3Roots San Diego Project
Environmental Impact Report

SCH No. 2018041065; Project No. 587128

Appendix N

Water Study

June 2019

DEXTER WILSON ENGINEERING, INC.

WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

WATER STUDY
FOR THE
3ROOTS PROJECT IN THE
CITY OF SAN DIEGO

April 10, 2019

2234 FARADAY AVENUE • CARLSBAD, CA • (760) 438-4422

From:	Itkin, Irina
To:	Andrew Oven
Cc:	Wilson, Leonard; Zounes, WilliamJ.
Subject:	3 Roots Water study PTS #587128
Date:	Friday, April 26, 2019 3:45:40 PM
Attachments:	2019-04-10 3Roots Water Study Letter ReportREV3.pdf

Andrew,

We have completed our review of the revised 3-Roots water study, dated April 10, 2019. The subject sewer study is accepted by the Water and Sewer Development Review Section of the Development Services Department.

Copy attached.

Thank you,

Irina Itkin
Assistant Engineer-Civil
Water and Sewer Development Review
Development Services
1222 First Avenue, MS 401
San Diego CA 92101
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WATER STUDY
FOR THE
3ROOTS PROJECT IN THE
CITY OF SAN DIEGO

April 10, 2019

Prepared for:

3ROOTS
by Mesa Canyon Community Partners

4-10-2019

Prepared by:
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Job No. 537-012

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April 10, 2019 537-012

Project Design Consultants
701 B Street, Suite 800
San Diego, CA 92101

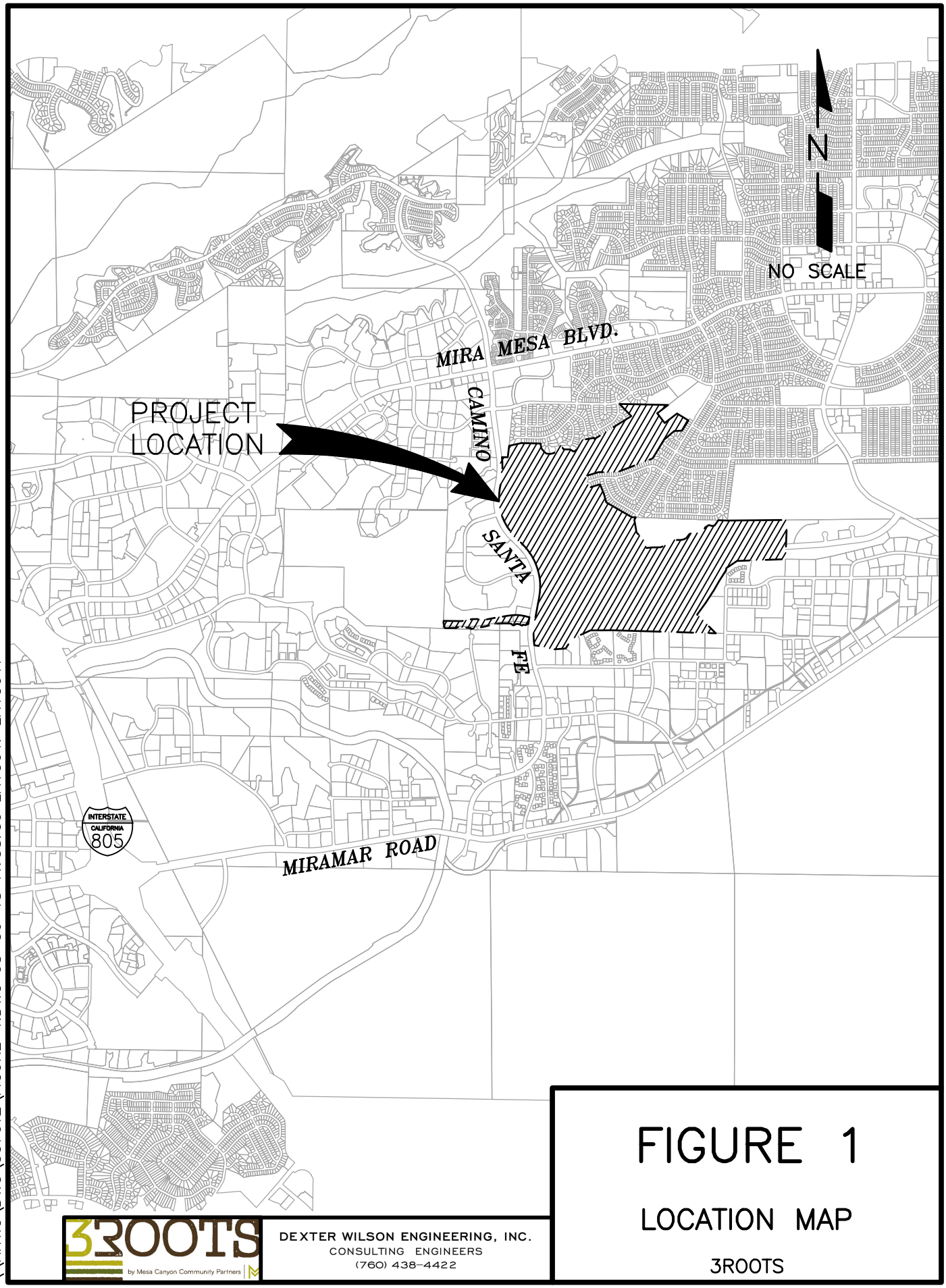
Attention: Greg Shields, P.E., Chief Executive Officer

Subject: Water Study for the 3Roots Project in the City of San Diego

Introduction

The 3Roots project is located in the City of San Diego, east of Camino Santa Fe, south of Mira Mesa Boulevard, and north of Miramar Road. Access to the project will be from Camino Santa Fe on the west and Carroll Canyon Road on the east. Public and private streets and drives will provide access throughout the project. As part of the project, Carroll Canyon Road will be constructed from the easterly terminus to the intersection with Camino Santa Fe. Figure 1 provides a vicinity map for the project.

The project encompasses approximately 412.9 acres and proposes to develop the site with a maximum of 1,800 residential dwelling units, a 10.8 acre commercial area, a 1.7 acre transit center, and several parks and trails totaling 38.7 acres. Elevations on the project range from approximately 258 feet to 334 feet. Topography of the project site slopes generally from a high point on the east end downwards towards the west.



\\ARTIC\DWG\537012\FIGURE-1.DWG 08-30-18 11:38:59 LAYOUT: LAYOUT1

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by Mesa Canyon Community Partners

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FIGURE 1

LOCATION MAP

3ROOTS

Water Demands

Water demands were developed in accordance with the City of San Diego Design Guidelines and Standards. Residential water demand is estimated based on population and a unit water demand of 150 gpd/person. Water demands for the commercial area and transit center are estimated based on net developed acreage and a unit water demand of 5,000 gal/net acre-day. Park water demands are estimated based on net developed acreage and a unit water demand of 4,000 gal/net acre-day.

Table 1 presents the average potable water demand for each planning area within the 3Roots project (971,485 gpd; 675 gpm). In order to determine water demands for residential areas, populations were estimated. Populations were estimated by determining dwelling unit densities from net area and dwelling unit data. Net area and dwelling unit data are presented on a Site Plan Exhibit, provided by the project civil engineer, in Appendix A. After determining the dwelling unit density for each planning area, the unit density was determined using Table 2-1 from Book 2 of the City of San Diego Design Guidelines and Standards, which is also included in Appendix A. Unit densities and dwelling unit counts were used to estimate population and ultimately water demand for each residential planning area.

The net area data presented on the Site Plan Exhibit in Appendix A and unit water demand factors were used to estimate water demand for nonresidential planning areas (PA 19 - MU, PA 20 - MM, and Community Park). Figure 2 presents the 3Roots project's planning areas.

From Book 2 of the City of San Diego Guidelines and Standards, Figure 2-2, the maximum day demand to average annual demand ratio is approximately 2.0 based on the Inland Central peaking curve, resulting in an estimated maximum day demand of 1,942,970 gpd (1,350 gpm).

From Book 2 of the City of San Diego Guidelines and Standards, Figure 2-1, the peak hour demand to average annual demand ratio is approximately 4.8 based on the Inland Central peaking curve, resulting in an estimated peak hour demand of 4,663,128 gpd (3,239 gpm).

Appendix B of this report presents the backup data for determining these peaking factors.

TABLE 1
3ROOTS PROJECT
AVERAGE POTABLE WATER DEMAND

Planning Area	Net Area, ac	Dwelling Units	Dwelling Unit Density, DU/ac	Unit Density, Pop./DU	Total Population	Average Water Demand, gpd
PA1	3.5	56	16.2	3.2	168.0	25,200
PA2	6.4	78	12.2	3.2	249.6	37,440
PA3	13.7	78	5.7	3.5	276.5	41,475
PA4	8.3	54	6.5	3.5	189.0	28,350
PA5	12.1	141	11.6	3.5	429.0	64,350
PA6	6.3	53	8.4	3.5	169.6	25,440
PA7	4.1	66	16.2	3.2	213.0	31,950
PA8	5.1	118	23.1	3.1	252.0	37,800
PA9	4.6	68	14.8	3.2	291.0	43,650
PA10	4.5	61	13.5	3.2	195.2	29,280
PA11	4.0	85	21.0	3.1	252.0	37,800
PA12	4.2	180	43.4	2.6	396.0	59,400
PA13	4.1	243	59.0	2.4	479.6	71,940
PA14	4.5	186	41.6	2.6	517.0	77,550
PA15	4.4	76	17.2	3.2	228.0	34,200
PA16	6.1	80	13.0	3.2	256.0	38,400
PA17	4.8	94	19.6	3.1	252.0	37,800
PA18	6.7	83	12.4	3.3	214.4	32,160
MU[1]	10.8	-	-	-	-	54,000
MM[1]	1.7	-	-	-	-	8,500
Community Park[2]	38.7	-	-	-	-	154,800
TOTAL	**158.6**	**1,800**			**5,028**	**971,485**

[1] Based on 5,000 gpd/ac demand
[2] Based on 4,000 gpd/ac demand

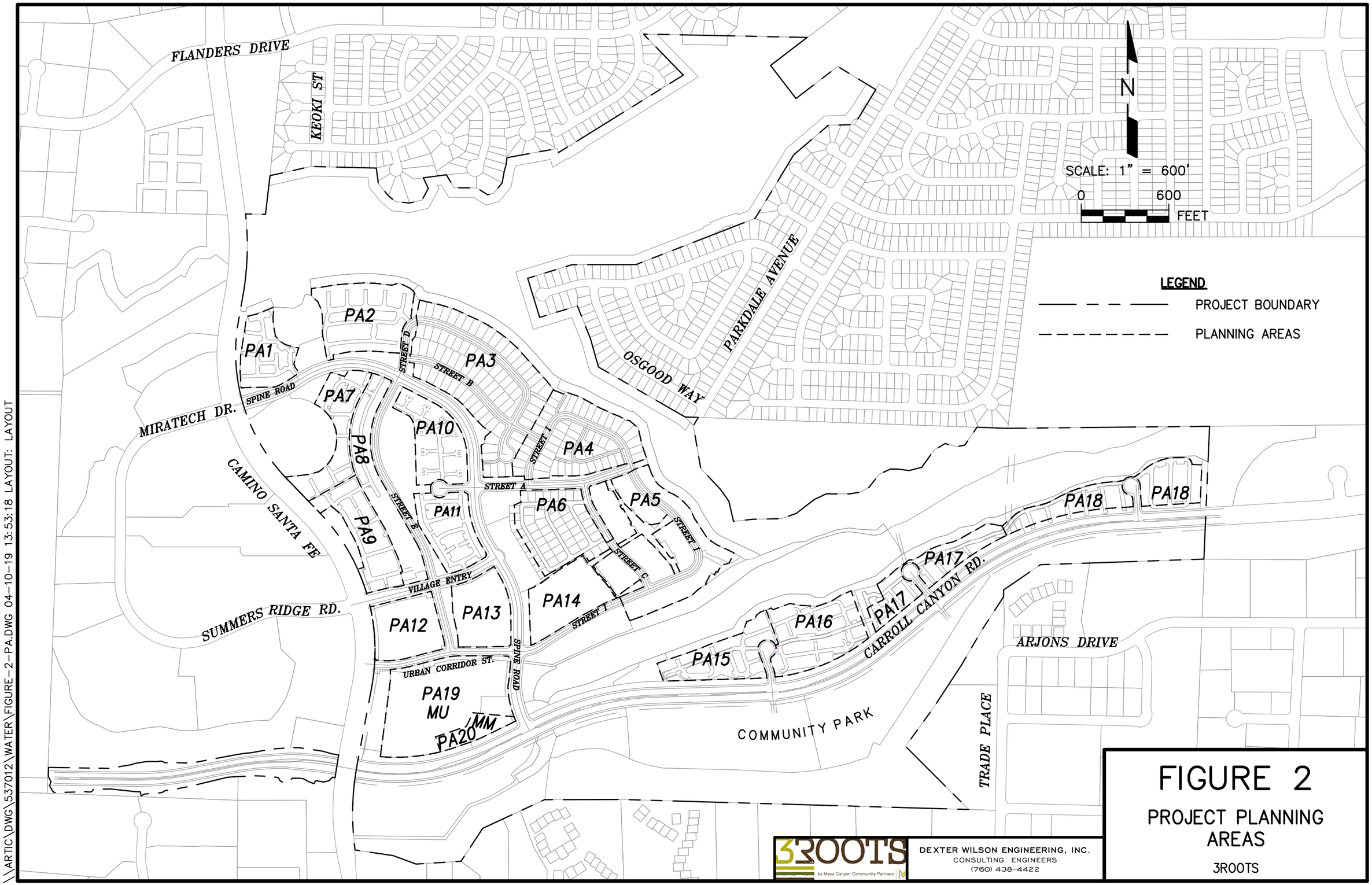

FIGURE 2

PROJECT PLANNING AREAS

3ROOTS

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\\ARTIC\DWG\537012\WATER\FIGURE-2-PA.DWG 04-10-19 13:53:18 LAYOUT: LAYOUT

City of San Diego Design Criteria

Book 2 of the City of San Diego Guidelines and Standards was used to analyze the water system. A summary of the design criteria from Book 2 is presented as Table 2.

TABLE 2
CITY OF SAN DIEGO
WATER SYSTEM DESIGN CRITERIA

Criteria	Design Requirement
Minimum Static Pressure	65 psi
Maximum Static Pressure	120 psi
Maximum Pressure Drop – Reservoir Out of Service	40 psi
Maximum Pressure Drop – Peak Hour & Max Day plus Fire	25 psi
Minimum Pressure – Peak Hour	40 psi
Minimum Pressure – Max Day plus Fire	20 psi
Maximum Pipeline Velocity (Fire Flow)[1]	15 fps
Maximum Pipeline Velocity (Normal Operating Conditions)[2]	5 fps

[1] Section 3.3.1 E
[2] Section 3.10.1

Fire Flow Requirements

Table 2-3 in Book 2 of the City of San Diego Design Guidelines and Standards was used as a guideline for the planning level fire flows for the analysis of the public water system for the 3Roots project. The fire flow used for single family residential areas is 2,000 gpm, for condominiums and apartments (multi-family residential areas) the fire flow used is 3,000 gpm, and for commercial areas the fire flow analyzed is 4,000 gpm.

Existing Water System

There are multiple hydraulic zones within the vicinity of the 3Roots project site, three of which are pertinent to the project development. The 3Roots project is currently identified to be within the North City 610 Pressure Zone. The project site is bordered by the Mira Mesa 625 Pressure Zone to the north and the Miramar 712 Pressure Zone to the south. There is a 54-inch 712 Zone transmission line in Mira Mesa Boulevard as well as a 36-inch 712 Zone transmission line in Miramar Road. These 712 Zone transmission lines supply the lower hydraulic grade line zones in the area. Figure 3 shows the existing water facilities in the vicinity of the 3Roots project.

The 610 Pressure Zone is fed by the 712 Pressure Zone pipelines from the north and the south. There is a pressure reducing station at the intersection of Flanders Drive and Mira Mesa Boulevard which supplies a 16-inch 610 Pressure Zone pipeline in Mira Mesa Boulevard, Flanders Drive, and Camino Santa Fe. There is also a pressure reducing station approximately 1,000 feet south of the intersection of Summers Ridge Road and Camino Santa Fe. This station provides a second feed to the 16-inch 610 Pressure Zone pipeline in Camino Santa Fe.

Proposed Buildout Water System

The proposed buildout water system for the 3Roots project will consist of three new pressure reducing stations that will create a new 485 Pressure Zone. The proposed new pressure zone will consist of 8-inch, 12-inch, and 16-inch diameter distribution piping. Figure 4 presents the proposed water system configuration and pipe sizes.

N

SCALE: 1"=1600'

0 1600 FEET

712/610 PRESSURE REDUCING STATION

712/625 PRESSURE REDUCING STATION

712/625 PRESSURE REDUCING STATION

712/625 PRESSURE REDUCING STATION

712/610 PRESSURE REDUCING STATION

MIRA MESA BOULEVARD

FLANDERS DRIVE

CAMINO RUIZ

PARKDALE AVENUE

SANTA SUMMERS RIDGE ROAD

CARROLL ROAD

MIRAMAR ROAD

FE

EL CAM.

MIRA MESA 625 ZONE

MIRAMAR 712 ZONE

NORTH CITY 610 ZONE

CARROLL RIDGE 610

LUSK PARK 470

VULCAN PROPERTY

54" 16" 12" 36"

LEGEND

- PROJECT BOUNDARY
- ZONE BOUNDARY
- EXISTING 610 ZONE PIPELINE
- EXISTING 625 ZONE PIPELINE
- EXISTING 712 ZONE PIPELINE

NOTE:
ONLY LARGE DIAMETER PIPES ARE SHOWN FOR CLARITY

FIGURE 3

EXISTING WATER SYSTEM

3ROOTS

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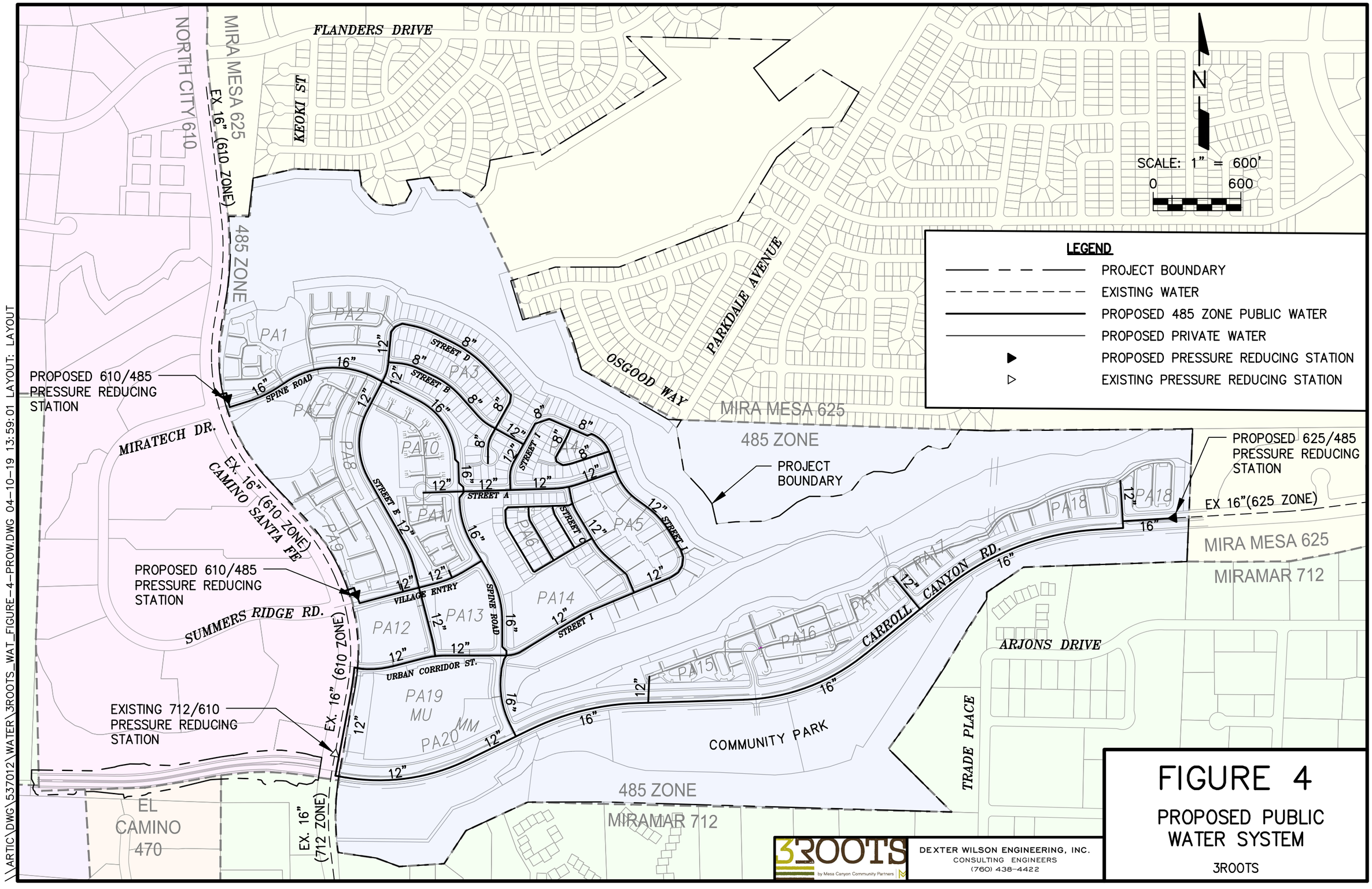
\\ARTIC\DWG\537012\WATER\3ROOTS_WAT_FIGURE-3-EX-W.DWG 11-09-18 16:20:52 LAYOUT: LAYOUT



\\ARTIC\DWG\537012\WATER\3ROOTS_WAT_FIGURE-4-PROW.DWG 04-10-19 13:59:01 LAYOUT: LAYOUT

FIGURE 4

PROPOSED PUBLIC WATER SYSTEM

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485 Pressure Zone. The 3Roots project currently lies within an undeveloped area which is generally identified to be within the North City 610 Pressure Zone; however, with proposed building pad elevations in the project ranging from 258 feet to 334 feet, the static pressures within the project based on a 610 hydraulic grade line would range from 120 psi to 153 psi. The City of San Diego design criteria summary presented in Table 2 presents the maximum allowable static pressure as being 120 psi. Thus, service from the 610 Pressure Zone does not meet static pressure requirements. To meet static pressure requirements a new 485 Pressure Zone is proposed to be created using three new pressure reducing stations.

