS-3 - This replacement will provide long term service to the north pier in Reuse Area 1. Based on current reuse projections, recommended repair actions in 2001 and anticipated lifespan, timing for replacement of all pumps and electrical equipment can be deferred until 2017.

WW-55: Replace Pumps at SPS-4 - This replacement will provide long term service to the northeast corner of the Base near and on the north pier. Given current reuse projections, recommended repairs in 2000 and anticipated lifespan, timing for replacement of all pumps and electrical equipment can be deferred until 2017.

~~**WW-42: Replace Pumps at DOM-3** - This improvement replaces the electrical panels, controllers and 2 pumps at DOM-3. Timing for this replacement is based on the anticipated remaining lifespan and its service of Reuse Area 3 in 2009.~~

WW-42: Replace Electrical Panels and Controllers at DOM-3: Valves and check valves were replaced and the pumps were overhauled in September/October 1997 by the City. The existing pumps will not need to be replaced as indicated in MIRIS. This improvement now replaces the electrical panels and controllers at DOM-3. Timing for this replacement is based on the anticipated remaining lifespan and its service of Reuse Area 3.

~~**WW-43: Replace Pumps at DOM-5** - This improvement replaces the electrical panels, controllers and 2 pumps at DOM-5. Timing for this replacement is based on its anticipated remaining lifespan and its service of Reuse Area 3 in 2008.~~

WW-43: Replace Electrical Panels and Controllers at DOM-5: The City rerouted electrical service in 1998; replaced VFD units with fixed speed motors in June/July 1999; and replaced pumps, valves, and check valves in January/February 2000. The existing pumps will not need to be replaced as indicated in MIRIS. This improvement now replaces only the electrical panels and controllers at DOM-5. Timing for this replacement is based on its anticipated remaining lifespan and its service of Reuse Area 3.

~~**WW-44: Replace Pumps at DOM-6** - This improvement replaces the electrical panels, controllers and 2 pumps at DOM-6. A major overhaul planned for 1997 will extend operations an estimated 10 years and permit timing for this replacement to be deferred until 2006.~~

WW-44: Replace Electrical Panels and Controllers at DOM-6: The City replaced pumps, valves, check valves, and VFD units with fixed speed motors in June/July 1999. The existing pumps will not need to be replaced as indicated in MIRIS. This improvement replaces the electrical panels and controllers at DOM-6.

~~**WW-45: Replace Pumps at DOM-7** – This improvement replaces the electrical panels, controllers and 3 pumps at DOM-7. Due to the location of this pump station on the main trunk line, timing for this replacement is recommended in 2005 prior to the end of its expected lifespan.~~

WW-45: Replace Electrical Panels and Controllers at DOM-7: The City replaced pumps, valves, check valves, and VFD units with fixed speed motors in June/July 1999. The existing pumps will not need to be replaced as indicated in MIRIS. This improvement replaces the electrical panels and controllers at DOM-7. Because of the location of this pump station on the main trunk line, timing for this replacement is recommended in 2005, before the end of its expected lifespan.

~~**WW-46: Replace Pumps at DOM-8** – This improvement replaces the electrical panels, controllers and pumps at DOM-8. A major overhaul planned for 1997 will extend operations an estimated 12-15 years and permit timing for this replacement to be deferred until 2007.~~

WW-46: Replace Electrical Panels and Controllers at DOM-8: The City replaced pumps, valves, and check valves in October/November 1997. The existing pumps no longer need to be replaced as indicated in MIRIS. This improvement replaces the electrical panels and controllers at DOM-8. Timing for this replacement will be deferred until 2007.

~~**WW-38: Replace Pumps at DOM-9** – This improvement replaces the electrical panels, controllers and upgrades pumps and wet wells at DOM-9. Due to its service area (Reuse Area 10) and the need for major redevelopment, replacement of this pump station is not recommended until 2017.~~

WW-38: Replace Pumps at DOM-9: The City replaced pumps, valves, and check valves in August/September 1998. The existing pumps no longer need to be replaced as indicated in MIRIS. This improvement replaces the electrical panels, and controllers at DOM-9. Because of its service area (Reuse Area 10) and the need for major redevelopment, replacement of this pump station is not recommended until the final phase of development begins, including Reuse Area 10.

WW-47: Replace Vitrified Clay Pipe Sewer Mains: These replacements are based on the age and condition of nearly 22,900 feet of vitrified clay pipe sewer mains currently in use on the island. The average size of this type of pipe for cost estimating purposes is 10". Based on the amount of pipe replaced by previous capital improvements, average date of installation, locations relative to unstable soils, and estimated remaining lifespan, 5% will need to be replaced because of deposition or failure during the period from 1997 to 2017.

WW-48: Replace Terra-Cotta Sewer Mains: These replacements are based on the age and condition of nearly 2,600 feet of terra-cotta sewer mains currently in use on the island. The average size of this type of pipe for cost estimating purposes is 10". Based on the amount of pipe replaced by previous capital improvements, average date

of installation, and favorable slope and bedding conditions, only 5% will need to be replaced because of deposition or failure during the period from 1997 to 2017.

WW-49: Replace Steel Sewer Mains: These replacements are based on the age and condition of nearly 7,400 feet of steel sewer mains currently in use on the island. The average size for this type of pipe for cost estimating purposes is 8". Based on the amount of pipe replaced by previous capital improvements, average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 5% will need to be replaced because of corrosion, deposition, or failure during the period from 1997 to 2017.

WW-50: Replace Reinforced Concrete Pipe Sewer Mains: These replacements are based on the age and condition of nearly 17,900 feet of reinforced concrete pipe sewer mains currently in use on the island. The average size of this type of pipe for cost estimating purposes is 21". Based on the amount of pipe replaced by previous capital improvements, average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 5% will need to be replaced because of deposition or failure during the period from 1997 to 2017.

WW-51: Replace PVC Sewer Mains: These replacements are based on the age and condition of nearly 1,900 feet of PVC sewer mains currently in use on the island. The average size of this type of pipe for cost estimating purposes is 12". Based on the amount of pipe replaced by previous capital improvements, average date of installation, and potential hydrocarbon exposure, 30% will need to be replaced during the period from 1997 to 2017.

WW-52: Replace Corrugated Metal Pipe Sewer Mains: These replacements are based on the age and condition of nearly 13,500 feet of corrugated metal pipe sewer mains currently in use on the island. The average size for this type of pipe, for cost estimating purposes and based on its application and effective length, is 12". Based on the average amount of corrugated metal pipe to be replaced by specific capital improvements, 30% will need to be replaced because of corrosion, deposition, or failure during the period from 1997 to 2017.

WW-53: Replace Cast Iron Pipe Sewer Mains: These replacements are based on the age and condition of nearly 2,500 feet of cast iron pipe sewer mains currently in use on the island. The average size of this type of pipe for cost estimating purposes is 10". Based on the amount of pipe replaced by previous capital improvements, average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 5% will need to be replaced because of corrosion, deposition, or failure during the period from 1997 to 2017.

3.0 STORM DRAINAGE COLLECTION SYSTEM

3.1 Basis of Design and Calculations

Criteria for sizing new lines and determining the adequacy of the existing lines is in accordance with the Design Standards. The following design criteria were used:

- All of the drainage areas are less than 200 acres. The facilities were sized based on capacities calculated by the rational method.
- The design level of protection is 15 years based upon the drainage area of less than 640 acres, with a storm duration based upon the time of concentration.
- Rainfall intensities were calculated based upon the Rainfall Depth Duration Frequency Curves for a 15-year event, Drawing No. BB of the Design Standards.
- The design tide elevation at the discharge points into Mare Island Strait is 3.5 feet above mean sea level.
- The highest hydraulic grade line elevation was designed to be at the rim of manholes and inlets, contrary to the VSFCD standard that the energy grade line be at least 2 feet below all manhole covers, grating, and inlets. This criterion was discussed with the VSFCD; because of the special conditions at Mare Island, this will be allowed. In most cases the 2-foot criterion is met; it is only at the critical locations in the drainage basins where the hydraulic grade line is at the rim.
- The VSFCD requires that the minimum full flow velocity in any storm drain be 2.5 feet per second. This criterion could not be met in all cases because of the flatness of Mare Island and the attempt to keep existing storm drainage structures and pipes. The velocities are shown in the calculations included in Appendix A.
- Because of the impervious nature of existing and proposed Mare Island development, the C value used in calculating the drainage was assumed to be 0.9.

All of the drainage areas were analyzed using the StormCAD analysis software by Haestad Methods. Printouts from this software package are included in Appendix A.

Drainage area designations shown on Figure 3 are different from MIRIS. The drainage areas referred to in the calculations are shown on Figure 3.

A tributary area drainage sketch for each of the drainage areas is also included in Appendix A.

3.2 Proposed Storm Drainage Collection System Improvements

Almost all of the existing storm drainage collection system on Mare Island is undersized and does not meet the VSFCD storm drainage design criteria. To meet these criteria, the existing lines will need to be replaced with larger-diameter pipes.

Within the reuse plan there are three distinct subdivision areas. The storm drainage improvements for these areas are to be designed with the subdivision improvements. Collectors in all streets will flow to trunk lines that will discharge into existing drainage areas to the west.

The proposed storm drainage collection system improvements are summarized in this section as revisions to MIRIS. The results of the improvements and revisions are shown in Figure 3. This figure shows the proposed storm drain lines and sizes and the locations of existing lines to remain that are necessary to support the use plan in this URPU.

3.3 Treatment of Stormwater

During the redevelopment of Mare Island, there will be a requirement to treat stormwater discharge. The treatment procedures will be in accordance with the State of California Regional Water Quality Control Board (RWQCB) requirements and the General Permit issued to the MIUD in the future for Mare Island. These requirements will be met through the use of Best Management Practices (BMPs) approved by MIUD. The BMPs will include a combination of measures on privately developed parcels.

All proposed projects shall incorporate an appropriate selection of postconstruction BMPs that promote the following conditions:

- prevention and control of erosion and sedimentation
- source control of potential pollutants
- control and treatment of runoff
- protection of wetlands and water quality resources

Postconstruction BMPs shall be based on site-specific conditions including, but not limited to, size of development, type of development, permeability of surfaces at and adjacent to the site, potential impact to water quality resources, and site topography. Use of the approach presented in the "Start at the Source" Residential Site Planning and Design Guidance Manual for Stormwater Quality Protection shall be strongly recommended.

A detailed explanation of the minimum requirements for postconstruction BMPs is presented in Section 4.4.4, "Postconstruction BMPs," and Appendix 4B of the "Vallejo Sanitation and Flood Control District Storm Water Management Plan FY 1997/98 - FY 2001/02."

Under a new RWQCB General Municipal Permit for Mare Island, there is a possibility that other BMPs and regulations may be implemented. Although not officially adopted by the MIUD, these measures may include:

- Through the BMPs, effectively treat 85% of the smallest storm events.
- Do not affect the rainfall hydrograph of the downstream facilities.
- Storm Water Pollution Prevention Plans will be required for projects with more than 1 acre of disturbed area, as opposed to the current 5-acre limit.

3.4 Changes In Existing Conditions Since Completion of MIRIS

During summer 2000, some of the existing storm drain lines on Mare Island were jetted and cleared of sediments by the City. During this operation, several plugged manholes and pipes were observed by the City's contractor. During the reconstruction of the storm drainage collection system, these plugged locations will be removed and replaced with new storm drain pipe.

Figure 2 replaces MIRIS Figure 4-4 as a part of this URPU.

3.5 Changes In Long Term Improvements of MIRIS

All struck out text in this section is from MIRIS and is replaced by the immediately following section.

3.5.1 Capital Improvements for Redevelopment

~~**SD-1: Repair Pump 1; SDPS-15** - This upgrade is for the replacement of piping and valves and repair of pump #1 at SDPS-15. Timing for this upgrade is immediate due to the low elevation of the land serviced by this pump station (Drainage Basin A) which floods through ground seepage and sewer backflow during high tides. Based on current tenants and planned redevelopment, this upgrade should be accomplished in 1997.~~

SD-1: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-2: Refurbish Pump 2; SDPS-15** - This upgrade is for the repair of pump #2 at SDPS-15. It has been separated in order to repair the pumps sequentially if necessary due to financial limitations and the estimated high cost of overhaul; however timing on this upgrade is also based on the low elevation of the land serviced (as SD-1). Based on current tenants and planned redevelopment, this upgrade should also be accomplished in 1997.~~ **~~Error! Bookmark not defined.~~**

SD-2: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-3: Repair Pump 1; SDPS-14** - This upgrade is for the replacement of piping and valves and repair of pump #1 at SDPS-14. Timing on this upgrade is based on the low elevation of the land serviced by this pump station (Drainage Basin B; center of Reuse Area 1) which floods through ground seepage during high tides. This upgrade should be accomplished in 1998 to serve current tenants and planned redevelopment.~~

SD-3: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-4: Refurbish Pump 2; SDPS-14** - This upgrade is for the repair of pump #2 at SDPS-14. It has been separated in order to repair the pumps sequentially if necessary however timing on this upgrade is also based on the low elevation of the land serviced (as SD-3). This upgrade should also be accomplished in 1998 along with SD-3.~~

SD-4: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-7: Construct 4'x2'Channel** - This improvement consists of 800 feet of an open, concrete-lined Collector Channel for storm drainage along Railroad Ave. in Reuse Area 1. (Covered box culverts could be used in this area depending on design layout and grading plans). In conjunction with SD-8 and 9, it forms a consolidated outfall for this area, combining drainage basins A, B and C. Timing for this improvement is based on redevelopment along Railroad Ave. currently planned for 2003.~~

SD-7: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-8: Construct 6'x5' Channel** - This improvement will provide of 1000 feet of an open, concrete-lined Collector Channel for storm drainage from Railroad Ave. to Mare Island Strait in Reuse Area 1. In conjunction with SD-7, 9 and 16, it forms a consolidated outfall for this area, combining drainage basins A, B and C. 1998 phasing for this improvement reflects redevelopment within the center of Reuse Area 1, preceding other collector improvements, including SD-16, 17, 18, and 19, currently planned for 2000.~~

SD-8: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-9: Construct 4'x2' Channel** - This improvement calls for 1400 feet of an open, concrete-lined Collector Channel for storm drainage along Railroad Ave. in Reuse Area 1. (Covered box culverts could be used in this area depending on design layout and grading plans). In conjunction with SD-7 and 8, it forms a consolidated outfall for this area, combining drainage basins A, B and C. Timing for this improvement is based on redevelopment along Railroad Ave. currently planned for 2003.~~

SD-9: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-10: Construct 18" Collector** – This improvement provides 300 feet of 18" RCP Collector Pipe draining into the channel to be constructed along Railroad Ave. Along with improvements SD-11, 12, 13, 14, and 15, these Collectors provide direct gravity drainage for storm water flows in the eastern third of Reuse Area 1. Unit prices for this upgrade are based on trenching through existing paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is related to completion of SD-7 and 8 and is based on redevelopment of the service area, currently projected for 2005.~~

SD-10: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-11: Construct 18" Collector** – This improvement consists of 200 feet of 18" RCP Collector Pipe draining into the channel to be constructed along Railroad Ave. Along with improvements SD-10, 12, 13, 14, and 15, these Collectors provide direct gravity drainage for storm water flows in the eastern third of Reuse Area 1. Unit prices for this upgrade are based on through asphalt trenching; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on the completion of SD-8 and 9 and is driven by redevelopment of the service area, projected for 2006.~~

SD-11: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-12: Construct 18" Collector** – This improvement results in200 feet of 18" RCP Collector Pipe draining into the channel to be constructed along Railroad Ave. Along with improvements SD-10, 11, 13, 14, and 15, these Collectors provide direct gravity drainage for storm water flows in the eastern third of Reuse Area 1. Unit prices for this upgrade reflect trenching through existing paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement follows completion of SD-8 and 9 and is based on redevelopment of the service area, one of the last, projected for 2007.~~

SD-12: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-13: Construct 24" Collector** – This improvement constructs 500 feet of 24" RCP Collector Pipe draining into the channel to be constructed along Railroad Ave. Along with improvements SD-10, 11, 12, 14, and 15, these Collectors provide direct gravity drainage for storm water flows in the eastern third of Reuse Area 1. Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing~~

~~for this improvement is based on the completion of SD-7 and 8 and reflects redevelopment of the service area, currently projected for 2004.~~

SD-13: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-14: Construct 24" Collector** – This improvement will provide 500 feet of 24" RCP Collector Pipe draining into the channel to be constructed along Railroad Ave. Along with improvements SD-10, 11, 12, 13, and 15, these Collectors provide direct gravity drainage for storm water flows in the eastern third of Reuse Area 1. Unit prices for this upgrade reflect trenching through existing paving, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement related to the completion of SD-8 and 9 and is based on redevelopment of the service area, currently projected for 2003.~~

SD-14: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-15: Construct 24" Collector** – This improvement consists of 500 feet of 24" RCP Collector Pipe draining into the channel to be constructed along Railroad Ave. Along with improvements SD-10, 11, 12, 13, and 14, these Collectors provide direct gravity drainage for storm water flows in the eastern third of Reuse Area 1. Unit prices for this upgrade are based on through paving trenching, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on the completion of SD-8 and 9 and reflects redevelopment of the service area, currently projected for 2003.~~

SD-15: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-16: Construct 36" Force Main** – This improvement, along with SD-17, 18 and 19 establishes a central storm water collection, detention and drainage facility for the western two-thirds of Reuse Area 1. These improvements will eliminate two current lift stations and allow smaller pumps to be used to drain the Detention Basin. This project is for the construction of 1850 feet of 36" high density polyethylene (HDPE) Force Main from the new pump station, across the Island's drainage divide, into the head of a new drainage channel (SD-8). Material selection for this line is based on the high corrosivity and the unstable (differential settlement potential) nature of local soils. Alternative material selection using metal pipe would require the installation of a cathodic protection system. This improvement is based on completion of SD-8, and should precede significant redevelopment along Cedar Ave. in 2000.~~

SD-16: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-17: Install New Pumps and Equipment** - This improvement, along with SD-16, 18 and 19 establishes a central storm water collection, detention and drainage facility for the western two-thirds of Reuse Area 1. These improvements will eliminate two current lift stations and allow smaller pumps to be used to drain the Detention Basin. This project is for the installation of four new Pumps and related equipment in a new Pump Station located by the Detention Basin. This improvement is based on completion of SD-8, and should be performed in conjunction with SD-18 in 2000.~~

SD-17: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-18: Construct New Pumphouse** - This project consists of a new pumphouse with wet and dry wells located next to the proposed Detention Basin. This improvement is preceded by completion of SD-8 and SD-16. It should be constructed in conjunction with SD-17 in 2000.~~

SD-18: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-19: Dredge Detention Basin** - This improvement, along with SD-16, 17 and 18 establishes a central Storm Water Collection, Detention and Drainage Facility for the western two-thirds of Reuse Area 1. These improvements will eliminate two current lift stations and allow smaller pumps to be used to drain the Detention Basin. This project includes dredging a 400 foot by 500 foot Detention Basin to elevation 0.0 (NGVD) in the remnant of a closed dredge pond immediately west or Reuse Area 1 (see Figure 4-3). This area will provide detention for a 15 year storm; in addition the remaining freeboard above elevation 5.0 (level of current dredge fill) throughout the dredge pond will provide adequate storage for a 100 year FEMA storm. Phasing for this improvement should closely follow completion of SD-8 in 1998, and should be constructed prior to SD-16, 17 and 18 in 1999.~~

SD-19: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-20: Construct 3'x5' Channel** - This improvement consists of 2400 feet of an open, concrete lined Collector Channel for storm drainage from Cedar Ave. west along the base boundary into, and through, the closed dredge pond immediately west of Reuse Area 1. This Channel will divert storm waters from the northern 40% of Reuse Area 1 into the Detention Basin (SD-19). Phasing for this improvement is based on redevelopment along Cedar Ave. and should be constructed in conjunction with SD-19 in 1999.~~

SD-20: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-21: Construct 36" Trunk Line** – This improvement constructs 600 feet of 36" RCP drainage pipeline along the north end of Cedar Ave. This Trunk Line provides direct gravity drainage for storm water flows into drainage channels on the north end of the area (SD-20). Unit prices for this upgrade are based on trenching through existing paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement reflects completion of SD-20 and redevelopment of the service area, currently projected for 2000.~~

SD-21: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-22: Construct 24" Trunk Line** – This improvement provides 600 feet of 24" RCP drainage pipeline along the north end of Cedar Ave. This Trunk Line provides direct gravity drainage for storm water flows into drainage channels on the north end of the area (SD-20 and 21). Unit prices for this upgrade reflect trenchingthrough paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is based on the completion of SD-21 and redevelopment of the service area, currently projected for 2001.~~

SD-22: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-23: Construct 30"Trunk Line** – This improvement consists of 1500 feet of 30" RCP drainage pipeline along the central portion of Cedar Ave. into the Detention Basin west of Reuse Area 1. This Trunk Line provides direct gravity drainage for storm water flows from the central 25% of the Reuse Area into the Detention Basin (SD-19). Unit prices for this upgrade are based on trenching through paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement follows completion of SD-19 and is driven by redevelopment of the service area, currently projected for 2001.~~

SD-23: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-24: Construct 24" Trunk Line** – This improvement constructs 500 feet of 24" RCP drainage pipeline along the central portion of Cedar Ave. to a detention basin west of Reuse Area 1. Along with SD-23, this trunk line provides direct gravity drainage for storm water flows from the central 25% of the Reuse Area into the Detention Basin (SD-19). Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is based on the completion of SD-23 and redevelopment of the service area, currently projected for 2001.~~

SD-24: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-25: Construct 3'x2' Channel** – This improvement will add of 1200 feet of an open, concrete lined Collector Channel for storm drainage along the northern end of Reuse Area 1. It provides surface drainage from the lowest elevations in the area into the Detention Basin (SD-19). This improvement serves redevelopment along Acacia St. currently projected for 2003.~~

SD-25: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-26: Construct 24" Collector** – This improvement provides 1000 feet of 24" RCP drainage pipeline across Cedar Ave. along proposed new roadways into redevelopment parcels in Reuse Area 1. This Collector will provide gravity storm water drainage from the central 25% of the Reuse Area to the Detention Basin. Unit prices for this upgrade are based on trenching through existing paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement matches completion of SD-21 and redevelopment of the service area, currently projected for 2002.~~

SD-26: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-27: Construct 18" Collector** – This improvement constructs 400 feet of 18" RCP drainage pipeline across Cedar Ave. along proposed new roadways into redevelopment parcels in Reuse Area 1. This Collector will provide gravity storm water drainage from the central 25% of the Reuse Area to the Detention Basin. Unit prices for this upgrade reflect trenching through asphalt; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement corresponds to completion of SD-23 and redevelopment of the service area, currently projected for 2001.~~

SD-27: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-28: Construct 18" Collector** – This improvement consists of 400 feet of 18" RCP drainage pipeline across Cedar Ave. along proposed new roadways into redevelopment parcels in Reuse Area 1. This Collector will provide gravity storm water drainage from the south central 25% of the Reuse Area to the Detention Basin. Unit prices for this upgrade are based on trenching through existing paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on the completion of SD-23 and final redevelopment of the service area, currently projected for 2001.~~

SD-28: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-29: Construct 4'x3' Channel** - This improvement will add 300 feet of an open, concrete lined Storm Water Discharge Channel from California Ave. into Mare Island Strait. This channel will provide a low maintenance outfall for Drainage Basin D. Timing for this improvement reflects redevelopment along Causeway Road (G St.) and should be performed prior to other basin improvements in 1999.~~

SD-29: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-30: Construct 15" Collector** - This improvement constructs 100 feet of 15" RCP drainage pipeline along Cedar Ave. in Reuse Area 1. This collector will provide gravity storm water drainage from the southwest corner of Reuse Area 1 into Drainage Basin D. Unit prices for this upgrade are based on trenching through asphalt; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on proposed early redevelopment of the service area, currently projected for 1998.~~

SD-30: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-31: Construct 24" Trunk Line** - This improvement constructs 550 feet of 24" RCP drainage pipeline along Cedar Ave. in Reuse Area 1. This Collector will complete gravity storm water drainage from the southwest corner of Reuse Area 1 into Drainage Basin D. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement corresponds to proposed final redevelopment of the service area, currently projected for 1999.~~

SD-31: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-34: Construct 30" Trunk Line** - This improvement replaces 1350 feet of RCP drainage pipeline along G St. This Trunk Line provides gravity storm water drainage into Drainage Basin D. Unit prices for this upgrade are based on trenching through existing paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. This improvement is based on potential redevelopment of the northern end of Reuse Areas 2 and 3 in 2004.~~

SD-34: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-35: Construct 27" Collector** - This improvement replaces 350 feet of RCP drainage collector along Walnut Ave. The new Collector will provide gravity storm water drainage from the northern end of Reuse Area 2 into Drainage Basin D. Unit prices for this upgrade are based on through asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway~~

~~improvements. Timing for this improvement is based on potential redevelopment of Reuse Area 2 in 2005.~~

SD-35: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-36: Construct 24" Collector** – This improvement replaces 750 feet of RCP drainage pipeline along Walnut Ave. This Collector will provide gravity storm water drainage from the northern end of Reuse Area 2 into drainage basin D. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing is the same as for SD-35.~~

SD-36: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-37: Construct 18" Collector** – This improvement replaces 600 feet of RCP collector along the west end of C St. This collector will provide gravity storm water drainage from the northern end of Reuse Area 2 into drainage basin D. Unit prices for this upgrade reflect the cost of trenching through existing paving; however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is based on potential redevelopment of Reuse Area 2 in 2005.~~

SD-37: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-38: Construct 15" Collector** – This improvement replaces 1100 feet of RCP collector along A St. This collector will provide gravity storm water drainage from the central portion of Reuse Area 2 into Drainage Basin E. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on potential redevelopment of Reuse Area 2 in 2006.~~

SD-38: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-39: Construct 18" Collector** – This improvement replaces 600 feet of RCP collector along A St. to Mare Island Strait. This collector will provide gravity storm water drainage from the central portions of Reuse Areas 2 and 3 into drainage basin E. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete is used for ground construction between California Ave. and the seawall. Timing for this improvement is based on potential redevelopment of Reuse Areas 2 and 3 in 2005.~~

SD-39: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-40: Construct 12" Collector** - This improvement replaces 700 feet of RCP collector along Cedar Ave. This collector will provide gravity storm water drainage from the central portion of Reuse Area 2 into drainage basin E. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on potential redevelopment of Reuse Area 2 in 2006.~~

SD-40: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-41: Construct 12" Collector** - This improvement replaces 700 feet of RCP collector along Walnut Ave. This collector will provide gravity storm water drainage from the central portion of Reuse Area 2 into drainage basin E. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is based on potential redevelopment of Reuse Area 2 in 2006.~~

SD-41: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-46: Construct 36" Collector** - This improvement replaces 600 feet of RCP collector along Walnut Ave. This collector will provide gravity storm water drainage from the central portion of Reuse Area 4 into drainage basin H. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on projected increased demands in Reuse Area 4 by 2001.~~

SD-46: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-47: Construct 18" Collector** - This improvement replaces 600 feet of RCP collector along Cedar Ave. This collector will provide gravity storm water drainage from the central portion of Reuse Area 4 into drainage basin H. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is based on projected increased demands in Reuse Area 4 by 2002.~~

SD-47: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-49: Construct 33" Collector** - This improvement replaces 1550 feet of RCP collector along the western edge of Reuse Area 6. This collector will provide gravity storm water drainage from Reuse Area 6 into drainage basin I. Unit prices for this~~

~~upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with construction through dikes around the dredge ponds to the west. Phasing for this improvement is based on projected increased demands in Reuse Area 6 by 2006.~~

SD-49: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-50: Construct 42" Trunk Line** - This improvement replaces 1000 feet of RCP trunk line between Reuse Areas 7 and 8. This improvement will provide adequate gravity storm water drainage from the Reuse Areas 6 and 7 into drainage basin I. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with construction through earth dikes surrounding Reuse Area 7. Timing for this improvement is based on projected increased demands in Reuse Area 4 by 2006.~~

SD-50: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-51: Construct 18" Collector** - This improvement replaces 800 feet of RCP collector along and west of California Ave. This collector will provide gravity storm water drainage from the northern portion of Reuse Area 5 into drainage basin I. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements and facility demolition. Phasing for this improvement is based on projected increased demands in Reuse Area 5 by 2006.~~

SD-51: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-52: Construct 48" Trunk Line** - This improvement replaces 650 feet of RCP trunk line along California Ave. This improvement will provide adequate gravity storm water drainage from Reuse Areas 6 and 7 and the northern portion of Reuse Area 5 through drainage basin I. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete is encountered between California Ave. and the seawall. Timing for this improvement is based on potential redevelopment of Reuse Areas 5 and 6 by 2006.~~

SD-52: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-53: Construct 18"Collector** - This improvement replaces 500 feet of RCP collector along 12th St. west of Railroad Ave. This collector will provide gravity storm water drainage from the northern portion of Reuse Area 5 into drainage basin I. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements and facility~~

~~demolition. Phasing for this improvement is based on projected redevelopment in this portion of Reuse Area 5 by 2004.~~

SD-53: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-54: Construct 60" Trunk Line** – This improvement replaces 300 feet of RCP trunk line between Dry Docks 3 and 4 along Mare Island Strait. This improvement will provide adequate gravity storm water drainage from the southern portions of Reuse Areas 5, 6 and 7 through drainage basin I. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete is encountered near the seawall. Timing for this improvement is based on potential redevelopment of Reuse Areas 5 in 2002.~~

SD-54: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-55: Construct 36" Trunk Line** – This improvement replaces 1600 feet of RCP trunk line south of Dry Dock 4. This improvement will provide adequate gravity storm water drainage from the central portion of Reuse Areas 5 through drainage basin J. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete is encountered between California Ave. and the seawall. Phasing for this improvement is based on potential reuse and redevelopment of the central portion of Reuse Area 5 by 2003.~~

SD-55: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-59: Construct 30" Trunk Line** – This improvement replaces 750 feet of RCP trunk line along 14th St. This improvement will provide adequate gravity storm water drainage from the Reuse Areas 5 and 8 into drainage basin K. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements and facility demolition. Timing for this improvement is based on projected increased demands in Reuse Areas 5 and 8 by 2006.~~

SD-59: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

~~**SD-60: Construct 42" Trunk Line** – This improvement replaces 350 feet of RCP trunk line along 14th St. This improvement will provide adequate gravity storm water drainage from the Reuse Areas 5 and 8 into drainage basin K. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements and facility~~

~~demolition. Phasing for this improvement is based on projected increased demands in Reuse Areas 5 and 8 by 2006.~~

SD-60: ***These master plan improvements no longer apply and are superceded by the improvements shown on Figure 3.***

3.5.2 Outfall Consolidation

SD-5: Isolation and Removal of SDPS-15: This upgrade removes and salvages equipment at SDPS-15 on the northern end of Reuse Area 1. Removal of these facilities in 2003 will eliminate a maintenance problem, reduce the number and size of stormwater lift stations, and permit the possible salvage of existing equipment for reuse in other lift stations.

SD-6: Isolation and Removal of SDPS-14: This upgrade removes and salvages equipment at SDPS-14 in the central portion of Reuse Area 1. Removal of these facilities in 2003 will eliminate a maintenance problem, reduce the number and size of stormwater lift stations and permit the possible salvage of existing equipment for reuse in other lift stations.

SD-70: Plug Manholes and Outfalls (GL002, 3, 4, 11, 12, 13, 15, 17, and 18): This project isolates and removes minor stormwater outfalls along the seawall between 1st Street and D Street. Because of the limited service area of these outfalls, this improvement can either be accomplished immediately or in conjunction with demolition and redevelopment of facilities in this part of Reuse Area 3.