The 485 Pressure Zone will be a new pressure zone that is fed by the 610 Pressure Zone from the west and the 625 Pressure Zone from the east. Both the 610 Pressure Zone and the 625 Pressure Zone have as their source the 712 Pressure Zone. The new 485 Pressure Zone will be capable of serving 3Roots building pad elevations between 258 feet and 334 feet with static pressures ranging from 65 psi to 98 psi, which are within the City design criteria for allowable minimum and maximum static pressures.

With a new 485 Pressure Zone and proposed 3Roots project pad elevations ranging from 258 feet to 334 feet, static pressures for the project will range from 65 psi to 98 psi. This pressure zone allows the project to meet the minimum and maximum static pressure requirements while also ensuring that areas Planning Areas to be served by private water systems will have adequate domestic and fire protection system pressure after the requisite backflow preventers.

Per the 2016 California Plumbing Code, individual pressure regulators are required for buildings that have more than 80 psi of static pressure. In the 485 Pressure Zone, buildings with a pad elevation of 300 feet or lower will have a static pressure of at least 80 psi and will be required to have an individual pressure regulator.

Planning Areas. The 3Roots project consists of 21 planning areas: Planning Areas 1-20 and community parks. Planning Areas 1-18 are residential areas. The remaining planning areas (Planning Area 19 - MU, Planning Area 20 - MM, and community parks) are nonresidential areas. Residential planning areas with a dwelling unit density of 10 dwelling units per acre or greater are considered multi-family planning areas for planning purposes. The remaining residential planning areas are considered single family planning areas.

All single family residential planning areas (Planning Areas 3, 4, and 6) will have individual water meters to each dwelling unit. All multi-family residential planning areas (Planning Areas 1, 2, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18) will have a master meter and private onsite water systems. Planning Area 5 is a multi-family planning area that may be metered in clusters or metered individually.

Multi-family residential planning areas are anticipated to have private water systems. Private water system pipelines are not included in the hydraulic model. Only the backbone public water system was modeled. Public water lines extending from the backbone system will be required for public streets that have a public fire hydrant. If a public street does not include a public fire hydrant but the buildings within the planning area are metered individually by the City of San Diego, then a public water line is required. Private planning areas will need to incorporate private fire hydrants in their onsite water systems.

Pressure Reducing Stations. As mentioned earlier in the report, three pressure reducing stations (PRSs) are proposed for the buildout of the 3Roots project. One pressure reducing station will be near the intersection of Summers Ridge Road and Camino Santa Fe (Summers Ridge PRS) and a second pressure reducing station will be located near the intersection of Miratech Drive and Camino Santa Fe (Miratech PRS). Placing the PRSs at these locations provides a loop for the proposed system until the third PRS is constructed. The third pressure reducing station will be located on Carroll Canyon Road (Carroll Canyon PRS) near the project's easternmost boundary. These stations will reduce the hydraulic grade line from the higher elevation zones surrounding the 3Roots site down to 485 feet.

The Summers Ridge PRS and the Miratech PRS will both be supplied by the existing 16-inch 610 Pressure Zone piping in Camino Santa Fe. The Carroll Canyon PRS will be supplied by the 16-inch 625 Pressure Zone piping in Carroll Canyon Road. After all of the pressure reducing stations have been constructed, they will work in tandem to supply water to the new 485 Pressure Zone serving the 3Roots project.

Supply to New PR Stations. The Summers Ridge PRS will connect to the existing 16-inch 610 Pressure Zone piping in Camino Santa Fe. It is possible for the PRS to connect to the 712 Pressure Zone piping in Camino Santa Fe north of the intersection of Camino Santa Fe and Trade Street, but a connection to this pressure zone presents the possibility of losing the Summers Ridge PRS to a pipe break if the pipe break occurs in the 712 Pressure Zone piping between the proposed PRS and Trade Street. The 16-inch 610 Pressure Zone piping in Camino Santa Fe west of the project is fed by the 712 Pressure Zone from the north and the south; thus, it provides a 16-inch loop between the Summers Ridge PRS and the Miratech PRS via Summers Ridge Road and Miratech Drive. Connecting the Summers Ridge PRS to the 610 Pressure Zone ensures redundancy in the supply system for the 485 Pressure Zone throughout the project's buildout.

From a capacity standpoint, the 610 Pressure Zone has capacity to serve both the Summers Ridge PRS and the Miratech PRS in the event that either of the 712/610 PRSs shown on Figure 3 are out of service. The 712/610 PRS located northwest of the project has two 12-inch pressure reducing valves that are conservatively assumed to have a maximum capacity of 8,000 gpm per valve for a total capacity of 16,000 gpm. The existing PRS located near the southwest corner of the 3Roots project also has two 12-inch pressure reducing valves that are assumed to have the same maximum capacity of 8,000 gpm per valve for a total capacity of 16,000 gpm.

A worst-case maximum day plus fire flow scenario with one of the existing PR stations out of service will require approximately 5,500 gpm to be supplied by the 610 Zone system. This is 10,500 gpm less than the flow capacity of either existing PR station. In such an event, the proposed Carroll Canyon PRS would also provide water to the 3Roots project, which reduces further the amount of water that the existing 610 Pressure Zone water system will need to deliver to the new 485 Pressure Zone.

Pressure Reducing Station Phasing Configuration. For the first phase of development on the 3Roots project, two PR Stations will be constructed: the Miratech PRS and the Summers Ridge PRS. Both of these stations are on the west side of the project and will connect to the existing 16" 610 Pressure Zone water line in Camino Santa Fe. In this first phase configuration, it is recommended that the Miratech PRS be the primary supply to the proposed 485 Pressure Zone and the Summers Ridge PRS act as a back-up station.

Pressure Reducing Station Build-Out Configuration. The second phase of the 3Roots project will complete the build-out of the development. Therefore, as part of the second phase of work, the third pressure reducing station, the Carroll Canyon PRS, will be constructed near the east end of Carroll Canyon Road. Once this third PR Station is completed, the roles of two of the PR Stations will be adjusted.

The Miratech PRS will remain as the primary feed to the 485 Pressure Zone. The Carroll Canyon PRS will become the secondary feed; and the Summers Ridge PRS will function as the backup feed to the 485 Pressure Zone.

PR Stations Setpoints. The Miratech PRS and the Carroll Canyon PRS are proposed to function as primary and secondary stations, respectively. It is recommended that the smaller pressure regulating valve at each station be set to provide a hydraulic grade line (HGL) of 485 feet to the 3Roots project. The larger valves at these two stations are recommended to be set slightly lower at 480 feet HGL.

The Summers Ridge PRS is proposed to function as the standby PR Station; it is recommended to be set to open at a HGL of 475 feet. In this way it will open only when the HGL for the system falls below this set point.

PR Station Valve Sizes. Each of the three proposed pressure reducing stations will have two pressure reducing valves. The water system is designed to supply maximum day plus a 4,000 gpm fire flow demand (5,385 gpm), through any 2 stations working in tandem. Ten-inch (10") main valves will be required for all the pressure reducing stations in order to supply maximum day demand plus fire flow independently in the event that one of the PR Stations is out of service. A 10" valve has a maximum intermittent capacity of 6,150 gpm.

Each pressure reducing station will use a 4-inch secondary valve (800 gpm maximum capacity). These secondary pressure reducing valves are sized in order for each station to provide service under average day demands (692 gpm) independently, while also being able to handle low flows throughout the day. Four-inch secondary valves will allow for any two stations working in tandem to supply maximum day demand (1,385 gpm).

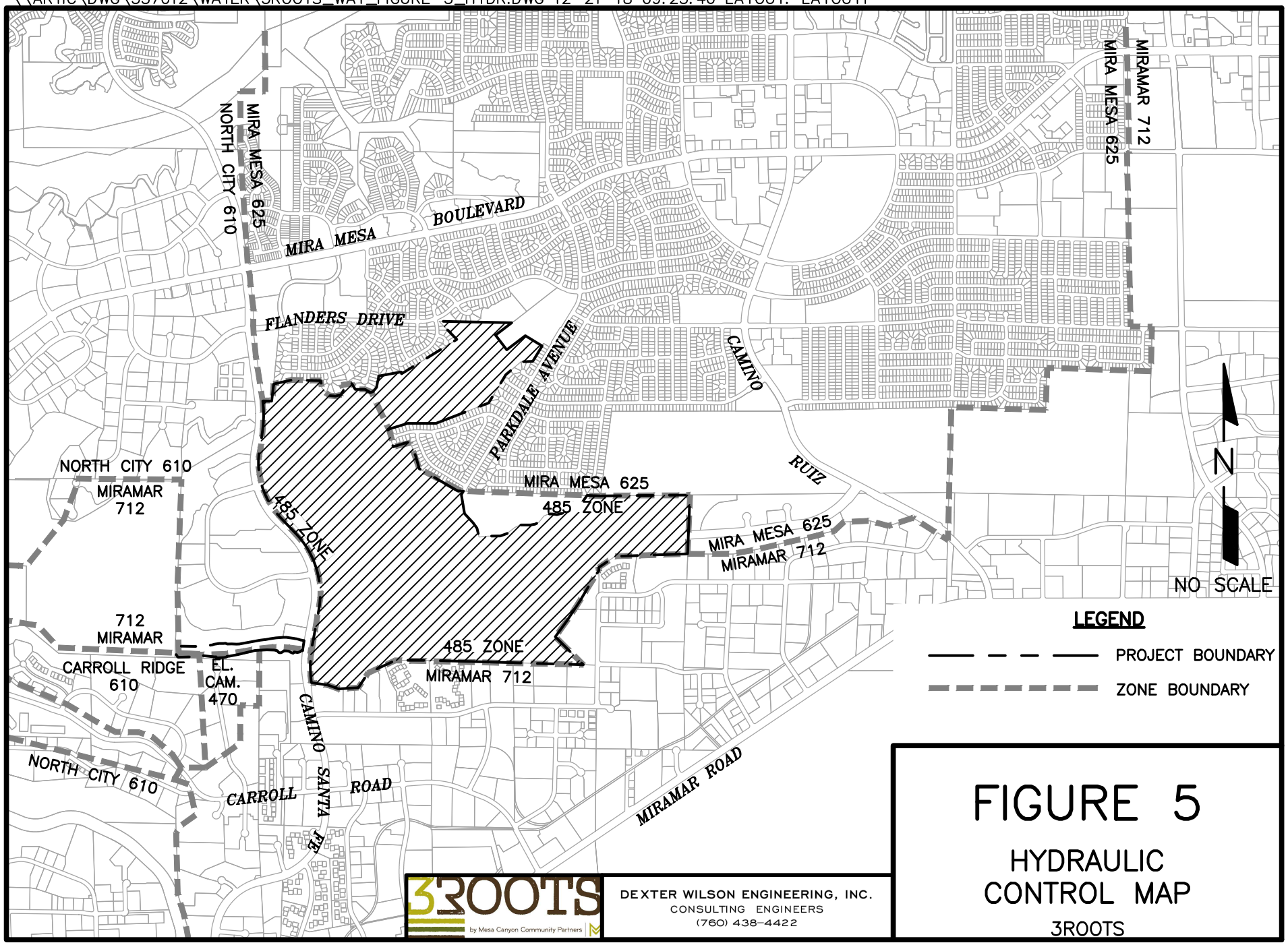
Distribution Piping. The project will be supplied with water via three new pressure reducing stations. The distribution system was sized to provide adequate flow and pressure to the project and is comprised of 8-inch, 12-inch, and 16-inch diameter piping. Figure 4 presents the proposed backbone water system configuration and pipe sizes.

The majority of the 485 Pressure Zone distribution piping will be installed within the subdivision streets of the 3Roots development. The exception is the 12" 485 Pressure Zone water line between Carroll Canyon Road and Urban Corridor Street at the western boundary of the project. This line is shown to be installed within the Camino Santa Fe right-of-way instead of in an easement within the 3Roots project along the western property boundary. If during the preparation of improvement plans for this segment of 485 Pressure Zone piping it is determined that there are too many existing utilities in Camino Santa Fe such that the construction of an additional 12" water line is impossible or impractical due to existing utility conflicts, then consideration will be given to placing the 12" line in an easement along the western property boundary. The easement will need to conform to City standards for width, accessibility, drivability, and in all other ways be acceptable to the City.

Figure 5 presents a hydraulic control map. The hydraulic control map shows the existing and proposed water service areas and pressure zones for the 3Roots project and surrounding area.

Computer Model Analysis. In order to analyze the proposed water system a hydraulic model of the system was created. Analysis using the KYPIPE computer software program developed by the University of Kentucky determined residual pressures throughout the water system. This computer software utilizes the Hazen-Williams equation for determining headloss in pipes. The Hazen-Williams "C" value used for all pipe sizes in our analysis is 120. Results of the hydraulic model for the project's ultimate condition are discussed in this section.

\\ARTIC\DWG\537012\WATER\3ROOTS_WAT_FIGURE-5_HYDR.DWG 12-21-18 09:23:46 LAYOUT: LAYOUT1



The hydraulic model for this analysis includes proposed and existing public water lines. All three proposed pressure reducing stations (PRSs) were modeled. Each of these PRSs are fed by 16-inch public water lines; thus, a portion of each of the existing 16-inch public water lines upstream of the PRSs was modeled as source nodes ("0" Nodes) in the computer model. The 16-inch line in Camino Santa Fe lies within the 610 Pressure Zone and feeds the Miratech PRS and the Summers Ridge PRS; thus, the two source nodes associated with this pipeline have their HGL set to 610 feet in the computer model. The source node in Carroll Canyon Road feeds the Carroll Canyon PRS, lies within the 625 Pressure Zone, and has its HGL set to 625 feet in the computer model.

To simulate minor losses through pipe fittings and valves, pipe lengths throughout the entire project were increased by 10 percent.

The water system was sized based on flow and pressure requirements for the proposed project. A 2,000 gpm fire flow was modeled at a single computer model node within a single family residential area. Fire flow requirements of 3,000 gpm and 4,000 gpm were modeled at two adjacent computer model nodes within multi-family residential and commercial areas, respectively. Maximum day plus fire flow demand scenarios were modeled under normal operating conditions (all pipes open) and broken pipe conditions (one pipe closed).

Appendix C presents the ultimate water system's computer model results. The computer model's corresponding Node and Pipe Diagram is presented as Exhibit A. These results include tables that demonstrate the system's compliance with the City's maximum velocity criterion and tables that demonstrate compliance with the City's maximum pressure drop criterion. Table 3 presents a summary of the computer model results.

TABLE 3
ULTIMATE WATER SYSTEM
COMPUTER MODEL RESULTS SUMMARY

Scenario	Condition	Node(s)	Maximum Pipeline Velocity, fps	Minimum Pressure, psi	Maximum ΔP, psi
2,000	Normal	316	7.3	57	9
2,000	Pipe 312 Closed	316	13.2	43	23
3,000	Normal	324, 328	5.4	63	6
3,000	Pipe 125 Closed	116, 120	8.9	59	9
3,000	Pipe 301 Closed	324, 328	6.1	58	10
3,000	Pipe 13 Closed	22, 24	3.1	64	8
3,000	Pipe 13 Closed	22, 32	5.3	63	12
3,000	Pipe 37 Closed	40.44	5.5	55	17
3,000	Pipe 209 Closed	204, 212	5.2	62	5
4,000	Normal	13, 15	6.1	63	9
4,000	Pipe 207 Closed	13, 15	6.1	60	12

As shown on Table 3, fire flows under each scenario are being met with more than 20 psi of residual pressure. For normal operating conditions, there is less than a 25 psi drop in pressure throughout the system for each scenario. For broken pipe conditions, there is less than a 40 psi drop in pressure throughout the system for each scenario. The maximum velocities presented do not include the velocities through pressure reducing valves (Pipes 5, 7, and 9) because these valves are designed for higher velocities.

The maximum velocity through a pressure reducing valve under any fire flow scenario is 21.0 fps. This maximum velocity occurs through the Carroll Canyon PRS (Pipe 9) when a 3,000 gpm fire flow is split between Computer Model Nodes 22 and 32, and Pipe 13 is closed (broken). When analyzing this scenario, it was determined that a 16-inch water line is required in Carroll Canyon Road from the Carroll Canyon PRS to Spine Road to meet the pressure drop criterion.

3Roots Project Phasing

The 3Roots project is proposed to be constructed in two phases. The first phase will be the areas north of Carroll Canyon Creek and will include Planning Areas 1 through 14. The second phase includes the areas south of Carroll Canyon Creek including Carroll Canyon Road and Planning Areas 15 through 20. Figure 6 shows the two development phases.

In order to provide water service to Phase 1 of the 3Roots project, two new pressure reducing stations will need to be constructed for redundancy. These two PR Stations will be the Miratech PR Station and the Summers Ridge PR Station. Both of these PR Stations are within the Phase 1 area of the 3Roots project and are located along Camino Santa Fe, the western boundary of the 3Roots development.

Phase 1 Hydraulic Analysis

Appendix D presents the results of the computer model analyses for the Phase 1 portion of the 3Roots project and Exhibit A.1 presents the computer model Node and Pipe Diagram. With two new pressure reducing stations providing service, all demand scenarios are satisfied with all pipes open as well as with pipe breaks. The analyses include pipe breaks such that one or the other of the two pressure reducing stations is put out of service. Based on the ultimate onsite distribution pipe sizes, the Phase 1 portion of the water system is adequate.

One reason that the Phase 1 system can stand on its own is that the fire flow requirement for Phase 1 is 3,000 gpm for multi-family residential development. Not until Phase 2 are the commercial land uses, Planning Areas 19 and 20, constructed which require a fire flow of 4,000 gpm.

Figure 7 shows the Phase 1 onsite water system configuration.