3.6 Ultimate Improvements

The improvements discussed above correct the majority of systemic problems by reducing the number of lift stations and increasing the capacity of lines in long term development areas. From the long term timeframe to ultimate development in 20XX, the remaining improvements focus on correcting localized slope and capacity restrictions to provide service to smaller redevelopment areas, final redevelopment areas (i.e., Reuse Area 10) and completing additional, high cost, outfall consolidations. Costs for manhole and catch basin replacement are excluded from pipe replacement costs because they will become a factor of in-tract development. Life cycle costs, although listed under ultimate development, should accrue on a straight line basis from 1997 through the entire assumed 20-year period to 2017.

3.6.1 Capital Improvements for Ultimate Redevelopment

~~**SD-32: Construct 18" Collector** This improvement constructs 150 feet of 18" RCP collector along G St. This collector will provide gravity storm water drainage from the southwest corner Reuse Area 1 into drainage basin D. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done~~

~~in conjunction with planned roadway improvements. Phasing for this improvement is based on potential redevelopment of, and around, the Rodman Center in 20XX.~~

SD-32: Construct 18 and 21" Collectors: This improvement constructs 200 feet of 18" and 1,800 feet of 21" RCP collector along G Street. This collector will provide gravity stormwater drainage from the southwest corner Reuse Area 1. Phasing for this improvement is based on potential redevelopment of, and around, the Rodman Center in 20XX.

~~**SD-33: Construct 21" Collector** - This improvement replaces 150 feet of RCP collector along G St. This collector will provide gravity storm water drainage from the southwest corner the reuse area into drainage basin D. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on potential redevelopment of, and around, the Rodman Center in 20XX.~~

SD-33: Construct 24" Collector: This improvement replaces 270 feet of reinforced concrete pipe collector along G Street. This collector will provide gravity stormwater drainage from the southwestern corner of the reuse area. Phasing for this improvement is based on potential redevelopment of, and around, the Rodman Center.

~~**SD-42: Construct 18" Collector** - This improvement replaces 1650 feet of reinforced concrete pipe collector along 3rd St. This collector will provide gravity storm water drainage from the southern portions of Reuse Areas 2 and 3 through drainage basin F. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete is used for ground construction between California Ave. and the seawall. Timing for this improvement is based on potential redevelopment of Reuse Areas 2 and 3 in 2009.~~

SD-42: Construct 36", 33", and 24" Trunk Lines and 18" Collector: This improvement replaces 1,900 feet of reinforced concrete pipe collector along 3rd Street. This collector will provide gravity stormwater drainage from the southern portions of Reuse Areas 2 and 3. Timing for this improvement is based on potential redevelopment of Reuse Areas 2 and 3.

~~**SD-43: Construct 10" Collector** - This improvement replaces 50 feet of RCP collector along California Ave. in Reuse Area 3. This collector will provide gravity storm water drainage from the southwest corner the reuse area into drainage basin G. Unit prices for this upgrade are based on asphalt construction. Timing for this improvement is based on potential redevelopment of, and around, the Power Plant in 20XX.~~

SD-43: Not applicable; removed. Does not apply to the new URPU. Most of the storm drainage systems in this area will be reconstructed. Refer to Figure 2.

~~**SD-44: Construct 18" Collector** - This improvement replaces 400 feet of RCP collector along Walnut Ave. This collector will provide gravity storm water drainage from the central portion of Reuse Area 4 into drainage basin H. Unit prices for this~~

~~upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on projected increased demands in Reuse Area 4 by 2007.~~

SD-44: Not applicable; removed. Does not apply to the new URPU. Most of the storm drainage systems in this area will be reconstructed (Figure 2).

~~**SD-45: Construct 18" Collector** – This improvement replaces 400 feet of RCP collector along 6th St. This collector will provide gravity storm water drainage from the central portion of Reuse Area 4 into drainage basin H. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is based on projected increased demands in Reuse Area 4 by 2007.~~

SD-45: Not applicable; removed. Does not apply to the new URPU. Most of the storm drainage systems in this area will be reconstructed (Figure 2).

~~**SD-48: Construct 21" Collector** – This improvement replaces 1000 feet of RCP collector along 9th St. This collector will provide gravity storm water drainage from the central portion of Reuse Area 6 into drainage basin I. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on projected increased demands in Reuse Area 6 by 2007.~~

SD-48: Not applicable; removed. Does not apply to the new URPU. This area will be reconstructed with new housing subdivisions. Existing storm drain lines will be removed during demolition process.

~~**SD-56: Construct 18" Collector** – This improvement replaces 400 feet of RCP collector in Reuse Area 8. This collector, along with SD-57 and 58, will provide gravity storm water drainage from Reuse Area 8 into drainage basin K. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Timing for this improvement is based on projected increased demands in Reuse Area 8 by 2007.~~

SD-56: Not applicable; removed. Does not apply to the new URPU. This area will be reconstructed with new housing subdivisions. Existing storm drain lines will be removed during demolition process.

~~**SD-57: Construct 15" Collector** – This improvement replaces 300 feet of RCP collector in Reuse Area 8. This collector, along with SD-56 and 58, will provide gravity storm water drainage from Reuse Area 8 into drainage basin K. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on projected increased demands in Reuse Area 8 by 2007.~~

SD-57: Not applicable; removed. Does not apply to the new URPU. This area will be reconstructed with new housing subdivisions. Existing storm drain lines will be removed during demolition process.

~~**SD-58: Construct 21" Collector** - This improvement replaces 1200 feet of RCP collector in Reuse Area 8. This collector, along with SD-56 and 57, will provide gravity storm water drainage from Reuse Area 8 into drainage basin K. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on projected increased demands in Reuse Area 8 by 2007.~~

SD-58: Not applicable; removed. Does not apply to the new URPU. This area will be reconstructed with new housing subdivisions. Existing storm drain lines will be removed during demolition process.

~~**SD-61: Construct 36" Trunk Line** - This improvement replaces 200 feet of RCP trunk line along 15th St. east of California Ave. This improvement will provide adequate gravity storm water drainage from the southern portion of Reuse Area 5 through drainage basin L. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete is encountered near the seawall. Timing for this improvement is based on potential redevelopment of Reuse Area 5 in 2012 and may be accelerated by proposed demolition in this area.~~

SD-61: Construct 60", 54", and 42" Trunk Line: This improvement replaces 1,200 feet of reinforced concrete pipe trunk line along 15th Street. This improvement will provide adequate gravity stormwater drainage from the southern portion of Reuse Area 5. Timing for this improvement is based on potential redevelopment of Reuse Area 5 and may be accelerated by proposed demolition in this area.

~~**SD-62: Construct 18" Collector** - This improvement replaces 400 feet of RCP collector north of the finger piers. This collector will provide gravity storm water drainage from the southern portion of Reuse Area 5 through drainage basin L. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete is encountered between California Ave. and the seawall. Timing for this improvement is based on potential redevelopment of Reuse Area 5 in 2012 and may be accelerated by proposed demolition in this area.~~

SD-62: Not applicable; removed. This improvement is to be part of the private land development outside public works right-of-ways (ROWs). This URPU only addresses the backbone systems for public works.

~~**SD-63: Construct 27" Collector** - This improvement replaces 400 feet of RCP collector in Reuse Area 9. This collector, along with SD-64 and 65, will provide gravity storm water drainage from Reuse Areas 5 and 9 into drainage basin M. Unit~~

~~prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on projected increased demands in Reuse Area 9 by 2014.~~

SD-63: Not applicable; removed. This improvement is to be part of the private land development outside public works ROWs and within the limits of the Touro University campus. This URPU only addresses the backbone systems for public works.

~~**SD-64: Construct 33" Collector** - This improvement replaces 300 feet of RCP collector along Railroad Ave. in Reuse Area 9. This collector, along with SD-63 and 65, will provide gravity storm water drainage from Reuse Areas 5 and 9 into drainage basin M. Unit prices for this upgrade are based on asphalt construction, however they also assume major earthwork will be done in conjunction with planned roadway improvements. Phasing for this improvement is based on projected increased demands in Reuse Area 9 and possible roadway improvements in 2014.~~

SD-64: Construct 18", 24", 27", 36", and 42" Collectors and Trunk Lines: This improvement replaces 950 feet of reinforced concrete pipe collector along Railroad Avenue in Reuse Area 9. This collector, along with SD-63 and 65, will provide gravity stormwater drainage from Reuse Areas 5 and 9. Phasing for this improvement is based on projected increased demands in Reuse Area 9 and possible roadway improvements.

SD-65: Construct 33" Collector: This improvement replaces 300 feet of reinforced concrete pipe collector leading to the seawall in Reuse Area 5. This collector, along with SD-63 and 64, will provide gravity stormwater drainage from Reuse Areas 5 and 9 into drainage basin M. Timing for this improvement is based on projected increased demands in Reuse Areas 5 and 9 by 2014.

SD-66: Construct 3'x4' Channel: This improvement is for construction of 1,500 feet of an open, concrete-lined collector channel for storm drainage along Blake Avenue in Reuse Area 10. In conjunction with SD-67, 68, and 69, it forms a consolidated outfall for this area, combining existing drainage basins N, O, and P. This improvement is based on redevelopment of Blake Avenue and Reuse Area 10 currently planned for 20XX.

SD-67: Construct 3'x2' Channel: This improvement is for construction of 1,300 feet of an open, concrete-lined collector channel for storm drainage along Railroad Avenue in Reuse Area 10. In conjunction with SD-66, 68, and 69, it forms a consolidated outfall for this area, combining existing drainage basins N, O, and P. This improvement is based on redevelopment of Railroad Avenue and Reuse Area 10 currently planned for 20XX.

SD-68: Construct 5'x4' Channel: This improvement is for construction of 400 feet of an open, concrete-lined channel for storm drainage from Blake Avenue to Mare Island Strait in Reuse Area 10. In conjunction with SD-66, 67, and 69, it forms a consolidated outfall for this area, combining drainage basins N, O, and P. This improvement is

based on redevelopment of Reuse Area 10, preceding other collector improvements, including SD-66, 67 and 69, currently planned for 20XX.

SD-69: Construct 3'x4' Channel: This improvement is for construction of 1,500 feet of an open, concrete-lined collector channel for storm drainage along Blake Avenue in Reuse Area 10. In conjunction with SD-66, 67, and 68, it forms a consolidated outfall for this area, combining drainage basins N, O, and P. This improvement is based on redevelopment of Blake Avenue and Reuse Area 10 currently planned for 20XX.

3.6.2 Life Cycle Repair and Replacement

SD-75: Replace ACP Storm Drainage Pipe Mains: These replacements are based on the age and condition of nearly 300 feet of asbestos cement storm sewers currently in use on the island. The average size of this type of pipe for cost estimating purposes is 18". Based on the number of pipes replaced by individual capital improvements, the average date of installation, locations relative to unstable soils, and estimated remaining lifespan, 30% will need to be replaced because of deposition or failure during the period from 1997 to 2017.

SD-76: Replace Redwood Drainage Boxes: These replacements are based on the age and condition of nearly 1,400 feet of redwood box storm sewers currently in use on the island. The average size of the redwood boxes is 18". Based on the number of pipes replaced by individual capital improvements, the average date of installation, locations relative to other improvements or unstable soils, and estimated remaining lifespan, 30% will need to be replaced because of deposition, rotting, or failure during the period from 1997 to 2017.

SD-77: Replace Brick Storm Sewers: These replacements are based on the age and condition of nearly 1,600 feet of brick storm sewers currently in use on the island. The average size for this type of pipe, for cost estimating purposes and based on its application and effective length, is 18". Based on the pipes' average date of installation, locations relative to other improvements or unstable soils, and estimated remaining lifespan, 30% will need to be replaced because of deposition or mortar failure during the period from 1997 to 2017.

SD-78: Replace Cast Iron Pipe Storm Sewer Pipes: These replacements are based on the age and condition of nearly 1,400 feet of cast iron storm sewers currently in use on the island. The average size for this type of pipe, for cost estimating purposes and based on its application and effective length, is 18". Based on the number of pipes replaced by individual capital improvements, the average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 10% will need to be replaced because of corrosion or failure during the period from 1997 to 2017.

SD-79: Replace Corrugated Metal Pipe Sewer Mains: These replacements are based on the age and condition of nearly 17,500 feet of corrugated metal storm sewers

currently in use on the island. The average size for this type of pipe, for cost estimating purposes and based on its application and effective length, is 18". Based on the pipes' average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 40% will need to be replaced because of corrosion, deposition, or failure during the period from 1997 to 2017.

SD-80: Replace Reinforced Concrete Pipe Sewer Mains: These replacements are based on the age and condition of nearly 16,200 feet of reinforced concrete storm sewers currently in use on the island. The average size for this type of pipe, for cost estimating purposes and based on its application and effective length, is 18". Based on the pipes' average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 5% will need to be replaced because of deposition or failure during the period from 1997 to 2017.

SD-81: Replace Terra-Cotta Sewer Mains: These replacements are based on the age and condition of nearly 2,700 feet of terra-cotta storm sewers currently in use on the island. The average size for this type of pipe, for cost estimating purposes and based on its application and effective length, is 18". Based on the pipes' average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 10% will need to be replaced because of aging, deposition, or failure during the period from 1997 to 2017.

SD-82: Replace Vitrified Clay Pipe Sewer Mains: These replacements are based on the age and condition of nearly 14,500 feet of vitrified clay storm sewers currently in use on the island. The average size for this type of pipe, for cost estimating purposes and based on its application and effective length, is 18". Based on the pipes' average date of installation, locations relative to highly corrosive or unstable soils, and estimated remaining lifespan, 5% will need to be replaced because of deposition or failure during the period from 1997 to 2017.

~~**SD-83: Replace Pumps 1 & 2; SDPS-13** This improvement replaces the two existing pumps at SDPS-13. This lift station serves a small drainage area in the hospital complex in Reuse area 9 and discharges into drainage basin L. Timing on this upgrade is based on the condition and redundancy of the existing pumps, limited area served by this lift station, and planned reuse or redevelopment of the area, currently planned for 2006.~~

SD-83: Replace Pumps 1 and 2, SDPS-13: This improvement replaces the two existing pumps at SDPS-13. This lift station serves a small drainage area in the hospital complex in Reuse Area 9 and discharges into drainage basin L. Timing on this upgrade is based on the condition and redundancy of the existing pumps, limited area served by this lift station, and planned reuse or redevelopment of the area, currently planned for 2006.

3.6.3 Outfall Consolidation

~~**SD-71: Install New 18" Intereceptor** – This improvement constructs an intereceptor line to capture and divert storm water discharge from 2 outfalls along the seawall between A St. and B St. and divert them into Drainage Basin E. Unit prices include construction through asphalt; however there is an additional line item for excavation and construction costs since structural, reinforced concrete encountered between California Ave. and the seawall. Due to the larger service area of these outfalls, this improvement should be accomplished in conjunction with facility demolition and redevelopment in 20XX.~~

SD-71: Not applicable; removed. This improvement is to be part of the private land development outside public works ROWs. This URPU only addresses the backbone systems for public works.

SD-72: Plug Manholes and Outfalls (GL010 and 16): This improvement isolates and removes two stormwater outfalls along the seawall between A Street and B Street. Because of the larger service area of these outfalls, this improvement should be accomplished in conjunction with SD-71 in 20XX.

SD-73: Install New 36" Interceptor: This improvement constructs an HDPE interceptor line to capture and divert stormwater discharge from outfalls for drainage basins J, K, and L along the face of the seawall under the dock "lip." Timing for this improvement is based on availability of funds (20XX).

SD-74: Construct Stormwater Monitoring Station: This improvement provides a monitoring station in conjunction with outfall consolidation for drainage basins J, K, and L (SD-73). Timing for this improvement should coincide with consolidation of the outfalls in 20XX.

4.0 JOINT TRENCH UTILITIES

4.1 General

This section discusses the three proposed joint trench utilities for Mare Island: electrical, gas, and telecommunications systems. The proposed joint trench will include conduits and substructures in support of these systems. Figure 4 shows the proposed location of a new joint trench in support of the development plan. In general, the proposed joint trench follows the street framework plan. Not all joint trench locations will include all three of the systems. The intent is to allow for new facilities in each joint trench in support of new development or more modern systems (specifically, telecommunications). Not all systems require a new joint trench. Existing systems will remain in place if they are adequate to service the existing and new facilities and are not in conflict with the proposed redevelopment plan.

The approximate locations of existing and proposed utility easements for electrical, gas, and telecommunications systems are shown on Figure 5. The purpose of this figure is to identify the locations of existing facilities that will have nonexclusive easements over them before redevelopment. These easements must be verified.

4.2 Electrical Distribution System

Island Energy is presently the electrical service provider on Mare Island. The City of Pittsburg, California, owns Island Energy and is finalizing an agreement with the Navy to formally take over the existing facilities. Within this agreement, the Navy will grant Island Energy nonexclusive easements for its existing electrical facilities on the island. The approximate locations of these proposed electrical easements are shown on Figure 5.

The overall condition of the electrical distribution system is very good. The primary electrical distribution system has proven to be a very reliable network and has experienced relatively few failures in recent past. Much of the present distribution system has been upgraded as recently as 1975. There are small portions of the system, which are in need of upgrading to comply with current electrical standards. Most underground electrical vaults have water intrusion from tidal waters. This presents water disposal problems when work must be done in these vaults.

Electricity is delivered to the island from Marin County via a dual 115-kiloVolt (-kV) transmission line owned by Pacific Gas and Electric Company (PG&E) that crosses over Mare Island Strait. The power is stepped down to 12 kV by two parallel 20-megaWatt transformers at Substation H. Power is distributed throughout the island from Substation H by a series of loops connecting a network of 26 major and 18 minor 12-kV switch stations and substations. The overall system uses a network configuration with multiple feeds to all substations for reliability and flexibility.

A significant portion of the existing system can support the proposed land uses. Relocation of existing overhead and underground facilities will be required to allow for new development areas. New electrical services to the existing and proposed buildings will be required.

To date, Island Energy has not prepared a master plan. Therefore, planned electrical system upgrades in support of the new development plan are not known. Discussions are continuing among the City, the City of Pittsburg, and the Navy regarding contracts and future operations. Until the issues are settled, the City of Pittsburg and Island Energy are deferring their master planning efforts.

Any new facilities must be planned to joint trench locations shown on Figure 4 or within existing conduits and substructures.

4.3 Gas Distribution System

Island Energy is presently the gas service provider on Mare Island. The City of Pittsburg owns Island Energy and is finalizing an agreement with the Navy to formally take over the existing facilities. Within this agreement, the Navy will grant Island Energy nonexclusive easements for its existing gas facilities on the island. The approximate locations of these proposed gas easements are shown on Figure 4.

Island Energy receives gas at 100 psig via a 10" main that crosses Mare Island Strait at the Causeway. This 10" line delivers gas to four pressure-reducing stations that reduce pressure from 100 psig to 30 psig. The 30-psig distribution system consists of 8" and smaller mains that cross connect to form loops. Individual pressure regulators installed at service locations further reduce gas pressure.

In general, the existing system can support the proposed land uses. Existing mains and facilities may need to be relocated to allow for the new development areas. New service connections will be installed at all new facilities and existing ones as they are occupied.

The gas distribution piping system throughout Mare Island appears to be in generally good condition. Most of the underground lines are polyethylene and all of the aboveground lines are steel. The polyethylene gas lines are inserted inside coated steel pipes. According to Mare Island public works personnel and historical records, the gas system has been a low maintenance utility system. A significant portion of the distribution system has been replaced in the last 20 years.

Most polyethylene pipe is rated at approximately 60 psig. Therefore, any new facility with a high-pressure demand will have to be located near the 10" high-pressure line and a new service line will have to be installed.

To date, Island Energy has not prepared a master plan. Therefore, planned gas system upgrades in support of the new development plan are not known. Discussions are continuing among the City, the City of Pittsburg, and the Navy regarding contracts and future operations. Until the issues are settled, the City of Pittsburg and Island Energy are deferring their master planning efforts.

Any new facilities must be planned to joint trench locations shown on Figure 4 or with existing conduits and substructures.

4.4 Telecommunications System

The existing system consists of two switches in Building 605A and underground copper cable for distribution. Two fiber optic cables connect Building 605A to two buildings: one at the northern end and one at the southern end of the island. These fiber optic cables cross Mare Island Strait at two locations. This system was built in the early 1990s and is in excellent condition.

Service to Mare Island residential units is provided and maintained by Pacific Bell up to the main point of entry (MPOE) at the exterior of each residence. The interior wire and phone equipment is the responsibility of the tenant.

The telephone system provider is currently Pacific Bell.

Any new facilities must be planned to joint trench locations shown on Figure 4 or with existing conduits and substructures.

5.0 OTHER UTILITY SYSTEMS

While in use as a shipyard, Mare Island had other industrial-related utility systems that will not be used in the redevelopment process. They include:

- salt water fire protection system
- steam
- pure water
- industrial waste
- fuel

These systems are not currently operating. They will be abandoned in place or removed to allow the redevelopment of Mare Island.

6.0 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

There are areas of environmental contamination on the island. On April 16, 2001, a Consent Agreement was executed between the City of Vallejo, the State of California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) and Lennar Mare Island. The agreement is for the cleanup of environmental contamination to the satisfaction of DTSC. The Consent Agreement applies to the Lennar Mare Island portion of the island, which covers most of the developed area of the island. The agreement includes a site-wide Land Use Covenant that prohibits any subsurface disturbances without approval of DTSC until cleanup is completed, and identifies a Soil and Groundwater Management Plan (SGWMP) as a mechanism for obtaining this approval.

An SGWMP was prepared by CH2MHill for Lennar, and has been submitted to the regulatory agencies. It describes areas where no DTSC approval is required and, where required, it provides procedures for planned subsurface disturbances, and emergency response procedures to be followed in case of an emergency.

Areas of potential environmental concern were evaluated during the preparation of this URPU. This evaluation was provided to assist the infrastructure design and

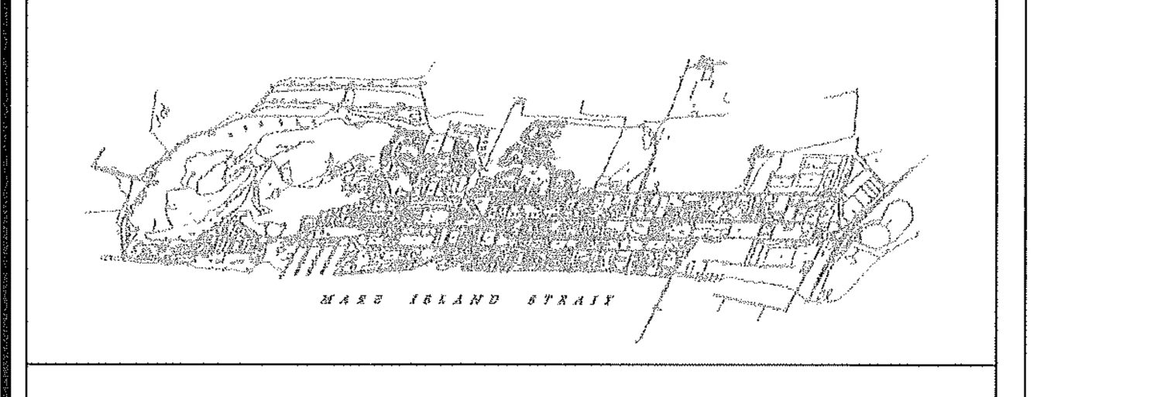
modifications to avoid, wherever possible, potential areas of environmental concern. A number of changes were made to avoid environmental contamination. Where contamination exists, the SGWMP will be followed until cleanup is completed.

MARE ISLAND UTILITY REUSE PLAN UPDATE
FIGURE 1
PROPOSED WATER LINE BACKBONE IMPROVEMENT PLAN

LEGEND

- Plan Right-of-Way
- Proposed New Water Line Within Right-of-Way
- Proposed New Water Line Outside Right-of-Way
- Existing Line to be Reused Within Right-of-Way
- Existing Line to be Reused Outside Right-of-Way
- Existing Water Lines (size as specified)

INDEX



GRAPHIC SCALE

400 0 200 400

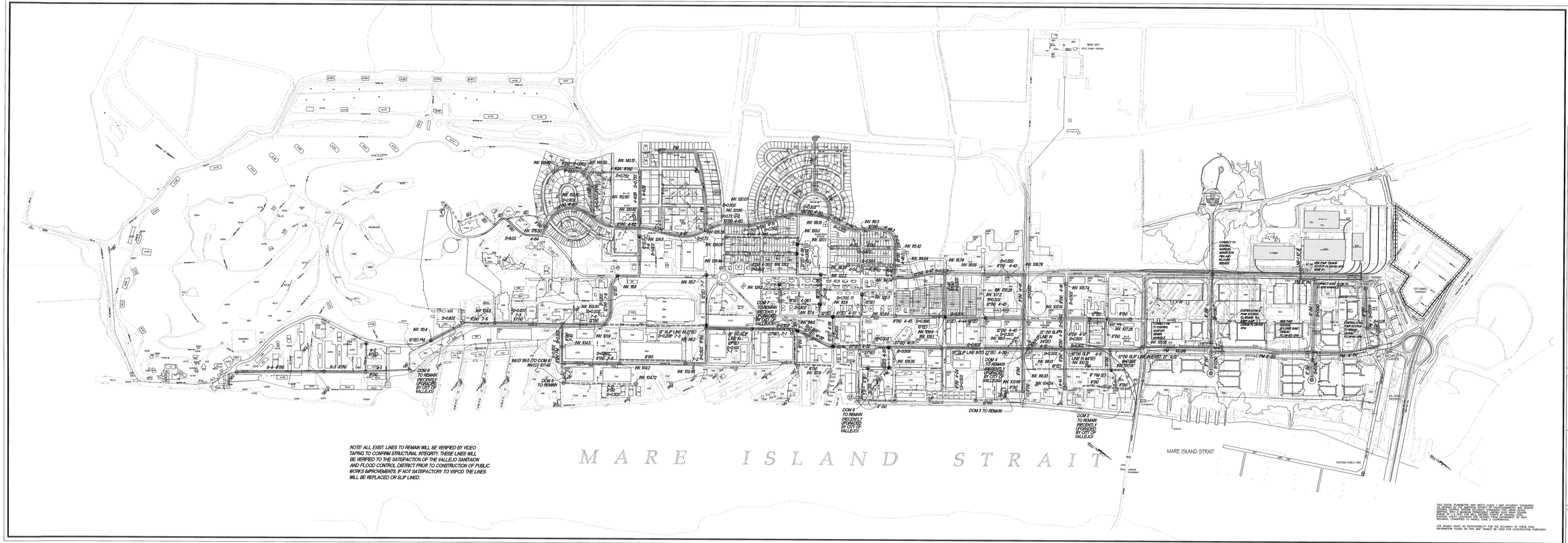
(IN FEET)

MAP SOURCE: MIRIS 1996 Aerial Planimetric

December 14, 2001

miprwatr.dwg

LFR REIMER
420 WALNUT AVENUE
QUARTERS 19
MARE ISLAND NSY
VALLEJO, CA 94592
PHONE (707) 562-7176
LFR.com



MARE ISLAND UTILITY REUSE PLAN UPDATE FIGURE 2 PROPOSED SANITARY SEWER BACKBONE IMPROVEMENT PLAN

LEGEND

- Plan Right-of-Way
- 4-11 8"(N) — Proposed New Sanitary Sewer Line Within Right-of-Way
- 4-12 8"(N) — Proposed New Sanitary Sewer Line Outside Right-of-Way
- 4-13 8"(E) — Existing Line to be Reused Within Right-of-Way
- 4-14 8"(E) — Existing Line to be Reused Outside Right-of-Way
- Existing Sanitary Sewer Lines
- Existing Pump
- New Pump
- Node Locations for Use with Sanitary Sewer Calculations

INDEX

GRAPHIC SCALE

400 0 200 400

(IN FEET)

MAP SOURCE: MIRIS 1996 Aerial Planimetric

December 14, 2001

mipsnewt.dwg

LFR REIMER
420 WALNUT AVENUE
QUARTERS 19
MARE ISLAND MSY
VALLEJO, CA 94592
PHONE (707) 562-7176
LFR.com

NOTES:

1: ALL EXIST. LINES TO REMAIN WILL BE VERIFIED BY VIDEO TAPING TO CONFIRM STRUCTURAL INTEGRITY. THESE LINES WILL BE VERIFIED TO THE SATISFACTION OF THE VALLEJO SANITAION AND FLOOD CONTROL DISTRICT PRIOR TO CONSTRUCTION OF PUBLIC WORKS IMPROVEMENTS. IF NOT SATISFACTORY TO VSFCD THE LINES WILL BE REPLACED OR SLIP LINED.

2: DEVELOPMENT OF NEW PARCELS WILL REQUIRE PRIVATE ON-SITE TREATMENT OF STORM WATER DISCHARGE THROUGH THE USE OF STORM WATER SEPARATORS, VEGETATED SWALES, OR OTHER BEST MANAGEMENT PRACTICES APPROVED BY THE REGIONAL WATER QUALITY CONTROL BOARD.

THIS DIGITAL PLANIMETRIC MAP MEETS CLASS 1 MAP ACCURACY STANDARDS AS ESTABLISHED BY THE AMERICAN SOCIETY OF PHOTOGRAMMETRY AND REMOTE SENSING. WITH A CONTOUR INTERVAL OF 2 FEET, 90% OF THE WELL DEFINED POINTS SHALL BE WITHIN ONE-HALF CONTOUR INTERVAL (1 FOOT) OF THEIR TRUE POSITION. HORIZONTAL VALUES ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83), CONVERTED TO NAD83, ZONE 2 (CONUS).

LFR REIMER TAKES NO RESPONSIBILITY FOR THE ACCURACY OF THESE DATA. INFORMATION FROM ON THIS MAP CANNOT BE USED FOR CONSTRUCTION PURPOSES.

MARE ISLAND UTILITY REUSE PLAN UPDATE FIGURE 3 PROPOSED STORM DRAIN BACKBONE IMPROVEMENT PLAN

LEGEND

- Plan Right-of-Way
- 24"W — Proposed New Storm Drain Line Within Right-of-Way
- 24"O — Proposed New Storm Drain Line Outside Right-of-Way
- 24"E — Existing Line to be Reused Within Right-of-Way
- 24"E — Existing Line to be Reused Outside Right-of-Way
- Proposed Private Storm Drain Line to Proposed Slough
- Existing Storm Drain Lines
- Proposed Storm Drain Drainage Ditches
- Node Used In Storm Drainage Calculations
- Proposed Storm Drain Outfall
- Proposed Detention Pond
- ALPHA — Drainage Area

INDEX

GRAPHIC SCALE

400 0 200 400

(IN FEET)

MAP SOURCE: MIRSE 1996 Aerial Planimetric December 14, 2001

migration.dwg

LFR REIMER

420 WALNUT AVENUE
QUARTERS 19
MARE ISLAND NSY
VALLEJO, CA 94592
PHONE (707) 562-7176
LFR.com

MARE ISLAND UTILITY REUSE PLAN UPDATE FIGURE 4 PROPOSED JOINT TRENCH BACKBONE IMPROVEMENT PLAN

LEGEND

- Plan Right-of-Way
- Proposed Joint Electric/ Gas/Telecommunications Trench
- Existing Electrical Service
- Existing Gas Service

NOTE: EXISTING ELECTRICAL, GAS, AND TELECOMMUNICATIONS UTILITIES THAT MEET THE REQUIREMENTS OF THE NEW USE PLAN ARE TO REMAIN IN PLACE AND IN SERVICE. THE PROPOSED JOINT TRENCH LOCATIONS ARE FOR LOCATIONS OF NEW UTILITIES THAT SUPPLEMENT THE EXISTING SYSTEMS.

INDEX

GRAPHIC SCALE

400 0 200 400

(IN FEET)

MAP SOURCE: MIRIS 1996 Aerial Planimetric

December 14, 2001

MIFIGUN1TIF.dwg

THIS DIGITAL PLANIMETRIC MAP MEETS CLASS 3 MAP ACCURACY STANDARDS AS PER NATIONAL MAP ACCURACY STANDARDS. ALL PLANIMETRIC AND TOPOGRAPHIC FEATURES SHOWN ON THIS MAP WERE COMPILED FROM AERIAL PHOTOGRAPHS TAKEN AT A SCALE OF 1" = 400' WITH A CONTOUR INTERVAL OF 2'. 1.5 FEET FOR WELL DEFINED POINTS AT HIGHER ELEVATIONS. ELEVATIONS ACCURATE TO WITHIN ONE-HALF CONTOUR INTERVAL FROM DEPARTMENT OF NAVY BENCHMARKS. ACCURACY TO BE MAINTAINED BY CONTRACTOR.

LFR REIMER MAKES NO RESPONSIBILITY FOR THE ACCURACY OF THESE DATA. INFORMATION SHOWN ON THIS MAP CANNOT BE USED FOR CONSTRUCTION PURPOSES.

LFR REIMER

420 WALNUT AVENUE
QUARTERS 19
MARE ISLAND NSY
VALLEJO, CA 94592
PHONE (707) 562-7176
LFR.com

THIS DIGITAL PLANIMETRIC MAP MEETS CLASS 1 MAP ACCURACY STANDARDS AS DEFINED BY THE AMERICAN SOCIETY OF PHOTOGRAMMETRY AND REMOTE SENSING (ASPRS), INTERIM ACCURACY STANDARDS FOR LARGE-SCALE MAPPING, WITH A MAXIMUM PERMISSIBLE LIMITING ROOT MEAN SQUARE ERROR OF 1.0 FEET FOR WELL DEFINED POINTS AT GROUND LEVEL. EXISTING UTILITY LOCATIONS ARE DERIVED FROM DEPARTMENT OF NAVY RECORDS, CONVERTED TO NAD83, ZONE 2 COORDINATES.

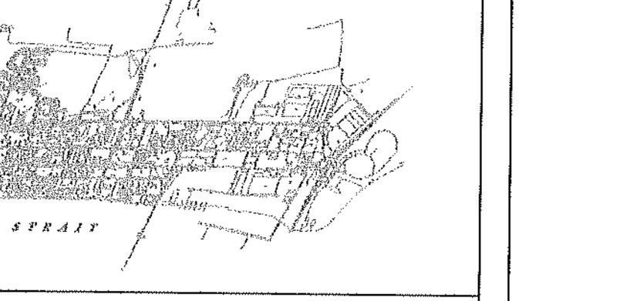
LFR REIMER TAKES NO RESPONSIBILITY FOR THE ACCURACY OF THESE DATA. INFORMATION FOUND ON THIS MAP CANNOT BE USED FOR CONSTRUCTION PURPOSES.

MARE ISLAND UTILITY REUSE PLAN UPDATE FIGURE 5 PROPOSED UTILITY EASEMENTS APPROXIMATE LOCATIONS

LEGEND

- Proposed Gas Easement
- Proposed Electrical Easement
- Proposed Telephone Easement

INDEX



GRAPHIC SCALE

400 0 200 400

(IN FEET)

MAP SOURCE: MIRIS 1996 Aerial Planimetric

December 14, 2001

MIPREASE.dwg

LFR REIMER
420 WALNUT AVENUE
QUARTERS 19
MARE ISLAND NSY
VALLEJO, CA 94592
PHONE (707) 562-7176
LFR.com

Appendix A

Calculations

Stormwater System Calculations

ASSUMPTIONS FOR DESIGN OF THE STORM DRAINAGE SYSTEM

LFR Reimer developed a model using StormCAD pressure network analysis software (Haestad Methods).

The drainage basins are less than 200 acres. The facilities were sized based on capacities calculated by the rational method.

The design level of protection is 15 years based upon the drainage area of less than 640 acres, with the storm duration based upon the time of concentration.

Rainfall intensities were calculated based upon the Rainfall Depth Duration Frequency Curves for a 15-year event, Drawing No. BB of the VSFCD standards.

The design tide elevation at the discharge points into Mare Island Strait is 3.5 feet above mean sea level.

The highest hydraulic grade line elevation was designed to be at the rim of manholes and inlets, contrary to the VSFCD standard that the energy grade line be at least 2 feet below al manhole covers, grating, and inlets. This criterion was discussed with the VSFCD; because of the special conditions at Mare Island, this will be allowed.

The minimum velocity in any storm drain is 2.5 feet per second according to VSFCD standards. This criterion could not be met in all cases because of the flatness of Mare Island. The velocities are shown in the storm drain calculations.

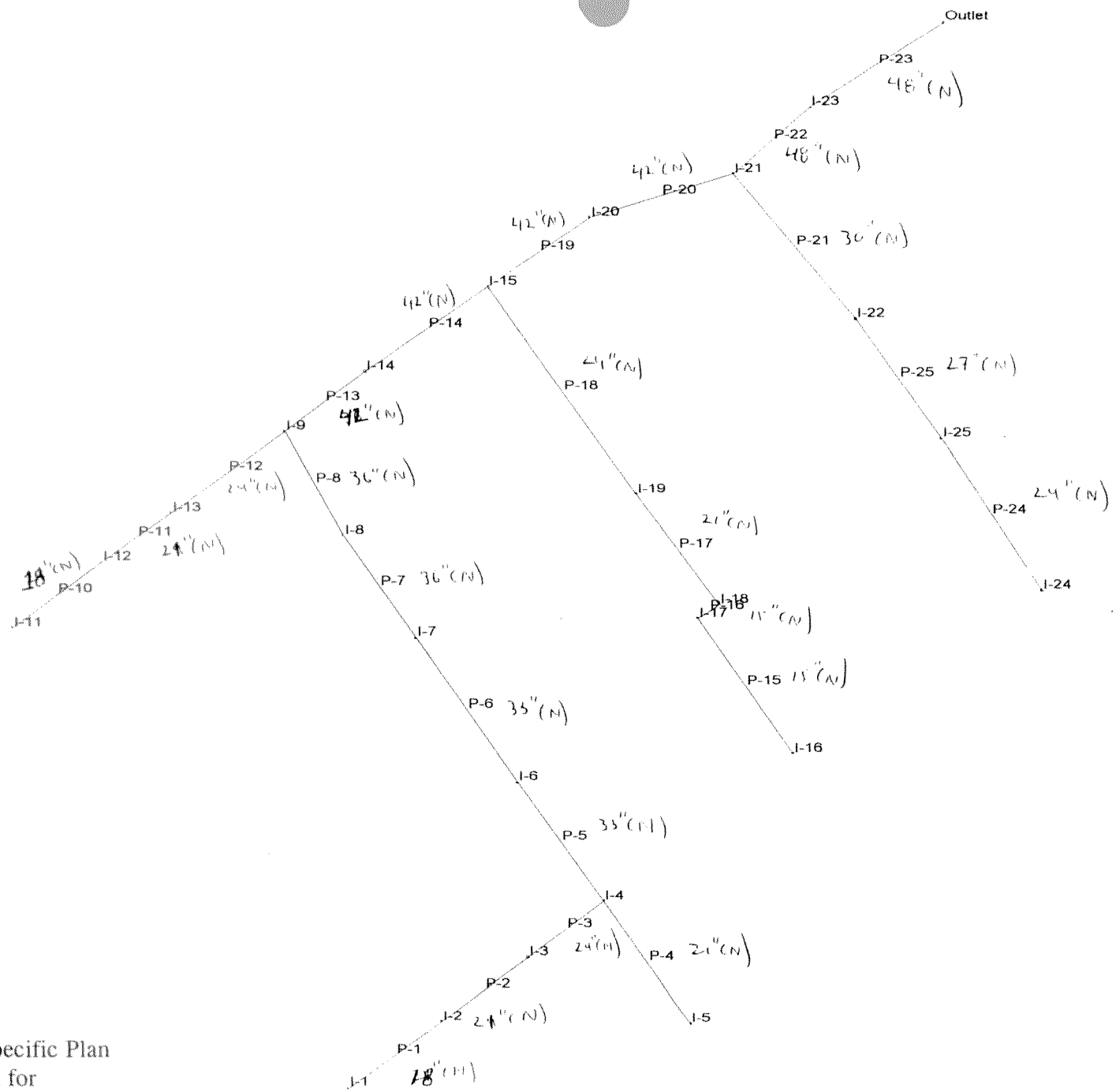
The storm drains must maintain a slope of 0.005.

The C value used in calculating the drainage is 0.80.

Exhibit 4 shows the drainage basin areas assumed in the analysis.

Mare Island Report - Charlie Basin

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)	Up HGL (ft)	Up Rim (ft)
P-24	NEW-GC018	I-24	I-25	349.00	5.65	0.90	5.09	5.09	10.00	10.00	24 inch	Concrete	0.013	15.97	10.15	3.23	108.20	106.46	0.004986	111.50	112.20
P-25	GC018-GC010	I-25	I-22	280.00	4.80	0.90	4.32	9.41	10.00	11.80	27 inch	Concrete	0.013	21.90	17.85	4.49	106.46	105.06	0.005000	110.80	111.36
P-21	GD029-GD002	I-22	I-21	365.00	4.55	0.90	4.09	13.50	10.00	12.84	30 inch	Concrete	0.013	29.04	24.86	5.06	105.06	103.23	0.005014	109.87	111.45
P-15	GD039-GD021	I-16	I-17	317.00	1.84	0.90	1.66	1.66	10.00	10.00	15 inch	Concrete	0.013	4.56	3.31	2.69	111.48	109.90	0.004984	114.22	115.48
P-16	GD021-GD020	I-17	I-18	50.00	0.00	0.90	0.00	1.66	10.00	11.96	15 inch	Concrete	0.013	4.57	3.13	2.55	109.90	109.65	0.005000	113.39	116.00
P-17	GD020-NEW	I-18	I-19	266.00	4.50	0.90	4.05	5.71	10.00	12.29	21 inch	Concrete	0.013	11.20	10.68	4.44	109.65	108.32	0.005000	113.28	116.49
P-18	NEW-GC001	I-19	I-15	486.00	1.92	0.90	1.73	7.43	10.00	13.29	24 inch	Concrete	0.013	16.00	13.51	4.30	108.32	105.89	0.005000	112.07	115.43
P-10	GC008-GC007	I-11	I-12	214.00	4.56	0.90	4.10	4.10	10.00	10.00	18 inch	Concrete	0.013	7.22	8.19	4.64	109.11	108.10	0.004720	114.58	114.69
P-11	GC007-GD005	I-12	I-13	166.00	2.37	0.90	2.13	6.24	10.00	10.77	21 inch	Concrete	0.013	10.43	12.19	5.07	108.10	107.38	0.004337	113.28	114.32
P-12	GD005-GC006	I-13	I-9	270.00	0.80	0.90	0.72	6.96	10.00	11.32	24 inch	Concrete	0.013	16.00	13.39	4.26	108.04	106.69	0.005000	112.30	115.56
P-4	GD043-GC059	I-5	I-4	287.00	4.29	0.90	3.86	3.86	10.00	10.00	18 inch	Concrete	0.013	5.75	7.71	4.36	110.82	109.96	0.002997	115.27	115.75
P-1	GD012-GC061	I-1	I-2	225.00	3.22	0.90	2.90	2.90	10.00	10.00	18 inch	Concrete	0.013	5.77	5.78	3.27	111.81	111.13	0.003022	115.25	115.79
P-2	GC061-GC060	I-2	I-3	207.00	1.25	0.90	1.12	4.02	10.00	11.15	21 inch	Concrete	0.013	8.67	7.78	3.23	111.13	110.51	0.002995	114.57	114.93
P-3	GC060-GC059	I-3	I-4	184.00	1.32	0.90	1.19	5.21	10.00	12.21	24 inch	Concrete	0.013	12.37	9.77	3.11	110.51	109.96	0.002989	114.07	114.86
P-5	GC059-GD025	I-4	I-6	282.00	1.14	0.90	1.03	10.10	10.00	13.20	30 inch	Concrete	0.013	22.52	18.40	3.75	109.96	109.11	0.003014	113.73	115.43
P-6	GD025-GD046	I-6	I-7	339.00	4.84	0.90	4.36	14.45	10.00	14.45	33 inch	Concrete	0.013	28.87	25.34	4.27	109.11	108.10	0.002979	113.16	114.82
P-7	GD046-GD048	I-7	I-8	240.00	3.82	0.90	3.44	17.89	10.00	15.78	36 inch	Concrete	0.013	36.53	30.08	4.26	108.10	107.38	0.003000	112.38	114.38
P-8	GD048-GC006	I-8	I-9	229.00	2.28	0.90	2.05	19.94	10.00	16.72	36 inch	Concrete	0.013	36.61	32.51	4.60	107.38	106.69	0.003013	111.89	114.36
P-13	GC006-GC004	I-9	I-14	195.00	0.64	0.90	0.58	27.48	10.00	17.55	42 inch	Concrete	0.013	71.32	43.55	4.53	106.69	105.71	0.005026	111.35	114.91
P-14	GC004-GC001	I-14	I-15	288.00	3.78	0.90	3.40	30.88	10.00	18.26	42 inch	Concrete	0.013	71.14	47.74	4.96	105.71	104.27	0.005000	110.98	115.35
P-19	GC001-GC003	I-15	I-20	238.00	0.00	0.00	0.00	38.31	0.00	19.23	42 inch	Concrete	0.013	71.14	57.21	5.95	104.27	103.08	0.005000	110.34	115.06
P-20	GD003-GDD002	I-20	I-21	293.00	3.09	0.90	2.78	41.09	10.00	19.90	42 inch	Concrete	0.013	71.02	59.88	6.22	103.08	101.62	0.004983	109.57	117.50
P-22	GD002-GD001	I-21	I-23	198.00	4.91	0.90	4.42	59.01	10.00	20.68	48 inch	Concrete	0.013	101.57	84.52	6.73	101.62	100.63	0.005000	108.53	109.60
P-23	GD001-Outfall	I-23	Outlet	307.00	0.00	0.00	0.00	59.01	0.00	21.17	48 inch	Concrete	0.013	101.73	83.70	6.66	100.63	99.09	0.005016	107.84	109.70

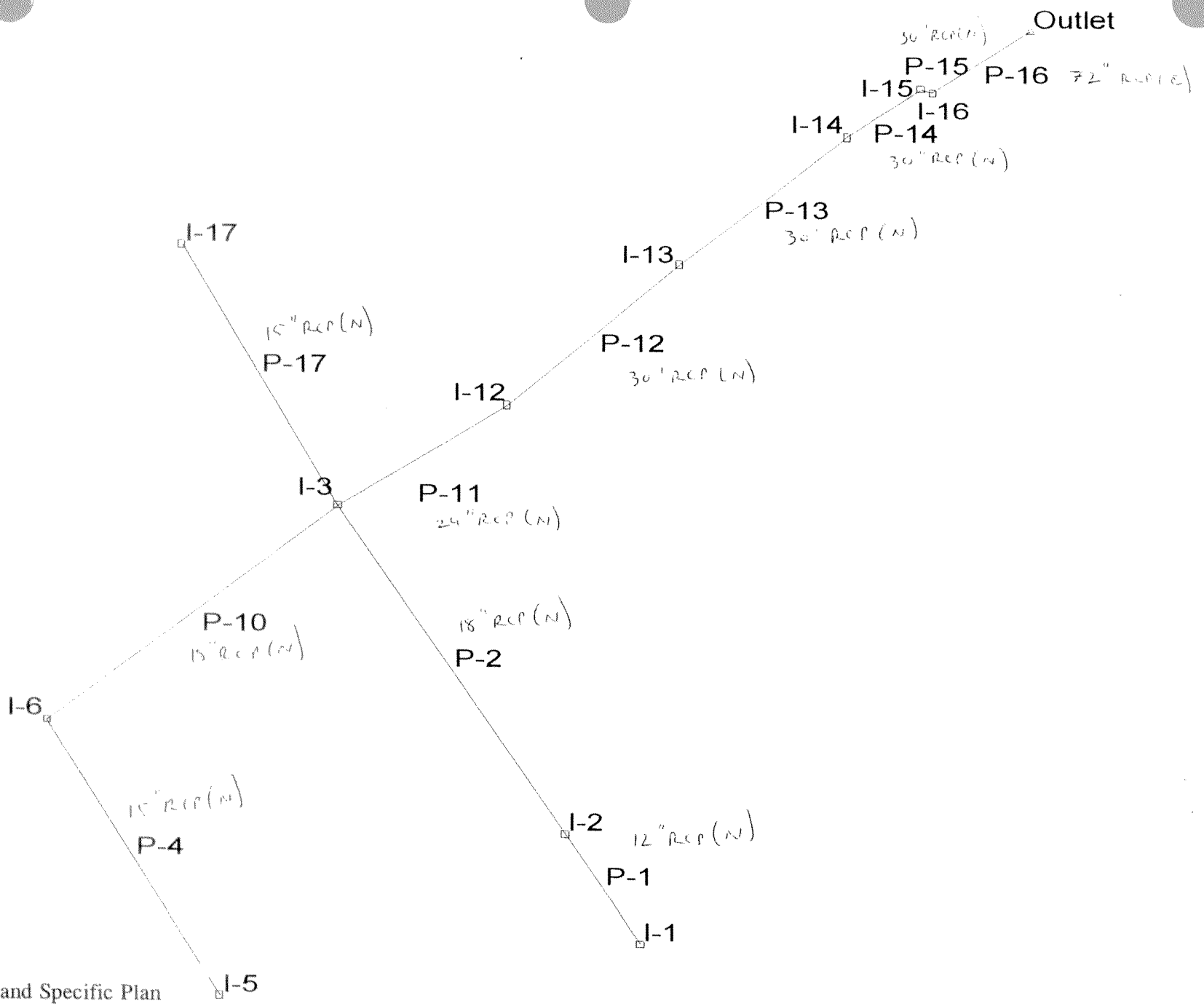


Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Charlie Basin

Project Engineer: Chris Williams
StormCAD v1.0
Page 1 of 1

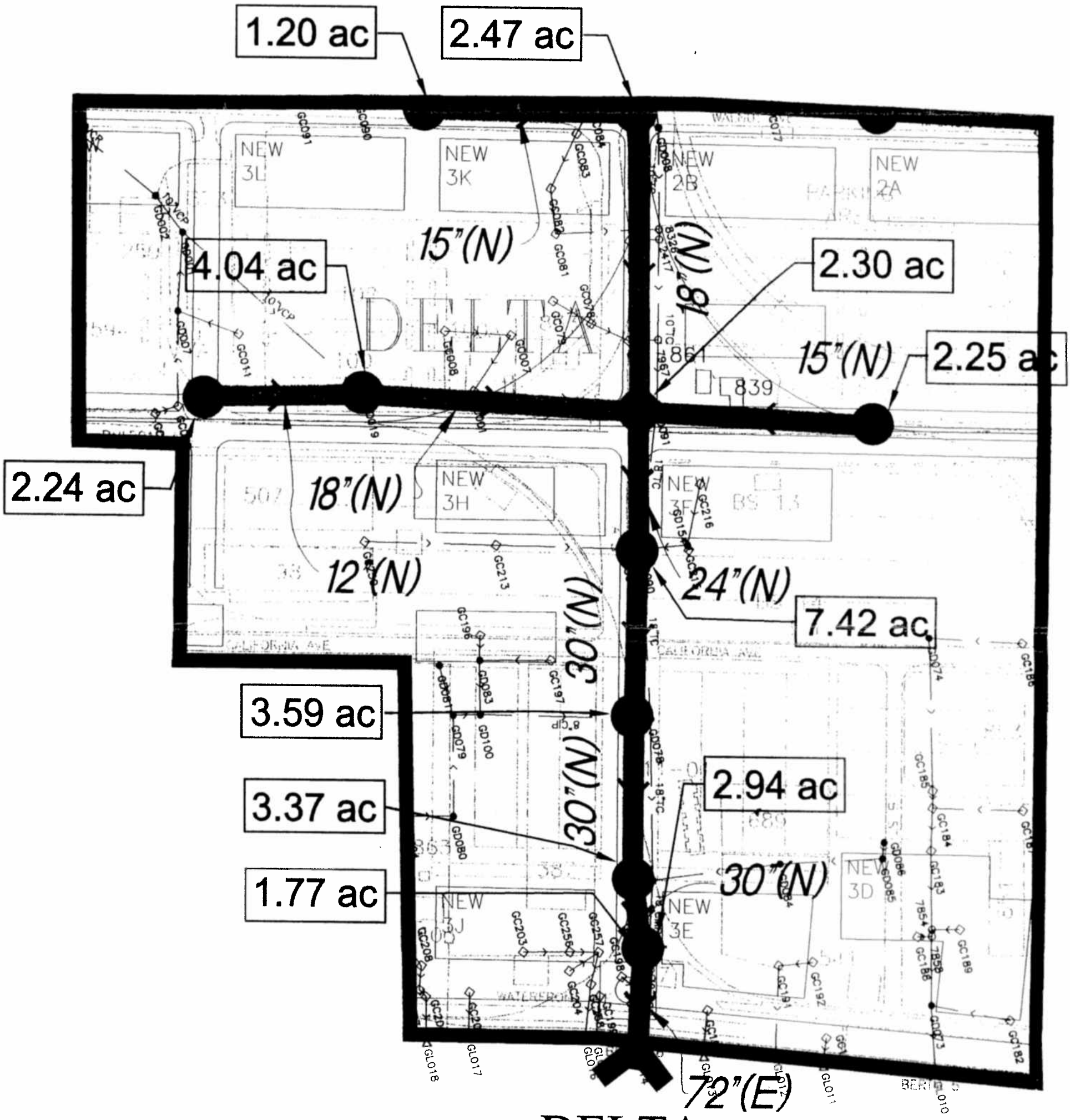
Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-17	NEW5-GD091	I-17	I-3	319.00	2.25	0.90	2.02	2.02	10.00	10.00	15 inch	Concrete	0.013	4.57	4.04	3.29	107.52	105.92	114.78	116.00
P-4	NEW1-GD008	I-5	I-6	342.00	1.20	0.90	1.08	1.08	10.00	10.00	15 inch	Concrete	0.013	6.35	2.16	1.76	111.68	108.38	115.17	117.50
P-10	GD008-GD091	I-6	I-3	385.00	2.47	0.90	2.22	3.30	10.00	13.25	18 inch	Concrete	0.013	8.40	6.01	3.40	108.38	105.92	114.79	116.83
P-1	NEW4-NEW3	I-1	I-2	140.00	2.24	0.90	2.02	2.02	10.00	10.00	12 inch	Concrete	0.013	4.26	4.02	5.12	111.22	109.22	120.04	120.38
P-2	GD019-GD091	I-2	I-3	420.00	4.04	0.90	3.64	5.65	10.00	10.46	18 inch	Concrete	0.013	9.31	11.14	6.30	109.22	105.92	118.25	118.50
P-11	GD091-GD090	I-3	I-12	209.00	2.30	0.90	2.07	13.05	10.00	15.13	24 inch	Concrete	0.013	17.98	22.40	7.13	105.92	104.60	113.53	116.67
P-12	GD090-GD078	I-12	I-13	237.00	7.42	0.90	6.68	19.73	10.00	15.62	30 inch	Concrete	0.013	31.30	33.34	6.79	104.60	103.22	111.48	116.73
P-13	GD078-GD077	I-13	I-14	224.00	3.59	0.90	3.23	22.96	10.00	16.20	30 inch	Concrete	0.013	31.00	38.07	7.76	103.22	101.94	109.91	116.79
P-14	GD077-GD076	I-14	I-15	94.00	3.37	0.90	3.03	25.99	10.00	16.68	30 inch	Concrete	0.013	31.09	42.42	8.64	101.94	101.40	107.98	112.50
P-15	GD076-GD075	I-15	I-16	13.00	2.94	0.90	2.65	28.64	10.00	16.87	30 inch	Concrete	0.013	35.97	46.46	9.46	101.40	101.30	106.98	112.24
P-16	GD075-OUTFALL	I-16	Outlet	124.00	1.77	0.90	1.59	30.23	10.00	16.89	72 inch	Concrete	0.013	433.61	49.00	1.77	101.30	100.00	106.81	112.01

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Delta Basin



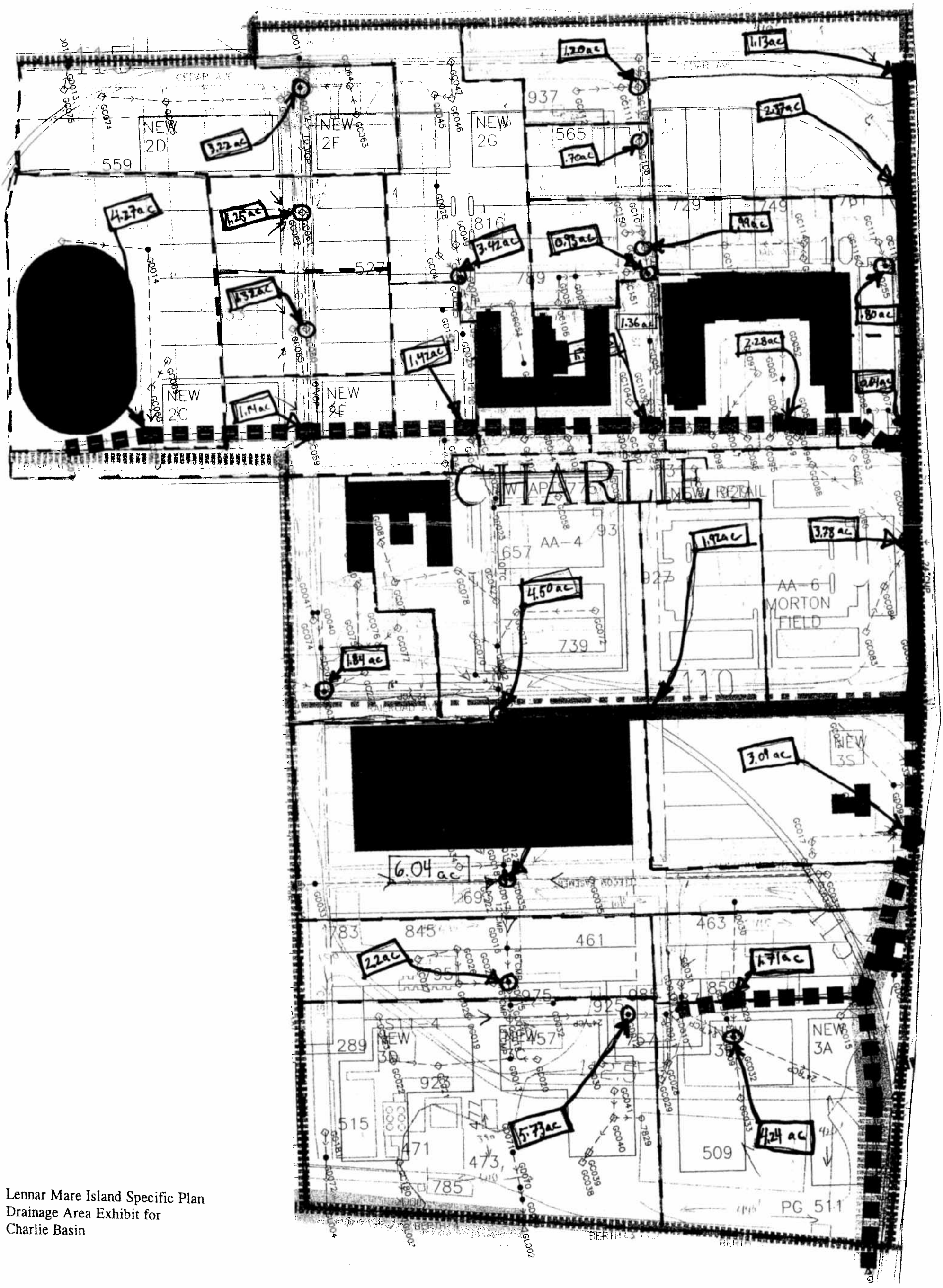
Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Delta Basin

Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 (203) 755-1666



Q = 49 cfs

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Delta Basin

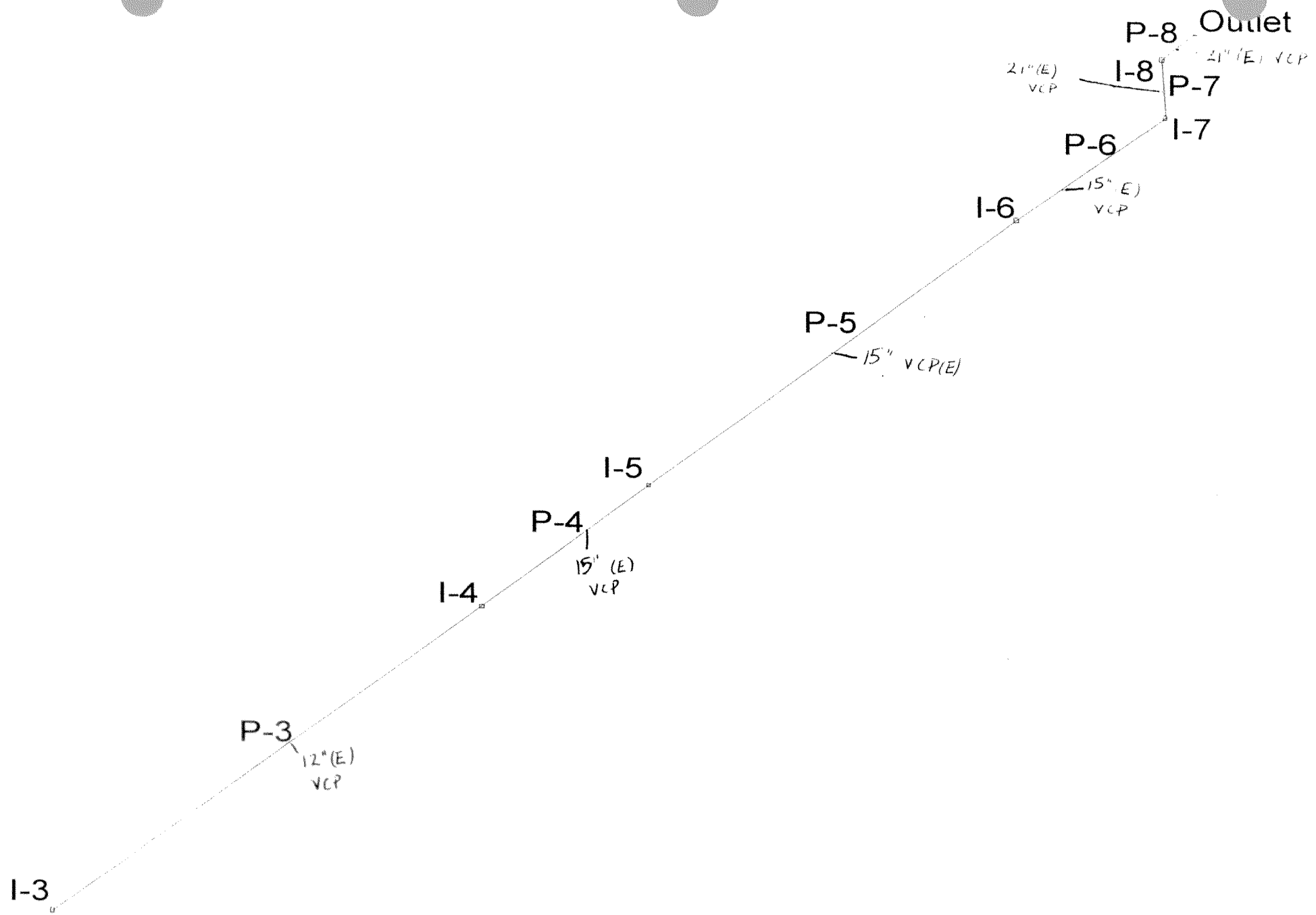


Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Charlie Basin

Mare Island Report - Foxtrot Basin

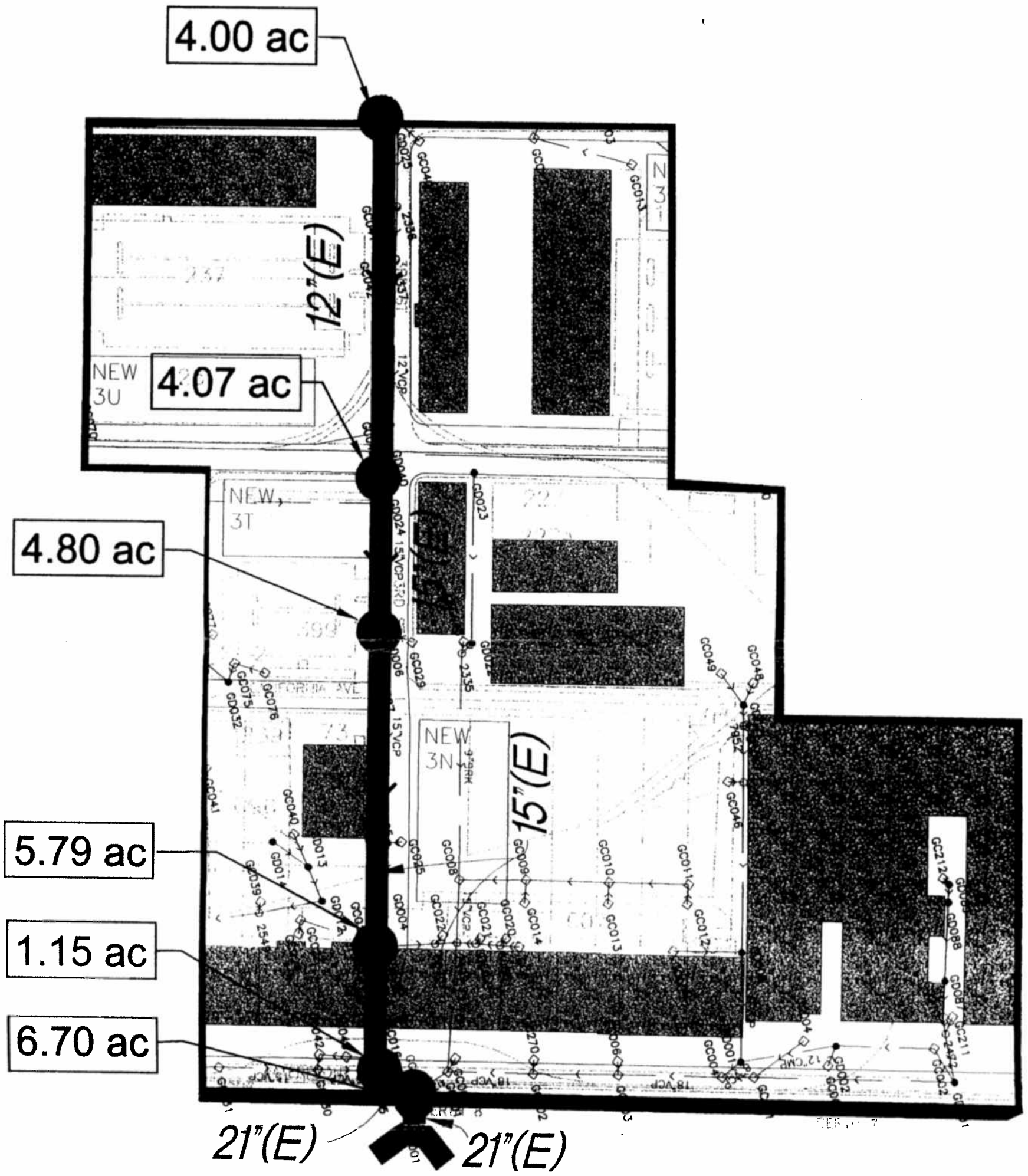
Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	S (ft/ft)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-3	GD025-GD024	I-3	I-4	482.00	4.00	0.90	3.60	3.60	10.00	10.00	12 inch	Concrete	0.016	2.23	1.20	1.52	.005934	111.20	108.34	115.92	123.30
P-4	GD024-GD006	I-4	I-5	189.00	4.07	0.90	3.66	7.26	10.00	15.27	15 inch	Concrete	0.016	3.87	2.99	2.44	.005450	108.34	107.31	115.09	122.94
P-5	GD006-GD003	I-5	I-6	416.00	4.80	0.90	4.32	11.58	10.00	16.56	15 inch	Concrete	0.016	3.98	5.00	4.08	.005745	107.31	104.92	114.48	120.65
P-6	GD003-GC015	I-6	I-7	166.00	5.79	0.90	5.21	16.79	10.00	18.26	15 inch	Concrete	0.016	5.73	7.68	6.26	.011928	104.92	102.94	110.70	114.67
P-7	GC015-GG001	I-7	I-8	53.00	1.15	0.90	1.03	17.83	10.00	18.70	21 inch	Concrete	0.013	14.44	8.28	3.44	.008302	102.94	102.50	107.14	112.74
P-8	GG001-GL001	I-8	Outlet	39.00	6.70	0.90	6.03	23.86	10.00	18.96	21 inch	Concrete	0.013	17.94	11.17	4.64	.012821	102.50	102.00	106.99	112.68

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Foxtrot Basin



Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Foxtrot Basin

Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 (203) 755-1666

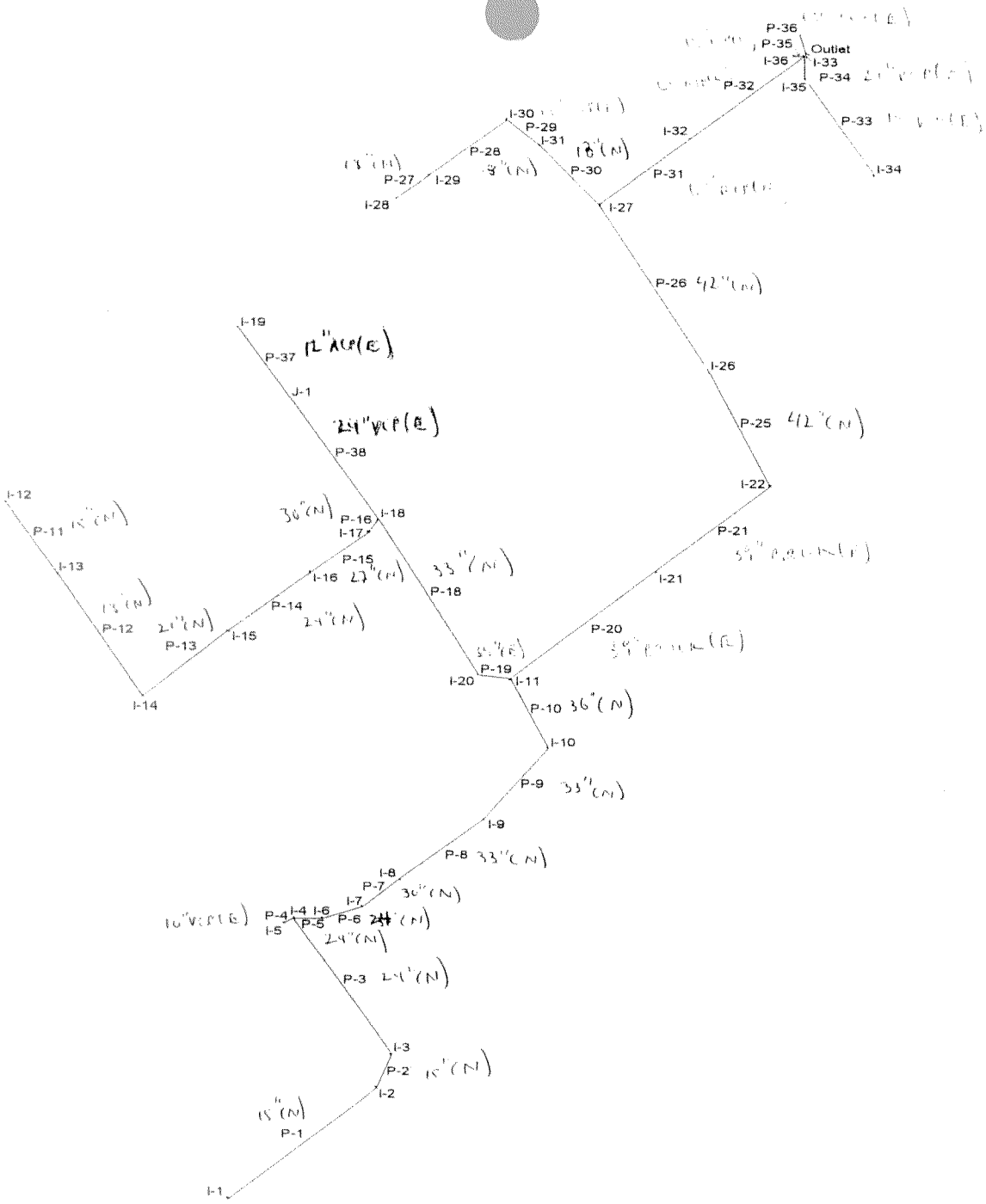


Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Foxtrot Basin

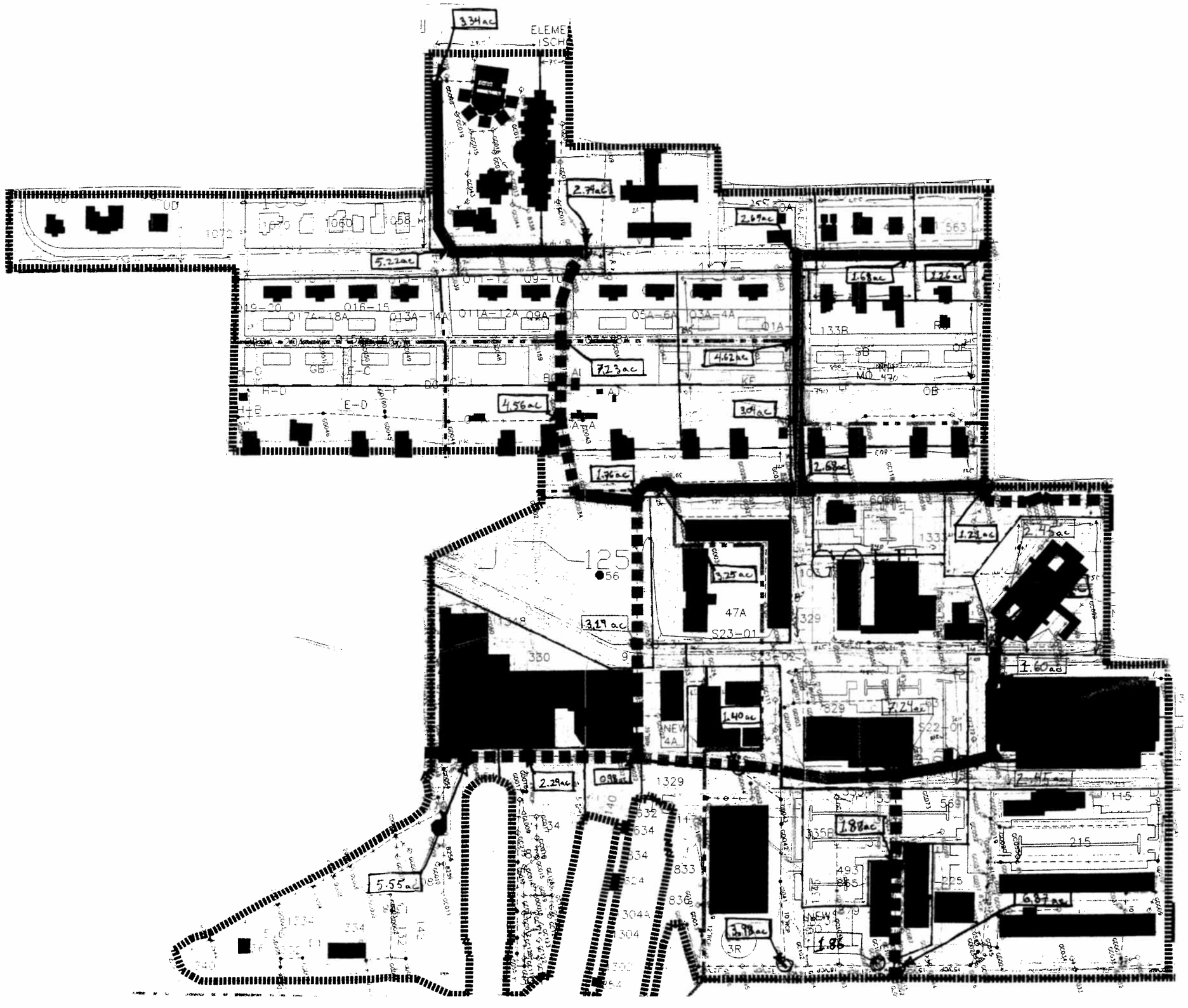
Mare Island Repo[illegible]olf Basin

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-35	GD015-GG002	I-36	I-33	22.00	6.87	0.90	6.18	6.18	10.00	10.00	15 inch	Concrete	0.016	9.49	12.34	10.06	99.03	98.31	107.93	112.83
P-33	GD040-GC091	I-34	I-35	244.00	3.98	0.90	3.58	3.58	10.00	10.00	18 inch	Concrete	0.016	5.96	7.15	4.05	104.38	103.19	108.62	112.00
P-34	GC091-GG002	I-35	I-33	47.00	1.86	0.90	1.67	5.26	10.00	11.01	21 inch	Concrete	0.013	51.05	10.20	4.24	103.19	98.31	106.91	112.48
P-27	GC066-GD029	I-28	I-29	84.00	2.45	0.90	2.21	2.21	10.00	10.00	12 inch	Concrete	0.016	2.74	4.40	5.60	116.90	116.15	122.85	123.06
P-28	GD029-GC065	I-29	I-30	198.00	1.60	0.90	1.44	3.65	10.00	10.25	15 inch	Concrete	0.013	5.45	7.23	5.89	116.15	114.74	120.91	123.40
P-29	GC065-2593	I-30	I-31	87.00	0.00	0.90	0.00	3.65	10.00	10.81	15 inch	Concrete	0.016	3.73	7.11	5.80	114.74	114.30	118.43	120.14
P-30	2593-GD027	I-31	I-27	172.00	2.45	0.90	2.21	5.85	10.00	11.06	18 inch	Concrete	0.013	7.47	11.34	6.72	114.30	113.43	116.83	120.00
P-37	GD042-GD038	I-19	J-1	179.00	1.21	0.90	1.09	1.09	10.00	10.00	12 inch	Concrete	0.016	2.05	2.17	3.58	126.97	126.07	127.84	128.83
P-38	GD038-GD027	J-1	I-18	305.00	N/A	N/A	N/A	1.09	N/A	10.83	24 inch	Concrete	0.016	26.14	2.12	2.04	126.07	119.90	126.58	127.77
P-11	GD004-GD003	I-12	I-13	181.00	1.26	0.90	1.13	1.13	10.00	10.00	15 inch	Concrete	0.013	6.44	2.26	1.84	126.16	124.36	128.61	129.28
P-12	GD003-GD002	I-13	I-14	304.00	1.68	0.90	1.51	2.65	10.00	11.64	18 inch	Concrete	0.013	6.49	5.05	2.86	124.36	123.20	128.39	131.26
P-13	GD002-GD001	I-14	I-15	221.00	2.67	0.90	2.40	5.05	10.00	13.41	21 inch	Concrete	0.013	8.26	9.14	3.80	123.20	122.60	127.68	133.20
P-14	GD001-GD029	I-15	I-16	209.00	4.62	0.90	4.16	9.21	10.00	14.38	24 inch	Concrete	0.013	6.26	16.18	5.15	122.60	122.44	126.95	130.00
P-15	GD029-GD028	I-16	I-17	147.00	3.04	0.90	2.74	11.94	10.00	15.06	27 inch	Concrete	0.013	35.76	20.55	5.17	122.44	120.48	125.88	130.09
P-16	GD028-GD027	I-17	I-18	32.00	0.00	0.90	0.00	11.94	10.00	15.53	30 inch	Concrete	0.013	55.22	20.24	4.12	120.48	119.90	125.23	127.53
P-18	GD027-GD025	I-18	I-20	378.00	2.68	0.90	2.41	15.44	10.00	15.66	33 inch	Concrete	0.013	30.77	26.07	4.39	119.90	118.62	125.15	128.10
P-19	GD025-GD024	I-20	I-11	66.00	3.25	0.90	2.93	18.37	10.00	17.09	36 inch	Concrete	0.015	21.34	29.57	4.18	118.62	118.53	124.24	128.33
P-4	GC008-GD039	I-5	I-4	24.00	2.74	0.90	2.47	2.47	10.00	10.00	10 inch	PVC	0.016	1.82	4.92	9.02	123.39	123.14	130.13	133.56
P-1	GD010-GD042	I-1	I-2	383.00	3.34	0.90	3.01	3.01	10.00	10.00	15 inch	Concrete	0.013	6.45	6.00	4.89	128.76	124.94	133.64	134.00
P-2	GD042-GC037	I-2	I-3	74.00	0.00	0.90	0.00	3.01	10.00	11.31	15 inch	Concrete	0.013	6.50	5.79	4.71	124.94	124.19	130.33	135.35
P-3	GC037-GD039	I-3	I-4	342.00	5.22	0.90	4.70	7.70	10.00	11.57	24 inch	Concrete	0.013	12.53	14.72	4.69	124.19	123.14	129.74	135.29
P-5	GD039-GD035	I-4	I-6	59.00	0.61	0.90	0.55	10.72	10.00	12.78	24 inch	Concrete	0.016	18.84	19.77	6.29	123.14	122.52	128.29	133.84
P-6	GD035-GD038	I-6	I-7	86.00	0.00	0.90	0.00	10.72	10.00	12.94	24 inch	Concrete	0.016	19.82	19.68	6.26	122.52	121.52	127.61	133.22
P-7	GD038-GD037	I-7	I-8	95.00	0.00	0.90	0.00	10.72	10.00	13.17	30 inch	Concrete	0.016	24.65	19.54	3.98	121.52	121.00	126.62	135.52
P-8	GD037-GD036	I-8	I-9	215.00	7.23	0.90	6.51	17.23	10.00	13.57	33 inch	Concrete	0.013	21.64	31.04	5.23	121.00	120.64	126.30	135.00
P-9	GD036-GC034	I-9	I-10	198.00	4.56	0.90	4.10	21.33	10.00	14.25	33 inch	Concrete	0.013	44.79	37.63	6.34	120.64	119.22	125.56	131.94
P-10	GC034-GD024	I-10	I-11	159.00	0.00	0.90	0.00	21.33	10.00	14.77	36 inch	Concrete	0.013	40.97	37.03	5.24	119.22	118.62	124.55	127.42
P-20	GD024-GG002	I-11	I-21	374.00	1.76	0.90	1.58	41.28	10.00	17.36	36 inch	PVC	0.015	58.34	65.86	9.32	118.53	114.72	124.06	127.02
P-21	GG002-GD023	I-21	I-22	297.00	3.19	0.90	2.87	44.15	10.00	18.03	36 inch	PVC	0.015	53.66	68.83	9.92	114.72	112.16	119.21	120.10
P-25	GD023-GD044	I-22	I-26	264.00	7.87	0.90	7.08	51.24	10.00	18.53	42 inch	Concrete	0.013	100.41	78.48	9.59	112.16	109.53	114.93	118.11
P-26	GD044-GD027	I-26	I-27	408.00	1.40	0.90	1.26	52.50	10.00	18.98	42 inch	Concrete	0.013	100.60	79.10	10.62	109.53	105.45	112.31	118.33
P-31	GD027-GD026	I-27	I-32	233.00	7.24	0.90	6.52	64.86	10.00	19.63	60 inch	Concrete	0.013	45.14	95.47	4.86	98.46	98.39	107.43	120.41
P-32	GD026-GG002	I-32	I-33	292.00	1.88	0.90	1.69	66.55	10.00	20.42	60 inch	Concrete	0.013	43.11	95.81	4.88	98.39	98.31	107.11	117.09
P-36	GG002-GL002	I-33	Outlet	10.00	0.00	0.90	0.00	77.99	10.00	21.42	60 inch	Concrete	0.013	458.53	110.08	5.61	98.31	98.00	106.72	112.00

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Golf Basin



Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Golf Basin

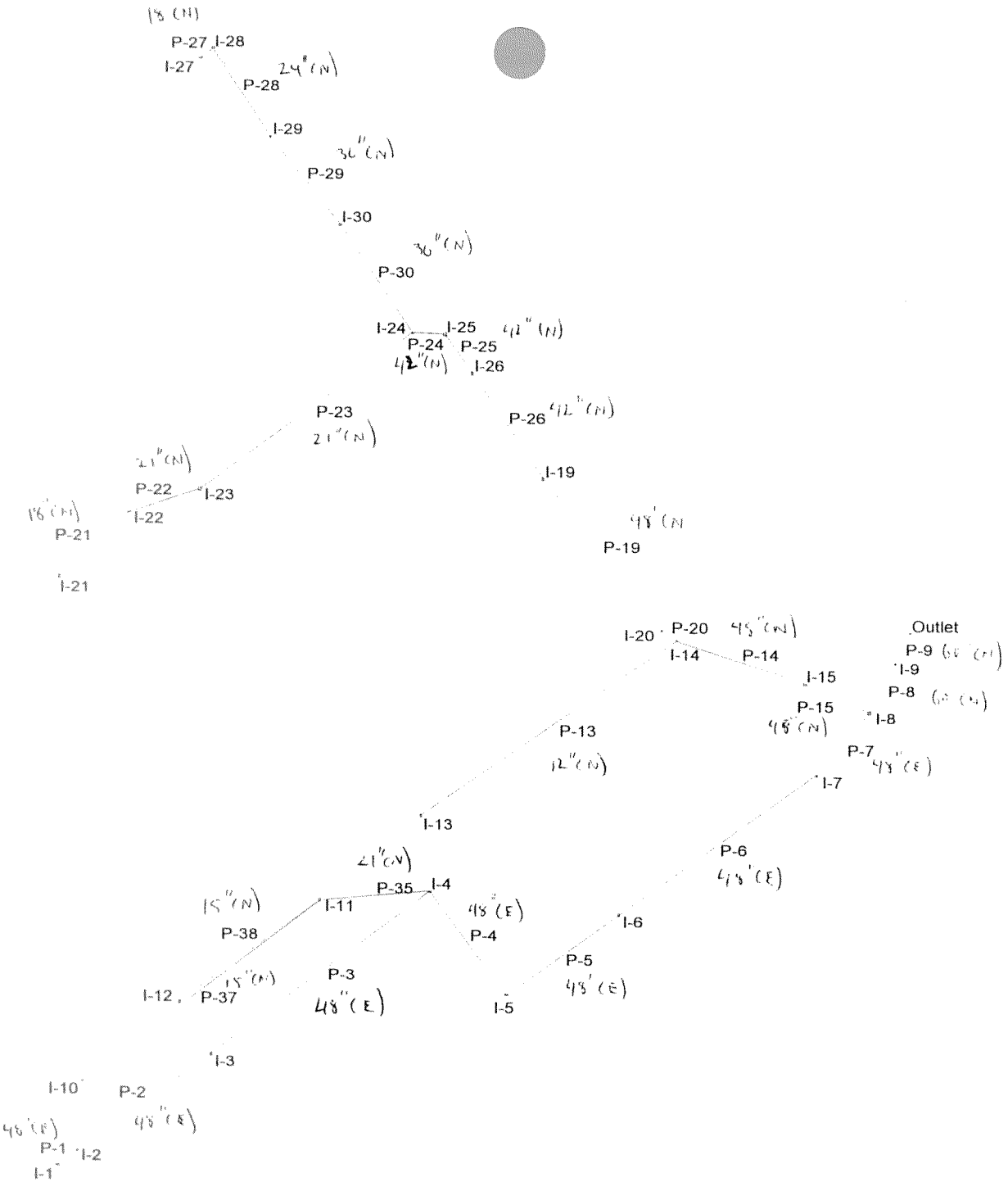


Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Golf Basin

Mare Island Re[illegible]- India Basin

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	S (ft/ft)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-27	GD050-NEW1	I-27	I-28	26.00	2.47	0.90	2.22	2.22	10.00	10.00	18 inch	Concrete	0.013	7.43	4.43	2.51	.005000	106.13	106.00	111.23	112.70
P-28	NEW1-GD056	I-28	I-29	180.00	5.55	0.90	5.00	7.22	10.00	10.17	24 inch	Concrete	0.013	16.00	14.33	4.56	.005000	106.00	105.10	111.18	111.30
P-29	GD056-GD058	I-29	I-30	192.00	4.89	0.90	4.40	11.61	10.00	10.83	30 inch	Concrete	0.013	29.00	22.66	4.62	.005000	105.10	104.14	110.46	111.17
P-30	GD058-GD300	I-30	I-24	222.00	3.04	0.90	2.73	14.35	10.00	11.52	30 inch	Concrete	0.013	44.22	27.44	5.59	.011622	104.14	101.56	109.88	112.34
P-21	GD064-GD062	I-21	I-22	164.00	5.20	0.90	4.68	4.68	10.00	10.00	18 inch	Concrete	0.013	7.43	9.35	5.29	.005000	105.31	104.49	118.22	119.08
P-22	GD062-GD061	I-22	I-23	130.00	5.08	0.90	4.57	9.25	10.00	10.52	21 inch	Concrete	0.013	11.20	18.21	7.57	.005000	104.49	103.84	116.92	118.00
P-23	GD061-GD300	I-23	I-24	455.00	0.35	0.90	0.32	9.57	10.00	10.80	21 inch	Concrete	0.013	11.22	18.68	7.77	.005011	103.84	101.56	115.21	115.75
P-24	GD300-GD112	I-24	I-25	56.00	1.72	0.90	1.55	25.46	10.00	12.19	42 inch	Concrete	0.013	71.14	47.79	4.97	.005000	101.56	101.28	108.88	113.00
P-25	GD112-GD074	I-25	I-26	80.00	0.00	0.00	0.00	25.46	10.00	12.37	42 inch	Concrete	0.013	71.14	47.53	4.94	.005000	101.28	100.88	108.76	110.62
P-26	GD074-GC131	I-26	I-19	215.00	0.94	0.90	0.85	26.31	10.00	12.64	42 inch	Concrete	0.013	11.88	48.72	5.06	.000140	100.88	100.85	108.58	111.08
P-19	GC131-GD073	I-19	I-20	328.00	6.02	0.90	5.42	31.73	10.00	13.35	48 inch	Concrete	0.013	38.85	57.53	4.58	.000732	100.85	100.61	108.07	110.45
P-20	GD073-GD072	I-20	I-14	32.00	1.37	0.90	1.23	32.96	10.00	14.54	48 inch	Concrete	0.013	56.78	57.62	4.59	.001562	100.61	100.56	107.55	111.06
P-13	GD087-GD072	I-13	I-14	536.00	1.73	0.90	1.56	1.56	10.00	10.00	12 inch	Concrete	0.013	2.75	3.11	3.96	.005951	105.00	101.81	111.58	112.57
P-14	GD072-GD071	I-14	I-15	234.00	1.80	0.90	1.62	36.13	10.00	14.66	48 inch	Concrete	0.013	84.51	62.95	5.01	.003462	101.81	101.00	107.50	111.11
P-15	GD071-GD068	I-15	I-8	122.00	0.00	0.90	0.00	36.13	10.00	15.44	48 inch	Concrete	0.013	83.27	61.42	4.89	.003361	101.00	100.59	107.05	111.41
P-38	GD082-GD088	I-12	I-11	300.00	3.16	0.90	2.84	2.84	10.00	10.00	15 inch	Concrete	0.013	4.20	5.68	4.63	.004233	109.48	108.21	113.53	116.66
P-37	5384-GD088	I-10	I-11	513.00	4.26	0.90	3.83	3.83	10.00	10.00	15 inch	Concrete	0.013	10.05	7.65	7.86	.024191	123.72	111.31	124.82	127.72
P-35	GD088-GD201	I-11	I-4	193.00	5.58	0.90	5.02	11.70	10.00	11.09	21 inch	Concrete	0.013	27.96	22.65	9.42	.031140	108.11	102.10	111.21	115.31
P-1	GD078-GD083	I-1	I-2	42.00	1.93	0.90	1.74	1.74	10.00	10.00	48 inch	Concrete	0.013	58.64	3.47	0.28	.001667	103.34	103.27	107.33	127.77
P-2	GD083-GD087	I-2	I-3	284.00	5.27	0.90	4.74	6.48	10.00	12.53	48 inch	Concrete	0.013	56.54	12.04	0.96	.001549	103.17	102.73	107.33	127.77
P-3	GD087-GD201	I-3	I-4	470.00	1.72	0.90	1.54	8.03	10.00	17.47	48 inch	Concrete	0.013	52.59	12.76	1.02	.001340	102.73	102.10	107.31	115.13
P-4	GD201-GD118	I-4	I-5	220.00	1.18	0.90	1.06	20.78	10.00	25.19	48 inch	Concrete	0.013	67.79	27.12	2.16	.002227	102.10	101.61	107.27	113.20
P-5	GD118-GD070	I-5	I-6	239.00	3.46	0.90	3.11	23.90	10.00	26.89	48 inch	Concrete	0.013	9.29	30.04	2.39	.000042	101.61	101.60	107.19	113.20
P-6	GD070-GD069	I-6	I-7	417.00	1.94	0.90	1.74	25.64	10.00	28.55	48 inch	Concrete	0.013	43.93	31.03	2.47	.000935	101.60	101.21	107.09	112.26
P-7	GD069-GD068	I-7	I-8	140.00	2.33	0.90	2.09	27.74	10.00	31.37	48 inch	Concrete	0.013	52.91	31.73	2.52	.001357	101.21	101.02	106.89	109.82
P-8	GD068-GD067	I-8	I-9	94.00	0.65	0.90	0.58	64.45	10.00	32.29	60 inch	Concrete	0.013	263.18	72.61	3.70	.010213	101.02	100.06	106.82	111.56
P-9	GD067-Outlet	I-9	Outlet	60.00	2.78	0.90	2.50	66.95	10.00	32.72	60 inch	Concrete	0.013	302.59	74.90	3.81	.013500	100.06	99.25	106.75	111.52