\\ARTIC\DWG\537012\WATER\3ROOTS_WAT_FIGURE-6 HATCH.DWG 04-10-19 14:02:41 LAYOUT: LAYOUT

FLANDERS DRIVE
KEOKI ST
PARKDALE AVENUE
OSGOOD WAY
MIRATECH DR.
SPINE ROAD
CAMINO SANTA FE
SUMMERS RIDGE RD.
VILLAGE ENTRY
URBAN CORRIDOR ST.
STREET A
STREET B
STREET C
STREET D
STREET E
STREET F
STREET I
STREET J
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PA8
PA9
PA10
PA11
PA12
PA13
PA14
PA15
PA16
PA17
PA18
PA19 MU
PA20 MM
CARROLL CANYON RD.
ARJONS DRIVE
TRADE PLACE
COMMUNITY PARK

N

SCALE: 1" = 600'
0 600
FEET

LEGEND

- PROJECT BOUNDARY
- PLANNING AREAS
- PHASE 1
- PHASE 2

FIGURE 6

DEVELOPMENT PHASING

3ROOTS

3ROOTS by Mesa Canyon Community Partners
DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

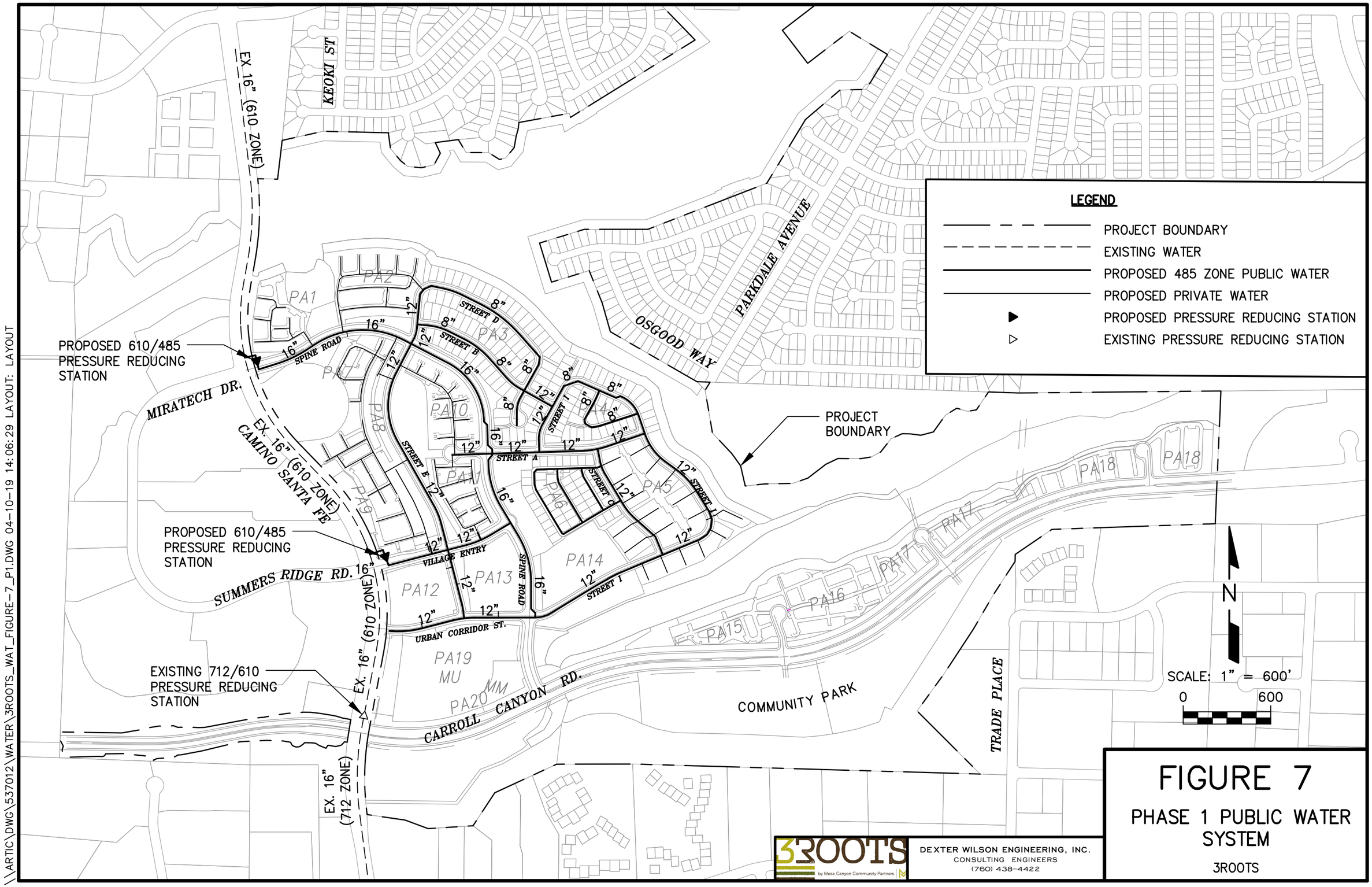


FIGURE 7

PHASE 1 PUBLIC WATER SYSTEM

3ROOTS

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

\\ARTIC\DWG\537012\WATER\3ROOTS_WAT_FIGURE-7_P1.DWG 04-10-19 14:06:29 LAYOUT: LAYOUT

Phase 2 Hydraulic Analysis

The Phase 2 onsite water system is the ultimate water system as shown in Figure 4. With three pressure reducing stations serving the new 485 Pressure Zone, all demand scenarios are satisfactory as was presented under the ultimate buildout analysis.

The reason for a Phase 2 analysis is to address the City of San Diego Public Utilities Department comment/question regarding the number of pressure reducing stations serving the 485 Pressure Zone. The City requested that the ultimate service configuration include only two (2) pressure reducing stations instead of three (3).

Included in Appendix E are the computer model outputs which are based on having only two pressure reducing stations to provide ultimate service. The two pressure reducing stations included in this ultimate system scenario are the Miratech Drive PRS and the Carroll Canyon Road PRS. Exhibit A.2 presents the Node and Pipe Diagram.

The results of our analysis indicate that with only two (2) PR Stations at buildout, the water main in Carroll Canyon Road would need to be increased in size from 16" to at least 18" in order to meet the City water system design guidelines. This requirement is based on a 4,000 gpm fire flow at the commercial site at the west end of Carroll Canyon Road with the proposed 16" pipe at the north end of Spine Road closed. This pipe closure results in the Miratech PR Station being out of service. Under this scenario all for the 3Roots project flow must come from the Carroll Canyon Road PR Station. Residual pressures are adequate, but the pressure drop from static exceeds 25 psi unless the pipe in Carroll Canyon Road is increased to at least 18-inch diameter.

It is recommended that the 3Roots water system design maintains all three (3) PR Stations under ultimate buildout conditions for the following reasons:

1. The City Design Guide does not recognize 18" pipe as an acceptable size. Therefore, with only two (2) PR Stations, the line in Carroll Canyon Road would need to be constructed as a 20" main to meet the water system design criteria.

2. A requirement for a 20" "distribution" water main within a closed zone is an unusual circumstance.

3. That a distribution main larger than 16" is needed to meet design criteria suggests that a two-PR Station system may not be adequate for the pressure zone.

4. While the total demand within the proposed new 485 3Roots Pressure Zone may be on the lower end of the scale as compared to other City pressure regulated zones, the unique configuration of this pressure zone should be considered. The long run of piping in Carroll Canyon Road is mitigated best by ensuring sources of supply at both ends of the project.

5. Three PR Stations will be constructed by the 3Roots project because of the project's phasing needs. Two PR Stations must be constructed for the Phase 1 development to have adequate looping and redundancy. The third PR Station on the east end of Carroll Canyon Road is necessary since there is a long stretch of non-looped piping in Carroll Canyon Road.

6. The long-term operation and maintenance costs for a third pressure reducing station are expected to be lower than the capital replacement cost for 4,800 linear feet of 20" water main.

7. A larger water main in Carroll Canyon Road may present water quality concerns based on the daily average demand for the dwelling units along this pipeline. The pipeline is sized based on maximum day demands plus 4,000 gpm fire flow.

Conclusions and Recommendations

1. The 3Roots project will be served by the City of San Diego public water system.

2. A new 485 Pressure Zone is proposed to be created to provide service to the 3Roots project by constructing three new pressure reducing stations. The hydraulic grade line of this new pressure zone was set to maintain maximum static pressures below 120 psi and keep minimum static pressures at or above 65 psi.

3. The onsite water system for the 3Roots project will connect to the existing public water system in the vicinity of the project at three locations via three pressure reducing stations. Two connections will be made to the 16-inch North City 610 Pressure Zone piping in Camino Santa Fe. A third connection will be made to the 16-inch Mira Mesa 625 Pressure Zone piping at the east end of Carroll Canyon Road.

4. The recommended onsite public water system pipe sizes are shown on Figure 4 in this report.

5. Private water systems are anticipated to be used for many of the planning areas. Private water system sizing is not included as part of this study but will need to be determined as individual Planning Areas proceed through the development process.

6. Pad elevations within the project range from 258 feet to 334 feet resulting in a static water pressure range from 65 psi to 98 psi within the proposed new 485 Pressure Zone.

7. Individual pressure regulators are required for each building with a pad elevation lower than 300 feet to limit service pressures to 80 psi in accordance with the 2016 California Plumbing Code.

8. This report presents the sizing and a general schematic layout of the proposed domestic water system. The design engineer for these systems should incorporate valves, fittings, and appurtenances as needed for proper installation and long-term operation of the water systems.

9. If PVC pipe is used for the water lines downstream of the project's proposed pressure reducing stations, 8-inch through 16-inch diameter piping shall be AWWA C900 DR 18 Class 235.

10. If any water lines to be constructed by this development are metallic, a California Licensed Corrosion Engineer will be required to perform a soil corrosivity study and to design a Corrosion Control System.

Thank you for the opportunity to assist you with the water system planning for this project. If you have any questions regarding the information presented in this report, please do not hesitate to call.

Dexter Wilson Engineering, Inc.

Andrew Oven, P.E.

AO:FF:sg

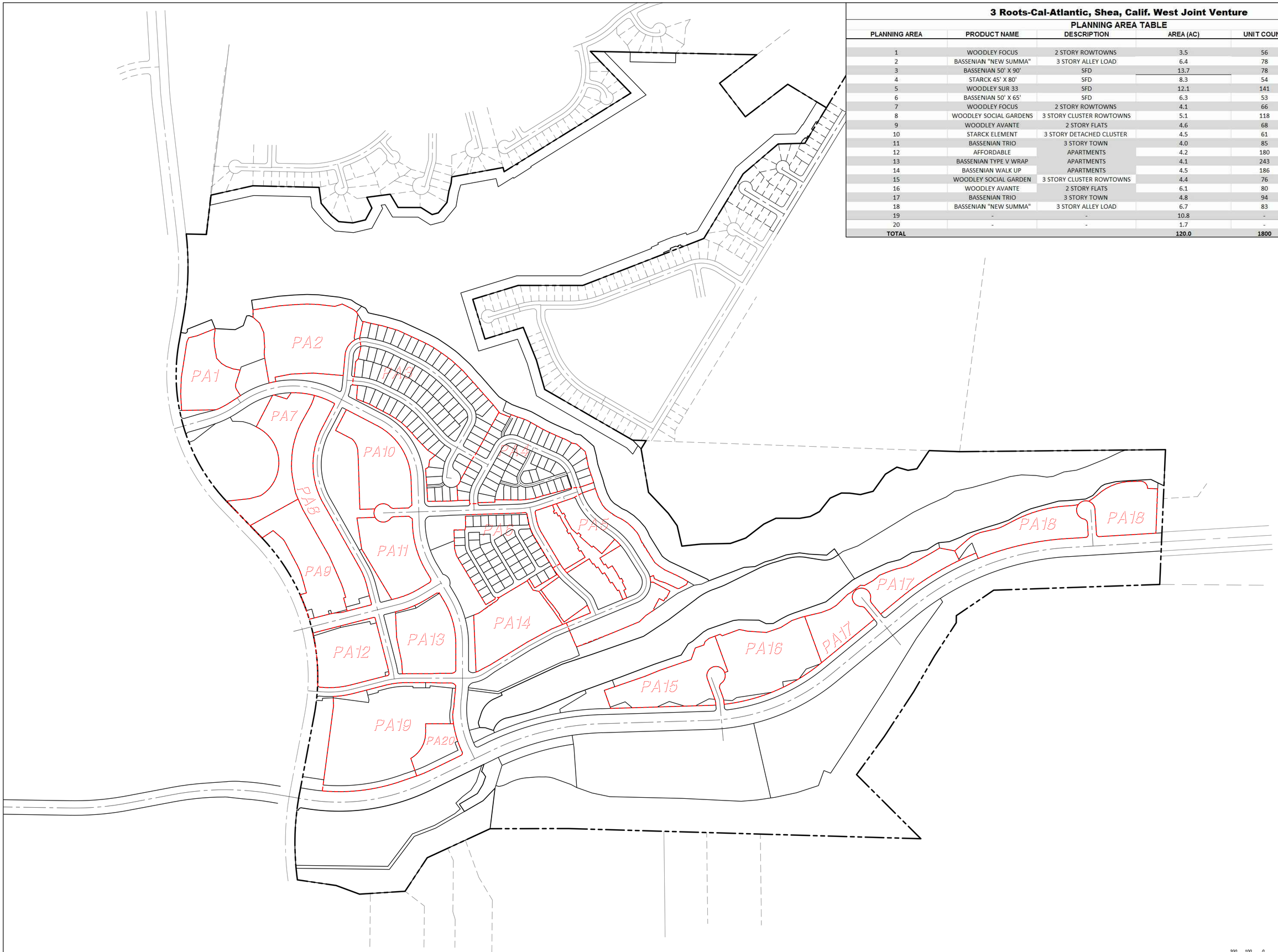
APPENDIX A

SITE PLAN EXHIBIT
AND
TABLE 2- 1 FROM BOOK 2 OF
CITY OF SAN DIEGO
DESIGN GUIDELINES AND STANDARDS

3 Roots-Cal-Atlantic, Shea, Calif. West Joint Venture

PLANNING AREA TABLE

PLANNING AREA	PRODUCT NAME	DESCRIPTION	AREA (AC)	UNIT COUNT	DENSITY
1	WOODLEY FOCUS	2 STORY ROWTOWNS	3.5	56	16.2
2	BASSENIAN "NEW SUMMA"	3 STORY ALLEY LOAD	6.4	78	12.2
3	BASSENIAN 50' X 90'	SFD	13.7	78	5.7
4	STARCK 45' X 80'	SFD	8.3	54	6.5
5	WOODLEY SUR 33	SFD	12.1	141	11.6
6	BASSENIAN 50' X 65'	SFD	6.3	53	8.4
7	WOODLEY FOCUS	2 STORY ROWTOWNS	4.1	66	16.2
8	WOODLEY SOCIAL GARDENS	3 STORY CLUSTER ROWTOWNS	5.1	118	23.1
9	WOODLEY AVANTE	2 STORY FLATS	4.6	68	14.8
10	STARCK ELEMENT	3 STORY DETACHED CLUSTER	4.5	61	13.5
11	BASSENIAN TRIO	3 STORY TOWN	4.0	85	21.0
12	AFFORDABLE	APARTMENTS	4.2	180	43.4
13	BASSENIAN TYPE V WRAP	APARTMENTS	4.1	243	59.0
14	BASSENIAN WALK UP	APARTMENTS	4.5	186	41.6
15	WOODLEY SOCIAL GARDEN	3 STORY CLUSTER ROWTOWNS	4.4	76	17.2
16	WOODLEY AVANTE	2 STORY FLATS	6.1	80	13.0
17	BASSENIAN TRIO	3 STORY TOWN	4.8	94	19.6
18	BASSENIAN "NEW SUMMA"	3 STORY ALLEY LOAD	6.7	83	12.4
19	-	-	10.8	-	
20	-	-	1.7	-	
TOTAL			**120.0**	**1800**	



N

200 100 0 200 400 600

SCALE: 1"=200'

PLANNING AREA EXHIBIT
2018-10-03

3ROOTS by Mesa Canyon Community Partners

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
701 B Street, Suite 800 San Diego, CA 92101
619.235.6471 Tel 619.234.0349 Fax

Last save by: VOEL, ANGELES, File Name: P:\4182.20\Engr\Exhibits\PLANNING AREA EXHIBIT\4182.20-PA-EXHIBIT.dwg,
Date Last Saved: 10/3/2018 2:02:31 PM, Date Plotted Last: 10/3/2018 2:02:44 PM

Chapter 2
WATER DEMANDS AND SERVICE CRITERIA

2.1 General

This chapter outlines planning procedures to estimate water demands and fire flows. Water system service requirements are also defined in terms of water pressure and reservoir storage.

2.2 Service Area

The DESIGN CONSULTANT defines the project's service area and identifies the pressure zones in which it is located. The Senior Civil Engineer in charge of either Water Planning and Project Development, or Planning and Development Review Water Review Section, approves the service area boundaries.

2.3 Land Use and Residential Population

The DESIGN CONSULTANT develops present and future land use maps for the service area to define the following land use categories: residential (by zone in accordance with Table 2-1), central business district, commercial and institutional, parks, hospitals, hotels, industrial, office, and schools.

The DESIGN CONSULTANT estimates the residential population in the service area based on present and future allowable land use. Unless more accurate population density estimates are available, the residential population in the service area is estimated based on the figures presented in Table 2-1.

Table 2-1
Residential Population Density

Zone	Dwelling Unit Density (dwelling unit/net acre)	Unit Density (persons/dwelling unit)	Population Density (persons/net acre)
A-1-10	0.1	3.5	0.4
A-1-5	0.2	3.5	0.7
A-1-1	1	3.5	3.5
R-1-40	1	3.5	3.5
R-1-20	2	3.5	7.0
R-1-10	4	3.5	14
R-1-5	9	3.5	32
R-2	14	3.2	45
R-2A	29	3.0	87
R-3	43	2.6	112
R-3A	73	2.2	161
R-4	109	1.8	196
R-4C	218	1.5	327

APPENDIX B

PEAKING FACTOR TABLES

FIGURE 2-2
MAXIMUM DAY DEMAND FACTOR

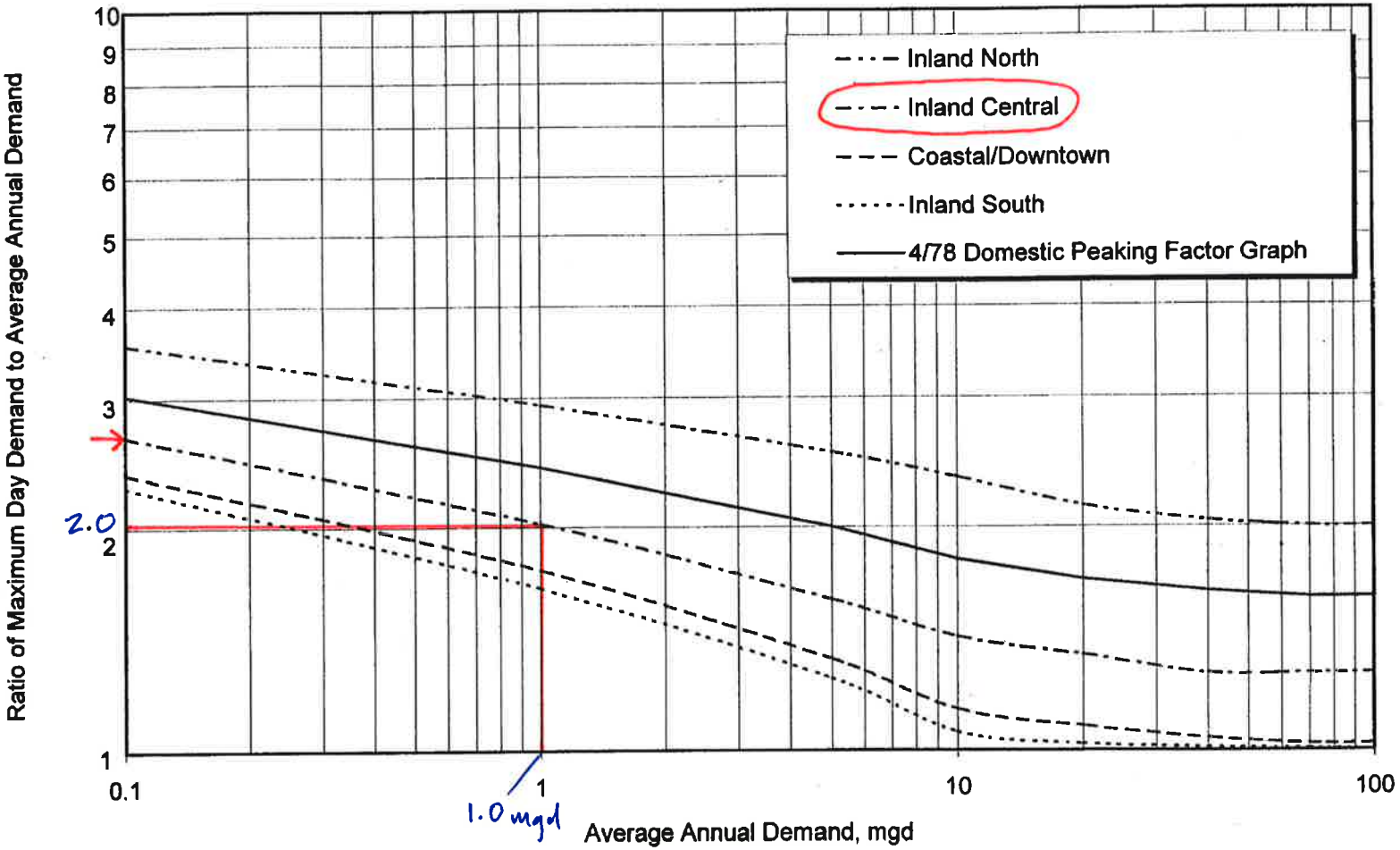
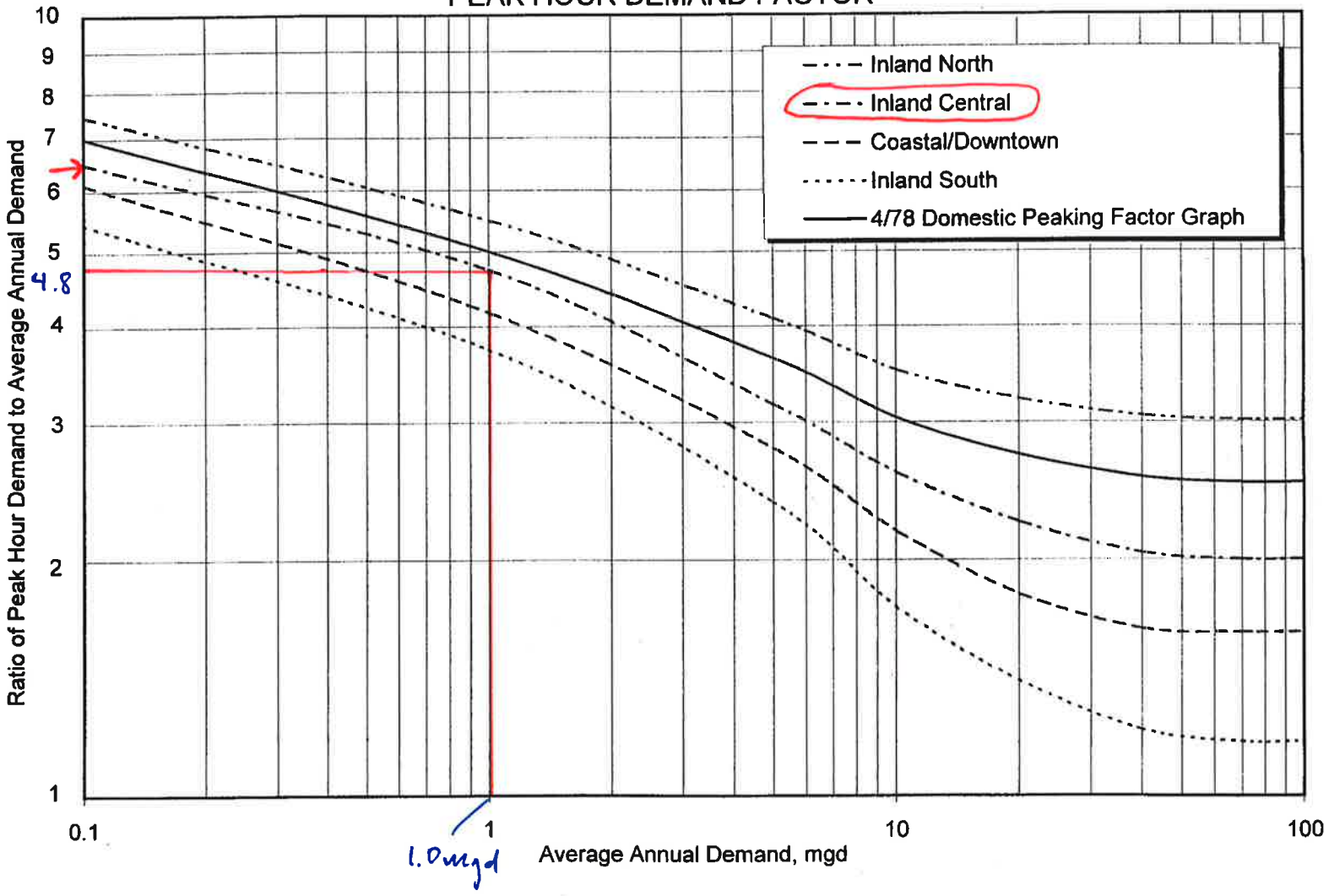