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
India Basin



Lennar Mare Island Specific Plan
Drainage Area Exhibit for
India Basin

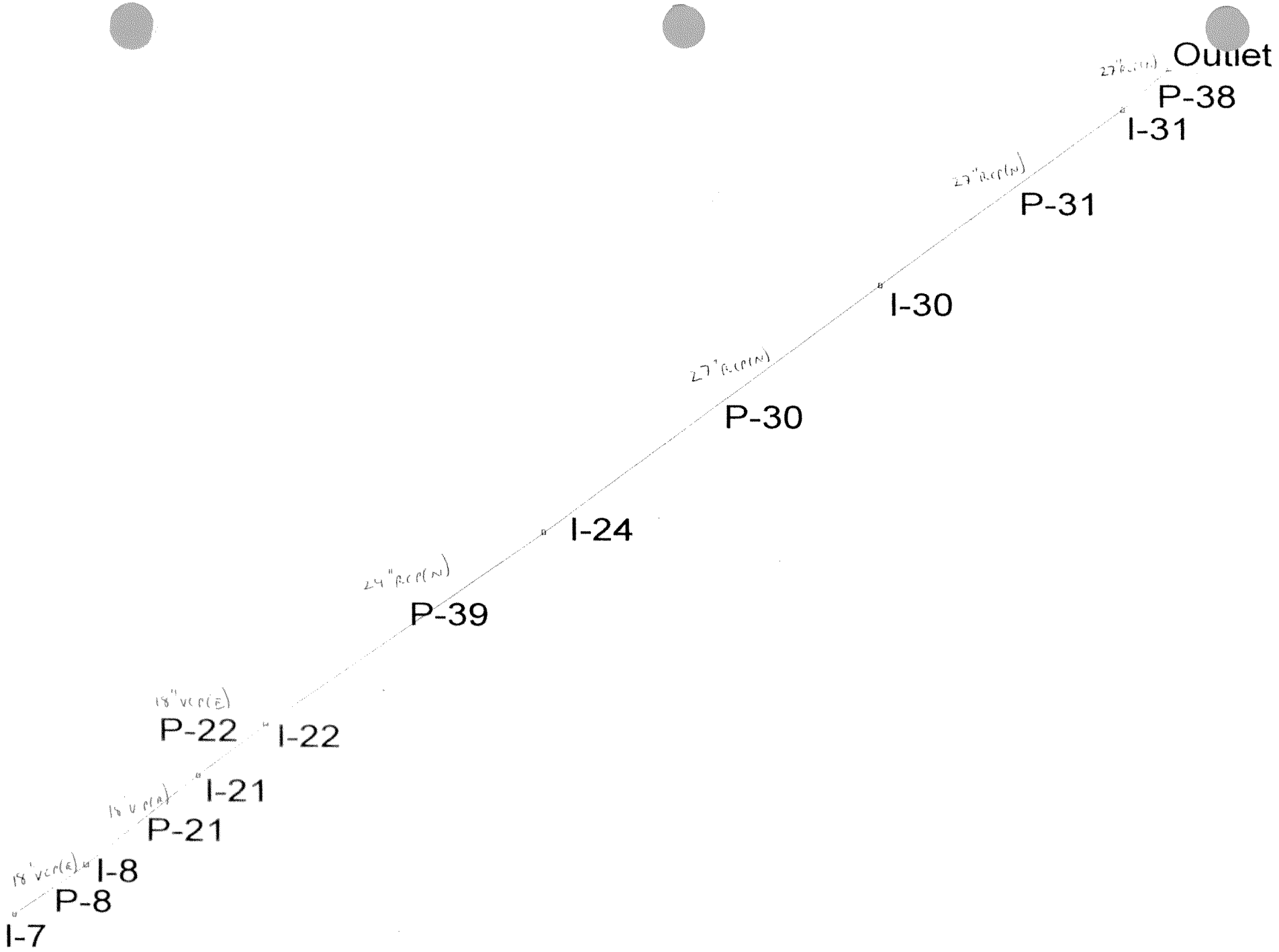
Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 (203) 755-1666

Project Engineer: Chris Williams
StormCAD v1.0

Mare Island Repo[illegible]uliet Basin

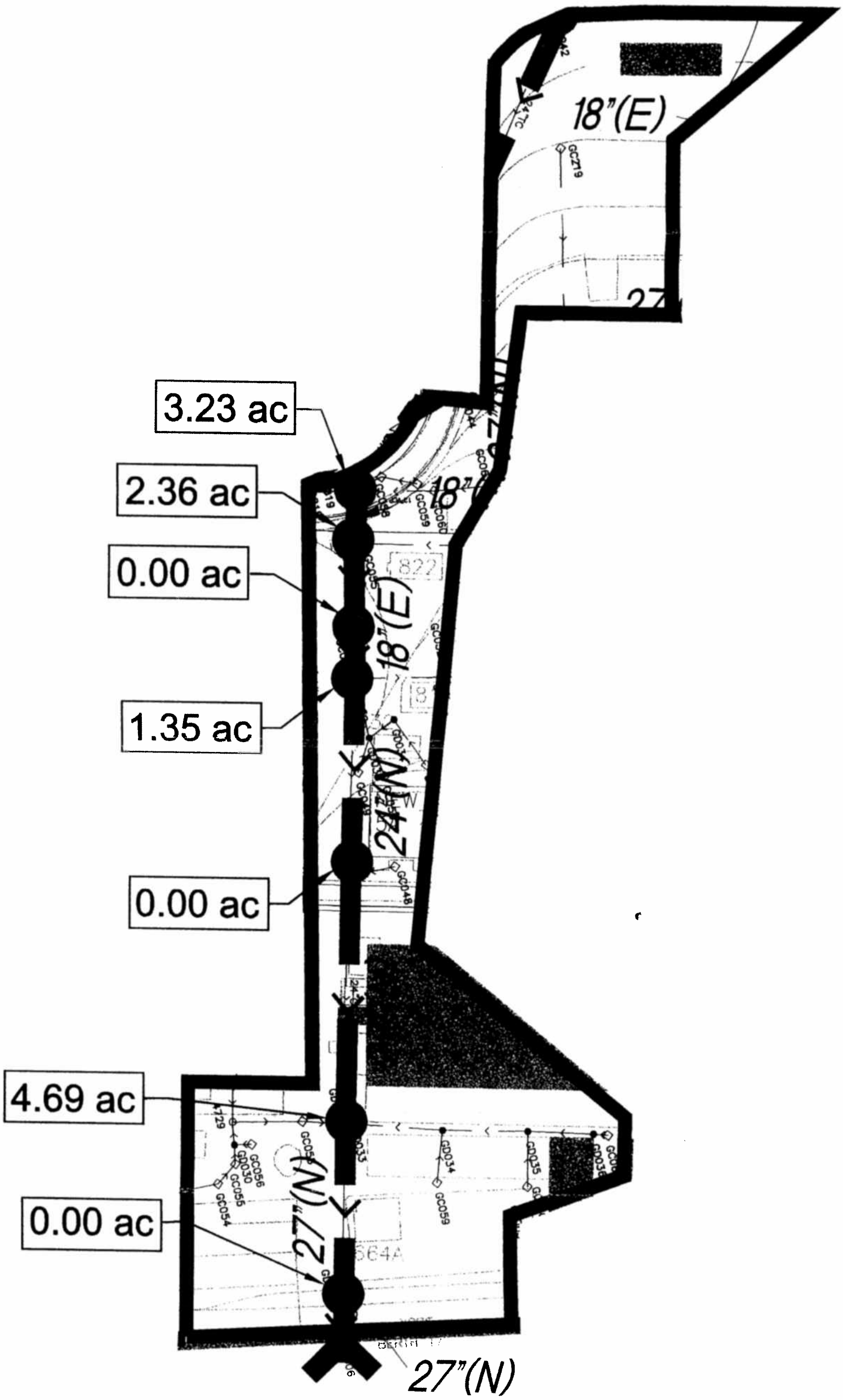
Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)	Up HGL (ft)	Up Rim (ft)
P-8	GD037-GD036	I-7	I-8	73.00	3.23	0.90	2.91	2.91	10.00	10.00	18 inch	Concrete	0.016	5.99	5.80	3.28	104.90	104.54	.004932	111.98	112.40
P-21	GD036-8439	I-8	I-21	119.00	2.36	0.90	2.12	5.03	10.00	10.37	18 inch	Concrete	0.016	5.96	9.94	5.62	104.54	103.96	.004874	111.64	112.00
P-22	8439-GD032	I-21	I-22	71.00	0.00	0.00	0.00	5.03	10.00	10.72	18 inch	Concrete	0.016	5.99	9.84	5.57	103.96	103.61	.004930	110.03	111.25
P-39	GD032-GD031	I-22	I-24	282.00	1.35	0.90	1.21	6.24	10.00	10.94	24 inch	Concrete	0.013	12.05	12.14	3.87	103.61	102.81	.002837	109.09	111.16
P-30	NEW1-GD032	I-24	I-30	349.00	0.00	0.90	0.00	6.24	10.00	12.15	27 inch	Concrete	0.013	16.58	11.73	2.95	102.81	101.81	.002865	108.27	111.00
P-31	GD032-GD031	I-30	I-31	251.00	4.69	0.90	4.22	10.47	10.00	14.12	27 inch	Concrete	0.013	16.47	18.54	4.66	101.81	101.10	.002829	107.77	108.65
P-38	GD031-GL006	I-31	Outlet	51.00	0.00	0.90	0.00	10.47	10.00	15.02	27 inch	Concrete	0.013	16.80	18.03	4.53	101.10	100.95	.002941	106.87	112.27

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Juliet Basin



Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Juliet Basin

Reimer Associates
Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 (203) 755-1666



JULIET

Q = 18 cfs

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Juliet Basin

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	S (ft/ft)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-26	GD054-GD053	I-25	I-26	181.00	4.74	0.90	4.27	4.27	10.00	10.00	18 inch	Concrete	0.016	7.18	8.51	4.82	0.007072	113.56	112.28	120.80	121.26
P-27	GD053-GD043	I-26	I-27	223.00	0.55	0.90	0.50	4.76	10.00	10.63	18 inch	Concrete	0.016	6.02	9.34	5.29	0.004978	112.28	111.17	118.99	123.08
P-28	GD043-GD042	I-27	I-28	54.00	6.90	0.90	6.21	10.97	10.00	11.33	24 inch	Concrete	0.013	16.58	21.10	6.72	0.005370	111.17	110.88	116.32	128.27
P-29	GD042-GD041	I-28	I-29	309.00	0.00	0.90	0.00	10.97	10.00	11.46	24 inch	Concrete	0.016	17.12	21.02	6.69	0.008673	110.78	108.10	115.85	125.98
P-30	GD041-GD044	I-29	I-30	244.00	0.19	0.90	0.17	11.14	10.00	12.23	27 inch	Concrete	0.013	25.39	20.88	5.25	0.006721	108.10	106.46	111.81	116.70
P-31	GD044-GD015	I-30	I-12	287.00	0.25	0.90	0.23	11.37	10.00	13.01	30 inch	Concrete	0.013	33.89	20.83	4.24	0.006829	106.46	104.50	110.70	112.56
P-11	GD015-GD012	I-12	I-13	73.00	10.79	0.58	6.26	17.63	10.00	14.13	36 inch	Concrete	0.013	31.22	31.21	4.42	0.002192	104.50	104.34	109.96	112.15
P-12	GD012-GD009	I-13	I-14	200.00	4.18	0.90	3.76	21.38	10.00	14.41	42 inch	Concrete	0.013	14.23	37.54	3.90	0.000200	104.34	104.30	109.80	112.15
P-13	GD009-GD027	I-14	I-15	296.00	1.71	0.90	1.54	22.92	10.00	15.26	42 inch	Concrete	0.013	26.15	39.18	4.07	0.000676	104.30	104.10	109.52	112.96
P-14	GD027-GD025	I-15	I-16	148.00	1.19	0.90	1.07	23.99	10.00	16.48	42 inch	Concrete	0.013	51.64	39.43	4.10	0.002635	104.10	103.71	109.07	112.24
P-15	GD025-GD021	I-16	I-17	293.00	1.19	0.90	1.07	25.07	10.00	17.08	42 inch	Concrete	0.013	51.57	40.38	4.20	0.002628	103.71	102.94	108.85	112.23
P-16	GD021-NEW1	I-17	I-11	42.00	1.23	0.90	1.11	26.17	10.00	18.24	42 inch	Concrete	0.013	49.09	40.50	4.21	0.002381	102.94	102.84	108.37	112.71
P-2	GD020-GD021	I-3	I-2	85.00	8.04	0.90	7.23	7.23	10.00	10.00	18 inch	Concrete	0.013	7.47	14.44	8.17	0.005059	110.18	109.75	114.90	115.05
P-1	GD022-GD021	I-1	I-2	121.00	8.75	0.30	2.62	2.62	10.00	10.00	18 inch	CMP	0.024	4.04	5.24	2.96	0.005041	110.36	109.75	114.32	116.93
P-24	GD0221-GD028	I-2	I-24	56.00	0.00	0.90	0.00	9.86	10.00	10.68	24 inch	Concrete	0.013	16.00	19.31	6.15	0.005000	109.75	109.47	113.29	115.01
P-25	GD028-GD029	I-24	I-4	87.00	1.25	0.90	1.13	10.99	10.00	10.83	27 inch	Concrete	0.013	21.77	21.43	5.39	0.004943	109.47	109.04	112.88	114.92
P-4	GD029-GD034	I-4	I-5	64.00	25.96	0.58	15.05	26.04	10.00	11.10	36 inch	Concrete	0.013	47.16	50.41	7.13	0.005000	109.04	108.72	112.47	113.78
P-5	GD034-GC024	I-5	I-6	130.00	0.87	0.90	0.78	26.82	10.00	11.25	36 inch	Concrete	0.013	47.16	51.71	7.32	0.005000	108.72	108.07	112.10	113.78
P-6	GC024-GD010	I-6	I-7	151.00	0.00	0.90	0.00	26.82	10.00	11.55	42 inch	Concrete	0.013	71.37	51.28	5.42	0.005033	108.07	107.31	111.32	112.47
P-7	GD010-GD011	I-7	I-8	77.00	1.15	0.90	1.03	27.86	10.00	12.01	42 inch	Concrete	0.013	70.67	52.55	5.46	0.004935	107.31	106.93	110.97	114.13
P-8	GD011-GD003	I-8	I-9	202.00	2.29	0.90	2.06	29.92	10.00	12.25	42 inch	Concrete	0.013	71.14	56.06	5.83	0.005000	106.93	105.92	110.76	113.53
P-9	GD003-NEW2	I-9	I-10	67.00	0.00	0.90	0.00	29.92	10.00	12.82	42 inch	Concrete	0.013	71.67	55.12	5.73	0.005075	105.92	105.58	110.13	112.97
P-10	NEW2-NEW1	I-10	I-11	548.00	0.00	0.90	0.00	29.92	10.00	13.02	42 inch	Concrete	0.013	71.14	54.80	5.70	0.005000	105.58	102.84	109.93	112.97
P-17	NEW1-GD014	I-11	I-18	46.00	0.00	0.90	0.00	56.10	10.00	18.41	54 inch	Concrete	0.013	41.00	86.29	5.43	0.000435	102.84	102.82	108.31	112.46
P-18	GD014-GD020	I-18	I-19	214.00	6.29	0.90	5.66	61.76	10.00	18.55	54 inch	Concrete	0.013	38.02	94.52	5.94	0.000374	102.82	102.74	108.22	112.46
P-19	GD020-GD018	I-19	I-20	94.00	0.52	0.90	0.47	62.23	10.00	19.15	54 inch	Concrete	0.013	90.70	93.20	5.86	0.002128	102.74	102.54	107.72	111.60
P-20	GD018-GD017	I-20	I-21	129.00	1.51	0.90	1.36	63.58	10.00	19.42	54 inch	Concrete	0.013	86.57	94.31	5.93	0.001938	102.54	102.29	107.51	112.29
P-21	GD017-GD016	I-21	I-22	131.00	1.31	0.90	1.18	64.76	10.00	19.78	54 inch	Concrete	0.013	98.69	94.78	5.96	0.002519	102.17	101.84	107.22	111.88
P-22	GD016-GD015	I-22	I-23	61.00	4.72	0.90	4.25	69.01	10.00	20.15	54 inch	Concrete	0.013	83.50	99.89	6.28	0.001803	101.84	101.73	106.91	111.29
P-23	GD015-GL005	I-23	Outlet	35.00	2.16	0.90	1.95	70.96	10.00	20.31	60 inch	Concrete	0.013	107.83	102.38	5.21	0.001714	101.73	101.67	106.75	112.17

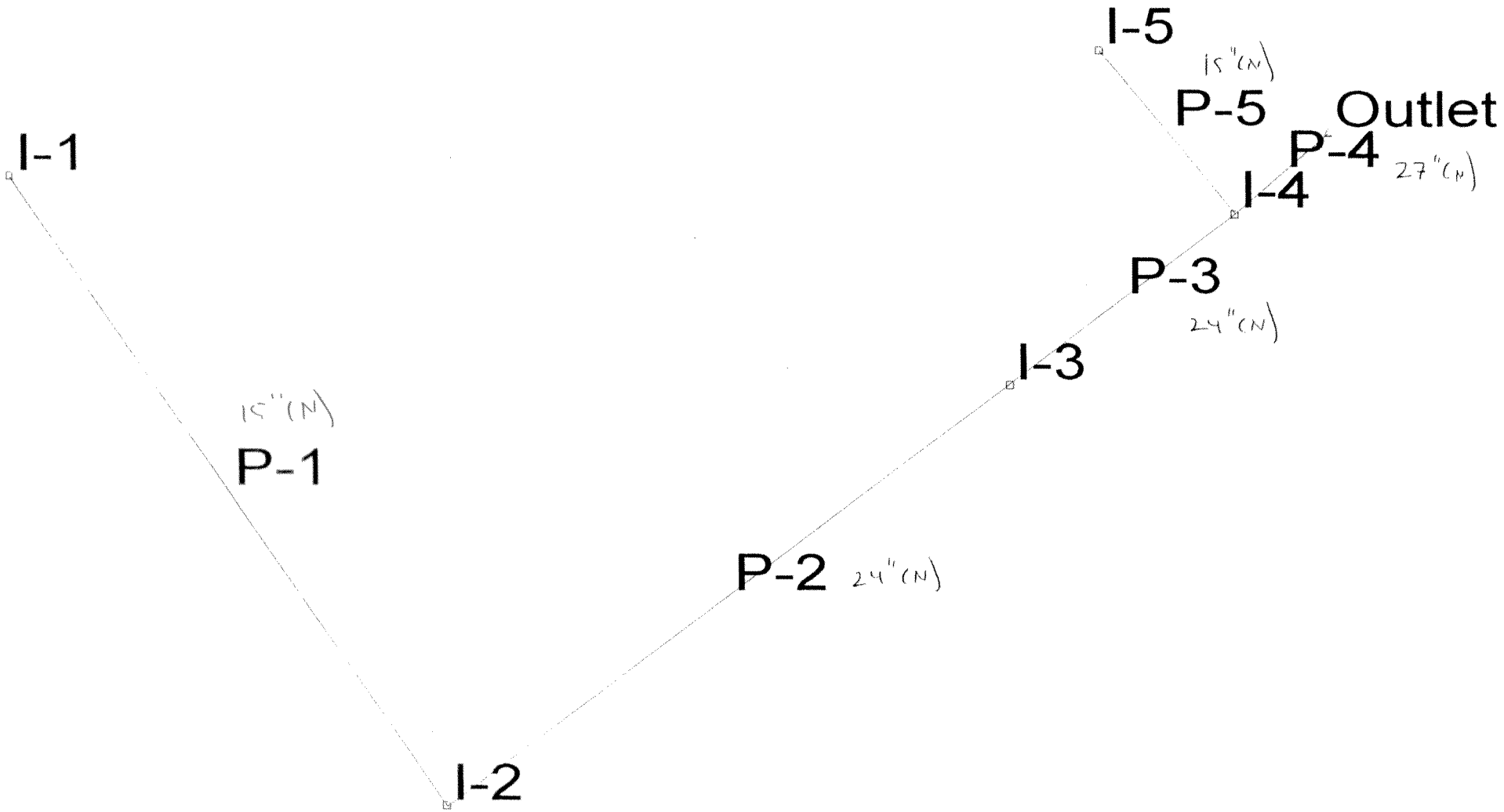
Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Lima Basin

Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Lima Basin

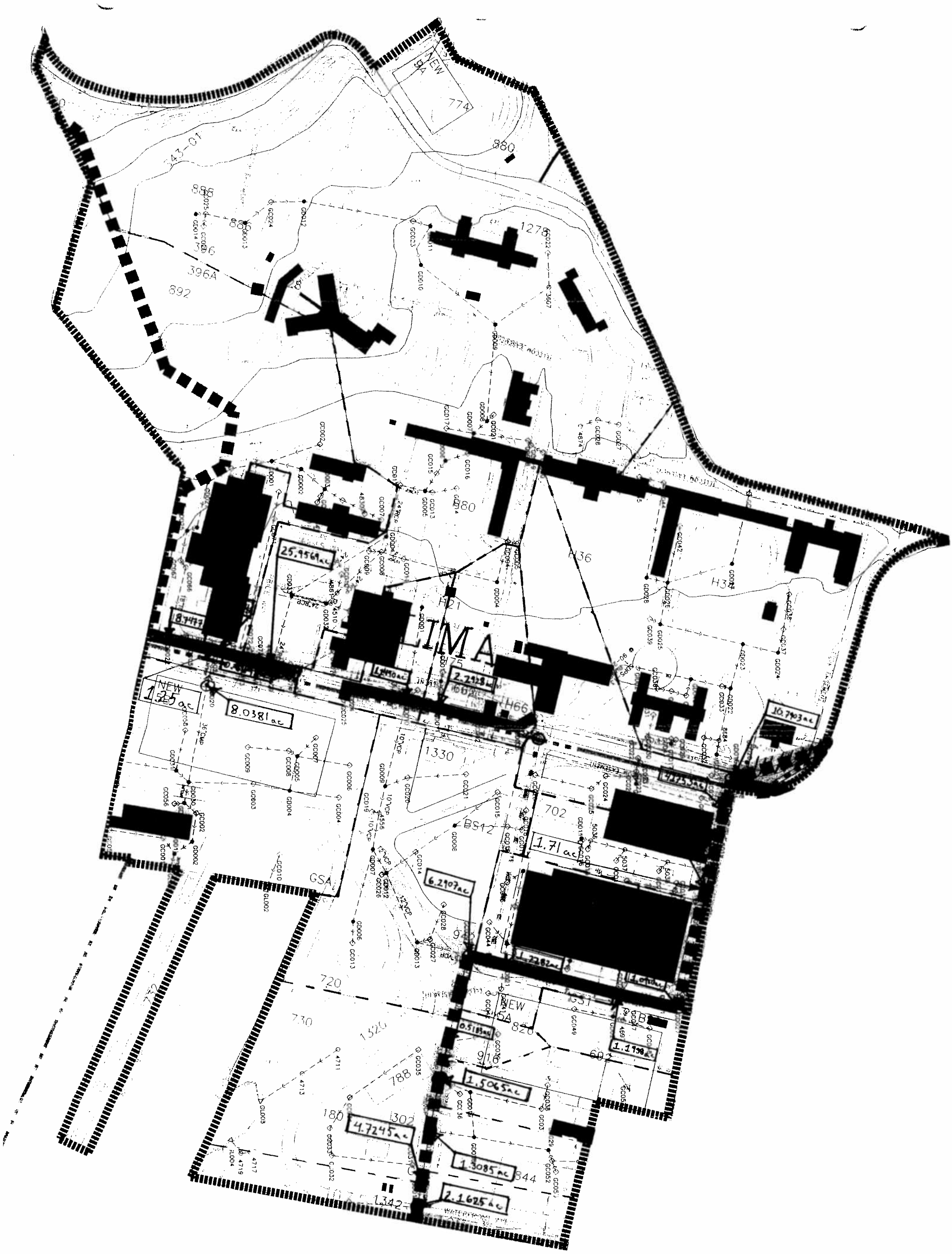
Mare Island Repo[illegible]ike Basin

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-5	GD019-GD016	I-5	I-4	113.00	3.16	0.90	2.84	2.84	10.00	10.00	15 inch	Concrete	0.013	3.54	5.67	4.62	103.68	103.34	108.55	110.28
P-1	GD023-GD024	I-1	I-2	403.00	3.26	0.90	2.94	2.94	10.00	10.00	15 inch	Concrete	0.013	4.56	5.86	4.78	112.16	110.15	117.31	117.98
P-2	GD024-GC045	I-2	I-3	376.00	10.26	0.90	9.23	12.17	10.00	11.41	24 inch	Concrete	0.013	20.71	23.35	7.43	110.15	107.00	113.99	122.70
P-3	GC045-GC016	I-3	I-4	151.00	3.03	0.90	2.73	14.90	10.00	12.25	24 inch	Concrete	0.013	30.86	27.91	8.88	106.15	103.34	109.98	112.15
P-4	GD016-Outlet	I-4	Outlet	65.00	3.02	0.90	2.72	20.46	10.00	12.53	27 inch	Concrete	0.013	43.29	38.01	9.56	103.34	102.07	107.68	111.19

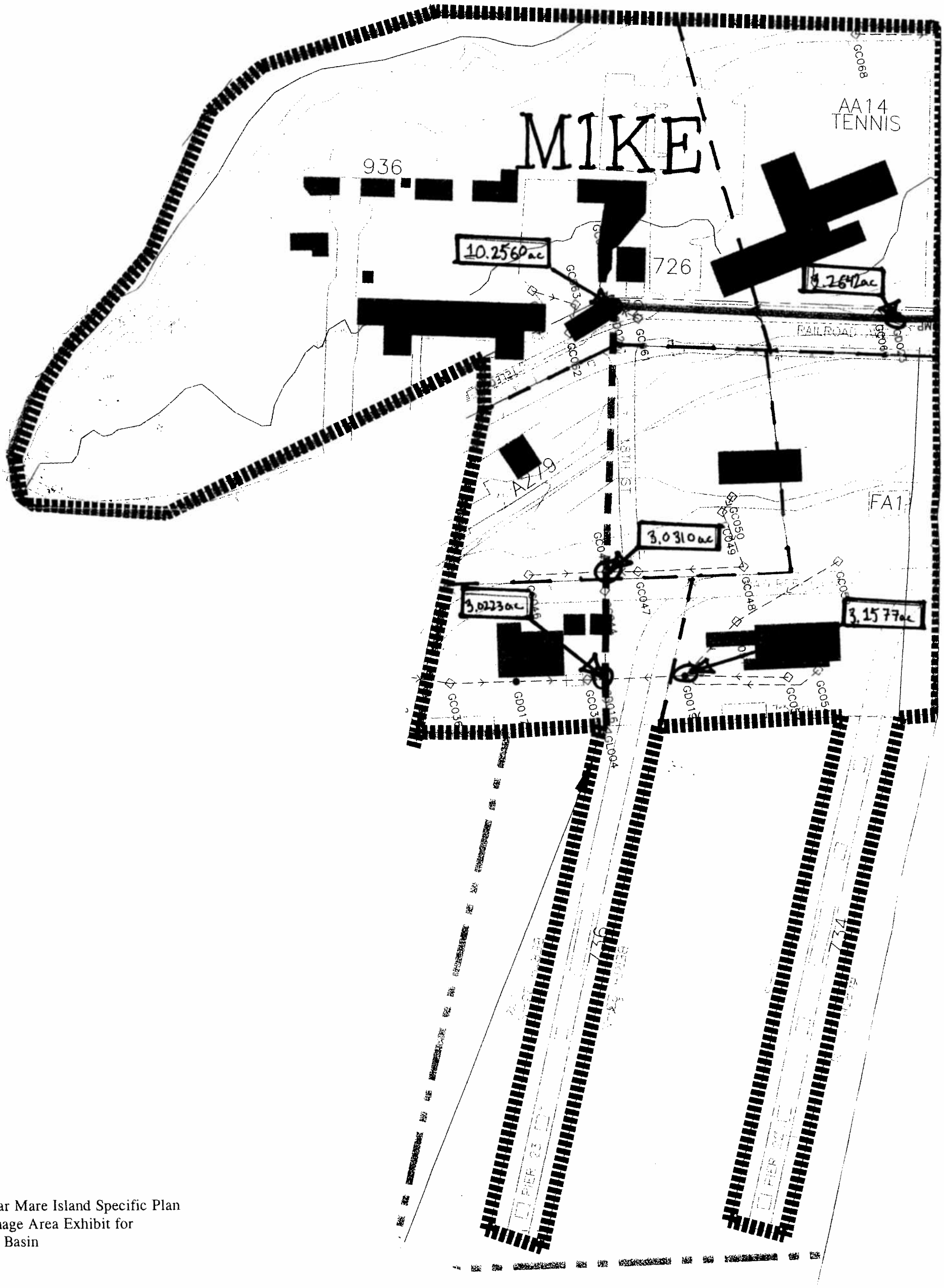
Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Mike Basin



Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Mike Basin



Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Lima Basin



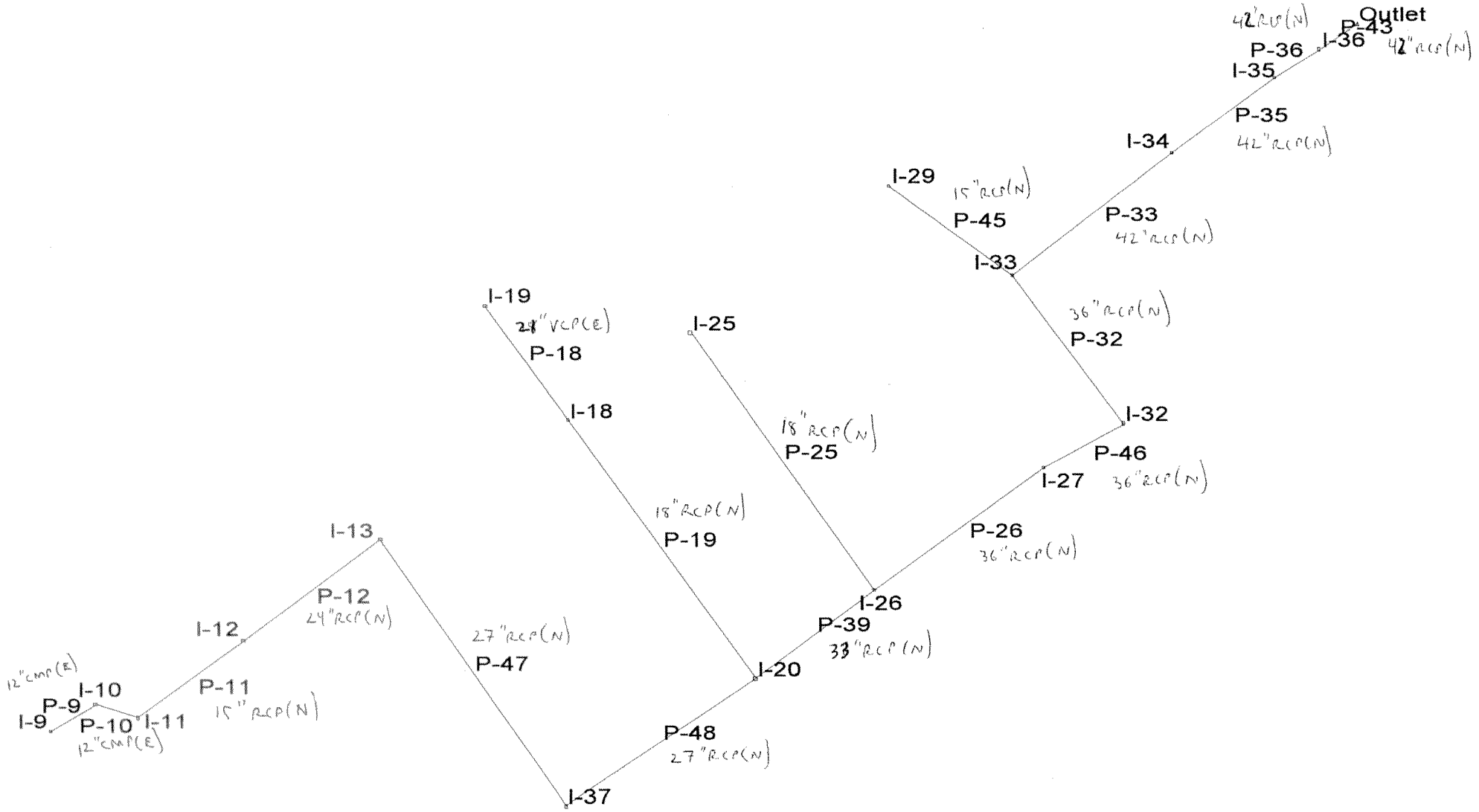
Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Mike Basin