FIGURE 2-1
PEAK HOUR DEMAND FACTOR



APPENDIX C

COMPUTER MODELING OUTPUT
3ROOTS
ULTIMATE WATER SYSTEM

NODE AND PIPE DIAGRAM REFERENCE:

Exhibit A in the back of the report.

CONDITIONS MODELED:

1. Average Day Demands
2. Peak Hour Demands
3. Maximum Day Demands plus 2,000 gpm Fire Flow at Node 316
4. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 324 and 328
5. Maximum Day Demands plus 4,000 gpm Fire Flow split between Nodes 13 and 15
6. Maximum Day Demands plus 2,000 gpm Fire Flow at Node 316, Pipe 312 Closed
7. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 116 and 120, Pipe 125 Closed
8. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 324 and 328, Pipe 301 Closed
9. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 22 and 24, Pipe 13 Closed
10. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 22 and 26, Pipe 13 Closed
11. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 40 and 44, Pipe 37 Closed
12. Maximum Day Demands plus 4,000 gpm Fire Flow split between Nodes 13 and 15, Pipe 207 Closed
13. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 212 and 204, Pipe 209 Closed

Project: 3Roots **Velocity Check**
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Average Day Demands

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	304.52	0.49
2	16	381	0.61
3	16	0	0
4	16	304.52	0.49
5	10 - PRV	304.52	1.24
6	16	381	0.61
7	10 - PRV	381	1.56
8	16	0	0
9	8 - PRV	CLOSED	CLOSED
10	12	-38.33	-0.11
11	12	29.48	0.08
12	16	-195.92	-0.31
13	16	220.37	0.35
14	12	-37.08	-0.11
15	16	-122.6	-0.2
27	12	39.58	0.11
29	16	-22.33	-0.04
33	12	22.33	0.06
37	16	0	0
101	16	-195.92	-0.31
105	16	-183.05	-0.29
109	16	-85.66	-0.14
113	16	-187.09	-0.3
117	16	343.1	0.55
121	16	363.5	0.58
125	16	381	0.61
201	12	-59.19	-0.17
202	12	-66.34	-0.19
203	12	47.18	0.13
205	12	-141.24	-0.4
207	12	304.52	0.86
209	12	-263.89	-0.75
211	12	-23.15	-0.07
213	12	-49.4	-0.14
215	12	-66.96	-0.19
241	12	23.29	0.07
249	12	-97.39	-0.28
253	12	-123	-0.35
301	12	78.14	0.22
303	8	-15.93	-0.1
304	8	-39.84	-0.25
305	8	-23.84	-0.15
309	8	-29.6	-0.19
312	12	81.64	0.23
313	12	46.29	0.13
317	8	27.53	0.18
321	8	21.77	0.14
325	12	21.93	0.06
329	12	7.03	0.02
333	12	-27.89	-0.08
335	8	-4.23	-0.03
337	12	32.6	0.09
341	12	-78.14	-0.22
357	12	30.56	0.09
359	8	2.68	0.02
361	8	3.55	0.02
363	8	1.47	0.01
365	8	2.06	0.01
367	8	7.04	0.04
369	8	14.97	0.1
371	8	1.45	0.01
373	8	4.41	0.03
387	12	45.54	0.13
389	8	18.99	0.12
393	8	-16.01	-0.1
399	8	-6.81	-0.04
401	8	7.26	0.05
403	8	-2.34	-0.01
405	12	-20.02	-0.06

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Peak Hour Demands

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1461.72	2.33
2	16	1828.78	2.92
3	16	0	0
4	16	1461.72	2.33
5	10 - PRV	1461.72	5.97
6	16	1828.78	2.92
7	10 - PRV	1828.78	7.47
8	16	0	0
9	8 - PRV	CLOSED	CLOSED
10	12	-183.97	-0.52
11	12	141.49	0.4
12	16	-940.43	-1.5
13	16	1057.78	1.69
14	12	-177.98	-0.5
15	16	-588.48	-0.94
27	12	189.98	0.54
29	16	-107.18	-0.17
33	12	107.18	0.3
37	16	0	0
101	16	-940.43	-1.5
105	16	-878.66	-1.4
109	16	-411.19	-0.66
113	16	-898.05	-1.43
117	16	1646.86	2.63
121	16	1744.78	2.78
125	16	1828.78	2.92
201	12	-284.1	-0.81
202	12	-318.42	-0.9
203	12	226.45	0.64
205	12	-677.97	-1.92
207	12	1461.72	4.15
209	12	-1266.69	-3.59
211	8	-111.12	-0.32
213	8	-237.12	-0.67
215	8	-321.41	-0.91
241	12	111.79	0.32
249	12	-467.47	-1.33
253	12	-590.4	-1.67
301	12	375.07	1.06
303	12	-76.47	-0.49
304	12	-191.24	-1.22
305	12	-114.41	-0.73
309	12	-142.06	-0.91
312	12	391.88	1.11
313	8	222.17	0.63
317	8	132.13	0.84
321	8	104.48	0.67
325	12	105.29	0.3
329	12	33.77	0.1
333	12	-133.86	-0.38
335	12	-20.32	-0.13
337	12	156.49	0.44
341	12	-375.07	-1.06
357	12	146.71	0.42
359	8	12.86	0.08
361	8	17.06	0.11
363	8	7.07	0.05
365	8	9.88	0.06
367	8	33.77	0.22
369	8	71.86	0.46
371	8	6.95	0.04
373	8	21.15	0.13
387	12	218.58	0.62
389	12	91.16	0.58
393	8	-76.83	-0.49
399	12	-32.7	-0.21
401	8	34.85	0.22
403	8	-11.23	-0.07
405	12	-96.1	-0.27

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands plus 2000 gpm at Node 316

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1439.77	2.3
2	16	1919.75	3.06
3	16	0	0
4	16	1439.77	2.3
5	10 - PRV	1439.77	5.88
6	16	1919.75	3.06
7	10 - PRV	1919.75	7.84
8	16	0	0
9	8 - PRV	CLOSED	CLOSED
10	12	-62.92	-0.18
11	12	45.22	0.13
12	16	-405.58	-0.65
13	16	440.74	0.7
14	12	-74.16	-0.21
15	16	-245.2	-0.39
27	12	79.16	0.22
29	16	-44.66	-0.07
33	12	44.66	0.13
37	16	0	0
101	16	-405.58	-0.65
105	16	-671.06	-1.07
109	16	-204.62	-0.33
113	16	-597.55	-0.95
117	16	1843.95	2.94
121	16	1884.75	3.01
125	16	1919.75	3.06
201	12	24.35	0.07
202	12	-118.94	-0.34
203	12	80.62	0.23
205	12	-635.64	-1.8
207	12	1439.77	4.08
209	12	-1358.51	-3.85
211	8	159.6	0.45
213	8	107.1	0.3
215	8	71.98	0.2
241	12	46.58	0.13
249	12	-466.44	-1.32
253	12	-517.66	-1.47
301	12	346.35	0.98
303	12	477.75	3.05
304	12	768.49	4.9
305	12	-381.53	-2.44
309	12	-393.05	-2.51
312	12	1303.59	3.7
313	8	899.02	2.55
317	8	861.5	5.5
321	8	-1138.5	-7.27
325	12	-101.87	-0.29
329	12	-131.67	-0.37
333	12	-53.02	-0.15
335	12	330.1	2.11
337	12	258.03	0.73
341	12	-346.35	-0.98
357	12	59.07	0.17
359	8	6.05	0.04
361	8	7.38	0.05
363	8	3.03	0.02
365	8	4.03	0.03
367	8	13.8	0.09
369	8	29.25	0.19
371	8	2.7	0.02
373	8	8.4	0.05
387	12	88.32	0.25
389	12	-300.58	-1.92
393	8	1150.02	7.34
399	12	184.96	1.18
401	8	-125.45	-0.8
403	8	135.29	0.86
405	12	108.45	0.31

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands plus 3000 gpm split between Nodes 324 and 328

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1908.03	3.04
2	16	2403.41	3.83
3	16	0	0
4	16	1908.03	3.04
5	10 - PRV	1908.03	7.79
6	16	2403.41	3.83
7	10 - PRV	2403.41	9.82
8	16	0	0
9	8 - PRV	CLOSED	CLOSED
10	12	-204.9	-0.58
11	12	187.2	0.53
12	16	-263.6	-0.42
13	16	440.74	0.7
14	12	-74.16	-0.21
15	16	-245.2	-0.39
27	12	79.16	0.22
29	16	-44.66	-0.07
33	12	44.66	0.13
37	16	0	0
101	16	-263.6	-0.42
105	16	-1092.75	-1.74
109	16	-150.59	-0.24
113	16	-1560.48	-2.49
117	16	2327.61	3.71
121	16	2368.41	3.78
125	16	2403.41	3.83
201	12	-536.39	-1.52
202	12	-260.92	-0.74
203	12	222.6	0.63
205	12	-1008.6	-2.86
207	12	1908.03	5.41
209	12	-1826.77	-5.18
211	8	-220.81	-0.63
213	8	-273.31	-0.78
215	8	-308.43	-0.87
241	12	46.58	0.13
249	12	-942.16	-2.67
253	12	-993.38	-2.82
301	12	1363.32	3.87
303	12	147.99	0.94
304	12	-360.3	-2.3
305	12	-192.83	-1.23
309	12	-204.35	-1.3
312	12	443.9	1.26
313	8	228.03	0.65
317	8	190.51	1.22
321	8	178.99	1.14
325	12	862.76	2.45
329	12	-637.24	-1.81
333	12	-904.38	-2.57
335	12	-468.93	-2.99
337	12	423.64	1.2
341	12	-1363.32	-3.87
357	12	704.01	2
359	8	-200.37	-1.28
361	8	-87.36	-0.56
363	8	-36.92	-0.24
365	8	43.98	0.28
367	8	108.54	0.69
369	8	235.67	1.5
371	8	57.5	0.37
373	8	120.08	0.77
387	12	939.68	2.67
389	12	498.45	3.18
393	8	-167.47	-1.07
399	12	-282.19	-1.8
401	8	206.42	1.32
403	8	-196.58	-1.25
405	12	1232.86	3.5

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands plus 4000 gpm split between Nodes 13 and 15

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	2137.21	3.41
2	16	2598.27	4.15
3	16	600.16	0.96
4	16	2137.21	3.41
5	10 - PRV	2137.21	8.73
6	16	2598.27	4.15
7	10 - PRV	2598.27	10.61
8	16	600.16	0.96
9	8 - PRV	600.16	3.83
10	12	235.08	0.67
11	12	-2235.08	-6.34
12	16	-2085.72	-3.33
13	16	-159.42	-0.25
14	12	-74.16	-0.21
15	16	354.96	0.57
27	12	79.16	0.22
29	16	555.5	0.89
33	12	44.66	0.13
37	16	600.16	0.96
101	16	-2085.72	-3.33
105	16	-1834.05	-2.93
109	16	-930.08	-1.48
113	16	-1561.61	-2.49
117	16	2522.47	4.02
121	16	2563.27	4.09
125	16	2598.27	4.15
201	12	79.42	0.23
202	12	-1803.24	-5.12
203	12	1764.92	5.01
205	12	-1419.89	-4.03
207	12	2137.21	6.06
209	12	-2055.95	-5.83
211	8	-364.73	-1.03
213	8	-417.23	-1.18
215	8	-452.35	-1.28
241	12	46.58	0.13
249	12	-903.97	-2.56
253	12	-955.19	-2.71
301	12	584.95	1.66
303	12	-367.23	-2.34
304	12	-410.11	-2.62
305	12	-218.64	-1.4
309	12	-230.16	-1.47
312	12	493.71	1.4
313	8	252.03	0.71
317	8	214.51	1.37
321	8	202.99	1.3
325	12	211.16	0.6
329	12	181.36	0.51
333	12	-312.21	-0.89
335	12	-3.52	-0.02
337	12	237.44	0.67
341	12	-584.95	-1.66
357	12	252.88	0.72
359	8	-59.33	-0.38
361	8	-23.46	-0.15
363	8	-10.26	-0.07
365	8	17.32	0.11
367	8	44.64	0.28
369	8	94.63	0.6
371	8	20.26	0.13
373	8	42.93	0.27
387	12	347.51	0.99
389	12	33.04	0.21
393	8	-191.47	-1.22
399	12	-10.92	-0.07
401	8	12.28	0.08
403	8	-2.44	-0.02
405	12	-463.77	-1.32

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 312 CLOSED - Max Day Demands Plus 2000 gpm at Node 316

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1551.63	2.48
2	16	1807.89	2.88
3	16	0	0
4	16	1551.63	2.48
5	10 - PRV	1551.63	6.34
6	16	1807.89	2.88
7	10 - PRV	1807.89	7.38
8	16	0	0
9	8 - PRV	CLOSED	CLOSED
10	12	50.9	0.14
11	12	-68.6	-0.19
12	16	-519.4	-0.83
13	16	440.74	0.7
14	12	-74.16	-0.21
15	16	-245.2	-0.39
27	12	79.16	0.22
29	16	-44.66	-0.07
33	12	44.66	0.13
37	16	0	0
101	16	-519.4	-0.83
105	16	-1211.83	-1.93
109	16	-553.42	-0.88
113	16	-1304.19	-2.08
117	16	1732.09	2.76
121	16	1772.89	2.83
125	16	1807.89	2.88
201	12	290.53	0.82
202	12	-5.12	-0.01
203	12	-33.2	-0.09
205	12	-1040.62	-2.95
207	12	1551.63	4.4
209	12	-1470.37	-4.17
211	8	-325.48	-0.92
213	8	-377.98	-1.07
215	8	-413.1	-1.17
241	12	46.58	0.13
249	12	-658.41	-1.87
253	12	-709.63	-2.01
301	12	704.19	2
303	12	1262.73	8.06
304	12	2072.08	13.22
305	12	619.33	3.95
309	12	607.81	3.88
312	12	CLOSED	CLOSED
313	8	596.29	1.69
317	8	558.77	3.57
321	8	-1441.23	-9.2
325	12	-272.85	-0.77
329	12	-302.65	-0.86
333	12	-63.23	-0.18
335	12	848.71	5.42
337	12	605.66	1.72
341	12	-704.19	-2
357	12	66.66	0.19
359	8	3.43	0.02
361	8	6.31	0.04
363	8	2.69	0.02
365	8	4.37	0.03
367	8	14.87	0.09
369	8	31.87	0.2
371	8	3.44	0.02
373	8	9.94	0.06
387	12	98.53	0.28
389	12	-819.19	-5.23
393	8	1452.75	9.27
399	12	488.1	3.12
401	8	-340.93	-2.18
403	8	350.77	2.24
405	12	269.22	0.76

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 116 and 120

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	3125.71	4.99
2	16	0	0
3	16	1169.53	1.87
4	16	3125.71	4.99
5	10 - PRV	3125.71	12.77
6	16	0	0
7	10 - PRV	0	0
8	16	1169.53	1.87
9	8 - PRV	1169.53	7.46
10	12	-9.6	-0.03
11	12	-8.1	-0.02
12	16	710.63	1.13
13	16	-728.79	-1.16
14	12	-74.16	-0.21
15	16	924.33	1.47
27	12	79.16	0.22
29	16	1124.87	1.79
33	12	44.66	0.13
37	16	1169.53	1.87
101	16	710.63	1.13
105	16	520.8	0.83
109	16	1521.79	2.43
113	16	1709.05	2.73
117	16	-3000	-4.79
121	16	-1500	-2.39
125	16	CLOSED	CLOSED
201	12	-368.75	-1.05
202	12	-65.62	-0.19
203	12	27.3	0.08
205	12	-875.85	-2.48
207	12	3125.71	8.87
209	12	-3044.45	-8.64
211	8	1070.77	3.04
213	8	1018.27	2.89
215	8	983.15	2.79
241	12	46.58	0.13
249	12	-1001	-2.84
253	12	-1052.22	-2.98
301	12	-233.83	-0.66
303	12	378.18	2.41
304	12	406.2	2.59
305	12	204.87	1.31
309	12	193.35	1.23
312	12	-322.6	-0.92
313	8	-140.77	-0.4
317	8	-178.29	-1.14
321	8	-189.81	-1.21
325	12	-145.52	-0.41
329	12	-175.32	-0.5
333	12	220.79	0.63
335	12	67.38	0.43
337	12	-48.34	-0.14
341	12	233.83	0.66
357	12	-156.91	-0.45
359	8	63.88	0.41
361	8	30.46	0.19
363	8	11.51	0.07
365	8	-4.45	-0.03
367	8	-9.28	-0.06
369	8	-28.58	-0.18
371	8	-11.89	-0.08
373	8	-26.36	-0.17
387	12	-185.49	-0.53
389	12	-37.86	-0.24
393	8	201.33	1.28
399	12	31.6	0.2
401	8	-16.09	-0.1
403	8	25.93	0.17
405	12	425.91	1.21

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 301 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 324 and 328

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1942.06	3.1
2	16	2369.38	3.78
3	16	0	0
4	16	1942.06	3.1
5	10 - PRV	1942.06	7.93
6	16	2369.38	3.78
7	10 - PRV	2369.38	9.68
8	16	0	0
9	8 - PRV	CLOSED	CLOSED
10	12	-205.25	-0.58
11	12	187.55	0.53
12	16	-263.25	-0.42
13	16	440.74	0.7
14	12	-74.16	-0.21
15	16	-245.2	-0.39
27	12	79.16	0.22
29	16	-44.66	-0.07
33	12	44.66	0.13
37	16	0	0
101	16	-263.25	-0.42
105	16	-1991.17	-3.18
109	16	-1191.96	-1.9
113	16	-1238.54	-1.98
117	16	2293.58	3.66
121	16	2334.38	3.72
125	16	2369.38	3.78
201	12	-537.35	-1.52
202	12	-261.27	-0.74
203	12	222.95	0.63
205	12	-1283.65	-3.64
207	12	1942.06	5.51
209	12	-1860.8	-5.28
211	8	-318.87	-0.9
213	8	-371.37	-1.05
215	8	-406.49	-1.15
241	12	46.58	0.13
249	12	-799.21	-2.27
253	12	-850.43	-2.41
301	12	CLOSED	CLOSED
303	12	421.73	2.69
304	12	-550.14	-3.51
305	12	-291.22	-1.86
309	12	-302.74	-1.93
312	12	633.74	1.8
313	8	319.48	0.91
317	8	281.96	1.8
321	8	270.44	1.73
325	12	614.54	1.74
329	12	-885.46	-2.51
333	12	-252.87	-0.72
335	12	-932.51	-5.95
337	12	-288.17	-0.82
341	12	0	0
357	12	207.86	0.59
359	8	-45.01	-0.29
361	8	-16.87	-0.11
363	8	-7.47	-0.05
365	8	14.53	0.09
367	8	38.05	0.24
369	8	80.31	0.51
371	8	16.46	0.11
373	8	35.2	0.22
387	12	288.17	0.82
389	12	962.03	6.14
393	8	-258.92	-1.65
399	12	-553.17	-3.53
401	8	399.02	2.55
403	8	-389.18	-2.48
405		2132.59	6.05

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 13 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 22 and 24

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1085.75	1.73
2	16	1344.55	2.15
3	16	1866.58	2.98
4	16	1085.75	1.73
5	10 - PRV	1085.75	4.43
6	16	1344.55	2.15
7	10 - PRV	1344.55	5.49
8	16	1866.58	2.98
9	8 - PRV	1866.58	11.91
10	12	-246.62	-0.7
11	12	228.92	0.65
12	16	218.86	0.35
13	16	CLOSED	CLOSED
14	12	-1500	-4.25
15	16	1621.38	2.59
27	12	79.16	0.22
29	16	1821.92	2.91
33	12	44.66	0.13
37	16	1866.58	2.98
101	16	-1281.14	-2.04
105	16	-874.82	-1.4
109	16	-426.03	-0.68
113	16	-765.18	-1.22
117	16	1268.75	2.02
121	16	1309.55	2.09
125	16	1344.55	2.15
201	12	-335.96	-0.95
202	12	-302.64	-0.86
203	12	264.32	0.75
205	12	-595.78	-1.69
207	12	1085.75	3.08
209	12	-1004.49	-2.85
211	8	-136.9	-0.39
213	8	-189.4	-0.54
215	8	-224.52	-0.64
241	12	46.58	0.13
249	12	-448.79	-1.27
253	12	-500.01	-1.42
301	12	292.57	0.83
303	12	-106.12	-0.68
304	12	-180.66	-1.15
305	12	-99.8	-0.64
309	12	-111.32	-0.71
312	12	264.26	0.75
313	8	141.42	0.4
317	8	103.9	0.66
321	8	92.38	0.59
325	12	112.25	0.32
329	12	82.45	0.23
333	12	-150.39	-0.43
335	12	-35.17	-0.22
337	12	106.88	0.3
341	12	-292.57	-0.83
357	12	130.59	0.37
359	8	-19.8	-0.13
361	8	-5.01	-0.03
363	8	-2.34	-0.01
365	8	9.4	0.06
367	8	26.19	0.17
369	8	55.1	0.35
371	8	9.72	0.06
373	8	21.86	0.14
387	12	185.69	0.53
389	12	64.69	0.41
393	8	-80.86	-0.52
399	12	-28.89	-0.18
401	8	25.96	0.17
403	8	-16.12	-0.1
405	12	-203.04	-0.58

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 13 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 22 and 32

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	411.6	0.66
2	16	518.7	0.83
3	16	3287.42	5.25
4	16	411.6	0.66
5	10 - PRV	411.6	1.68
6	16	518.7	0.83
7	10 - PRV	518.7	2.12
8	16	3287.42	5.25
9	8 - PRV	3287.42	20.98
10	12	7.71	0.02
11	12	-25.41	-0.07
12	16	-35.47	-0.06
13	16	CLOSED	CLOSED
14	12	-1500	-4.25
15	16	1621.38	2.59
27	12	1500	4.25
29	16	3242.76	5.17
33	12	44.66	0.13
37	16	3287.42	5.25
101	16	-35.47	-0.06
105	16	-166.28	-0.27
109	16	-75.96	-0.12
113	16	-214.36	-0.34
117	16	442.9	0.71
121	16	483.7	0.77
125	16	518.7	0.83
201	12	-37.91	-0.11
202	12	-48.31	-0.14
203	12	9.99	0.03
205	12	-151.17	-0.43
207	12	411.6	1.17
209	12	-330.34	-0.94
211	8	-7.97	-0.02
213	8	-60.47	-0.17
215	8	-95.59	-0.27
241	12	46.58	0.13
249	12	-90.32	-0.26
253	12	-141.54	-0.4
301	12	91.82	0.26
303	12	1.65	0.01
304	12	-34.54	-0.22
305	12	-24.62	-0.16
309	12	-36.14	-0.23
312	12	118.14	0.34
313	8	70.48	0.2
317	8	32.96	0.21
321	8	21.44	0.14
325	12	10.31	0.03
329	12	-19.49	-0.06
333	12	-13.25	-0.04
335	12	3.17	0.02
337	12	43.28	0.12
341	12	-91.82	-0.26
357	12	27.7	0.08
359	8	14.45	0.09
361	8	10.14	0.06
363	8	3.61	0.02
365	8	3.45	0.02
367	8	11.04	0.07
369	8	20.85	0.13
371	8	0.53	0
373	8	2.75	0.02
387	12	48.55	0.14
389	12	26.35	0.17
393	8	-9.92	-0.06
399	12	-7.58	-0.05
401	8	8.93	0.06
403	8	0.91	0.01
405	12	36.04	0.1

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 37 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 40 and 44

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1941.7	3.1
2	16	2384.69	3.8
3	16	0	0
4	16	1941.7	3.1
5	10 - PRV	1941.7	7.93
6	16	2384.69	3.8
7	10 - PRV	2384.69	9.74
8	16	0	0
9	8 - PRV	0	0
10	12	-613.12	-1.74
11	12	595.42	1.69
12	16	-2810.72	-4.48
13	16	3396.08	5.42
14	12	-74.16	-0.21
15	16	-3200.54	-5.11
27	12	79.16	0.22
29	16	-3000	-4.79
33	12	1500	4.25
37	16	CLOSED	CLOSED
101	16	-2810.72	-4.48
105	16	-1782.51	-2.84
109	16	-887.65	-1.42
113	16	-1460.89	-2.33
117	16	2308.89	3.68
121	16	2349.69	3.75
125	16	2384.69	3.8
201	12	-685.97	-1.95
202	12	-669.14	-1.9
203	12	630.82	1.79
205	12	-1170.45	-3.32
207	12	1941.7	5.51
209	12	-1860.44	-5.28
211	8	-301.7	-0.86
213	8	-354.2	-1
215	8	-389.32	-1.1
241	12	46.58	0.13
249	12	-894.86	-2.54
253	12	-946.08	-2.68
301	12	526.66	1.49
303	12	-247.96	-1.58
304	12	-360.28	-2.3
305	12	-192.81	-1.23
309	12	-204.33	-1.3
312	12	443.88	1.26
313	8	228.03	0.65
317	8	190.51	1.22
321	8	178.99	1.14
325	12	224.01	0.64
329	12	194.21	0.55
333	12	-310.51	-0.88
335	12	-72.96	-0.47
337	12	180.85	0.51
341	12	-526.66	-1.49
357	12	251.07	0.71
359	8	-59.44	-0.38
361	8	-24.3	-0.16
363	8	-11.43	-0.07
365	8	18.49	0.12
367	8	45.48	0.29
369	8	94.74	0.6
371	8	19.93	0.13
373	8	42.2	0.27
387	12	345.81	0.98
389	12	102.48	0.65
393	8	-167.47	-1.07
399	12	-50.69	-0.32
401	8	41.94	0.27
403	8	-32.1	-0.2
405	12	-474.92	-1.35

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 207 CLOSED - Max Day Demands Plus 4000 gpm split between Nodes 13 and 15

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	0	0
2	16	3802.68	6.07
3	16	1532.96	2.45
4	16	0	0
5	10 - PRV	0	0
6	16	3802.68	6.07
7	10 - PRV	3802.68	15.53
8	16	1532.96	2.45
9	8 - PRV	1532.96	9.78
10	12	298.74	0.85
11	12	-2298.74	-6.52
12	16	-1216.58	-1.94
13	16	-1092.22	-1.74
14	12	-74.16	-0.21
15	16	1287.76	2.05
27	12	79.16	0.22
29	16	1488.3	2.37
33	12	44.66	0.13
37	16	1532.96	2.45
101	16	-1216.58	-1.94
105	16	-1367.94	-2.18
109	16	-1518.76	-2.42
113	16	-2107.73	-3.36
117	16	3726.88	5.95
121	16	3767.68	6.01
125	16	3802.68	6.07
201	12	469.05	1.33
202	12	-1739.58	-4.93
203	12	1701.26	4.83
205	12	-903.82	-2.56
207	12	CLOSED	CLOSED
209	12	81.26	0.23
211	8	-931.07	-2.64
213	8	-983.57	-2.79
215	8	-1018.69	-2.89
241	12	46.58	0.13
249	12	150.83	0.43
253	12	99.61	0.28
301	12	542.39	1.54
303	12	-430.02	-2.74
304	12	-502.06	-3.2
305	12	-266.3	-1.7
309	12	-277.82	-1.77
312	12	585.66	1.66
313	8	296.32	0.84
317	8	258.8	1.65
321	8	247.28	1.58
325	12	209.64	0.59
329	12	179.84	0.51
333	12	-300.33	-0.85
335	12	-32.67	-0.21
337	12	206.76	0.59
341	12	-542.39	-1.54
357	12	243.86	0.69
359	8	-56.47	-0.36
361	8	-22.15	-0.14
363	8	-9.71	-0.06
365	8	16.77	0.11
367	8	43.33	0.28
369	8	91.77	0.59
371	8	19.5	0.12
373	8	41.38	0.26
387	12	335.63	0.95
389	12	62.19	0.4
393	8	-235.76	-1.5
399	12	-27.44	-0.18
401	8	24.91	0.16
403	8	-15.07	-0.1
405	**12**	-450.37	-1.28

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 209 CLOSED - Max Day Demands Plus 3000 gpm split between Node 204 and 212

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	40.63	0.06
2	16	3239.26	5.17
3	16	356.58	0.57
4	16	40.63	0.06
5	10 - PRV	40.63	0.17
6	16	3239.26	5.17
7	10 - PRV	3239.26	13.23
8	16	356.58	0.57
9	8 - PRV	356.58	2.28
10	12	163.07	0.46
11	12	-171.92	-0.49
12	16	-40.74	-0.07
13	16	-136.21	-0.22
14	12	-37.08	-0.11
15	16	233.98	0.37
27	12	39.58	0.11
29	16	334.25	0.53
33	12	22.33	0.06
37	16	356.58	0.57
101	16	-40.74	-0.07
105	16	-252.33	-0.4
109	16	-1200.92	-1.92
113	16	-1508.01	-2.41
117	16	3201.36	5.11
121	16	3221.76	5.14
125	16	3239.26	5.17
201	12	402.28	1.14
202	12	135.06	0.38
203	12	-154.22	-0.44
205	12	793.82	2.25
207	12	40.63	0.12
209	12	CLOSED	CLOSED
211	8	216.79	0.61
213	8	-1283.21	-3.64
215	8	-1300.77	-3.69
241	12	23.29	0.07
249	12	948.59	2.69
253	12	922.98	2.62
301	12	283.8	0.81
303	12	-288.12	-1.84
304	12	-343.38	-2.19
305	12	-181.02	-1.16
309	12	-186.78	-1.19
312	12	385.18	1.09
313	8	192.64	0.55
317	8	173.88	1.11
321	8	168.12	1.07
325	12	119.66	0.34
329	12	104.76	0.3
333	12	-167.17	-0.47
335	12	-35.58	-0.23
337	12	98.98	0.28
341	12	-283.8	-0.81
357	12	134.85	0.38
359	8	-32.32	-0.21
361	8	-12.95	-0.08
363	8	-5.64	-0.04
365	8	9.17	0.06
367	8	23.54	0.15
369	8	49.97	0.32
371	8	10.83	0.07
373	8	22.91	0.15
387	12	184.82	0.52
389	12	50.34	0.32
393	8	-162.36	-1.04
399	12	-24.9	-0.16
401	8	20.52	0.13
403	8	-15.6	-0.1
405	**12**	-257.03	-0.73

Project: 3Roots **Pressure Check**
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Average Day Demands

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	143	0.00
4	292	610	137.80	137.8	0.00
6	292	485	83.63	83.63	0.00
8	290	610	138.67	138.66	0.01
10	320	610	125.67	125.66	0.01
12	320	485	71.50	71.5	0.00
13	250	485	101.83	101.74	0.09
14	335	625	125.67	125.67	0.00
15	256	485	99.23	99.14	0.09
16	328	625	128.70	128.7	0.00
17	261	485	97.07	96.97	0.10
18	328	485	68.03	67.9	0.13
20	262	485	96.63	96.54	0.09
22	273	485	91.87	91.75	0.12
24	273	485	91.87	91.75	0.12
32	300	485	80.17	80.04	0.13
36	298	485	81.03	80.91	0.12
40	317	485	72.80	72.67	0.13
44	318	485	72.37	72.24	0.13
100	270	485	93.17	93.08	0.09
104	294	485	82.77	82.69	0.08
108	306	485	77.57	77.49	0.08
112	308	485	76.70	76.64	0.06
116	305	485	78.00	77.96	0.04
120	298	485	81.03	81.01	0.02
200	274	485	91.43	91.35	0.08
202	268	485	94.03	93.94	0.09
204	288	485	85.37	85.3	0.07
208	292	485	83.63	83.59	0.04
212	297	485	81.47	81.4	0.07
216	306	485	77.57	77.5	0.07
232	306	485	77.57	77.49	0.08
236	292	485	83.63	83.56	0.07
300	314	485	74.10	74.02	0.08
302	322	485	70.63	70.56	0.07
304	325.5	485	69.12	69.04	0.08
308	314	485	74.10	74.04	0.06
312	321	485	71.07	71	0.07
316	333.5	485	65.65	65.57	0.08
318	333	485	65.87	65.79	0.08
320	328	485	68.03	67.95	0.08
324	312	485	74.97	74.88	0.09
328	310	485	75.83	75.75	0.08
332	322	485	70.63	70.55	0.08
352	318	485	72.37	72.28	0.09
354	317	485	72.80	72.71	0.09
356	317	485	72.80	72.71	0.09
358	317	485	72.80	72.71	0.09
360	317	485	72.80	72.71	0.09
362	317	485	72.80	72.71	0.09
364	317	485	72.80	72.71	0.09
376	328	485	68.03	67.95	0.08
378	328	485	68.03	67.95	0.08
380	326	485	68.90	68.81	0.09
382	326	485	68.90	68.81	0.09

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Peak Hour Demands

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.97	0.03
4	292	610	137.80	137.74	0.06
6	292	485	83.63	83.6	0.03
8	290	610	138.67	138.62	0.05
10	320	610	125.67	125.57	0.10
12	320	485	71.50	71.45	0.05
13	250	485	101.83	100.13	1.70
14	335	625	125.67	125.67	0.00
15	256	485	99.23	97.49	1.74
16	328	625	128.70	128.7	0.00
17	261	485	97.07	95.29	1.78
18	328	485	68.03	65.69	2.34
20	262	485	96.63	94.9	1.73
22	273	485	91.87	89.72	2.15
24	273	485	91.87	89.73	2.14
32	300	485	80.17	77.81	2.36
36	298	485	81.03	78.69	2.34
40	317	485	72.80	70.45	2.35
44	318	485	72.37	70.02	2.35
100	270	485	93.17	91.56	1.61
104	294	485	82.77	81.35	1.42
108	306	485	77.57	76.18	1.39
112	308	485	76.70	75.59	1.11
116	305	485	78.00	77.31	0.69
120	298	485	81.03	80.62	0.41
200	274	485	91.43	89.9	1.53
202	268	485	94.03	92.39	1.64
204	288	485	85.37	84.16	1.21
208	292	485	83.63	82.86	0.77
212	297	485	81.47	80.28	1.19
216	306	485	77.57	76.43	1.14
232	306	485	77.57	76.17	1.40
236	292	485	83.63	82.28	1.35
300	314	485	74.10	72.64	1.46
302	322	485	70.63	69.22	1.41
304	325.5	485	69.12	67.77	1.35
308	314	485	74.10	72.96	1.14
312	321	485	71.07	69.9	1.17
316	333.5	485	65.65	64.28	1.37
318	333	485	65.87	64.47	1.40
320	328	485	68.03	66.47	1.56
324	312	485	74.97	73.38	1.59
328	310	485	75.83	74.25	1.58
332	322	485	70.63	69.08	1.55
352	318	485	72.37	70.81	1.56
354	317	485	72.80	71.23	1.57
356	317	485	72.80	71.23	1.57
358	317	485	72.80	71.23	1.57
360	317	485	72.80	71.23	1.57
362	317	485	72.80	71.23	1.57
364	317	485	72.80	71.23	1.57
376	328	485	68.03	66.52	1.51
378	328	485	68.03	66.48	1.55
380	326	485	68.90	67.34	1.56
382	326	485	68.90	67.34	1.56

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands plus 2000 gpm at Node 316

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.97	0.03
4	292	610	137.80	137.74	0.06
6	292	485	83.63	83.6	0.03
8	290	610	138.67	138.61	0.06
10	320	610	125.67	125.56	0.11
12	320	485	71.50	71.45	0.05
13	250	485	101.83	100.27	1.56
14	335	625	125.67	125.67	0.00
15	256	485	99.23	97.66	1.57
16	328	625	128.70	128.7	0.00
17	261	485	97.07	95.49	1.58
18	328	485	68.03	66.35	1.68
20	262	485	96.63	95.07	1.56
22	273	485	91.87	90.22	1.65
24	273	485	91.87	90.22	1.65
32	300	485	80.17	78.48	1.69
36	298	485	81.03	79.35	1.68
40	317	485	72.80	71.11	1.69
44	318	485	72.37	70.68	1.69
100	270	485	93.17	91.63	1.54
104	294	485	82.77	81.34	1.43
108	306	485	77.57	76.15	1.42
112	308	485	76.70	75.42	1.28
116	305	485	78.00	77.22	0.78
120	298	485	81.03	80.58	0.45
200	274	485	91.43	89.9	1.53
202	268	485	94.03	92.48	1.55
204	288	485	85.37	84.13	1.24
208	292	485	83.63	82.88	0.75
212	297	485	81.47	80.2	1.27
216	306	485	77.57	76.29	1.28
232	306	485	77.57	76.15	1.42
236	292	485	83.63	82.27	1.36
300	314	485	74.10	72.62	1.48
302	322	485	70.63	67.04	3.59
304	325.5	485	69.12	66.14	2.98
308	314	485	74.10	72.5	1.60
312	321	485	71.07	69.15	1.92
316	333.5	485	65.65	57.04	8.61
318	333	485	65.87	59.19	6.68
320	328	485	68.03	66.44	1.59
324	312	485	74.97	73.39	1.58
328	310	485	75.83	74.27	1.56
332	322	485	70.63	69.08	1.55
352	318	485	72.37	70.81	1.56
354	317	485	72.80	71.24	1.56
356	317	485	72.80	71.24	1.56
358	317	485	72.80	71.24	1.56
360	317	485	72.80	71.24	1.56
362	317	485	72.80	71.24	1.56
364	317	485	72.80	71.24	1.56
376	328	485	68.03	65.71	2.32
378	328	485	68.03	66.13	1.90
380	326	485	68.90	67.05	1.85
382	326	485	68.90	67.14	1.76

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands plus 3000 gpm split between Nodes 324 and 328