Mare Island Report - Oscar Basin

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Size	Section Material	Roughness	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	S (ft/ft)	Up HGL (ft)	Up Rim (ft)
P-45	GDO92-GD094	I-29	I-33	189.00	2.81	0.90	2.53	2.53	10.00	10.00	15 inch	Concrete	0.013	4.58	5.05	4.12	102.84	101.89	.005026	108.90	110.07
P-9	GD112-GC111	I-9	I-10	67.00	1.30	0.90	1.17	1.17	10.00	10.00	12 inch	CMP	0.024	1.37	2.34	2.98	110.91	110.57	.005075	115.54	119.50
P-10	GC111-GD110	I-10	I-11	55.00	0.00	0.00	0.00	1.17	10.00	10.38	12 inch	CMP	0.024	1.35	2.31	2.95	110.57	110.30	.004909	114.56	114.70
P-11	GD110-GD107	I-11	I-12	163.00	1.56	0.90	1.41	2.58	10.00	10.69	15 inch	Concrete	0.013	5.75	5.05	4.11	110.30	109.01	.007914	113.77	114.40
P-12	GD107-GD106	I-12	I-13	212.00	6.25	0.90	5.63	8.20	10.00	11.35	24 inch	Concrete	0.013	16.07	15.77	5.02	109.01	107.94	.005047	112.77	113.90
P-47	GD107-NewMH	I-13	I-37	402.00	0.53	0.90	0.48	8.68	10.00	12.05	27 inch	Concrete	0.013	19.54	16.35	4.11	107.94	106.34	.003980	111.74	113.50
P-48	NewMH-NewMH2	I-37	I-20	285.00	1.06	0.90	0.95	9.63	10.00	13.68	27 inch	Concrete	0.013	19.59	17.30	4.35	106.34	105.20	.004000	110.62	113.30
P-18	GC169-GD121	I-19	I-18	176.00	1.16	0.90	1.05	1.05	10.00	10.00	21 inch	Concrete	0.016	9.05	2.09	0.87	106.89	106.02	.004943	110.71	111.40
P-19	GC121-GD099	I-18	I-20	396.00	1.96	0.90	1.76	2.81	10.00	13.38	18 inch	Concrete	0.013	4.78	5.09	2.88	106.02	105.20	.002071	110.66	111.52
P-39	GD099-GD097	I-20	I-26	185.00	2.79	0.90	2.51	14.95	10.00	15.67	33 inch	Concrete	0.013	34.12	25.23	4.25	105.20	104.43	.004162	109.73	111.80
P-25	GD124-GD097	I-25	I-26	392.00	3.72	0.90	3.35	3.35	10.00	10.00	18 inch	Concrete	0.013	4.95	6.68	3.78	105.30	104.43	.002219	110.90	112.76
P-26	GD097-GD096	I-26	I-27	263.00	1.31	0.90	1.18	19.48	10.00	16.39	36 inch	Concrete	0.013	43.13	32.10	4.54	104.43	103.33	.004183	109.31	111.35
P-46	GD096-GD095	I-27	I-32	113.00	1.89	0.90	1.70	21.18	10.00	17.36	36 inch	Concrete	0.013	43.01	33.79	4.78	103.33	102.86	.004159	108.70	110.88
P-32	GD095-GD094	I-32	I-33	230.00	1.75	0.90	1.57	22.75	10.00	17.75	36 inch	Concrete	0.013	43.31	35.81	5.07	102.86	101.89	.004217	108.41	110.20
P-33	GD094-GD089	I-33	I-34	251.00	0.80	0.90	0.72	26.01	10.00	18.51	42 inch	Concrete	0.013	65.07	39.86	4.14	101.89	100.84	.004183	107.75	109.42
P-35	GD089-GD038	I-34	I-35	160.00	4.36	0.90	3.92	29.93	10.00	19.52	42 inch	Concrete	0.013	65.10	44.23	4.60	100.84	100.17	.004188	107.35	110.15
P-36	GD038-GD037	I-35	I-36	65.00	0.00	0.00	0.00	29.93	10.00	20.10	42 inch	Concrete	0.013	64.84	43.36	4.51	100.17	99.90	.004154	107.04	110.65
P-43	GD037-GD007	I-36	Outlet	58.00	2.55	0.90	2.29	32.22	10.00	20.34	42 inch	Concrete	0.013	66.05	46.46	4.83	99.90	99.65	.004310	106.92	109.50

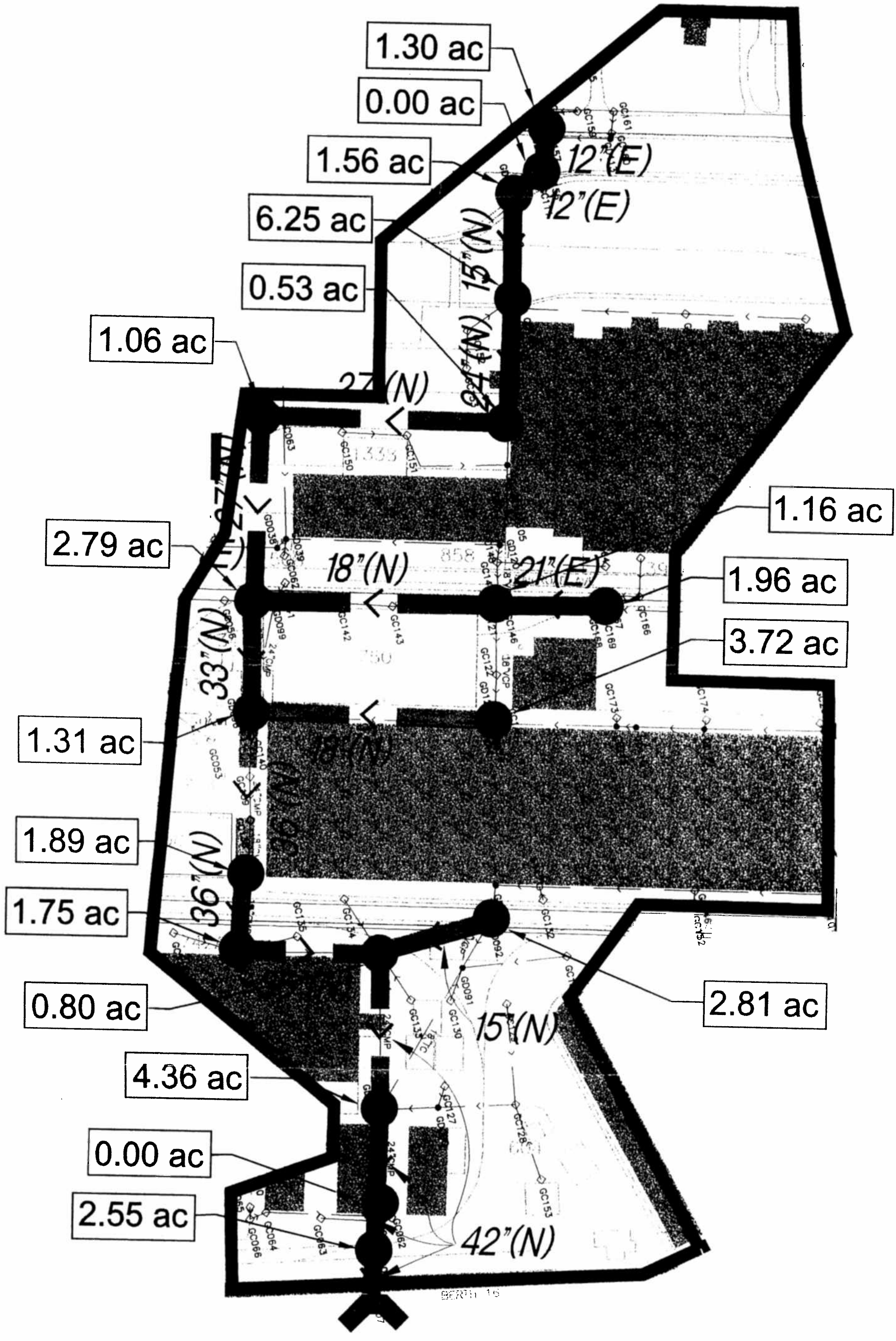
Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Oscar Basin

Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 (203) 755-1666



Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Oscar Basin

Project Engineer: Chris Williams
StormCAD v1.0
Page 1 of 1

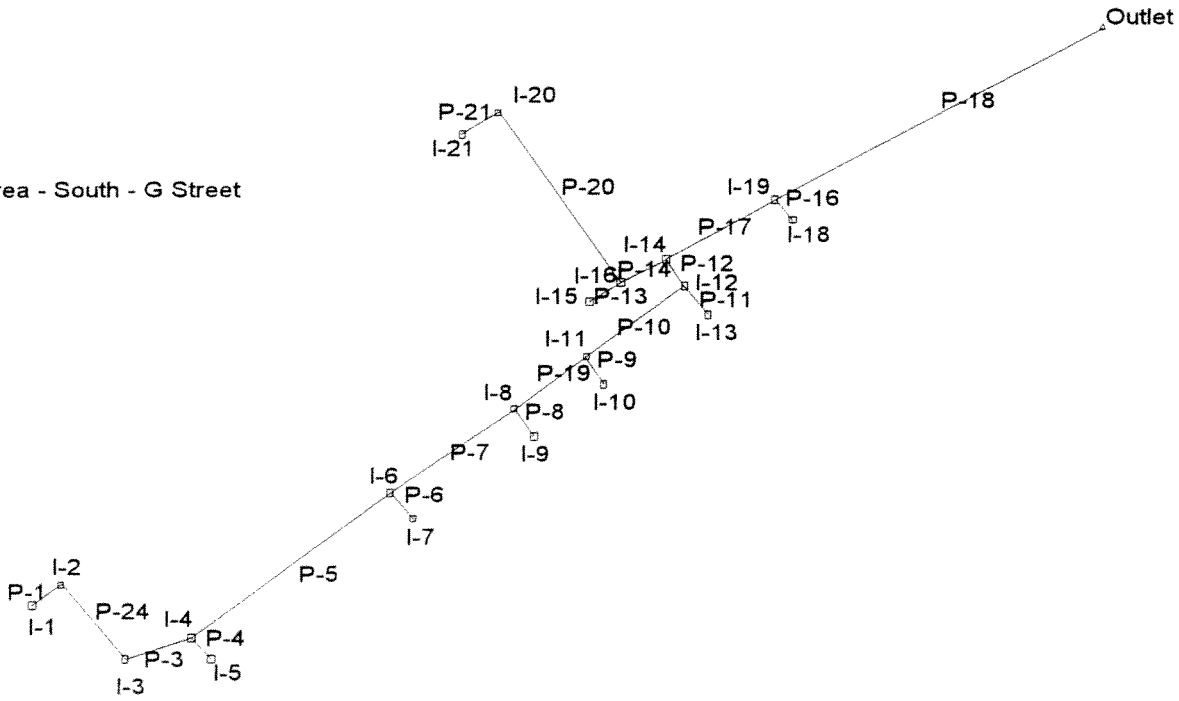


Lennar Mare Island Specific Plan
Drainage Area Exhibit for
Oscar Ba[illegible]

OSCAR

Q = 4[illegible] cfs

Legacy Development Area - South - G Street

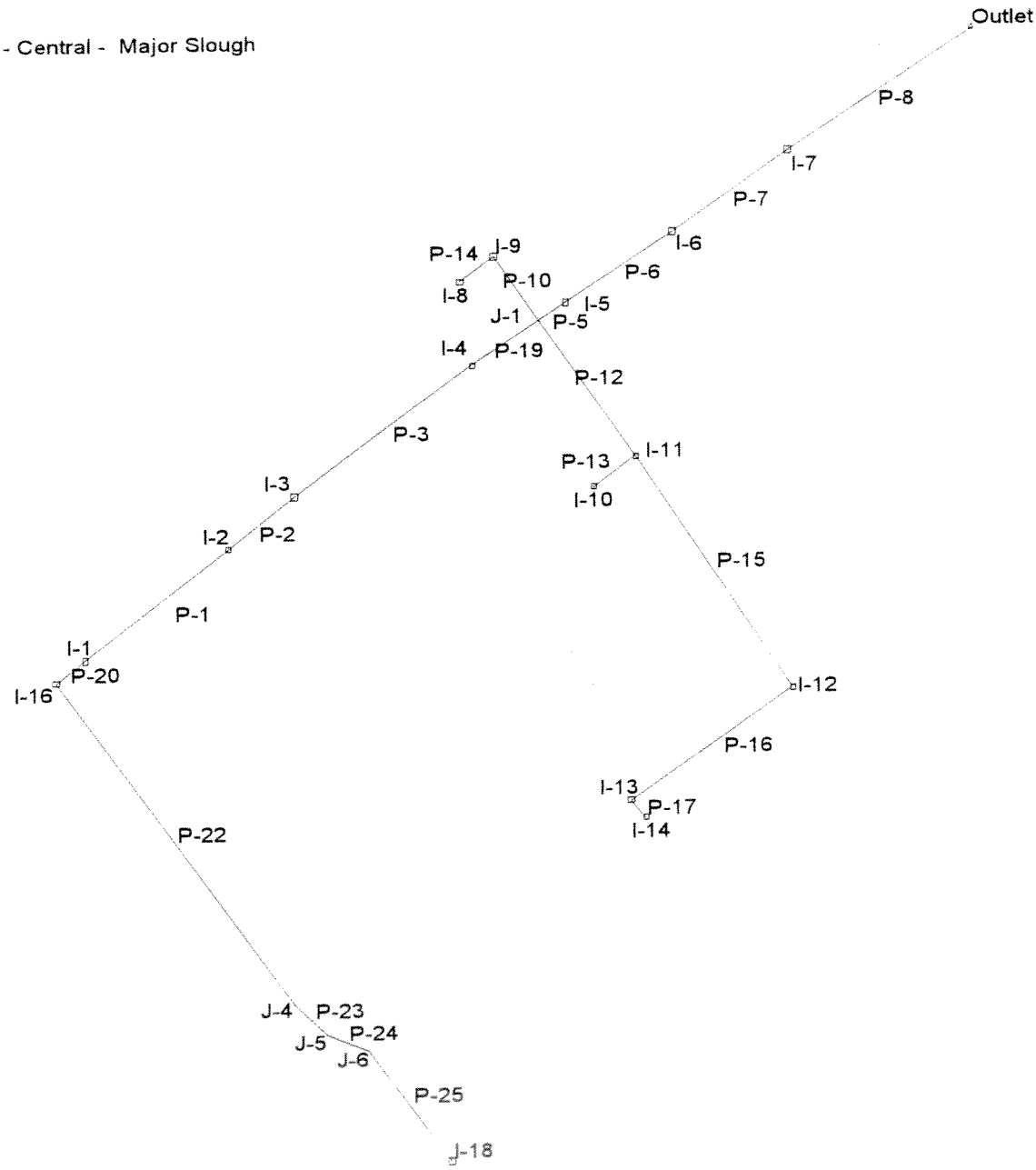



Outlet
Legacy Development Area - South - G Street

Mare Island Repor[illegible]egacy Area

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Shape	Size	Section Material	Roughness	S (ft/ft)	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-21		I-21	I-20	73.00	0.87	0.80	0.70	0.70	10.00	10.00	Circular	12 inch	Concrete	0.013	0.006849	2.95	0.23	0.29	3.20	2.70	5.29	8.50
P-20		I-20	I-16	368.00	0.86	0.80	0.69	1.38	10.00	14.13	Circular	12 inch	Concrete	0.013	0.005978	2.75	0.55	0.70	2.70	0.50	5.28	8.50
P-13		I-15	I-16	63.00	0.49	0.80	0.39	0.39	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005159	2.56	0.13	0.17	0.83	0.50	5.20	10.00
P-14		I-16	I-14	88.00	0.49	0.80	0.39	2.17	10.00	22.94	Circular	12 inch	Concrete	0.013	0.005682	2.69	1.11	1.42	0.50	0.00	5.18	10.00
P-11		I-13	I-12	65.00	0.30	0.80	0.24	0.24	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005385	2.61	0.08	0.10	0.65	0.30	5.34	11.00
P-8		I-9	I-8	59.00	0.00	0.00	0.00	0.00	10.00	10.00	Circular	12 inch	Concrete	0.013	0.007627	3.11	0.00	0.00	2.45	2.00	6.32	12.00
P-6		I-7	I-6	62.00	23.60	0.80	18.88	18.88	16.00	16.00	Circular	12 inch	Concrete	0.013	0.006452	2.86	7.99	10.18	3.90	3.50	11.33	12.00
P-4		I-5	I-4	50.00	3.50	0.80	2.80	2.80	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005000	2.52	0.93	1.19	5.75	5.50	9.23	12.50
P-1		I-1	I-2	61.00	0.89	0.80	0.71	0.71	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005738	2.70	0.24	0.30	7.60	7.25	9.25	12.20
P-24		I-2	I-3	171.00	0.00	0.80	0.00	0.71	10.00	13.37	Circular	12 inch	Concrete	0.013	0.005263	2.58	0.27	0.35	7.25	6.35	9.25	11.00
P-3		I-3	I-4	119.00	0.73	0.80	0.58	1.30	10.00	21.57	Circular	12 inch	Concrete	0.013	0.005462	2.63	0.65	0.82	6.35	5.70	9.23	12.00
P-5		I-4	I-6	426.00	2.05	0.80	1.64	5.74	10.00	23.97	Circular	15 inch	Concrete	0.013	0.005164	4.64	3.00	2.45	5.70	3.50	9.14	12.00
P-7		I-6	I-8	257.00	9.52	0.80	7.62	32.23	10.00	26.87	Circular	24 inch	Concrete	0.013	0.005058	16.09	17.83	5.67	3.50	2.20	7.91	12.00
P-19		I-8	I-11	154.00	3.00	0.80	2.40	34.63	10.00	27.63	Circular	30 inch	Concrete	0.013	0.005195	29.56	19.42	3.96	2.20	1.40	6.17	12.00
P-9		I-10	I-11	56.00	12.00	0.80	9.60	9.60	13.30	13.30	Circular	15 inch	Concrete	0.013	0.007143	5.46	3.67	2.99	1.80	1.40	6.01	12.00
P-10		I-11	I-12	209.00	4.72	0.80	3.78	48.01	10.00	28.28	Circular	36 inch	Concrete	0.013	0.005263	48.39	27.23	3.85	1.40	0.30	5.69	12.00
P-12		I-12	I-14	57.00	0.23	0.80	0.18	48.43	10.00	29.18	Circular	36 inch	Concrete	0.013	0.005263	48.39	27.91	3.95	0.30	0.00	5.19	12.00
P-17		I-14	I-19	215.00	3.58	0.80	2.86	53.46	10.00	29.42	Box	5 x 5 ft	Concrete	0.045	0.002372	46.65	30.94	1.24	0.00	-0.51	5.08	10.00
P-16		I-18	I-19	47.00	16.20	0.80	12.96	12.96	10.00	10.00	Circular	15 inch	Concrete	0.013	0.308723	35.89	4.31	4.21	14.00	-0.51	14.84	15.00
P-18		I-19	Outlet	640.00	7.84	0.80	6.27	72.70	10.00	32.32	Box	5 x 5 ft	Concrete	0.045	0.002328	46.22	43.69	1.75	-0.51	-2.00	4.83	5.00

Legacy Development Area - Central - Major Slough

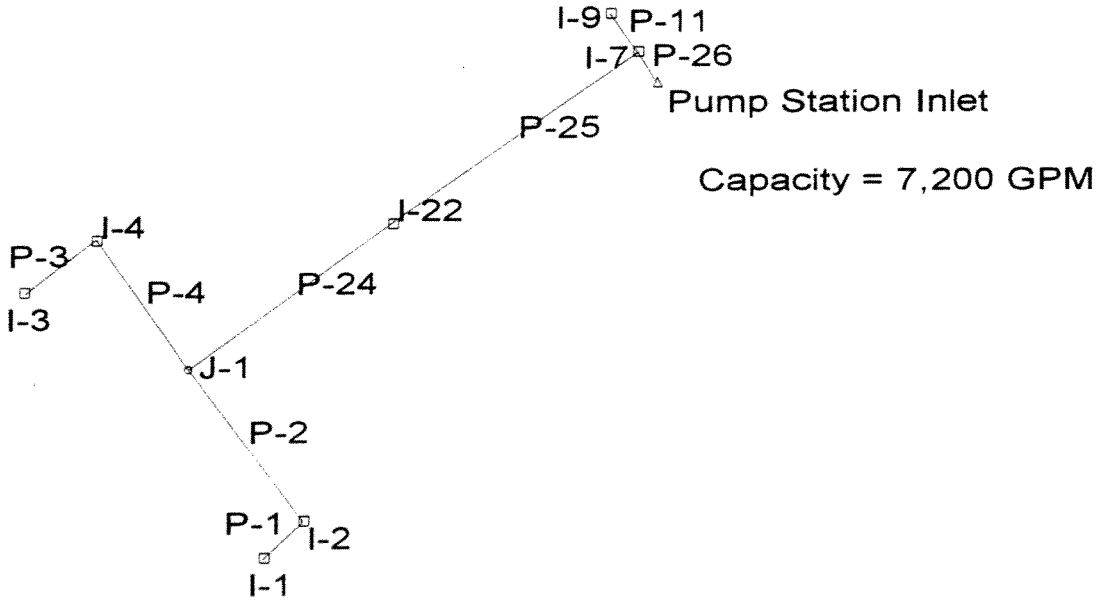



Outlet
P-8
J-7
8.71 ACRES
9.58 ACRES
J-6
P-14
J-9
P-10
J-8
J-5
P-9
J-4
P-13
5.29 ACRES
P-3
J-3
J-11
P-12
J-10
P-15
P-2
J-2
7.89 ACRES
10.60 ACRES
P-1
J-1
J-20
J-18
P-16
J-12
6.64 ACRES
33.51 ACRES
12.78 ACRES
9.21 ACRES
P-22
J-13
P-17
J-14
4.72 ACRES
3.58 ACRES
J-4
P-23
P-24
J-5
J-6
P-25
J-18
3.00 ACRES
9.62 ACRES
15.0 ACRES
17.0 ACRES
23.6 ACRES
35 ACRES
7.08 ACRES
0.85 ACRES
0.63 ACRES
3.72 ACRES
4.39 ACRES
5.56 ACRES
5.82 ACRES
7.14 ACRES
16.69 ACRES
9.0 ACRES
Legacy Development Area - Central - Major Slough

Mare Island Report - Legacy Area

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Shape	Size	Section Material	Roughness	S (ft/ft)	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-25		I-18	J-6	265.00	12.78	0.80	10.22	10.22	10.00	10.00	Circular	15 inch	Concrete	0.013	0.005283	4.70	3.40	2.77	7.10	5.70	9.28	10.60
P-24		J-6	J-5	82.00	N/A	N/A	N/A	10.22	N/A	11.59	Circular	15 inch	Concrete	0.013	0.012805	7.31	3.65	2.97	5.70	4.65	8.46	9.60
P-23		J-5	J-4	86.00	N/A	N/A	N/A	10.22	N/A	12.05	Circular	18 inch	Concrete	0.013	0.005233	7.60	3.72	2.10	4.65	4.20	8.18	8.20
P-22		J-4	I-16	768.00	N/A	N/A	N/A	10.22	N/A	12.73	Circular	18 inch	Concrete	0.013	0.005013	7.44	3.82	2.16	4.20	0.35	8.03	8.20
P-20		I-16	I-1	70.00	33.51	0.80	26.81	37.03	15.00	18.65	Circular	24 inch	Concrete	0.013	0.005000	16.00	17.16	5.46	0.35	0.00	6.74	8.00
P-1	slough	I-1	I-2	344.00	0.00	0.00	0.00	37.03	10.00	18.86	Box	6 x 5 ft	Concrete	0.045	0.001047	39.41	17.28	0.58	0.00	-0.36	6.33	8.00
P-2	slough	I-2	I-3	161.00	9.21	0.80	7.37	44.40	10.00	28.82	Box	6 x 5 ft	Concrete	0.045	0.000994	38.40	25.43	0.85	-0.36	-0.52	6.26	8.00
P-3	slough	I-3	I-4	418.00	7.89	0.80	6.31	50.71	10.00	31.98	Box	6 x 5 ft	Concrete	0.045	0.000957	37.68	30.36	1.01	-0.52	-0.92	6.19	8.00
P-19	RR Ave	I-4	J-1	153.00	10.60	0.80	8.48	59.19	10.00	38.87	Circular	42 inch	Concrete	0.013	0.000980	31.50	38.31	3.98	-0.92	-1.07	5.79	8.00
P-17		I-14	I-13	44.00	1.43	0.80	1.14	1.14	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005000	2.52	0.38	0.48	6.42	6.20	7.53	9.00
P-16		I-13	I-12	374.00	0.00	0.80	0.00	1.14	10.00	11.51	Circular	12 inch	Concrete	0.013	0.005027	2.53	0.41	0.52	6.20	4.32	7.52	9.00
P-15		I-12	I-11	537.00	1.24	0.80	0.99	2.14	10.00	23.55	Circular	12 inch	Concrete	0.013	0.004972	2.51	1.11	1.41	4.32	1.65	7.45	8.00
P-13		I-10	I-11	99.00	1.11	0.80	0.89	0.89	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005051	2.53	0.30	0.38	2.15	1.65	6.94	8.00
P-12		I-11	J-1	321.00	1.08	0.80	0.86	3.89	10.00	29.88	Circular	12 inch	Concrete	0.013	0.005140	2.55	2.27	2.89	1.65	0.00	6.87	8.00
P-14		I-8	I-9	79.00	1.31	0.80	1.05	1.05	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005063	2.54	0.35	0.44	1.15	0.75	5.62	8.00
P-10		I-9	J-1	149.00	0.90	0.80	0.72	1.77	10.00	12.97	Circular	12 inch	Concrete	0.013	0.005034	2.53	0.67	0.85	0.75	0.00	5.62	7.00
P-5		J-1	I-5	61.00	N/A	N/A	N/A	64.85	N/A	39.51	Circular	42 inch	Concrete	0.013	0.000984	31.55	42.26	4.39	-1.07	-1.13	5.32	6.00
P-6	slough	I-5	I-6	244.00	5.29	0.80	4.23	69.08	10.00	39.74	Box	6 x 5 ft	Concrete	0.045	0.000984	38.20	45.13	1.50	-1.13	-1.37	5.22	8.00
P-7	slough	I-6	I-7	267.00	8.11	0.80	6.49	75.57	10.00	42.44	Box	6 x 5 ft	Concrete	0.045	0.000936	37.27	50.63	1.69	-1.37	-1.62	4.88	8.00
P-8	slough	I-7	Outlet	419.00	9.58	0.80	7.66	83.23	10.00	45.08	Box	6 x 5 ft	Concrete	0.045	0.000907	36.68	57.09	1.90	-1.62	-2.00	4.42	7.00

Legacy Development Area - North - Pump Station



Project Title: Mare Island - Legacy Development Area
t:\projects\8019\stormcad\nalegpst.stm
07/24/01 05:29:44 PM

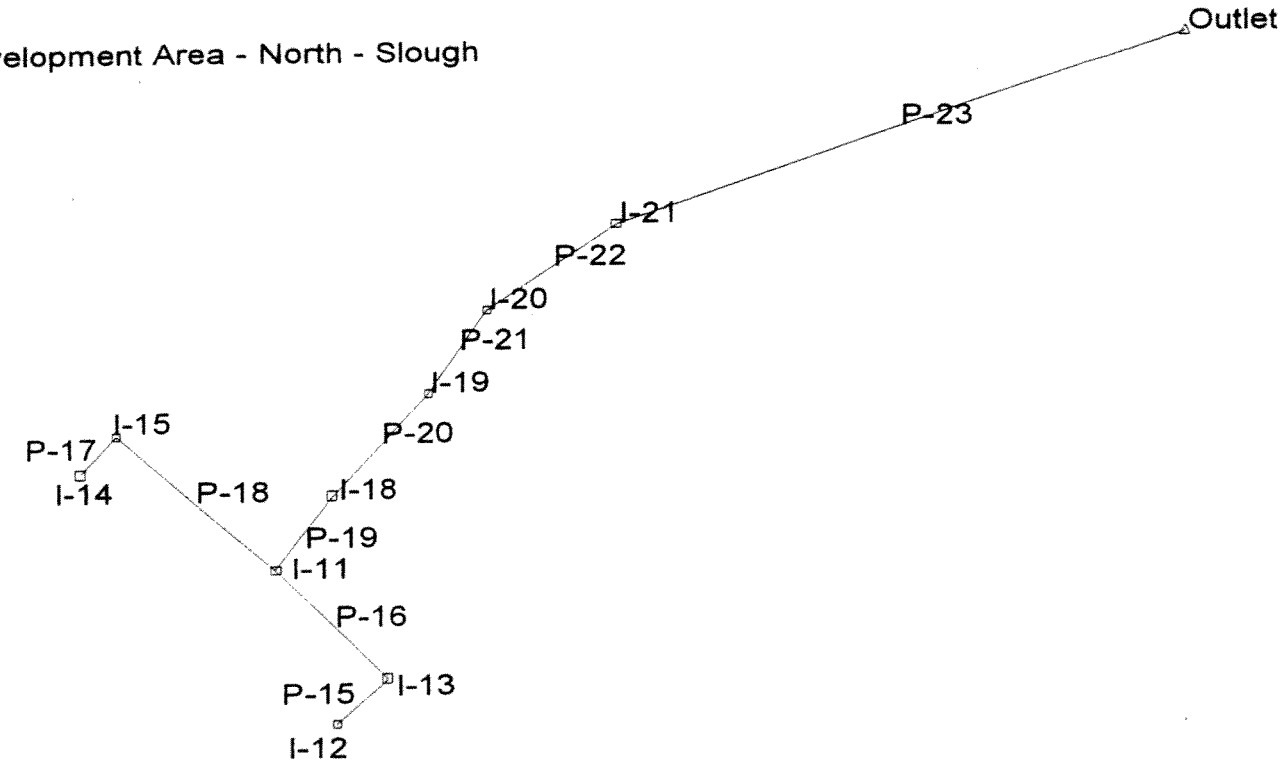
Reimer Associates
Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 (203) 755-1666

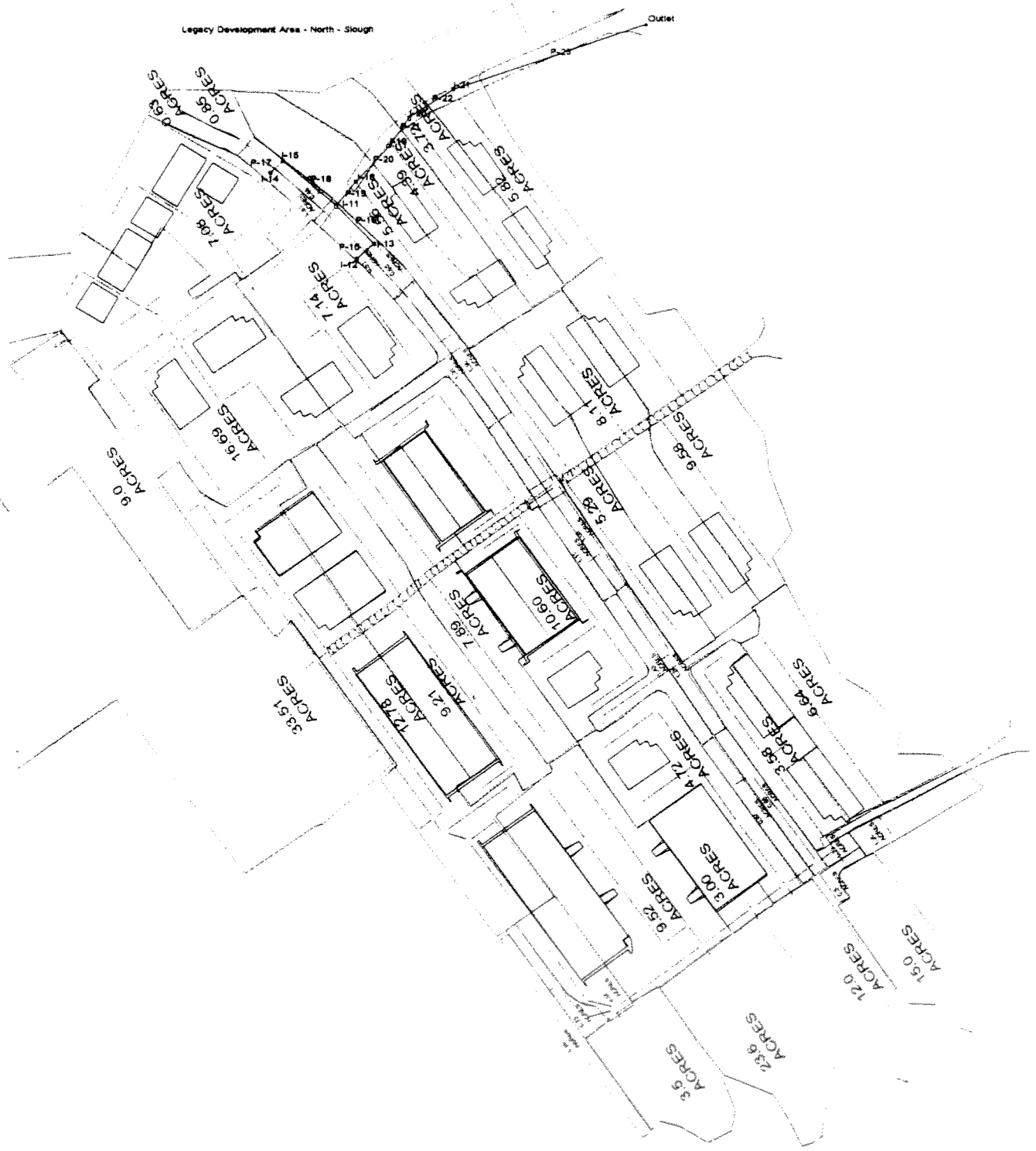
Project Engineer: Joy Sandler
StormCAD v1.0
Page 1 of 1