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.95	0.05
4	292	610	137.80	137.7	0.10
6	292	485	83.63	83.58	0.05
8	290	610	138.67	138.59	0.08
10	320	610	125.67	125.51	0.16
12	320	485	71.50	71.42	0.08
13	250	485	101.83	98.89	2.94
14	335	625	125.67	125.67	0.00
15	256	485	99.23	96.24	2.99
16	328	625	128.70	128.7	0.00
17	261	485	97.07	94.02	3.05
18	328	485	68.03	64.88	3.15
20	262	485	96.63	93.59	3.04
22	273	485	91.87	88.75	3.12
24	273	485	91.87	88.75	3.12
32	300	485	80.17	77.01	3.16
36	298	485	81.03	77.88	3.15
40	317	485	72.80	69.64	3.16
44	318	485	72.37	69.21	3.16
100	270	485	93.17	90.14	3.03
104	294	485	82.77	80.01	2.76
108	306	485	77.57	74.82	2.75
112	308	485	76.70	74.74	1.96
116	305	485	78.00	76.82	1.18
120	298	485	81.03	80.35	0.68
200	274	485	91.43	88.62	2.81
202	268	485	94.03	91.15	2.88
204	288	485	85.37	83.26	2.11
208	292	485	83.63	82.36	1.27
212	297	485	81.47	79.41	2.06
216	306	485	77.57	75.58	1.99
232	306	485	77.57	74.82	2.75
236	292	485	83.63	81.12	2.51
300	314	485	74.10	70.52	3.58
302	322	485	70.63	68.05	2.58
304	325.5	485	69.12	66.7	2.42
308	314	485	74.10	72.1	2.00
312	321	485	71.07	69.04	2.03
316	333.5	485	65.65	63.21	2.44
318	333	485	65.87	63.37	2.50
320	328	485	68.03	63.43	4.60
324	312	485	74.97	69.43	5.54
328	310	485	75.83	70.5	5.33
332	322	485	70.63	66.12	4.51
352	318	485	72.37	67.72	4.65
354	317	485	72.80	68.08	4.72
356	317	485	72.80	68.05	4.75
358	317	485	72.80	68.04	4.76
360	317	485	72.80	68.04	4.76
362	317	485	72.80	68.02	4.78
364	317	485	72.80	67.96	4.84
376	328	485	68.03	65.13	2.90
378	328	485	68.03	64.06	3.97
380	326	485	68.90	64.8	4.10
382	326	485	68.90	64.63	4.27

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands plus 4000 gpm split between Nodes 13 and 15

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.94	0.06
4	292	610	137.80	137.67	0.13
6	292	485	83.63	83.57	0.06
8	290	610	138.67	138.57	0.10
10	320	610	125.67	125.48	0.19
12	320	485	71.50	71.41	0.09
13	250	485	101.83	92.51	9.32
14	335	625	125.67	125.66	0.01
15	256	485	99.23	89.98	9.25
16	328	625	128.70	128.69	0.01
17	261	485	97.07	92.4	4.67
18	328	485	68.03	63.68	4.35
20	262	485	96.63	92.13	4.50
22	273	485	91.87	87.2	4.67
24	273	485	91.87	87.21	4.66
32	300	485	80.17	75.58	4.59
36	298	485	81.03	76.45	4.58
40	317	485	72.80	68.4	4.40
44	318	485	72.37	67.97	4.40
100	270	485	93.17	89.24	3.93
104	294	485	82.77	79.56	3.21
108	306	485	77.57	74.51	3.06
112	308	485	76.70	74.43	2.27
116	305	485	78.00	76.64	1.36
120	298	485	81.03	80.24	0.79
200	274	485	91.43	87.5	3.93
202	268	485	94.03	87.6	6.43
204	288	485	85.37	82.75	2.62
208	292	485	83.63	82.06	1.57
212	297	485	81.47	78.99	2.48
216	306	485	77.57	75.25	2.32
232	306	485	77.57	74.51	3.06
236	292	485	83.63	80.65	2.98
300	314	485	74.10	70.87	3.23
302	322	485	70.63	67.58	3.05
304	325.5	485	69.12	66.28	2.84
308	314	485	74.10	71.78	2.32
312	321	485	71.07	68.71	2.36
316	333.5	485	65.65	62.79	2.86
318	333	485	65.87	62.93	2.94
320	328	485	68.03	64.58	3.45
324	312	485	74.97	71.44	3.53
328	310	485	75.83	72.29	3.54
332	322	485	70.63	67.21	3.42
352	318	485	72.37	68.92	3.45
354	317	485	72.80	69.34	3.46
356	317	485	72.80	69.33	3.47
358	317	485	72.80	69.33	3.47
360	317	485	72.80	69.33	3.47
362	317	485	72.80	69.33	3.47
364	317	485	72.80	69.32	3.48
376	328	485	68.03	64.58	3.45
378	328	485	68.03	64.58	3.45
380	326	485	68.90	65.44	3.46
382	326	485	68.90	65.44	3.46

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 312 CLOSED - Max Day Demands Plus 2000 gpm at Node 316

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.96	0.04
4	292	610	137.80	137.73	0.07
6	292	485	83.63	83.6	0.03
8	290	610	138.67	138.62	0.05
10	320	610	125.67	125.57	0.10
12	320	485	71.50	71.45	0.05
13	250	485	101.83	99.67	2.16
14	335	625	125.67	125.67	0.00
15	256	485	99.23	97.07	2.16
16	328	625	128.70	128.7	0.00
17	261	485	97.07	94.91	2.16
18	328	485	68.03	65.76	2.27
20	262	485	96.63	94.49	2.14
22	273	485	91.87	89.64	2.23
24	273	485	91.87	89.64	2.23
32	300	485	80.17	77.9	2.27
36	298	485	81.03	78.77	2.26
40	317	485	72.80	70.53	2.27
44	318	485	72.37	70.1	2.27
100	270	485	93.17	91.07	2.10
104	294	485	82.77	81	1.77
108	306	485	77.57	75.86	1.71
112	308	485	76.70	75.55	1.15
116	305	485	78.00	77.31	0.69
120	298	485	81.03	80.63	0.40
200	274	485	91.43	89.26	2.17
202	268	485	94.03	91.86	2.17
204	288	485	85.37	83.94	1.43
208	292	485	83.63	82.76	0.87
212	297	485	81.47	80.15	1.32
216	306	485	77.57	76.38	1.19
232	306	485	77.57	75.86	1.71
236	292	485	83.63	81.99	1.64
300	314	485	74.10	72.14	1.96
302	322	485	70.63	55.76	14.87
304	325.5	485	69.12	52.75	16.37
308	314	485	74.10	54.63	19.47
312	321	485	71.07	51.45	19.62
316	333.5	485	65.65	43.03	22.62
318	333	485	65.87	46.23	19.64
320	328	485	68.03	65.63	2.40
324	312	485	74.97	72.68	2.29
328	310	485	75.83	73.6	2.23
332	322	485	70.63	68.4	2.23
352	318	485	72.37	70.14	2.23
354	317	485	72.80	70.57	2.23
356	317	485	72.80	70.57	2.23
358	317	485	72.80	70.57	2.23
360	317	485	72.80	70.57	2.23
362	317	485	72.80	70.57	2.23
364	317	485	72.80	70.57	2.23
376	328	485	68.03	61.13	6.90
378	328	485	68.03	63.82	4.21
380	326	485	68.90	65.01	3.89
382	326	485	68.90	65.52	3.38

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 116 and 120

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.87	0.13
4	292	610	137.80	137.54	0.26
6	292	485	83.63	83.51	0.12
8	290	610	138.67	138.67	0.00
10	320	610	125.67	125.67	0.00
12	320	485	71.50	71.5	0.00
13	250	485	101.83	95.96	5.87
14	335	625	125.67	125.65	0.02
15	256	485	99.23	93.36	5.87
16	328	625	128.70	128.66	0.04
17	261	485	97.07	91.19	5.88
18	328	485	68.03	63.64	4.39
20	262	485	96.63	90.73	5.90
22	273	485	91.87	86.17	5.70
24	273	485	91.87	86.17	5.70
32	300	485	80.17	74.93	5.24
36	298	485	81.03	75.8	5.23
40	317	485	72.80	68.24	4.56
44	318	485	72.37	67.8	4.57
100	270	485	93.17	87.19	5.98
104	294	485	82.77	76.72	6.05
108	306	485	77.57	71.14	6.43
112	308	485	76.70	69.34	7.36
116	305	485	78.00	69.4	8.60
120	298	485	81.03	72.22	8.81
200	274	485	91.43	85.56	5.87
202	268	485	94.03	88.16	5.87
204	288	485	85.37	80.03	5.34
208	292	485	83.63	80.46	3.17
212	297	485	81.47	75.15	6.32
216	306	485	77.57	70.42	7.15
232	306	485	77.57	71.14	6.43
236	292	485	83.63	77.85	5.78
300	314	485	74.10	67.71	6.39
302	322	485	70.63	63.87	6.76
304	325.5	485	69.12	62.16	6.96
308	314	485	74.10	66.77	7.33
312	321	485	71.07	63.74	7.33
316	333.5	485	65.65	58.69	6.96
318	333	485	65.87	58.98	6.89
320	328	485	68.03	61.68	6.35
324	312	485	74.97	68.65	6.32
328	310	485	75.83	69.53	6.30
332	322	485	70.63	64.28	6.35
352	318	485	72.37	66.02	6.35
354	317	485	72.80	66.45	6.35
356	317	485	72.80	66.45	6.35
358	317	485	72.80	66.45	6.35
360	317	485	72.80	66.45	6.35
362	317	485	72.80	66.45	6.35
364	317	485	72.80	66.46	6.34
376	328	485	68.03	61.65	6.38
378	328	485	68.03	61.66	6.37
380	326	485	68.90	62.53	6.37
382	326	485	68.90	62.54	6.36

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 301 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 324 and 328

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.95	0.05
4	292	610	137.80	137.69	0.11
6	292	485	83.63	83.58	0.05
8	290	610	138.67	138.59	0.08
10	320	610	125.67	125.51	0.16
12	320	485	71.50	71.42	0.08
13	250	485	101.83	98.43	3.40
14	335	625	125.67	125.67	0.00
15	256	485	99.23	95.77	3.46
16	328	625	128.70	128.7	0.00
17	261	485	97.07	93.56	3.51
18	328	485	68.03	64.41	3.62
20	262	485	96.63	93.13	3.50
22	273	485	91.87	88.28	3.59
24	273	485	91.87	88.29	3.58
32	300	485	80.17	76.54	3.63
36	298	485	81.03	77.41	3.62
40	317	485	72.80	69.18	3.62
44	318	485	72.37	68.74	3.63
100	270	485	93.17	89.67	3.50
104	294	485	82.77	80.11	2.66
108	306	485	77.57	75.14	2.43
112	308	485	76.70	74.79	1.91
116	305	485	78.00	76.85	1.15
120	298	485	81.03	80.37	0.66
200	274	485	91.43	88.16	3.27
202	268	485	94.03	90.69	3.34
204	288	485	85.37	83.18	2.19
208	292	485	83.63	82.32	1.31
212	297	485	81.47	79.39	2.08
216	306	485	77.57	75.62	1.95
232	306	485	77.57	75.14	2.43
236	292	485	83.63	81.15	2.48
300	314	485	74.10	64.32	9.78
302	322	485	70.63	67.42	3.21
304	325.5	485	69.12	66.27	2.85
308	314	485	74.10	72.11	1.99
312	321	485	71.07	69.03	2.04
316	333.5	485	65.65	62.77	2.88
318	333	485	65.87	62.85	3.02
320	328	485	68.03	58.29	9.74
324	312	485	74.97	64.72	10.25
328	310	485	75.83	65.97	9.86
332	322	485	70.63	60.85	9.78
352	318	485	72.37	62.57	9.80
354	317	485	72.80	62.99	9.81
356	317	485	72.80	62.99	9.81
358	317	485	72.80	62.99	9.81
360	317	485	72.80	62.99	9.81
362	317	485	72.80	62.98	9.82
364	317	485	72.80	62.98	9.82
376	328	485	68.03	64.14	3.89
378	328	485	68.03	60.5	7.53
380	326	485	68.90	60.94	7.96
382	326	485	68.90	60.33	8.57

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 13 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 22 and 24

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.98	0.02
4	292	610	137.80	137.76	0.04
6	292	485	83.63	83.62	0.01
8	290	610	138.67	138.64	0.03
10	320	610	125.67	125.61	0.06
12	320	485	71.50	71.47	0.03
13	250	485	101.83	100.67	1.16
14	335	625	125.67	125.62	0.05
15	256	485	99.23	97.99	1.24
16	328	625	128.70	128.6	0.10
17	261	485	97.07	95.76	1.31
18	328	485	68.03	63.55	4.48
20	262	485	96.63	95.32	1.31
22	273	485	91.87	83.55	8.32
24	273	485	91.87	84.05	7.82
32	300	485	80.17	73.64	6.53
36	298	485	81.03	74.51	6.52
40	317	485	72.80	67.92	4.88
44	318	485	72.37	67.49	4.88
100	270	485	93.17	92.09	1.08
104	294	485	82.77	81.87	0.90
108	306	485	77.57	76.7	0.87
112	308	485	76.70	76.05	0.65
116	305	485	78.00	77.6	0.40
120	298	485	81.03	80.8	0.23
200	274	485	91.43	90.44	0.99
202	268	485	94.03	92.95	1.08
204	288	485	85.37	84.64	0.73
208	292	485	83.63	83.18	0.45
212	297	485	81.47	80.76	0.71
216	306	485	77.57	76.9	0.67
232	306	485	77.57	76.7	0.87
236	292	485	83.63	82.8	0.83
300	314	485	74.10	73.19	0.91
302	322	485	70.63	69.78	0.85
304	325.5	485	69.12	68.31	0.81
308	314	485	74.10	73.43	0.67
312	321	485	71.07	70.39	0.68
316	333.5	485	65.65	64.84	0.81
318	333	485	65.87	65.04	0.83
320	328	485	68.03	67.06	0.97
324	312	485	74.97	73.97	1.00
328	310	485	75.83	74.84	0.99
332	322	485	70.63	69.67	0.96
352	318	485	72.37	71.4	0.97
354	317	485	72.80	71.82	0.98
356	317	485	72.80	71.82	0.98
358	317	485	72.80	71.82	0.98
360	317	485	72.80	71.82	0.98
362	317	485	72.80	71.82	0.98
364	317	485	72.80	71.82	0.98
376	328	485	68.03	67.09	0.94
378	328	485	68.03	67.07	0.96
380	326	485	68.90	67.93	0.97
382	326	485	68.90	67.93	0.97

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 13 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 22 and 32

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	143	0.00
4	292	610	137.80	137.79	0.01
6	292	485	83.63	83.63	0.00
8	290	610	138.67	138.66	0.01
10	320	610	125.67	125.66	0.01
12	320	485	71.50	71.5	0.00
13	250	485	101.83	101.7	0.13
14	335	625	125.67	125.52	0.15
15	256	485	99.23	99.1	0.13
16	328	625	128.70	128.42	0.28
17	261	485	97.07	96.93	0.14
18	328	485	68.03	63.28	4.75
20	262	485	96.63	96.5	0.13
22	273	485	91.87	79.39	12.48
24	273	485	91.87	79.89	11.98
32	300	485	80.17	68.62	11.55
36	298	485	81.03	70.35	10.68
40	317	485	72.80	66.91	5.89
44	318	485	72.37	66.48	5.89
100	270	485	93.17	93.03	0.14
104	294	485	82.77	82.64	0.13
108	306	485	77.57	77.44	0.13
112	308	485	76.70	76.6	0.10
116	305	485	78.00	77.93	0.07
120	298	485	81.03	80.99	0.04
200	274	485	91.43	91.3	0.13
202	268	485	94.03	93.9	0.13
204	288	485	85.37	85.26	0.11
208	292	485	83.63	83.56	0.07
212	297	485	81.47	81.36	0.11
216	306	485	77.57	77.46	0.11
232	306	485	77.57	77.44	0.13
236	292	485	83.63	83.51	0.12
300	314	485	74.10	73.97	0.13
302	322	485	70.63	70.51	0.12
304	325.5	485	69.12	68.99	0.13
308	314	485	74.10	73.99	0.11
312	321	485	71.07	70.96	0.11
316	333.5	485	65.65	65.53	0.12
318	333	485	65.87	65.74	0.13
320	328	485	68.03	67.9	0.13
324	312	485	74.97	74.83	0.14
328	310	485	75.83	75.7	0.13
332	322	485	70.63	70.5	0.13
352	318	485	72.37	72.23	0.14
354	317	485	72.80	72.66	0.14
356	317	485	72.80	72.66	0.14
358	317	485	72.80	72.66	0.14
360	317	485	72.80	72.66	0.14
362	317	485	72.80	72.66	0.14
364	317	485	72.80	72.66	0.14
376	328	485	68.03	67.9	0.13
378	328	485	68.03	67.9	0.13
380	326	485	68.90	68.76	0.14
382	326	485	68.90	68.76	0.14

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 37 CLOSED - Max Day Demands Plus 3000 gpm split between Nodes 40 and 44

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	142.95	0.05
4	292	610	137.80	137.69	0.11
6	292	485	83.63	83.58	0.05
8	290	610	138.67	138.59	0.08
10	320	610	125.67	125.51	0.16
12	320	485	71.50	71.42	0.08
13	250	485	101.83	97.9	3.93
14	335	625	125.67	125.67	0.00
15	256	485	99.23	94.89	4.34
16	328	625	128.70	128.7	0.00
17	261	485	97.07	92.32	4.75
18	328	485	68.03	63.7	4.33
20	262	485	96.63	92.19	4.44
22	273	485	91.87	83.95	7.92
24	273	485	91.87	83.95	7.92
32	300	485	80.17	67.7	12.47
36	298	485	81.03	68.57	12.46
40	317	485	72.80	55.37	17.43
44	318	485	72.37	55.75	16.62
100	270	485	93.17	89.72	3.45
104	294	485	82.77	80	2.77
108	306	485	77.57	74.94	2.63
112	308	485	76.70	74.77	1.93
116	305	485	78.00	76.84	1.16
120	298	485	81.03	80.36	0.67
200	274	485	91.43	88.33	3.10
202	268	485	94.03	90.53	3.50
204	288	485	85.37	83.19	2.18
208	292	485	83.63	82.32	1.31
212	297	485	81.47	79.38	2.09
216	306	485	77.57	75.6	1.97
232	306	485	77.57	74.94	2.63
236	292	485	83.63	81.08	2.55
300	314	485	74.10	71.33	2.77
302	322	485	70.63	68.08	2.55
304	325.5	485	69.12	66.73	2.39
308	314	485	74.10	72.13	1.97
312	321	485	71.07	69.07	2.00
316	333.5	485	65.65	63.24	2.41
318	333	485	65.87	63.4	2.47
320	328	485	68.03	65.08	2.95
324	312	485	74.97	71.94	3.03
328	310	485	75.83	72.78	3.05
332	322	485	70.63	67.7	2.93
352	318	485	72.37	69.41	2.96
354	317	485	72.80	69.83	2.97
356	317	485	72.80	69.83	2.97
358	317	485	72.80	69.83	2.97
360	317	485	72.80	69.83	2.97
362	317	485	72.80	69.82	2.98
364	317	485	72.80	69.82	2.98
376	328	485	68.03	65.16	2.87
378	328	485	68.03	65.11	2.92
380	326	485	68.90	65.97	2.93
382	326	485	68.90	65.96	2.94

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 207 CLOSED - Max Day Demands Plus 4000 gpm split between Nodes 13 and 15

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	143	0.00
4	292	610	137.80	137.8	0.00
6	292	485	83.63	83.63	0.00
8	290	610	138.67	138.48	0.19
10	320	610	125.67	125.29	0.38
12	320	485	71.50	71.32	0.18
13	250	485	101.83	89.82	12.01
14	335	625	125.67	125.63	0.04
15	256	485	99.23	87.33	11.90
16	328	625	128.70	128.63	0.07
17	261	485	97.07	89.99	7.08
18	328	485	68.03	63.6	4.43
20	262	485	96.63	89.62	7.01
22	273	485	91.87	85.18	6.69
24	273	485	91.87	85.18	6.69
32	300	485	80.17	74.32	5.85
36	298	485	81.03	75.19	5.84
40	317	485	72.80	68.09	4.71
44	318	485	72.37	67.66	4.71
100	270	485	93.17	86.37	6.80
104	294	485	82.77	76.38	6.39
108	306	485	77.57	71.55	6.02
112	308	485	76.70	72.06	4.64
116	305	485	78.00	75.23	2.77
120	298	485	81.03	79.43	1.60
200	274	485	91.43	84.46	6.97
202	268	485	94.03	84.72	9.31
204	288	485	85.37	78.97	6.40
208	292	485	83.63	77.23	6.40
212	297	485	81.47	75.83	5.64
216	306	485	77.57	72.7	4.87
232	306	485	77.57	71.55	6.02
236	292	485	83.63	77.24	6.39
300	314	485	74.10	67.94	6.16
302	322	485	70.63	64.88	5.75
304	325.5	485	69.12	63.68	5.44
308	314	485	74.10	69.39	4.71
312	321	485	71.07	66.32	4.75
316	333.5	485	65.65	60.18	5.47
318	333	485	65.87	60.28	5.59
320	328	485	68.03	61.68	6.35
324	312	485	74.97	68.54	6.43
328	310	485	75.83	69.39	6.44
332	322	485	70.63	64.3	6.33
352	318	485	72.37	66.02	6.35
354	317	485	72.80	66.43	6.37
356	317	485	72.80	66.43	6.37
358	317	485	72.80	66.43	6.37
360	317	485	72.80	66.43	6.37
362	317	485	72.80	66.43	6.37
364	317	485	72.80	66.42	6.38
376	328	485	68.03	61.71	6.32
378	328	485	68.03	61.68	6.35
380	326	485	68.90	62.55	6.35
382	326	485	68.90	62.55	6.35

Project: 3Roots
Date: 03/20/2017
Job Number: 537-012

Scenario: Pipe 209 CLOSED - Max Day Demands Plus 3000 gpm split between Node 204 and 212

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	143.00	143	0.00
4	292	610	137.80	137.8	0.00
6	292	485	83.63	83.63	0.00
8	290	610	138.67	138.53	0.14
10	320	610	125.67	125.39	0.28
12	320	485	71.50	71.36	0.14
13	250	485	101.83	97.28	4.55
14	335	625	125.67	125.66	0.01
15	256	485	99.23	94.72	4.51
16	328	625	128.70	128.7	0.00
17	261	485	97.07	92.59	4.48
18	328	485	68.03	63.69	4.34
20	262	485	96.63	92.16	4.47
22	273	485	91.87	87.4	4.47
24	273	485	91.87	87.4	4.47
32	300	485	80.17	75.74	4.43
36	298	485	81.03	76.6	4.43
40	317	485	72.80	68.44	4.36
44	318	485	72.37	68.01	4.36
100	270	485	93.17	88.69	4.48
104	294	485	82.77	78.31	4.46
108	306	485	77.57	73.35	4.22
112	308	485	76.70	73.23	3.47
116	305	485	78.00	75.93	2.07
120	298	485	81.03	79.84	1.19
200	274	485	91.43	86.83	4.60
202	268	485	94.03	89.45	4.58
204	288	485	85.37	80.32	5.05
208	292	485	83.63	83.63	0.00
212	297	485	81.47	76.37	5.10
216	306	485	77.57	73.74	3.83
232	306	485	77.57	73.35	4.22
236	292	485	83.63	78.94	4.69
300	314	485	74.10	69.84	4.26
302	322	485	70.63	66.62	4.01
304	325.5	485	69.12	65.26	3.86
308	314	485	74.10	70.59	3.51
312	321	485	71.07	67.54	3.53
316	333.5	485	65.65	61.78	3.87
318	333	485	65.87	61.94	3.93
320	328	485	68.03	63.72	4.31
324	312	485	74.97	70.63	4.34
328	310	485	75.83	71.49	4.34
332	322	485	70.63	66.32	4.31
352	318	485	72.37	68.05	4.32
354	317	485	72.80	68.48	4.32
356	317	485	72.80	68.48	4.32
358	317	485	72.80	68.48	4.32
360	317	485	72.80	68.48	4.32
362	317	485	72.80	68.48	4.32
364	317	485	72.80	68.47	4.33
376	328	485	68.03	63.74	4.29
378	328	485	68.03	63.72	4.31
380	326	485	68.90	64.59	4.31
382	326	485	68.90	64.59	4.31

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

A SUMMARY OF THE ORIGINAL DATA FOLLOWS

THERE IS A PRV AT JUNCTION 4 FOR LINE 5 SET AT A GRADE OF 485.00
THERE IS A PRV AT JUNCTION 10 FOR LINE 7 SET AT A GRADE OF 485.00
THERE IS A PRV AT JUNCTION 16 FOR LINE 9 SET AT A GRADE OF 475.00

PIPE NO.	NODE NOS.		LENGTH (FEET)	DIAMETER (INCHES)	ROUGHNESS	MINOR LOSS K	FIXED GRADE
1	0	2	50.0	16.0	120.0	.00	610.00
2	0	8	50.0	16.0	120.0	.00	610.00
3	0	14	50.0	16.0	120.0	.00	625.00
4	2	4	50.0	16.0	120.0	.00	
5	4	6	5.0	10.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 5							
6	8	10	50.0	16.0	120.0	.00	
7	10	12	5.0	10.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 7							
8	14	16	50.0	16.0	120.0	.00	
9	16	18	5.0	8.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 9							
10	15	13	810.0	12.0	120.0	.00	
11	15	17	810.0	12.0	120.0	.00	
12	17	20	140.0	16.0	120.0	.00	
13	17	24	1050.0	16.0	120.0	.00	
14	22	24	185.0	12.0	120.0	.00	
15	36	24	1680.0	16.0	120.0	.00	
27	36	32	320.0	12.0	120.0	.00	
29	44	36	1730.0	16.0	120.0	.00	
33	44	40	300.0	12.0	120.0	.00	
37	18	44	400.0	16.0	120.0	.00	
101	20	100	470.0	16.0	120.0	.00	
105	100	104	740.0	16.0	120.0	.00	
109	104	108	550.0	16.0	120.0	.00	
113	108	112	1100.0	16.0	120.0	.00	
117	116	112	520.0	16.0	120.0	.00	
121	120	116	320.0	16.0	120.0	.00	
125	12	120	380.0	16.0	120.0	.00	
201	100	200	540.0	12.0	120.0	.00	
202	202	200	660.0	12.0	120.0	.00	
203	202	13	790.0	12.0	120.0	.00	
205	200	204	540.0	12.0	120.0	.00	
207	6	208	290.0	12.0	120.0	.00	
209	204	208	215.0	12.0	120.0	.00	
211	204	212	680.0	12.0	120.0	.00	
213	212	216	630.0	12.0	120.0	.00	
215	216	112	170.0	12.0	120.0	.00	
241	108	232	300.0	12.0	120.0	.00	
249	104	236	210.0	12.0	120.0	.00	
253	236	204	320.0	12.0	120.0	.00	
301	108	300	370.0	12.0	120.0	.00	

303	200	376	335.0	8.0	120.0	.00
304	376	302	225.0	8.0	120.0	.00
305	302	304	395.0	8.0	120.0	.00
309	304	308	850.0	8.0	120.0	.00
312	112	308	150.0	12.0	120.0	.00
313	308	312	310.0	12.0	120.0	.00
317	312	316	960.0	8.0	120.0	.00
321	316	318	165.0	8.0	120.0	.00
325	320	324	970.0	12.0	120.0	.00
329	324	328	370.0	12.0	120.0	.00
333	328	364	470.0	12.0	120.0	.00
335	320	382	145.0	8.0	120.0	.00
337	332	320	340.0	12.0	120.0	.00
341	332	300	410.0	12.0	120.0	.00
357	352	364	295.0	12.0	120.0	.00
359	364	362	125.0	8.0	120.0	.00
361	362	360	160.0	8.0	120.0	.00
363	360	358	360.0	8.0	120.0	.00
365	356	358	405.0	8.0	120.0	.00
367	354	356	160.0	8.0	120.0	.00
369	352	354	125.0	8.0	120.0	.00
371	356	360	405.0	8.0	120.0	.00
373	354	362	325.0	8.0	120.0	.00
387	332	352	115.0	12.0	120.0	.00
389	376	378	425.0	8.0	120.0	.00
393	302	318	260.0	8.0	120.0	.00
399	382	378	340.0	8.0	120.0	.00
401	378	380	255.0	8.0	120.0	.00
403	382	380	385.0	8.0	120.0	.00
405	100	328	1230.0	12.0	120.0	.00

JUNCTION NUMBER	DEMAND	ELEVATION	CONNECTING PIPES			
2	.00	280.00	1	4		
4	.00	292.00	4	5		
6	.00	292.00	5	207		
8	.00	290.00	2	6		
10	.00	320.00	6	7		
12	.00	320.00	7	125		
13	8.85	250.00	10	203		
14	.00	335.00	3	8		
15	8.85	256.00	10	11		
16	.00	328.00	8	9		
17	5.03	261.00	11	12	13	
18	.00	328.00	9	37		
20	.00	262.00	12	101		
22	37.08	273.00	14			
24	60.69	273.00	13	14	15	
32	39.58	300.00	27			
36	60.69	298.00	15	27	29	
40	22.33	317.00	33			
44	.00	318.00	29	33	37	
100	66.34	270.00	101	105	201	405
104	.00	294.00	105	109	249	
108	.00	306.00	109	113	241	301

112	7.40	308.00	113	117	215	312
116	20.40	305.00	117	121		
120	17.50	298.00	121	125		
200	31.65	274.00	201	202	205	303
202	19.16	268.00	202	203		
204	22.80	288.00	205	209	211	253
208	40.63	292.00	207	209		
212	26.25	297.00	211	213		
216	17.56	306.00	213	215		
232	23.29	306.00	241			
236	25.61	292.00	249	253		
300	.00	314.00	301	341		
302	.00	322.00	304	305	393	
304	5.76	325.50	305	309		
308	5.76	314.00	309	312	313	
312	18.76	321.00	313	317		
316	5.76	333.50	317	321		
318	5.76	333.00	321	393		
320	14.90	328.00	325	335	337	
324	14.90	312.00	325	329		
328	14.90	310.00	329	333	405	
332	.00	322.00	337	341	387	
352	.00	318.00	357	369	387	
354	3.53	317.00	367	369	373	
356	3.53	317.00	365	367	371	
358	3.53	317.00	363	365		
360	3.53	317.00	361	363	371	
362	3.53	317.00	359	361	373	
364	.00	317.00	333	357	359	
376	4.92	328.00	303	304	389	
378	4.92	328.00	389	399	401	
380	4.92	326.00	401	403		
382	4.92	326.00	335	399	403	

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 OUTPUT SELECTION:  ALL RESULTS ARE OUTPUT EACH PERIOD
    5 VALUES ARE OUTPUT FOR MAXIMUM AND MINIMUM PRESSURES

THIS SYSTEM HAS MULTIPLE SUPPLY ZONES


ZONE NO.   1 IS SUPPLIED THROUGH THESE PIPES:
    5
    7
    9


    THIS SYSTEM HAS  69 PIPES WITH  55 JUNCTIONS ,  10 LOOPS AND   6 FGNS



 THE RESULTS ARE OBTAINED AFTER  9 TRIALS WITH AN ACCURACY =  .00033
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3Roots - Ultimate Water System
Water System Analysis
Average Day Demands

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	304.52	.00	.00	.00	.49	.08
2	0	8	381.00	.01	.00	.00	.61	.12
3	0	14	.00	.00	.00	.00	.00	.00
4	2	4	304.52	.00	.00	.00	.49	.08
5	0	6	304.52	.00	.00	.00	1.24	.79
6	8	10	381.00	.01	.00	.00	.61	.12
7	0	12	381.00	.01	.00	.00	1.56	1.20
8	14	16	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 9 IS CLOSED								
10	15	13	-38.33	-.01	.00	.00	-.11	-.01
11	15	17	29.48	.00	.00	.00	.08	.00
12	17	20	-195.92	.00	.00	.00	-.31	-.04
13	17	24	220.37	.05	.00	.00	.35	.04
14	22	24	-37.08	.00	.00	.00	-.11	-.01
15	36	24	-122.60	-.02	.00	.00	-.20	-.01
27	36	32	39.58	.00	.00	.00	.11	.01
29	44	36	-22.33	.00	.00	.00	-.04	.00
33	44	40	22.33	.00	.00	.00	.06	.00
37	18	44	.00	.00	.00	.00	.00	.00
101	20	100	-195.92	-.02	.00	.00	-.31	-.04
105	100	104	-183.05	-.02	.00	.00	-.29	-.03
109	104	108	-85.66	.00	.00	.00	-.14	-.01
113	108	112	-187.09	-.04	.00	.00	-.30	-.03
117	116	112	343.10	.05	.00	.00	.55	.10
121	120	116	363.50	.04	.00	.00	.58	.11
125	12	120	381.00	.05	.00	.00	.61	.12
201	100	200	-59.19	-.01	.00	.00	-.17	-.02
202	202	200	-66.34	-.01	.00	.00	-.19	-.02
203	202	13	47.18	.01	.00	.00	.13	.01
205	200	204	-141.24	-.04	.00	.00	-.40	-.08
207	6	208	304.52	.09	.00	.00	.86	.33
209	204	208	-263.89	-.05	.00	.00	-.75	-.25
211	204	212	-23.15	.00	.00	.00	-.07	.00
213	212	216	-49.40	-.01	.00	.00	-.14	-.01
215	216	112	-66.96	.00	.00	.00	-.19	-.02
241	108	232	23.29	.00	.00	.00	.07	.00
249	104	236	-97.39	-.01	.00	.00	-.28	-.04
253	236	204	-123.00	-.02	.00	.00	-.35	-.06
301	108	300	78.14	.01	.00	.00	.22	.03
303	200	376	-15.93	.00	.00	.00	-.10	-.01
304	376	302	-39.84	-.01	.00	.00	-.25	-.05
305	302	304	-23.84	-.01	.00	.00	-.15	-.02
309	304	308	-29.60	-.03	.00	.00	-.19	-.03
312	112	308	81.64	.00	.00	.00	.23	.03
313	308	312	46.29	.00	.00	.00	.13	.01
317	312	316	27.53	.03	.00	.00	.18	.03
321	316	318	21.77	.00	.00	.00	.14	.02
325	320	324	21.93	.00	.00	.00	.06	.00
329	324	328	7.03	.00	.00	.00	.02	.00

333	328	364	-27.89	.00	.00	.00	-.08	.00
335	320	382	-4.23	.00	.00	.00	-.03	.00
337	332	320	32.60	.00	.00	.00	.09	.01
341	332	300	-78.14	-.01	.00	.00	-.22	-.03
357	352	364	30.56	.00	.00	.00	.09	.00
359	364	362	2.68	.00	.00	.00	.02	.00
361	362	360	3.55	.00	.00	.00	.02	.00
363	360	358	1.47	.00	.00	.00	.01	.00
365	356	358	2.06	.00	.00	.00	.01	.00
367	354	356	7.04	.00	.00	.00	.04	.00
369	352	354	14.97	.00	.00	.00	.10	.01
371	356	360	1.45	.00	.00	.00	.01	.00
373	354	362	4.41	.00	.00	.00	.03	.00
387	332	352	45.54	.00	.00	.00	.13	.01
389	376	378	18.99	.01	.00	.00	.12	.01
393	302	318	-16.01	.00	.00	.00	-.10	-.01
399	382	378	-6.81	.00	.00	.00	-.04	.00
401	378	380	7.26	.00	.00	.00	.05	.00
403	382	380	-2.34	.00	.00	.00	-.01	.00
405	100	328	-20.02	.00	.00	.00	-.06	.00

JUNCTION	NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2		.00	610.00	280.00	143.00
4		.00	609.99	292.00	137.80
6		.00	485.00	292.00	83.63
8		.00	609.99	290.00	138.66
10		.00	609.99	320.00	125.66
12		.00	484.99	320.00	71.50
13		8.85	484.78	250.00	101.74
14		.00	625.00	335.00	125.67
15		8.85	484.78	256.00	99.14
16		.00	625.00	328.00	128.70
17		5.03	484.78	261.00	96.97
18		.00	484.70	328.00	67.90
20		.00	484.78	262.00	96.54
22		37.08	484.73	273.00	91.75
24		60.69	484.73	273.00	91.75
32		39.58	484.70	300.00	80.04
36		60.69	484.70	298.00	80.91
40		22.33	484.70	317.00	72.67
44		.00	484.70	318.00	72.24
100		66.34	484.80	270.00	93.08
104		.00	484.82	294.00	82.69
108		.00	484.82	306.00	77.49
112		7.40	484.86	308.00	76.64
116		20.40	484.91	305.00	77.96
120		17.50	484.95	298.00	81.01
200		31.65	484.81	274.00	91.35
202		19.16	484.79	268.00	93.94
204		22.80	484.85	288.00	85.30
208		40.63	484.90	292.00	83.59
212		26.25	484.85	297.00	81.40
216		17.56	484.86	306.00	77.50
232		23.29	484.82	306.00	77.49

236	25.61	484.83	292.00	83.56
300	.00	484.81	314.00	74.02
302	.00	484.82	322.00	70.56
304	5.76	484.83	325.50	69.04
308	5.76	484.86	314.00	74.04
312	18.76	484.85	321.00	71.00
316	5.76	484.83	333.50	65.57
318	5.76	484.82	333.00	65.79
320	14.90	484.80	328.00	67.95
324	14.90	484.80	312.00	74.88
328	14.90	484.80	310.00	75.75
332	.00	484.80	322.00	70.55
352	.00	484.80	318.00	72.28
354	3.53	484.80	317.00	72.71
356	3.53	484.80	317.00	72.71
358	3.53	484.80	317.00	72.71
360	3.53	484.80	317.00	72.71
362	3.53	484.80	317.00	72.71
364	.00	484.80	317.00	72.71
376	4.92	484.81	328.00	67.95
378	4.92	484.80	328.00	67.95
380	4.92	484.80	326.00	68.81
382	4.92	484.80	326.00	68.81
	MAXIMUM PRESSURES			
2	.00	610.00	280.00	143.00
8	.00	609.99	290.00	138.66
4	.00	609.99	292.00	137.80
16	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67
	MINIMUM PRESSURES			
316	5.76	484.83	333.50	65.57
318	5.76	484.82	333.00	65.79
18	.00	484.70	328.00	67.90
320	14.90	484.80	328.00	67.95
378	4.92	484.80	328.00	67.95

THE NET SYSTEM DEMAND = 685.52

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	304.52
2	381.00
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 685.52
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 4.80

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00000

3Roots - Ultimate Water System
Water System Analysis
Peak Hour Demands

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1461.72	.07	.00	.00	2.33	1.46
2	0	8	1828.78	.11	.00	.00	2.92	2.22
3	0	14	.00	.00	.00	.00	.00	.00
4	2	4	1461.72	.07	.00	.00	2.33	1.46
5	0	6	1461.72	.07	.00	.00	5.97	14.44
6	8	10	1828.78	.11	.00	.00	2.92	2.22
7	0	12	1828.78	.11	.00	.00	7.47	21.86
8	14	16	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 9 IS CLOSED								
10	15	13	-183.97	-.10	.00	.00	-.52	-.13
11	15	17	141.49	.06	.00	.00	.40	.08
12	17	20	-940.43	-.09	.00	.00	-1.50	-.65
13	17	24	1057.78	.84	.00	.00	1.69	.80
14	22	24	-177.98	-.02	.00	.00	-.50	-.12
15	36	24	-588.48	-.46	.00	.00	-.94	-.27
27	36	32	189.98	.04	.00	.00	.54	.14
29	44	36	-107.18	-.02	.00	.00	-.17	-.01
33	44	40	107.18	.01	.00	.00	.30	.05
37	18	44	.00	.00	.00	.00	.00	.00
101	20	100	-940.43	-.30	.00	.00	-1.50	-.65
105	100	104	-878.66	-.42	.00	.00	-1.40	-.57
109	104	108	-411.19	-.08	.00	.00	-.66	-.14
113	108	112	-898.05	-.65	.00	.00	-1.43	-.59
117	116	112	1646.86	.95	.00	.00	2.63	1.83
121	120	116	1744.78	.65	.00	.00	2.78	2.03
125	12	120	1828.78	.84	.00	.00	2.92	2.22
201	100	200	-284.10	-.15	.00	.00	-.81	-.29
202	202	200	-318.42	-.23	.00	.00	-.90	-.35
203	202	13	226.45	.15	.00	.00	.64	.19
205	200	204	-677.97	-.77	.00	.00	-1.92	-1.43
207	6	208	1461.72	1.72	.00	.00	4.15	5.94
209	204	208	-1266.69	-.98	.00	.00	-3.59	-4.56
211	204	212	-111.12	-.03	.00	.00	-.32	-.05
213	212	216	-237.12	-.13	.00	.00	-.67	-.20
215	216	112	-321.41	-.06	.00	.00	-.91	-.36
241	108	232	111.79	.02	.00	.00	.32	.05
249	104	236	-467.47	-.15	.00	.00	-1.33	-.72
253	236	204	-590.40	-.35	.00	.00	-1.67	-1.11
301	108	300	375.07	.18	.00	.00	1.06	.48
303	200	376	-76.47	-.06	.00	.00	-.49	-.18
304	376	302	-191.24	-.22	.00	.00	-1.22	-.99
305	302	304	-114.41	-.15	.00	.00	-.73	-.38
309	304	308	-142.06	-.49	.00	.00	-.91	-.57

312	112	308	391.88	.08	.00	.00	1.11	.52
313	308	312	222.17	.06	.00	.00	.63	.18
317	312	316	132.13	.48	.00	.00	.84	.50
321	316	318	104.48	.05	.00	.00	.67	.32
325	320	324	105.29	.04	.00	.00	.30	.05
329	324	328	33.77	.00	.00	.00	.10	.01
333	328	364	-133.86	-.03	.00	.00	-.38	-.07
335	320	382	-20.32	.00	.00	.00	-.13	-.02
337	332	320	156.49	.03	.00	.00	.44	.09
341	332	300	-375.07	-.20	.00	.00	-1.06	-.48
357	352	364	146.71	.02	.00	.00	.42	.08
359	364	362	12.86	.00	.00	.00	.08	.01
361	362	360	17.06	.00	.00	.00	.11	.01
363	360	358	7.07	.00	.00	.00	.05	.00
365	356	358	9.88	.00	.00	.00	.06	.00
367	354	356	33.77	.01	.00	.00	.22	.04
369	352	354	71.86	.02	.00	.00	.46	.16
371	356	360	6.95	.00	.00	.00	.04	.00
373	354	362	21.15	.01	.00	.00	.13	.02
387	332	352	218.58	.02	.00	.00	.62	.18
389	376	378	91.16	.11	.00	.00	.58	.25
393	302	318	-76.83	-.05	.00	.00	-.49	-.18
399	382	378	-32.70	-.01	.00	.00	-.21	-.04
401	378	380	34.85	.01	.00	.00	.22	.04
403	382	380	-11.23	.00	.00	.00	-.07	-.01
405	100	328	-96.10	-.05	.00	.00	-.27	-.04