Mare Island Repo[illegible] Legacy Area

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Shape	Size	Section Material	Roughness	S (ft/ft)	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-3		I-3	I-4	107.00	9.00	0.80	7.20	7.20	10.00	10.00	Circular	12 inch	Concrete	0.013	0.022804	5.38	2.40	3.05	-1.56	-4.00	2.63	4.50
P-4		I-4	J-1	195.00	0.00	0.80	0.00	7.20	10.00	10.58	Circular	12 inch	Concrete	0.013	0.005128	2.55	2.46	3.13	-4.00	-5.00	2.06	3.00
P-1		I-1	I-2	66.00	0.65	0.80	0.52	0.52	10.00	10.00	Circular	12 inch	Concrete	0.013	0.006061	2.77	0.17	0.22	-3.40	-3.80	1.14	5.00
P-2		I-2	J-1	234.00	0.00	0.80	0.00	0.52	10.00	14.99	Circular	12 inch	Concrete	0.013	0.005128	2.55	0.21	0.27	-3.80	-5.00	1.14	5.00
P-24		J-1	I-22	305.00	N/A	N/A	N/A	7.72	N/A	29.43	Circular	15 inch	Concrete	0.013	0.005246	4.68	4.47	3.64	-5.00	-6.60	1.01	3.00
P-25		I-22	I-7	361.00	16.69	0.80	13.35	21.07	10.00	30.82	Circular	21 inch	Concrete	0.013	0.005263	11.49	12.44	5.17	-6.60	-8.50	-0.70	2.00
P-11		I-9	I-7	58.00	7.08	0.80	5.66	5.66	10.00	10.00	Circular	12 inch	Concrete	0.013	0.005172	2.56	1.88	2.40	-8.20	-8.50	-2.77	2.50
P-26	Pump Stn	I-7	Pump	45.00	0.00	0.80	0.00	26.74	10.00	31.99	Circular	21 inch	Concrete	0.013	0.006667	12.94	16.01	6.65	-8.50	-8.80	-3.34	2.50

Legacy Development Area - North - Slough




Legacy Development Area - North - Slough
Outlet
P-25
P-24
P-22
P-20
P-18
P-16
P-15
P-13
P-12
P-11
P-10
P-9
P-8
P-7
P-6
P-5
P-4
P-3
P-2
P-1
0.63 ACRES
0.85 ACRES
3.74 ACRES
4.39 ACRES
5.82 ACRES
7.08 ACRES
5.98 ACRES
7.14 ACRES
16.69 ACRES
9.0 ACRES
6.1 ACRES
9.58 ACRES
5.29 ACRES
10.60 ACRES
7.89 ACRES
9.21 ACRES
7.78 ACRES
33.51 ACRES
6.64 ACRES
3.58 ACRES
4.72 ACRES
3.00 ACRES
9.52 ACRES
15.0 ACRES
12.0 ACRES
23.6 ACRES
35 ACRES

Mare Island Report - Legacy Area

Pipe	Description	Up Node	Dn Node	Length (ft)	Inlet A (acres)	C	Inlet CA (acres)	Tot CA (acres)	TC (min)	Sys Flow Time (min)	Shape	Size	Section Material	Roughness	S (ft/ft)	Cap (cfs)	Q (cfs)	V avg (ft/s)	Up Invert (ft)	Dn Invert (ft)	Up HGL (ft)	Up Rim (ft)
P-17		I-14	I-15	69	0.81	0.80	0.65	0.65	10	10	Circular	12 inch	Concrete	0.013	0.005072	2.54	0.22	0.27	2.35	2.00	5.83	6.20
P-18		I-15	I-11	275	0.46	0.80	0.37	1.02	10	14	Circular	12 inch	Concrete	0.013	0.005055	2.53	0.40	0.51	2.00	0.61	5.82	6.20
P-15		I-12	I-13	89	8.96	0.80	7.17	7.17	10	10	Circular	15 inch	Concrete	0.013	0.005056	4.59	2.38	1.94	2.10	1.65	6.38	7.20
P-16		I-13	I-11	206	1.55	0.80	1.24	8.41	10	11	Circular	15 inch	Concrete	0.013	0.005049	4.59	2.89	2.36	1.65	0.61	6.20	7.20
P-19		I-11	I-18	123	33.50	0.80	26.80	36.22	10	23	Circular	24 inch	Concrete	0.013	0.004959	15.93	18.67	5.94	0.61	0.00	5.46	9.10
P-20	slough	I-18	I-19	187	5.56	0.80	4.45	40.67	10	23	Box	5 x 5 ft	Concrete	0.045	0.001604	38.37	21.11	0.89	0.00	-0.30	4.62	6.00
P-21	slough	I-19	I-20	135	4.39	0.80	3.51	44.18	10	27	Box	5 x 5 ft	Concrete	0.045	0.001481	36.87	24.49	1.00	-0.30	-0.50	4.55	6.00
P-22	slough	I-20	I-21	204	3.72	0.80	2.98	47.16	10	29	Box	5 x 5 ft	Concrete	0.045	0.001422	36.12	27.21	1.09	-0.50	-0.79	4.49	6.00
P-23	slough	I-21	Outlet	783	5.82	0.80	4.66	51.82	10	32	Box	5 x 5 ft	Concrete	0.045	0.001545	37.66	31.16	1.25	-0.79	-2.00	4.33	6.00

Sanitary Sewer System Calculations

PIPE	US INV.	DS INV.	LENGTH (ft)	SLOPE (ft/ft)	MAT'L	NEW/EXIST	"n"	DIAMETER (in)	Qfull (MGD)	Vfull (f/s)	INFLOW (MGD)	% CAP	PEAK INFLOW	INFILTRATION (MGD)	PEAK + INFILTRATION (MGD)	PEAK %CAP	PEAK VELOCITY (f/s)
9-1	101.38	98.00	650	0.005	HDPE	N	0.013	8	0.565	2.503	0.072	13%	0.1952	0.0031	0.1983	35.1%	1.420
9-2	102.94	101.38	400	0.004	HDPE	E	0.013	10	0.887	2.515	0.018	2%	0.0488	0.0026	0.0514	5.8%	1.001
9-3	105.54	101.38	800	0.005	HDPE	N	0.013	8	0.565	2.503	0.054	10%	0.1464	0.0122	0.1585	28.1%	1.598
9-4	111.78	105.54	1200	0.005	HDPE	N	0.013	8	0.565	2.503	0.036	6%	0.0976	0.0063	0.1039	18.4%	1.411
7-1	98.20	96.50	1300	0.001	HDPE	N SLIP LINE	0.013	16	1.798	1.993	0.584	32%	0.8250	0.0111	0.8360	46.5%	2.121
7-2	102.46	98.20	820	0.005	HDPE	N	0.013	8	0.565	2.503	0.026	5%	0.0702	0.0103	0.0804	14.2%	1.277
7-3	101.90	98.20	1500	0.002	HDPE	N SLIP LINE	0.013	12	1.147	2.259	0.480	42%	0.6830	0.0108	0.6938	60.5%	2.645
7-4	103.50	101.90	640	0.002	HDPE	N	0.013	12	1.154	2.274	0.290	25%	0.4193	0.0044	0.4237	36.7%	2.134
7-5	105.20	103.50	1000	0.002	HDPE	N	0.013	10	0.585	1.661	0.155	26%	0.2276	0.0149	0.2425	41.4%	1.549
7-6	113.40	105.20	1020	0.008	HDPE	N	0.013	8	0.702	3.112	0.090	13%	0.2441	0.0053	0.2494	35.5%	2.324
7-7	115.70	98.20	780	0.022	RCP	E	0.013	12	3.458	6.813	0.026	1%	0.0702	0.0102	0.0804	2.3%	2.002
7-8	111.80	101.90	820	0.012	RCP	E	0.013	12	2.537	4.998	0.138	5%	0.2040	0.0111	0.2151	8.5%	2.770
7-9	126.50	111.80	920	0.016	VCP	E	0.013	12	2.918	5.750	0.102	3%	0.1521	0.0074	0.1595	5.5%	2.692
7-10	107.45	103.50	760	0.005	HDPE	N	0.013	8	0.565	2.503	0.103	18%	0.1538	0.0070	0.1608	28.5%	1.924
7-11	104.20	99.00	1000	0.005	HDPE	N	0.013	8	0.565	2.503	0.052	9%	0.1404	0.0070	0.1474	26.1%	1.575
7-12	104.72	99.00	1100	0.005	HDPE	N	0.013	8	0.565	2.503	0.052	9%	0.1404	0.0088	0.1491	26.4%	1.575
4-10	98.13	96.33	600	0.003	HDPE	N	0.013	12	1.265	2.491	0.616	49%	0.8689	0.0033	0.8722	69.0%	2.603
4-11	100.14	98.13	670	0.003	HDPE	N	0.013	12	1.265	2.491	0.516	41%	0.7324	0.0027	0.7351	58.1%	2.410
4-12	101.58	100.14	480	0.003	HDPE	N	0.013	12	1.265	2.491	0.516	41%	0.7324	0.0037	0.7361	58.2%	2.410
4-13	104.88	101.58	1100	0.003	HDPE	N	0.013	12	1.265	2.491	0.516	41%	0.7324	0.0000	0.7324	57.9%	2.410
4-14	104.54	100.80	720	0.005	HDPE	N	0.013	8	0.565	2.503	0.042	7%	0.1146	0.0055	0.1201	21.3%	1.491
4-15	103.14	100.8	450	0.005	HDPE	N	0.013	8	0.565	2.503	0.057	10%	0.1558	0.0021	0.1579	28.0%	1.614
4-16	105.74	103.14	500	0.005	HDPE	N	0.013	8	0.565	2.503	0.023	4%	0.0623	0.0066	0.0689	12.2%	0.427
4-17	107.28	103.14	360	0.005	HDPE	N	0.013	8	0.565	2.503	0.023	4%	0.0623	0.0078	0.0701	12.4%	1.267
4-20	103.68	99.00	900	0.005	HDPE	N	0.013	8	0.565	2.503	0.042	7%	0.1146	0.0063	0.1209	21.4%	1.540
4-30	106.1	99.00	1190	0.006	HDPE	N SLIP LINE	0.013	16	3.841	4.256	0.912	24%	1.2719	0.0084	1.2803	33.3%	4.109
4-31	108.35	106.1	750	0.003	RCP	E	0.013	27	10.992	4.278	0.677	6%	0.9523	0.0078	0.9601	8.7%	2.998
4-32	110.90	108.35	850	0.003	RCP	E	0.013	27	10.992	4.278	0.671	6%	0.9448	0.0067	0.9516	8.7%	2.996
4-33	111.7	110.25	650	0.002	RCP	E	0.013	27	9.479	3.689	0.600	6%	0.8473	0.0040	0.8514	9.0%	2.064
4-34	109.95	106.1	740	0.005	HDPE	N	0.013	8	0.565	2.503	0.106	19%	0.1579	0.0081	0.1660	29.4%	1.943
4-35	103.68	101.58	700	0.003	VCP	E	0.013	12	1.265	2.491	0.005	0%	0.0148	0.0046	0.0194	1.5%	0.622
4-36	113.8	110.90	450	0.006	CMP	E	0.024	15	1.820	2.295	0.039	2%	0.1053	0.0025	0.1078	5.9%	1.404
4-37	126.3	113.8	730	0.017	VCP	E	0.013	10	1.858	5.271	0.006	0%	0.0158	0.0070	0.0229	1.2%	1.222
4-38	122.2	113.8	830	0.010	VCP	E	0.013	12	2.323	4.576	0.033	1%	0.0894	0.0025	0.0920	4.0%	1.652
4-38.1	129.2	117.80	650	0.018	VCP	E	0.013	18	9.015	7.893	0.006	0%	0.0177	0.0052	0.0229	0.3%	2.009
4-39	133.0	122.20	820	0.013	VCP	E	0.013	12	2.650	5.220	0.026	1%	0.0718	0.0038	0.0755	2.9%	1.708
4-39.1	139.08	133.0	1170	0.005	HDPE	N	0.013	8	0.565	2.503	0.005	1%	0.0135	0.0035	0.0170	3.0%	0.784
4-39.2	138.46	133.0	1050	0.005	HDPE	N	0.013	8	0.565	2.503	0.010	2%	0.0270	0.0045	0.0315	5.6%	0.984
4-40	100.35	99.00	450	0.003	HDPE	N	0.013	12	1.265	2.491	0.277	22%	0.4001	0.0018	0.4019	31.8%	1.997
4-41	108.78	105.28	640	0.005	HDPE	N	0.013	8	0.579	2.567	0.089	15%	0.2418	0.0034	0.2452	42.3%	1.911
4-42	111.95	108.78	580	0.005	HDPE	N	0.013	8	0.579	2.566	0.078	13%	0.2107	0.0036	0.2142	37.0%	1.788
4-43	107.20	105.28	640	0.003	HDPE	N	0.013	12	1.265	2.491	0.188	15%	0.2747	0.0031	0.2777	22.0%	1.785
4-44	109.90	107.20	500	0.005	VCP	E	0.013	10	1.043	2.960	0.165	16%	0.2421	0.0050	0.2471	23.7%	2.163

PIPE	US INV.	DS INV.	LENGTH (ft)	SLOPE (ft/ft)	MAT'L	NEW/EXIST	"n"	DIAMETER (in)	Qfull (MGD)	Vfull (f/s)	INFLOW (MGD)	% CAP	PEAK INFLOW	INFILTRATION (MGD)	PEAK + INFILTRATION (MGD)	PEAK %CAP	PEAK VELOCITY (f/s)
4-45	113.64	109.90	720	0.005	HDPE	N	0.013	8	0.565	2.503	0.016	3%	0.0440	0.0046	0.0487	8.6%	1.112
4-46	111.79	109.90	630	0.003	HDPE	N	0.013	10	0.778	2.206	0.135	17%	0.1998	0.0018	0.2017	25.9%	1.763
4-47	114.04	111.79	750	0.003	HDPE	N	0.013	10	0.778	2.206	0.134	17%	0.1974	0.0037	0.2010	25.9%	1.672
4-48.1	114.64	114.04	200	0.003	HDPE	N	0.013	10	0.778	2.206	0.129	17%	0.1912	0.0002	0.1914	24.6%	1.634
4-48.2	115.42	114.64	260	0.003	HDPE	N	0.013	10	0.778	2.206	0.128	16%	0.1894	0.0002	0.1897	24.4%	1.630
4-48.3	116.50	115.42	360	0.003	HDPE	N	0.013	10	0.778	2.206	0.120	15%	0.1786	0.0018	0.1804	23.2%	1.602
4-49	118.15	116.50	550	0.003	HDPE	N	0.013	10	0.778	2.206	0.117	15%	0.1730	0.0008	0.1738	22.3%	1.585
4-50	120.07	118.15	640	0.003	HDPE	N	0.013	10	0.778	2.206	0.083	11%	0.2248	0.0038	0.2285	29.4%	1.435
4-51	121.96	120.07	630	0.003	HDPE	N	0.013	10	0.778	2.206	0.077	10%	0.2089	0.0049	0.2138	27.5%	1.406
4-52	120.49	118.15	780	0.003	HDPE	N	0.013	8	0.429	1.901	0.024	6%	0.0658	0.0118	0.0775	18.1%	1.046
4-53	120.10	115.42	900	0.005	HDPE	N	0.013	8	0.565	2.503	0.008	1%	0.0206	0.0034	0.0239	4.2%	0.885
4-54	118.28	114.64	700	0.005	HDPE	N	0.013	8	0.565	2.503	0.008	1%	0.0206	0.0027	0.0233	4.1%	0.885
4-60	126.38	121.96	620	0.007	HDPE	N	0.013	10	1.199	3.401	0.066	5%	0.1790	0.0014	0.1804	15.0%	1.841
4-61	133.80	126.38	1040	0.007	HDPE	N	0.013	10	1.199	3.402	0.039	3%	0.1050	0.0066	0.1116	9.3%	1.578
4-62	152.80	133.80	790	0.024	HDPE	N	0.013	8	1.214	5.383	0.021	2%	0.0570	0.0060	0.0630	5.2%	2.262
4-62a	146.50	140.15	840	0.008	HDPE	N	0.013	8	0.681	3.018	0.008	1%	0.0211	0.0000	0.0211	3.1%	1.249
4-62b	140.15	133.80	820	0.008	HDPE	N	0.013	8	0.689	3.055	0.008	1%	0.0211	0.0000	0.0211	3.1%	1.269
4-63	175.50	152.80	810	0.028	HDPE	N	0.013	8	1.311	5.811	0.018	1%	0.0476	0.0094	0.0570	4.3%	2.080
4-64	241.50	175.50	820	0.080	HDPE	N	0.013	8	2.222	9.848	0.011	0%	0.0288	0.0057	0.0345	1.6%	2.527
4-65a	148.80	146.50	460	0.005	HDPE	N	0.013	8	0.554	2.454	0.005	1%	0.0129	0.0032	0.0161	2.9%	0.750
4-65b	152.80	146.50	610	0.010	HDPE	N	0.013	8	0.796	3.528	0.003	0%	0.0082	0.0025	0.0107	1.3%	1.535
4-66	130.02	126.38	700	0.005	HDPE	N	0.013	8	0.565	2.503	0.022	4%	0.0599	0.0067	0.0666	11.8%	1.223
4-67	135.48	130.02	1050	0.005	HDPE	N	0.013	8	0.565	2.503	0.009	2%	0.0247	0.0097	0.0343	6.1%	1.015

ASSUMPTIONS FOR DESIGN OF THE SANITARY SEWER SYSTEM

Each building has a connection extending to the most distant point of the building from the connection to the backbone.

Sewer pipes are designed to maintain a 1% slope and any runs that do not meet this criteria are clearly marked on the exhibit. The areas not meeting the minimum 1% are located in the western portion of north Mare Island where consolidation of the soils is predicted to be less than in the remaining portion of north Mare Island.

The demands are based on the attached Utility Demand Factor Table.

The peak factor is based on the equations shown on page 5-9 of the City of Vallejo, Sanitation and Flood Control District (VSFCD) Design Standards.

The model accumulates peak flows through the system. Pipeline flow capacities are computed using Manning's equation. The roughness coefficient for Manning's equation computations is based on the VSFCD requirement of "n" = 0.013 for all pipes.

Infiltration allowances were based on 600 gallons per day per acre for new developments, and 4,000 gallons per day per acre for areas sewered as of January 1970 per VSFCD standards.

Utility Demand Factors [1]	LAND USE CLASSIFCATIONS																			
	NON-RESIDENTIAL							RESIDENTIAL						CIVIC/RECREATION/OPEN SPACE						
	HI	LI	WH	MIX	RET	UNIV	SCH	HR	MR	SF	SF-EX	L/W	DORM	GOLF	D-PK	R-PK	OS [4]	CVC	GOV	RDS
WATER																				
AFY/SF	0.00011	0.00008	0.00006	0.00008	0.00022	0.00022	0.00022											0.00022	0.00022	
AFY/AC (irrigation)		0.11202	0.05601	0.22404	0.22404	0.22404	0.22404	0.22404	0.22404	0.22404	0.22404	0.11202	0.11202		1.5			0.22404	0.22404	0.22404
AFY/DU								0.25	0.3	0.35	0.35	0.25								
AFY/EMP&PERS	0.05601	0.05601	0.05601	0.05601		0.05601	0.05601								0.01680	0.01680				
AFY/BED													0.11							
AFY/COURSE														315						
AFY/SF/CLUBHSE														0.0005						
WASTE WATER																				
% WATER/SF	85%	85%	80%	90%	85%	90%	90%							90%				90%	90%	
% WATER/EMP	85%	85%	85%	85%										80%	80%	85%				
GPD/DU								216	216	216	216	216	175							
STORM WATER																				
NEW C FACTOR [2]	0.90	0.68	0.85	0.65	0.73	0.65	0.65	0.40	0.40	0.35	0.35	0.35	0.35	0.20	0.20	0.20	0.27	0.20	0.20	0.80
EXIST. C FACTOR [3]	0.95	0.95	0.95	0.95	0.95										0.27		0.27	0.27	0.27	0.95

[1] Assumes Tight Lines. At the time of design, new lines will be increased one commercial size to account for I&I (according to the City of Vallejo).

[2] "C" Factor applicable to new development or redevelopment areas to City of Vallejo Standards.

[3] "C" Factor applicable to existing conditions and reuse of existing facilities; also includes local soil conditions for open areas.

[4] OS - There are a few areas where a portion of the open space will require irrigation.

LAND USE CLASSIFICATIONS

NON RESIDENTIAL		RESIDENTIAL		CIVIC/REC/OPEN SPACE/RDS	
HI	HEAVY INDUSTRIAL	HR	HIGH DENSITY - NEW	GOLF	GOLF COURSE
LI	LIGHT IND/ASSMBLY-MFG	MR	MED DENSITY - NEW	D-PK	DEVELOPED PARK
WH	WAREHOUSE/DISTRIBUTION	SF	SINGLE FAMILIY - NEW	R-PK	REGIONAL PARK
MIX	MIXED USE/OFFICE/R&D	SF-EX	SINGLE FAMILY - EXITING	OS	OPEN SPACE/SLC/MISC
RET	RETAIL/COMM	L/W	CONDO/LIVE/WORK	CVC	CIVIC/REC SPACE
UNIV	UNIVERSITY	DORM	DORMITORY BEDS	GOV	VA/ARMY/USFS
SCH	SCHOOLS			RDS	ROADS

MARE ISLAND NORTH ROAD IMPROVEMENT PROJECT
SANITARY SEWER SYSTEM
PIPE SIZE CALCULATIONS AND PUMP STATION DESIGN FLOWS

PIPE	US INV.	DS INV.	LENGTH (ft)	SLOPE (ft/ft)	MAT'L	NEW/ EXIST	"n"	DIAMETER (in)	Qfull (MGD)	Vfull (f/s)	90% BLDG ksf * 200gal/ksf	INFLOW (MGD)	% CAP	PEAK INFLOW	INFILTRATION (MGD)	PEAK + INFILTRATION (MGD)	PEAK %CAP	Q/Qfull	V/Vfull (from graph)	PEAK VELOCITY (f/s)	CONTRIBUTING AREA (ac)	INFILTRATION (gpd)	TOTAL INFLOW (MGD)
DOM 2 PUMP STATION																							
S-1	5.35	1.85	350	0.010	HDPE	N	0.013	6	0.364	2.865	14868.0	0.015	4%	0.0404	0.0033	0.0437	12.0%	0.120	0.540	1.547	5.51	3304	0.0437
S-2	1.85	-1.15	290	0.010	HDPE	N	0.013	6	0.370	2.914	14868.0	0.030	8%	0.0808	0.0066	0.0874	23.6%	0.236	0.670	1.953	5.51	3304	0.0874
S-4	4.50	1.60	340	0.0085	HDPE	N	0.013	6	0.336	2.646	13500.0	0.014	4%	0.0367	0.0029	0.0396	11.8%	0.118	0.530	1.403	4.84	2904	0.0396
S-3	1.60	-1.15	270	0.0102	HDPE	N	0.013	6	0.367	2.892	13500.0	0.027	7%	0.0734	0.0058	0.0792	21.6%	0.216	0.660	1.909	4.84	2904	0.0792
S-5	2.30	-1.15	450	0.0077	HDPE	N	0.013	8	0.686	3.039	7956.0	0.008	1%	0.0216	0.0024	0.0240	3.5%	0.035	0.320	0.973	4.0	2400	0.0240
S-6	-1.15	-3.03	280	0.007	HDPE	N	0.013	8	0.641	2.841	0.0	0.065	10%	0.1759	0.0148	0.1907	29.7%	0.297	0.720	2.046	0	0	0.1907
S-7	-3.03	-4.81	270	0.007	HDPE	N	0.013	8	0.637	2.822	0.0	0.065	10%	0.1759	0.0148	0.1907	30.0%	0.300	0.720	2.032	0	0	0.1907
S-10	2.60	0.20	240	0.010	HDPE	N	0.013	6	0.364	2.865	10755.0	0.011	3%	0.0292	0.0017	0.0309	8.5%	0.085	0.480	1.375	2.75	1652	0.0309
S-11	0.20	-2.80	260	0.012	HDPE	N	0.013	6	0.391	3.078	10755.0	0.022	6%	0.0585	0.0033	0.0618	15.8%	0.158	0.600	1.847	2.75	1652	0.0618
S-12	-2.80	-4.81	220	0.009	HDPE	N	0.013	6	0.348	2.739	3978.0	0.025	7%	0.0693	0.0057	0.0750	21.6%	0.216	0.660	1.808	4.00	2400	0.0750
S-15	1.99	0.34	165	0.010	HDPE	N	0.013	6	0.364	2.865	9162.0	0.009	3%	0.0249	0.0015	0.0264	7.2%	0.072	0.440	1.261	2.42	1452	0.0264
S-14	0.34	-2.91	330	0.010	HDPE	N	0.013	6	0.361	2.844	9162.0	0.018	5%	0.0498	0.0029	0.0527	14.6%	0.146	0.580	1.649	2.42	1452	0.0527
S-13	-2.91	-4.81	180	0.011	HDPE	N	0.013	6	0.374	2.944	7956.0	0.026	7%	0.0714	0.0053	0.0767	20.5%	0.205	0.650	1.914	4.00	2400	0.0767
S-8	-4.81	-5.91	110	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.116	15%	0.1728	0.0258	0.1986	25.4%	0.254	0.690	2.395	0	0	0.1986
S-16	5.00	0.63	480	0.009	HDPE	N	0.013	6	0.347	2.734	15750.0	0.016	5%	0.0428	0.0030	0.0459	13.2%	0.132	0.550	1.504	5.07	3042	0.0459
S-17	0.63	-2.38	330	0.009	HDPE	N	0.013	6	0.347	2.737	15750.0	0.032	9%	0.0856	0.0061	0.0917	26.4%	0.264	0.700	1.916	5.07	3042	0.0917
S-18	3.10	-2.38	350	0.016	HDPE	N	0.013	6	0.455	3.585	30132.0	0.030	7%	0.0819	0.0043	0.0862	18.9%	0.189	0.610	2.187	7.136667	4282	0.0862
S-9	-2.38	-5.91	330	0.011	HDPE	N	0.013	8	0.810	3.590	0.0	0.062	8%	0.1675	0.0146	0.1822	22.5%	0.225	0.680	2.441	7.136667	4282	0.1822
S-19	-5.91	-6.81	90	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.178	23%	0.2609	0.0405	0.3014	38.5%	0.385	0.790	2.742	0	0	0.3014
S-20	-6.81	-7.61	80	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.178	23%	0.2609	0.0405	0.3014	38.5%	0.385	0.790	2.742	0	0	0.3014
																						FLOW FROM DOM 2 DRAINAGE AREA (GPM):	**209**
																						FLOW FROM NEW RAILROAD AVENUE PUMP STATION:	**320**
																						TOTAL FLOW TO DOM 2:	**529**
CEDAR AVENUE PUMP STATION																							
LNS-1	11.00	8.00	300	0.010	HDPE	E	0.013	10	1.420	4.028	77328.0	0.077	5%	0.2102	0.0253	0.2355	16.6%	0.166	0.730	2.940	42.13	25278	0.235477
																						FLOW TO NEW CEDAR AVENUE PUMP STATION (GPM):	**164**
NEW RAILROAD AVENUE PUMP STATION																							
S-26	2.40	-0.60	310	0.010	HDPE	N	0.013	6	0.358	2.819	10800.0	0.011	3%	0.0294	0.0023	0.0317	8.9%	0.089	0.480	1.353	3.8525	2311.5	0.0317
S-27	-0.60	-2.50	190	0.010	HDPE	N	0.013	6	0.364	2.865	10800.0	0.022	6%	0.0587	0.0046	0.0633	17.4%	0.174	0.600	1.719	3.8525	2311.5	0.0633
S-28	-2.50	-4.40	200	0.010	HDPE	N	0.013	8	0.763	3.383	0.0	0.099	13%	0.2689	0.0046	0.2735	35.8%	0.358	0.790	2.673	0	0	0.2735
S-50	-1.90	-4.40	260	0.010	HDPE	N	0.013	6	0.357	2.810	12528.0	0.013	4%	0.0341	0.0023	0.0364	10.2%	0.102	0.520	1.461	3.8775	2326.5	0.0364
S-29	-4.40	-7.40	290	0.010	HDPE	N	0.013	8	0.796	3.530	0.0	0.111	14%	0.1656	0.0069	0.1725	21.7%	0.217	0.680	2.401	0	0	0.1725
S-30	1.70	-0.2	190	0.010	HDPE	N	0.013	6	0.364	2.865	7884.0	0.008	2%	0.0214	0.0023	0.0237	6.5%	0.065	0.420	1.203	3.8525	2311.5	0.0237
S-31	-0.20	-7.40	250	0.029	HDPE	N	0.013	6	0.617	4.863	7884.0	0.016	3%	0.0429	0.0046	0.0475	7.7%	0.077	0.480	2.334	3.8525	2311.5	0.0475

MARE ISLAND NORTH RO... IMPROVEMENT PROJECT
SANITARY SE... SYSTEM
PIPE SIZE CALCULATIONS AND PUMP STATION DESIGN FLOWS

PIPE	US INV.	DS INV.	LENGTH (ft)	SLOPE (ft/ft)	MAT'L	NEW/ EXIST	"n"	DIAMETER (in)	Qfull (MGD)	Vfull (f/s)	90% BLDG ksf * 200gal/ksf)	INFLOW (MGD)	% CAP	PEAK INFLOW	INFILTRATION (MGD)	PEAK + INFILTRATION (MGD)	PEAK %CAP	Q/Qfull	V/Vfull (from graph)	PEAK VELOCITY (f/s)	CONTRIBUTING AREA (ac)	INFILTRATION (gpd)	TOTAL INFLOW (MGD)
S-32	3.90	-7.40	250	0.045	HDPE	N	0.013	6	0.773	6.092	12528.0	0.013	2%	0.0341	0.0023	0.0364	4.7%	0.047	0.400	2.437	3.8775	2326.5	0.0364
S-33	-7.40	-9.20	170	0.011	HDPE	N	0.013	8	0.806	3.572	0.0	0.140	17%	0.2062	0.0139	0.2201	27.3%	0.273	0.700	2.500	0	0	0.2201
S-38	1.80	-2.8	460	0.010	HDPE	N	0.013	6	0.364	2.865	18576.0	0.019	5%	0.0505	0.0051	0.0556	15.3%	0.153	0.600	1.719	8.453333	5072	0.0556
S-37	-2.80	-5.20	220	0.011	HDPE	N	0.013	6	0.380	2.993	18576.0	0.037	10%	0.1010	0.0076	0.1086	28.6%	0.286	0.710	2.125	4.226667	2536	0.1086
S-36	-1.30	-5.20	390	0.010	HDPE	N	0.013	6	0.364	2.865	30132.0	0.030	8%	0.0819	0.0086	0.0905	24.9%	0.249	0.670	1.920	14.27333	8564	0.0905
S-35	-5.20	-7.2	200	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.067	9%	0.1829	0.0162	0.1991	25.4%	0.254	0.680	2.360	0	0	0.1991
S-34	-7.20	-9.20	190	0.011	HDPE	N	0.013	8	0.803	3.561	0.0	0.067	8%	0.1829	0.0162	0.1991	24.8%	0.248	0.680	2.422	0	0	0.1991
S-24	-9.20	-9.80	40	0.015	HDPE	N	0.013	8	0.959	4.251	0.0	0.207	22%	0.3019	0.0301	0.3320	34.6%	0.346	0.780	3.316	0	0	0.3320
S-23	-9.80	-12.80	20	0.150	HDPE	N	0.013	8	3.033	13.444	0.0	0.207	7%	0.3019	0.0301	0.3320	10.9%	0.109	0.530	7.125	0	0	0.3320
																						FLOW TO NEW RAILROAD AVENUE PUMP STATION FROM DRAINAGE AREA (GPM):	**231**
																						FLOW FROM DOM 1 (GPM):	**89**
																						TOTAL FLOW TO NEW RAILROAD AVENUE PUMP STATION (GPM):	**320**

DOM 1 PUMP STATION

PIPE	US INV.	DS INV.	LENGTH (ft)	SLOPE (ft/ft)	MAT'L	NEW/ EXIST	"n"	DIAMETER (in)	Qfull (MGD)	Vfull (f/s)	90% BLDG ksf * 200gal/ksf)	INFLOW (MGD)	% CAP	PEAK INFLOW	INFILTRATION (MGD)	PEAK + INFILTRATION (MGD)	PEAK %CAP	Q/Qfull	V/Vfull (from graph)	PEAK VELOCITY (f/s)	CONTRIBUTING AREA (ac)	INFILTRATION (gpd)	TOTAL INFLOW (MGD)
S-49	0.50	-1.20	120	0.014	HDPE	N	0.013	6	0.433	3.410	2808.0	0.003	1%	0.0076	0.0009	0.0085	2.0%	0.020	0.290	0.989	1.48	888	0.0085
S-39	-1.20	-2.20	100	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.003	0%	0.0076	0.0009	0.0085	1.1%	0.011	0.240	0.833	0	0	0.0085
S-51	2.3	-2.20	500	0.009	HDPE	N	0.013	6	0.345	2.718	12528.0	0.013	4%	0.0341	0.0023	0.0364	10.5%	0.105	0.520	1.414	3.8775	2326.5	0.0364
S-40	-2.20	-3.40	120	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.015	2%	0.0417	0.0032	0.0449	5.7%	0.057	0.420	1.458	0	0	0.0449
S-48	0.50	-3.40	200	0.020	HDPE	N	0.013	6	0.508	4.001	5166.0	0.005	1%	0.0140	0.0009	0.0149	2.9%	0.029	0.380	1.520	1.48	888	0.0149
S-52	1.5	-3.40	410	0.012	HDPE	N	0.013	6	0.397	3.132	12528.0	0.013	3%	0.0341	0.0023	0.0364	9.2%	0.092	0.500	1.566	3.8775	2326.5	0.0364
S-41	-3.40	-5.30	190	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.033	4%	0.0898	0.0064	0.0962	12.3%	0.123	0.530	1.840	0	0	0.0962
S-47	0.50	-5.30	250	0.023	HDPE	N	0.013	6	0.554	4.364	2808.0	0.003	1%	0.0076	0.0009	0.0085	1.5%	0.015	0.250	1.091	1.48	888	0.0085
S-42	-5.30	-7.00	180	0.009	HDPE	N	0.013	8	0.761	3.373	0.0	0.036	5%	0.0974	0.0073	0.1047	13.8%	0.138	0.540	1.822	0	0	0.1047
S-46	0.50	-2.50	150	0.020	HDPE	N	0.013	6	0.514	4.052	5166.0	0.005	1%	0.0140	0.0009	0.0149	2.9%	0.029	0.380	1.540	1.48	888	0.0149
S-45	0.50	-2.50	140	0.021	HDPE	N	0.013	6	0.532	4.194	2808.0	0.003	1%	0.0076	0.0009	0.0085	1.6%	0.016	0.280	1.174	1.48	888	0.0085
S-43	-2.50	-7.00	170	0.026	HDPE	N	0.013	8	1.274	5.647	0.0	0.008	1%	0.0217	0.0018	0.0235	1.8%	0.018	0.285	1.810	0	0	0.0235
S-44	-7.00	-7.10	10	0.010	HDPE	N	0.013	8	0.783	3.471	0.0	0.044	6%	0.1191	0.0091	0.1282	16.4%	0.164	0.600	2.083	0	0	0.1282
																						TOTAL FLOW TO DOM 1 (GPM):	**89**

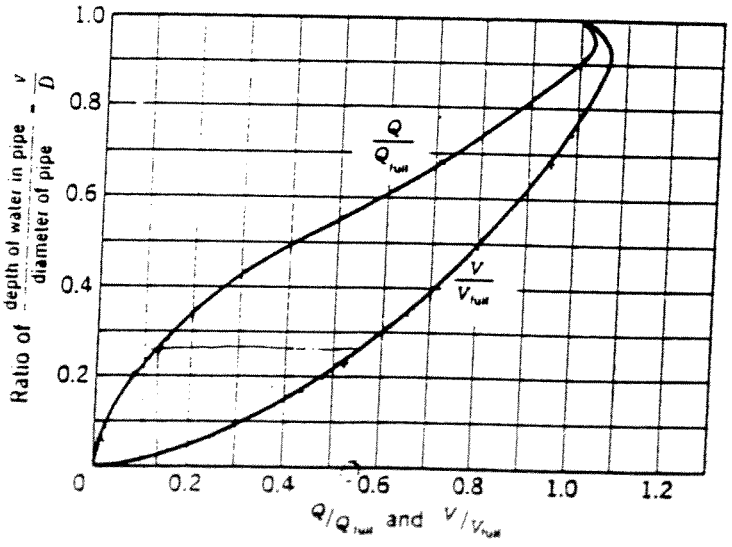


Figure 10-3 circular pipe

Size Force Main from Dom 2 to MH, Gravity flow from MH. to City of Vallejo TS

$Q = VA$

$V = 2.5\ ft/sec$ - City of Vallejo std.

$$Q = 530\ gal/min \cdot \frac{ft^3}{7.48\ gal} \cdot \frac{min}{60\ sec} = 1.18\ \frac{ft^3}{sec}$$

$$A = \frac{1.18\ ft^3/sec}{2.5\ ft/sec} = 0.47\ ft^2 \cdot \frac{144\ in^2}{ft^2} = 68\ in^2$$

circular pipe: $A = \pi r^2 = 68.0\ in^2$

$$r^2 = 21.65\ in^2$$

$$r = 4.65\ in$$

$$d = 9.3\ in \longrightarrow \underline{10"\ pipe}$$

Size FM from Dom I Pump Station — N. MI

$Q = VA$

given $V = 2.5$ ft/sec - City of Vallejo min. design standard

$Q = 128{,}200$ gal/day - Flow as estimated for Dom I

$$128{,}200 \frac{\text{gal}}{\text{day}} \cdot \frac{1 \text{ day}}{24 \text{ hrs}} \cdot \frac{\text{hr}}{60 \text{ min}} = 89 \frac{\text{gal}}{\text{min}}$$

$$89 \frac{\text{gal}}{\text{min}} \cdot \frac{\text{ft}^3}{7.48 \text{ gal}} \cdot \frac{\text{min}}{60 \text{ sec}} = 0.198 \frac{\text{ft}^3}{\text{sec}}$$

$$A = \frac{0.198 \text{ ft}^3/\text{sec}}{2.5 \text{ ft/sec}} = 0.08 \text{ ft}^2$$

$$0.08 \text{ ft}^2 \cdot \frac{144 \text{ in}^2}{\text{ft}^2} = 11.42 \text{ in}^2$$

circular pipe:

$A = \pi r^2 = 11.42 \text{ in}^2$

$A = r^2 = \frac{10.5 \text{ in}^2}{\pi}$

$r^2 = 3.64 \text{ in}^2$

$r = 1.91$ in

$d = 3.8$ in $\longrightarrow$ 4 in pipe

Size FM from Lennar Dev. Area near Cedar Ave.

$Q = VA$

given $V = 2.5\ ft/sec$.

$$Q = 165\ gal/min \cdot \frac{1\ ft^3}{7.48\ gals} \cdot \frac{1\ min}{60\ sec} = 0.37\ ft^3/sec$$

$$A = \frac{0.37\ ft^3/sec}{2.5\ ft/sec} = 0.15\ ft^2 \cdot \frac{144\ in^2}{1\ ft^2} = 21.2\ in^2$$

$$A = \pi r^2 = 21.2\ in^2$$

$$r^2 = 6.74\ in^2$$

$$r = 2.6\ in$$

$$d = 5.2\ in \longrightarrow \underline{6"\ pipe}$$

Size Force Main from New Pump Station along Railroad Ave to Dom 2

$Q = VA$

$V = 2.5\ ft/sec$ - City of Vallejo Standard

$Q = 320\ gal/min \rightarrow$ estimated flow for Dom 2

$= 0.71\ ft^3/sec$

$$A = \frac{0.71\ \frac{ft^3}{sec}}{2.5\ ft/sec} = 0.285\ ft^2 \cdot \frac{144\ in^2}{ft^2} = 41.1\ in^2$$

$A = \pi r^2 = 41.1\ in^2$

$r^2 = 13.07\ in^2$

$r = 3.62\ in$

$d = 7.23\ in \rightarrow$ 8 in pipe

Water Distribution System Calculations

Table 3-1. Historical Water Use in the City of Vallejo

Year	Flow rate, mgd[a]		Ratio of maximum to average
	Average day	Maximum day	
1980	14.31	-	-
1981	14.99	-	-
1982	14.77	-	-
1983	14.89	-	-
1984	17.27	-	-
1985	17.23	29.152	1.69
1986	18.28	29.095	1.59
1987	18.87	30.907	1.64
1988	19.78	29.289	1.48
1989	20.20	33.360	1.65
1990	19.41	27.922	1.44
1991	19.64	28.41	1.45
1992	18.92	29.47	1.56
1993	17.73	29.56	1.67
1994	16.06	24.76	1.54
3-year average[b]	17.57	-	1.59[c]

[a]Fleming Hill Water Treatment Plant records of flows to distribution system.
[b]1992-1994.
[c]Ten-year average is 1.57.

The ratio of maximum day demand to average day demand was relatively constant during this period. This ratio, denoted the maximum day factor, ranged between 1.44 and 1.67. The lowest ratios occurred during the most severe drought period, and likely a reflection of water conservation. For the purpose of this study, a value of 1.6 was used, which was the latest 3-year average ratio of maximum day demand to average day demand.

The ratio of peak hour demand (defined as the maximum flow rate sustained for an hour) to maximum day demand cannot be calculated, because hourly demand data are not available. This ratio, denoted the peak hour factor, was assumed to be 1.66 in this study. This is the value

Table 3-3. Vallejo Fire Department Fire Flow Requirements

Zoning designation	Fire flow requirement	
	Flow rate, gpm	Duration, hours
Resource Conservation (RC)	None	None
Rural Residential (RR)	1,500	2
Low Density Residential (LDR)	1,500	2
Medium Density Residential (MDR)	2,500	2
Residential View District (RVD)	2,500	2
Neighborhood Shopping and Service (CN)	2,500	2
Schools	3,000	3
High Density Residential (HDR)	3,500	3
Architectural Heritage District (A-H)	3,500	3
Linear Commercial (CL)	3,500	3
Waterfront Shopping and Service (CW)	3,500	3
Freeway Shopping and Service (CF)	3,500	3
Planned Development Residential (PDR)	3,500	3
Intensive Use (IU)	3,500	3
Limited Office (LO)	3,500	3
Pedestrian Shopping and Service (CP)	4,500	4
Planned Development Commercial (PDC)	4,500	4
Planned Development Industrial (PDI)	4,500	4
Medical	4,500	4

Note: Adjustments to fire flow requirements may be made based on consultations with the fire marshall.

Fire flow requirements are added to maximum day demands when evaluating pumping and storage needs. Based upon a recent review of land use and zoning, the Vallejo Fire Department (VFD) has established fire flow requirements based on zoning as presented in Table 3-3. Fire flow requirements vary between 1,500 gallons per minute (gpm) for certain residential areas to 4,500 gpm for high-risk zones such as medical facilities and certain commercial areas. Figure 3-2 depicts the overall fire requirements by pressure zone. Certain individual structures require higher fire flows. For example, Insurance Service Office (ISO) has identified one location at Virginia Street, east of Marin Street, with a fire flow demand of 8,000 gpm. Note that the VFD has previously recognized that the existing water mains will not deliver the minimum fire flows shown on Figure 3-2 without significant costly distribution system improvements. For example, in 1991 for the Burnham Zone, the VFD agreed that a 1,000-gpm fire flow was sufficient for planning purposes (Brown and Caldwell, 1991). This was subsequently revised to 2,500 gpm for the Capitol Zone and 1,500 gpm for the Burnham Zone during a meeting with the VFD on August 17, 1995.

Unit Demand Factors. The 1985 Water Master Plan specified demand factors used for establishing the water demand at each node in the Kentucky Pipe model. The demand factors were reviewed, for suitability for the Cybernet model used for this update.

- **Residential Density.** Density of 2.77 persons per unit. The 1985 Water Master Plan stated that this value was obtained from the City Planning Department. In January 1995, the density was 2.9 persons *per household*, according to the City Planning Department. The density per lot would be higher due to multiple housing units on some lots.

- **Commercial and Industrial Area Population Density.** Density of 15 persons per acre. This value is reasonable, considering the light nature of industry in Vallejo.

- **Domestic Usage.** Usage of 152 gallons per capita per day, derived in the 1985 Water Master Plan by subtracting metered industrial and commercial demands from the total demand and dividing by the population, using mid-1980s data.

For this report, the demand at each node in the model was increased from the demands defined in the 1985 Water Master Plan so that the annual demand of all nodes totaled 17.6 mgd, which agrees with the 3-year average value of 17.6 mgd (Table 3-1).

Projected Future Demands. The City water use in 1994 was 16.1 mgd (17,900 acre-feet per year). The City's 1985 Water Master Plan projected that ultimate average day water use would be 25.6 mgd (28,687 acre-feet per year). Maximum day demand was projected at

Scenario: Base

Scenario: Base
Fire Flow Analysis
Fire Flow Report

Node Label	Needed Fire Flow (gpm)	Total Needed Flow (gpm)	Satisfies Fire Flow Constraints	Available Fire Flow (gpm)	Residual Pressure (psi)	Calculated Residual Pressure (psi)	Minimum Zone Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Minimum System Pressure (psi)	Calculated Minimum System Pressure (psi)	Minimum System Junction
J-1	4,500.00	4,626.95	true	4,501.00	30.00	57.92	30.00	43.46	J-21	30.00	43.46	J-21
J-2	4,500.00	4,544.73	true	4,501.00	30.00	43.91	30.00	43.34	J-21	30.00	43.34	J-21
J-3	4,500.00	4,544.76	false	4,301.43	30.00	30.00	30.00	36.48	J-5	30.00	36.48	J-5
J-4	4,500.00	4,544.76	false	3,852.54	30.00	30.00	30.00	36.77	J-3	30.00	36.77	J-3
J-5	4,500.00	4,544.73	false	3,708.76	30.00	30.00	30.00	38.82	J-3	30.00	38.82	J-3
J-6	4,500.00	4,562.55	true	4,501.00	30.00	54.25	30.00	43.37	J-21	30.00	43.37	J-21
J-7	4,500.00	4,529.44	true	4,501.00	30.00	49.48	30.00	43.32	J-21	30.00	43.32	J-21
J-8	4,500.00	4,529.44	true	4,501.00	30.00	51.05	30.00	43.32	J-21	30.00	43.32	J-21
J-9	4,500.00	4,562.55	true	4,501.00	30.00	55.11	30.00	43.37	J-21	30.00	43.37	J-21
J-10	4,500.00	4,562.55	true	4,501.00	30.00	59.52	30.00	43.37	J-21	30.00	43.37	J-21
J-11	4,500.00	4,572.86	true	4,501.00	30.00	56.76	30.00	43.38	J-21	30.00	43.38	J-21
J-12	4,500.00	4,540.35	true	4,501.00	30.00	60.46	30.00	43.34	J-21	30.00	43.34	J-21
J-13	4,500.00	4,529.44	true	4,501.00	30.00	45.77	30.00	43.32	J-21	30.00	43.32	J-21
J-14	4,500.00	4,529.44	true	4,501.00	30.00	53.76	30.00	43.32	J-21	30.00	43.32	J-21
J-15	4,500.00	4,569.96	true	4,501.00	30.00	51.39	30.00	43.38	J-21	30.00	43.38	J-21
J-16	4,500.00	4,538.89	true	4,501.00	30.00	42.39	30.00	41.87	J-29	30.00	41.87	J-29
J-17	4,500.00	4,576.07	true	4,501.00	30.00	40.82	30.00	41.38	J-29	30.00	41.38	J-29
J-20	4,500.00	4,507.31	true	4,501.00	30.00	38.92	30.00	39.55	J-31	30.00	39.55	J-31
J-21	4,500.00	4,533.12	true	4,501.00	30.00	43.33	30.00	61.12	J-22	30.00	61.12	J-22
J-22	4,500.00	4,634.91	true	4,501.00	30.00	47.60	30.00	43.47	J-21	30.00	43.47	J-21
J-23	4,500.00	4,594.51	true	4,501.00	30.00	49.07	30.00	43.41	J-21	30.00	43.41	J-21
J-24	4,500.00	4,520.49	true	4,501.00	30.00	40.74	30.00	43.31	J-21	30.00	43.31	J-21
J-25	4,500.00	4,622.89	true	4,501.00	30.00	44.23	30.00	43.45	J-21	30.00	43.45	J-21
J-26	4,500.00	4,530.17	true	4,501.00	30.00	38.97	30.00	42.48	J-24	30.00	42.48	J-24
J-27	4,500.00	4,535.57	true	4,501.00	30.00	39.47	30.00	39.78	J-28	30.00	39.78	J-28
J-28	4,500.00	4,513.21	true	4,501.00	30.00	37.32	30.00	40.62	J-36	30.00	40.62	J-36
J-29	4,500.00	4,517.11	true	4,501.00	30.00	39.07	30.00	40.45	J-34	30.00	40.45	J-34
J-30	4,500.00	4,509.26	true	4,501.00	30.00	33.46	30.00	37.28	J-39	30.00	37.28	J-39
J-31	4,500.00	4,518.89	true	4,501.00	30.00	39.28	30.00	39.64	J-20	30.00	39.64	J-20
J-32	4,500.00	4,524.39	true	4,501.00	30.00	45.80	30.00	40.20	J-34	30.00	40.20	J-34
J-33	4,500.00	4,535.37	true	4,501.00	30.00	36.80	30.00	38.72	J-28	30.00	38.72	J-28
J-34	4,500.00	4,500.00	true	4,501.00	30.00	35.95	30.00	39.77	J-36	30.00	39.77	J-36
J-35	4,500.00	4,520.33	true	4,501.00	30.00	37.68	30.00	38.44	J-28	30.00	38.44	J-28
J-36	4,500.00	4,553.18	true	4,501.00	30.00	37.71	30.00	39.75	J-28	30.00	39.75	J-28
J-37	4,500.00	4,533.92	true	4,501.00	30.00	48.96	30.00	39.12	J-34	30.00	39.12	J-34
J-38	4,500.00	4,539.26	true	4,501.00	30.00	38.12	30.00	39.70	J-34	30.00	39.70	J-34
J-39	4,500.00	4,514.90	false	4,058.10	30.00	30.00	30.00	43.89	J-21	30.00	43.89	J-21
J-40	4,500.00	4,574.37	true	4,501.00	30.00	38.06	30.00	36.42	J-44	30.00	36.42	J-44
J-41	4,500.00	4,546.82	true	4,501.00	30.00	37.99	30.00	36.90	J-45	30.00	36.90	J-45
J-42	4,500.00	4,527.42	true	4,501.00	30.00	37.26	30.00	37.49	J-45	30.00	37.49	J-45
J-43	4,500.00	4,515.11	true	4,501.00	30.00	33.01	30.00	34.55	J-47	30.00	34.55	J-47
J-44	4,500.00	4,519.39	true	4,501.00	30.00	30.74	30.00	36.72	J-45	30.00	36.72	J-45
J-45	4,500.00	4,530.66	false	4,458.33	30.00	30.00	30.00	37.26	J-44	30.00	37.26	J-44
J-47	4,500.00	4,521.87	false	4,131.90	30.00	30.00	30.00	40.52	J-43	30.00	40.52	J-43
J-48	4,500.00	4,524.58	true	4,501.00	30.00	34.87	30.00	34.99	J-44	30.00	34.99	J-44
J-49	4,500.00	4,538.74	true	4,501.00	30.00	35.78	30.00	35.57	J-45	30.00	35.57	J-45
J-50	4,500.00	4,541.91	true	4,501.00	30.00	35.87	30.00	35.73	J-45	30.00	35.73	J-45
J-51	4,500.00	4,547.35	true	4,501.00	30.00	31.64	30.00	36.30	J-72	30.00	36.30	J-72
J-52	4,500.00	4,525.97	true	4,501.00	30.00	33.48	30.00	34.12	J-57	30.00	34.12	J-57
J-53	4,500.00	4,559.63	true	4,501.00	30.00	35.06	30.00	35.06	J-56	30.00	35.06	J-56

Scenario: Base
Fire Flow Analysis
Fire Flow Report

Node Label	Needed Fire Flow (gpm)	Total Needed Flow (gpm)	Satisfies Fire Flow Constraints	Available Fire Flow (gpm)	Residual Pressure (psi)	Calculated Residual Pressure (psi)	Minimum Zone Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Minimum System Pressure (psi)	Calculated Minimum System Pressure (psi)	Minimum System Junction
J-55	4,500.00	4,539.82	true	4,501.00	30.00	34.12	30.00	30.17	J-57	30.00	30.17	J-57
J-56	4,500.00	4,547.94	true	4,501.00	30.00	33.81	30.00	34.01	J-58	30.00	34.01	J-58
J-57	4,500.00	4,560.84	true	4,501.00	30.00	30.19	30.00	30.37	J-62	30.00	30.37	J-62
J-58	4,500.00	4,544.90	true	4,501.00	30.00	30.30	30.00	30.42	J-60	30.00	30.42	J-60
J-60	4,500.00	4,537.49	false	4,389.35	30.00	30.00	30.00	30.42	J-61	30.00	30.42	J-61
J-61	4,500.00	4,526.16	false	4,359.13	30.00	30.00	30.00	30.79	J-60	30.00	30.79	J-60
J-62	4,500.00	4,562.67	false	4,423.83	30.00	30.00	30.00	30.90	J-61	30.00	30.90	J-61
J-64	4,500.00	4,540.58	true	4,501.00	30.00	33.82	30.00	34.49	J-52	30.00	34.49	J-52
J-63	4,500.00	4,554.76	false	4,485.15	30.00	30.00	30.00	30.89	J-57	30.00	30.89	J-57
J-66	4,500.00	4,532.70	true	4,501.00	30.00	35.40	30.00	41.00	J-29	30.00	41.00	J-29
J-69	4,500.00	4,500.00	true	4,501.00	30.00	38.68	30.00	39.11	J-30	30.00	39.11	J-30
J-70	4,500.00	4,500.00	true	4,501.00	30.00	35.07	30.00	35.58	J-72	30.00	35.58	J-72
J-72	4,500.00	4,500.00	true	4,501.00	30.00	32.39	30.00	36.02	J-70	30.00	36.02	J-70
J-73	4,500.00	4,529.44	true	4,501.00	30.00	49.54	30.00	43.01	J-24	30.00	43.01	J-24
J-74	4,500.00	4,500.00	true	4,501.00	30.00	35.31	30.00	34.68	J-51	30.00	34.68	J-51

Scenario: Base
Fire Flow Analysis
JUNCTION REPORT MARE ISLAND

Node Label	Elevation (ft)
J-1	100.00
J-2	125.00
J-3	125.00
J-4	110.00
J-5	110.00
J-6	112.50
J-7	111.00
J-8	112.50
J-9	112.50
J-10	125.00
J-11	120.00
J-12	100.00
J-13	112.00
J-14	112.00
J-15	112.00
J-16	115.00
J-17	125.00
J-20	120.00
J-21	185.00
J-22	140.00
J-23	125.00
J-24	135.00
J-25	120.00
J-26	130.00
J-27	120.00
J-28	130.00
J-29	125.00
J-30	112.00
J-31	120.00
J-32	100.00
J-33	120.00
J-34	125.00
J-35	120.00
J-36	125.00
J-37	100.00
J-38	120.00
J-39	112.00
J-40	115.00
J-41	117.00
J-42	117.00
J-43	112.00
J-44	120.00
J-45	120.00
J-47	112.00
J-48	110.00
J-49	110.00
J-50	110.00
J-51	112.00
J-52	110.00
J-53	110.00
J-55	100.00
J-56	110.00

Node Label	Elevation (ft)
J-57	110.00
J-58	110.00
J-60	110.00
J-61	110.00
J-62	110.00
J-64	110.00
J-63	110.00
J-66	125.00
J-69	112.00
J-70	116.00
J-72	116.00
J-73	112.00
J-74	110.00

Scenario: Base
Fire Flow Analysis
PIPE DATA MARE ISLAND

Link Label	Length (ft)	Diameter (in)	Material	Roughness	Minor Loss
P-2	1,344.00	20	PVC	120.0	0.55
P-8	983.00	20	PVC	120.0	2.56
P-3	1,465.00	20	PVC	120.0	1.68
P-4	668.00	12	PVC	120.0	2.43
P-30	1,248.00	20	PVC	120.0	0.63
P-5	616.00	10	PVC	120.0	2.08
P-6	1,853.00	10	PVC	120.0	1.60
P-7	2,481.00	12	PVC	120.0	1.20
P-9	583.00	12	PVC	120.0	2.08
P-12	675.00	20	PVC	120.0	1.15
P-10	2,106.00	12	PVC	120.0	0.00
P-13	652.00	12	Ductile Iro	100.0	0.00
P-118	1,469.00	12	Cast iron	100.0	2.60
P-14	387.00	12	Cast iron	100.0	1.50
P-15	1,235.00	12	Cast iron	100.0	0.70
P-18	818.00	12	PVC	120.0	2.66
P-36	597.00	12	Cast iron	100.0	0.85
P-20	502.00	10	Cast iron	100.0	2.56
P-21	691.00	10	Ductile Iro	100.0	0.70
P-23	1,219.00	10	Cast iron	100.0	0.70
P-19	513.00	12	PVC	120.0	1.63
P-22	700.00	12	PVC	120.0	0.00
P-24	1,240.00	12	PVC	120.0	1.20
P-29	258.00	10	Cast iron	100.0	0.70
P-25	263.00	10	Cast iron	100.0	1.78
P-45	428.00	12	PVC	120.0	0.85
P-47	111.00	12	PVC	120.0	0.00
P-111	750.00	10	Cast iron	100.0	5.96
P-31	1,356.00	16	PVC	120.0	2.13
P-32	1,668.00	12	PVC	120.0	1.63
P-33	679.00	8	Cast iron	100.0	2.56
P-34	1,300.00	12	PVC	120.0	0.70
P-35	754.00	12	PVC	120.0	2.56
P-37	1,113.00	12	PVC	120.0	0.70
P-39	507.00	12	Cast iron	100.0	0.70
P-119	641.00	12	Cast iron	100.0	1.83
P-38	890.00	8	Cast iron	100.0	2.56
P-41	1,317.00	12	PVC	120.0	0.70
P-43	1,424.00	12	Cast iron	100.0	1.63
P-42	753.00	12	PVC	120.0	0.85
P-51	857.00	12	Cast iron	100.0	2.58
P-53	743.00	12	PVC	120.0	0.85
P-48	333.00	8	Cast iron	100.0	0.00
P-52	756.00	12	Cast iron	100.0	0.85
P-60	722.00	10	Cast iron	100.0	0.00
P-49	461.00	12	PVC	120.0	1.00
P-109	527.00	12	PVC	120.0	1.30
P-58	727.00	12	PVC	120.0	0.00
P-57	400.00	12	PVC	120.0	0.00
P-54	661.00	8	Cast iron	130.0	2.56
P-62	1,174.00	12	PVC	120.0	0.70
P-55	432.00	12	Cast iron	100.0	0.70

Scenario: Base
Fire Flow Analysis
PIPE DATA MARE ISLAND

Link Label	Length (ft)	Diameter (in)	Material	Roughness	Minor Loss
P-63	1,152.00	12	Cast iron	100.0	0.85
P-59	342.00	12	PVC	120.0	0.00
P-64	1,177.00	12	Cast iron	100.0	0.85
P-103	437.00	12	PVC	120.0	1.00
P-65	1,196.00	10	Cast iron	100.0	0.70
P-66	650.00	12	PVC	120.0	1.78
P-69	601.00	12	PVC	120.0	0.70
P-67	439.00	12	PVC	120.0	1.00
P-70	589.00	12	Cast iron	100.0	1.00
P-112	302.00	12	Cast iron	100.0	1.78
P-72	593.00	10	PVC	120.0	0.70
P-76	1,144.00	12	PVC	120.0	0.70
P-77	1,202.00	12	Cast iron	100.0	2.40
P-79	1,358.00	10	PVC	120.0	3.23
P-80	653.00	14	Cast iron	100.0	2.18
P-83	983.00	14	Transite	100.0	0.70
P-81	465.00	20	Cast iron	100.0	1.70
P-84	917.00	20	PVC	120.0	1.00
P-124	351.00	14	Cast iron	100.0	2.40
P-87	1,281.00	14	Cast iron	100.0	0.35
P-99	645.00	16	PVC	120.0	1.78
P-88	812.00	20	PVC	120.0	0.35
P-89	240.00	16	PVC	120.0	0.35
P-90	669.00	14	Cast iron	100.0	0.50
P-97	679.00	16	PVC	120.0	1.63
P-93	372.00	14	Cast iron	100.0	0.50
P-94	475.00	16	PVC	120.0	0.80
P-95	1,112.00	16	PVC	120.0	1.60
P-96	748.00	16	PVC	120.0	1.15
P-100	460.00	16	PVC	120.0	1.78
P-98	498.00	16	PVC	120.0	0.85
P-121	1,183.00	8	Cast iron	100.0	2.08
P-122	881.00	12	Cast iron	100.0	4.96
P-123	395.00	10	Cast iron	100.0	1.30
P-110	471.00	12	PVC	120.0	1.30
P-113	542.00	12	Cast iron	100.0	1.78
P-116	598.00	14	Cast iron	100.0	1.78
P-120	179.00	12	Cast iron	100.0	1.83
P-125	394.00	14	Cast iron	100.0	2.40
P-126	1,159.00	14	Cast iron	100.0	1.00

Scenario: Base
Fire Flow Analysis
MARE ISLAND TANK REPORT

Node Label	Base Elevation (ft)	Minimum Level (ft)	Initial Level (ft)	Maximum Level (ft)	Inactive Volume (ft^3)	Tank Diameter (ft)	Tank Inflow (gpm)	Current Status	Calculated Hydraulic Grade (ft)	Tank Level (ft)
T-1	285.00	6.20	12.20	31.20	802,000.00	200.00	-2,619.38	Draining	297.20	12.20