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.93	280.00	142.97
4	.00	609.85	292.00	137.74
6	.00	484.93	292.00	83.60
8	.00	609.89	290.00	138.62
10	.00	609.78	320.00	125.57
12	.00	484.89	320.00	71.45
13	42.48	481.07	250.00	100.13
14	.00	625.00	335.00	125.67
15	42.48	480.97	256.00	97.49
16	.00	625.00	328.00	128.70
17	24.14	480.90	261.00	95.29
18	.00	479.58	328.00	65.69
20	.00	480.99	262.00	94.90
22	177.98	480.04	273.00	89.72
24	291.31	480.06	273.00	89.73
32	189.98	479.56	300.00	77.81
36	291.31	479.60	298.00	78.69
40	107.18	479.57	317.00	70.45
44	.00	479.58	318.00	70.02
100	318.43	481.30	270.00	91.56
104	.00	481.72	294.00	81.35
108	.00	481.80	306.00	76.18
112	35.52	482.45	308.00	75.59
116	97.92	483.40	305.00	77.31
120	84.00	484.05	298.00	80.62
200	151.92	481.45	274.00	89.90

202	91.97	481.22	268.00	92.39
204	109.44	482.23	288.00	84.16
208	195.02	483.21	292.00	82.86
212	126.00	482.26	297.00	80.28
216	84.29	482.39	306.00	76.43
232	111.79	481.78	306.00	76.17
236	122.93	481.87	292.00	82.28
300	.00	481.62	314.00	72.64
302	.00	481.74	322.00	69.22
304	27.65	481.89	325.50	67.77
308	27.65	482.37	314.00	72.96
312	90.05	482.32	321.00	69.90
316	27.65	481.84	333.50	64.28
318	27.65	481.78	333.00	64.47
320	71.52	481.39	328.00	66.47
324	71.52	481.35	312.00	73.38
328	71.52	481.34	310.00	74.25
332	.00	481.42	322.00	69.08
352	.00	481.40	318.00	70.81
354	16.94	481.38	317.00	71.23
356	16.94	481.38	317.00	71.23
358	16.94	481.37	317.00	71.23
360	16.94	481.38	317.00	71.23
362	16.94	481.38	317.00	71.23
364	.00	481.38	317.00	71.23
376	23.62	481.51	328.00	66.52
378	23.62	481.41	328.00	66.48
380	23.62	481.40	326.00	67.34
382	23.62	481.39	326.00	67.34

MAXIMUM PRESSURES

2	.00	609.93	280.00	142.97
8	.00	609.89	290.00	138.62
4	.00	609.85	292.00	137.74
16	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67

MINIMUM PRESSURES

316	27.65	481.84	333.50	64.28
318	27.65	481.78	333.00	64.47
18	.00	479.58	328.00	65.69
320	71.52	481.39	328.00	66.47
378	23.62	481.41	328.00	66.48

THE NET SYSTEM DEMAND = 3290.50

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1461.72
2	1828.78
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3290.50
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
316	2000.00

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00015

3Roots - Ultimate Water System
Maximum Day Demands plus Fire Flow
2000 GPM Fire Flow at Node 316

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1439.77	.07	.00	.00	2.30	1.42
2	0	8	1919.75	.12	.00	.00	3.06	2.42
3	0	14	.00	.00	.00	.00	.00	.00
4	2	4	1439.77	.07	.00	.00	2.30	1.42
5	0	6	1439.77	.07	.00	.00	5.88	14.04
6	8	10	1919.75	.12	.00	.00	3.06	2.42
7	0	12	1919.75	.12	.00	.00	7.84	23.92
8	14	16	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 9 IS CLOSED								
10	15	13	-62.92	-.01	.00	.00	-.18	-.02
11	15	17	45.22	.01	.00	.00	.13	.01
12	17	20	-405.58	-.02	.00	.00	-.65	-.14
13	17	24	440.74	.17	.00	.00	.70	.16
14	22	24	-74.16	.00	.00	.00	-.21	-.02
15	36	24	-245.20	-.09	.00	.00	-.39	-.05
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	-44.66	.00	.00	.00	-.07	.00
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	.00	.00	.00	.00	.00	.00
101	20	100	-405.58	-.06	.00	.00	-.65	-.14
105	100	104	-671.06	-.26	.00	.00	-1.07	-.35
109	104	108	-204.62	-.02	.00	.00	-.33	-.04
113	108	112	-597.55	-.31	.00	.00	-.95	-.28
117	116	112	1843.95	1.17	.00	.00	2.94	2.25
121	120	116	1884.75	.75	.00	.00	3.01	2.34
125	12	120	1919.75	.92	.00	.00	3.06	2.42
201	100	200	24.35	.00	.00	.00	.07	.00
202	202	200	-118.94	-.04	.00	.00	-.34	-.06
203	202	13	80.62	.02	.00	.00	.23	.03
205	200	204	-635.64	-.69	.00	.00	-1.80	-1.27
207	6	208	1439.77	1.68	.00	.00	4.08	5.78
209	204	208	-1358.51	-1.12	.00	.00	-3.85	-5.19
211	204	212	159.60	.07	.00	.00	.45	.10
213	212	216	107.10	.03	.00	.00	.30	.05
215	216	112	71.98	.00	.00	.00	.20	.02
241	108	232	46.58	.00	.00	.00	.13	.01

249	104	236	-466.44	-.15	.00	.00	-1.32	-.72
253	236	204	-517.66	-.28	.00	.00	-1.47	-.87
301	108	300	346.35	.15	.00	.00	.98	.41
303	200	376	477.75	1.81	.00	.00	3.05	5.39
304	376	302	768.49	2.93	.00	.00	4.90	13.01
305	302	304	-381.53	-1.40	.00	.00	-2.44	-3.56
309	304	308	-393.05	-3.19	.00	.00	-2.51	-3.76
312	112	308	1303.59	.72	.00	.00	3.70	4.81
313	308	312	899.02	.75	.00	.00	2.55	2.41
317	312	316	861.50	15.43	.00	.00	5.50	16.08
321	316	318	-1138.50	-4.45	.00	.00	-7.27	-26.94
325	320	324	-101.87	-.04	.00	.00	-.29	-.04
329	324	328	-131.67	-.03	.00	.00	-.37	-.07
333	328	364	-53.02	-.01	.00	.00	-.15	-.01
335	320	382	330.10	.39	.00	.00	2.11	2.72
337	332	320	258.03	.08	.00	.00	.73	.24
341	332	300	-346.35	-.17	.00	.00	-.98	-.41
357	352	364	59.07	.00	.00	.00	.17	.02
359	364	362	6.05	.00	.00	.00	.04	.00
361	362	360	7.38	.00	.00	.00	.05	.00
363	360	358	3.03	.00	.00	.00	.02	.00
365	356	358	4.03	.00	.00	.00	.03	.00
367	354	356	13.80	.00	.00	.00	.09	.01
369	352	354	29.25	.00	.00	.00	.19	.03
371	356	360	2.70	.00	.00	.00	.02	.00
373	354	362	8.40	.00	.00	.00	.05	.00
387	332	352	88.32	.00	.00	.00	.25	.03
389	376	378	-300.58	-.97	.00	.00	-1.92	-2.29
393	302	318	1150.02	7.14	.00	.00	7.34	27.45
399	382	378	184.96	.32	.00	.00	1.18	.93
401	378	380	-125.45	-.12	.00	.00	-.80	-.45
403	382	380	135.29	.20	.00	.00	.86	.52
405	100	328	108.45	.06	.00	.00	.31	.05

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.93	280.00	142.97
4	.00	609.86	292.00	137.74
6	.00	484.93	292.00	83.60
8	.00	609.88	290.00	138.61
10	.00	609.76	320.00	125.56
12	.00	484.88	320.00	71.45
13	17.70	481.39	250.00	100.27
14	.00	625.00	335.00	125.67
15	17.70	481.38	256.00	97.66
16	.00	625.00	328.00	128.70
17	10.06	481.37	261.00	95.49
18	.00	481.11	328.00	66.35
20	.00	481.39	262.00	95.07
22	74.16	481.20	273.00	90.22
24	121.38	481.20	273.00	90.22
32	79.16	481.11	300.00	78.48
36	121.38	481.11	298.00	79.35
40	44.66	481.11	317.00	71.11
44	.00	481.11	318.00	70.68

100	132.68	481.45	270.00	91.63
104	.00	481.71	294.00	81.34
108	.00	481.73	306.00	76.15
112	14.80	482.04	308.00	75.42
116	40.80	483.21	305.00	77.22
120	35.00	483.96	298.00	80.58
200	63.30	481.45	274.00	89.90
202	38.32	481.42	268.00	92.48
204	45.60	482.14	288.00	84.13
208	81.26	483.25	292.00	82.88
212	52.50	482.07	297.00	80.20
216	35.12	482.04	306.00	76.29
232	46.58	481.73	306.00	76.15
236	51.22	481.86	292.00	82.27
300	.00	481.58	314.00	72.62
302	.00	476.72	322.00	67.04
304	11.52	478.12	325.50	66.14
308	11.52	481.32	314.00	72.50
312	37.52	480.57	321.00	69.15
316	2000.00	465.14	333.50	57.04
318	11.52	469.58	333.00	59.19
320	29.80	481.33	328.00	66.44
324	29.80	481.37	312.00	73.39
328	29.80	481.40	310.00	74.27
332	.00	481.41	322.00	69.08
352	.00	481.41	318.00	70.81
354	7.06	481.40	317.00	71.24
356	7.06	481.40	317.00	71.24
358	7.06	481.40	317.00	71.24
360	7.06	481.40	317.00	71.24
362	7.06	481.40	317.00	71.24
364	.00	481.40	317.00	71.24
376	9.84	479.65	328.00	65.71
378	9.84	480.62	328.00	66.13
380	9.84	480.73	326.00	67.05
382	9.84	480.93	326.00	67.14

MAXIMUM PRESSURES

2	.00	609.93	280.00	142.97
8	.00	609.88	290.00	138.61
4	.00	609.86	292.00	137.74
16	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67

MINIMUM PRESSURES

316	2000.00	465.14	333.50	57.04
318	11.52	469.58	333.00	59.19
376	9.84	479.65	328.00	65.71
378	9.84	480.62	328.00	66.13
304	11.52	478.12	325.50	66.14

THE NET SYSTEM DEMAND = 3359.52

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1439.77
2	1919.75
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3359.52
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
324	1500.00
328	1500.00

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00034

3Roots - Ultimate Water System
Maximum Day Demands plus Fire Flow
3000 GPM Fire Flow split between Nodes 324 and 328

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1908.03	.12	.00	.00	3.04	2.40
2	0	8	2403.41	.18	.00	.00	3.83	3.68
3	0	14	.00	.00	.00	.00	.00	.00
4	2	4	1908.03	.12	.00	.00	3.04	2.40
5	0	6	1908.03	.12	.00	.00	7.79	23.65
6	8	10	2403.41	.18	.00	.00	3.83	3.68
7	0	12	2403.41	.18	.00	.00	9.82	36.26
8	14	16	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 9 IS CLOSED								
10	15	13	-204.90	-.13	.00	.00	-.58	-.16
11	15	17	187.20	.11	.00	.00	.53	.13
12	17	20	-263.60	-.01	.00	.00	-.42	-.06
13	17	24	440.74	.17	.00	.00	.70	.16
14	22	24	-74.16	.00	.00	.00	-.21	-.02
15	36	24	-245.20	-.09	.00	.00	-.39	-.05
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	-44.66	.00	.00	.00	-.07	.00
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	.00	.00	.00	.00	.00	.00
101	20	100	-263.60	-.03	.00	.00	-.42	-.06
105	100	104	-1092.75	-.63	.00	.00	-1.74	-.85
109	104	108	-150.59	-.01	.00	.00	-.24	-.02
113	108	112	-1560.48	-1.82	.00	.00	-2.49	-1.65
117	116	112	2327.61	1.80	.00	.00	3.71	3.46
121	120	116	2368.41	1.14	.00	.00	3.78	3.58

125	12	120	2403.41	1.40	.00	.00	3.83	3.68
201	100	200	-536.39	-.50	.00	.00	-1.52	-.93
202	202	200	-260.92	-.16	.00	.00	-.74	-.24
203	202	13	222.60	.14	.00	.00	.63	.18
205	200	204	-1008.60	-1.61	.00	.00	-2.86	-2.99
207	6	208	1908.03	2.82	.00	.00	5.41	9.73
209	204	208	-1826.77	-1.93	.00	.00	-5.18	-8.98
211	204	212	-220.81	-.12	.00	.00	-.63	-.18
213	212	216	-273.31	-.17	.00	.00	-.78	-.27
215	216	112	-308.43	-.06	.00	.00	-.87	-.33
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-942.16	-.55	.00	.00	-2.67	-2.63
253	236	204	-993.38	-.93	.00	.00	-2.82	-2.91
301	108	300	1363.32	1.93	.00	.00	3.87	5.22
303	200	376	147.99	.21	.00	.00	.94	.62
304	376	302	-360.30	-.72	.00	.00	-2.30	-3.20
305	302	304	-192.83	-.40	.00	.00	-1.23	-1.01
309	304	308	-204.35	-.95	.00	.00	-1.30	-1.12
312	112	308	443.90	.10	.00	.00	1.26	.65
313	308	312	228.03	.06	.00	.00	.65	.19
317	312	316	190.51	.94	.00	.00	1.22	.98
321	316	318	178.99	.14	.00	.00	1.14	.88
325	320	324	862.76	2.17	.00	.00	2.45	2.24
329	324	328	-637.24	-.47	.00	.00	-1.81	-1.28
333	328	364	-904.38	-1.15	.00	.00	-2.57	-2.44
335	320	382	-468.93	-.76	.00	.00	-2.99	-5.21
337	332	320	423.64	.20	.00	.00	1.20	.60
341	332	300	-1363.32	-2.14	.00	.00	-3.87	-5.22
357	352	364	704.01	.45	.00	.00	2.00	1.54
359	364	362	-200.37	-.13	.00	.00	-1.28	-1.08
361	362	360	-87.36	-.04	.00	.00	-.56	-.23
363	360	358	-36.92	-.02	.00	.00	-.24	-.05
365	356	358	43.98	.03	.00	.00	.28	.07
367	354	356	108.54	.06	.00	.00	.69	.35
369	352	354	235.67	.18	.00	.00	1.50	1.46
371	356	360	57.50	.04	.00	.00	.37	.11
373	354	362	120.08	.14	.00	.00	.77	.42
387	332	352	939.68	.30	.00	.00	2.67	2.62
389	376	378	498.45	2.48	.00	.00	3.18	5.84
393	302	318	-167.47	-.20	.00	.00	-1.07	-.77
399	382	378	-282.19	-.69	.00	.00	-1.80	-2.03
401	378	380	206.42	.29	.00	.00	1.32	1.14
403	382	380	-196.58	-.40	.00	.00	-1.25	-1.04
405	100	328	1232.86	5.33	.00	.00	3.50	4.33

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.88	280.00	142.95
4	.00	609.76	292.00	137.70
6	.00	484.88	292.00	83.58
8	.00	609.82	290.00	138.59
10	.00	609.63	320.00	125.51
12	.00	484.82	320.00	71.42
13	17.70	478.21	250.00	98.89
14	.00	625.00	335.00	125.67

15	17.70	478.08	256.00	96.24
16	.00	625.00	328.00	128.70
17	10.06	477.98	261.00	94.02
18	.00	477.72	328.00	64.88
20	.00	477.99	262.00	93.59
22	74.16	477.81	273.00	88.75
24	121.38	477.81	273.00	88.75
32	79.16	477.71	300.00	77.01
36	121.38	477.72	298.00	77.88
40	44.66	477.71	317.00	69.64
44	.00	477.72	318.00	69.21
100	132.68	478.02	270.00	90.14
104	.00	478.65	294.00	80.01
108	.00	478.66	306.00	74.82
112	14.80	480.48	308.00	74.74
116	40.80	482.28	305.00	76.82
120	35.00	483.42	298.00	80.35
200	63.30	478.52	274.00	88.62
202	38.32	478.35	268.00	91.15
204	45.60	480.13	288.00	83.26
208	81.26	482.06	292.00	82.36
212	52.50	480.25	297.00	79.41
216	35.12	480.42	306.00	75.58
232	46.58	478.66	306.00	74.82
236	51.22	479.20	292.00	81.12
300	.00	476.73	314.00	70.52
302	.00	479.03	322.00	68.05
304	11.52	479.43	325.50	66.70
308	11.52	480.38	314.00	72.10
312	37.52	480.32	321.00	69.04
316	11.52	479.38	333.50	63.21
318	11.52	479.23	333.00	63.37
320	29.80	474.38	328.00	63.43
324	1500.00	472.21	312.00	69.43
328	1500.00	472.68	310.00	70.50
332	.00	474.59	322.00	66.12
352	.00	474.28	318.00	67.72
354	7.06	474.10	317.00	68.08
356	7.06	474.05	317.00	68.05
358	7.06	474.02	317.00	68.04
360	7.06	474.00	317.00	68.04
362	7.06	473.97	317.00	68.02
364	.00	473.83	317.00	67.96
376	9.84	478.31	328.00	65.13
378	9.84	475.83	328.00	64.06
380	9.84	475.54	326.00	64.80
382	9.84	475.14	326.00	64.63
	MAXIMUM PRESSURES			
2	.00	609.88	280.00	142.95
8	.00	609.82	290.00	138.59
4	.00	609.76	292.00	137.70
16	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67

MINIMUM PRESSURES

316	11.52	479.38	333.50	63.21
318	11.52	479.23	333.00	63.37
320	29.80	474.38	328.00	63.43
378	9.84	475.83	328.00	64.06
382	9.84	475.14	326.00	64.63

THE NET SYSTEM DEMAND = 4311.44

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1908.03
2	2403.41
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4311.44
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
13	2000.00
15	2000.00

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00151

3Roots - Ultimate Water System
Maximum Day Demands plus Fire Flow
4000 GPM Fire Flow split between Nodes 13 and 15

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	2137.21	.15	.00	.00	3.41	2.96
2	0	8	2598.27	.21	.00	.00	4.15	4.25
3	0	14	600.16	.01	.00	.00	.96	.28
4	2	4	2137.21	.15	.00	.00	3.41	2.96
5	0	6	2137.21	.15	.00	.00	8.73	29.17
6	8	10	2598.27	.21	.00	.00	4.15	4.25
7	0	12	2598.27	.21	.00	.00	10.61	41.89
8	14	16	600.16	.01	.00	.00	.96	.28
9	0	18	600.16	.04	.00	.00	3.83	8.23
10	15	13	235.08	.16	.00	.00	.67	.20
11	15	17	-2235.08	-10.57	.00	.00	-6.34	-13.04
12	17	20	-2085.72	-.40	.00	.00	-3.33	-2.83
13	17	24	-159.42	-.03	.00	.00	-.25	-.02
14	22	24	-74.16	.00	.00	.00	-.21	-.02

15	36	24	354.96	.18	.00	.00	.57	.11
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	555.50	.42	.00	.00	.89	.24
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	600.16	.11	.00	.00	.96	.28
101	20	100	-2085.72	-1.33	.00	.00	-3.33	-2.83
105	100	104	-1834.05	-1.65	.00	.00	-2.93	-2.23
109	104	108	-930.08	-.35	.00	.00	-1.48	-.63
113	108	112	-1561.61	-1.82	.00	.00	-2.49	-1.65
117	116	112	2522.47	2.09	.00	.00	4.02	4.02
121	120	116	2563.27	1.33	.00	.00	4.09	4.14
125	12	120	2598.27	1.61	.00	.00	4.15	4.25
201	100	200	79.42	.01	.00	.00	.23	.03
202	202	200	-1803.24	-5.78	.00	.00	-5.12	-8.76
203	202	13	1764.92	6.65	.00	.00	5.01	8.42
205	200	204	-1419.89	-3.04	.00	.00	-4.03	-5.63
207	6	208	2137.21	3.48	.00	.00	6.06	12.01
209	204	208	-2055.95	-2.40	.00	.00	-5.83	-11.17
211	204	212	-364.73	-.31	.00	.00	-1.03	-.45
213	212	216	-417.23	-.37	.00	.00	-1.18	-.58
215	216	112	-452.35	-.12	.00	.00	-1.28	-.68
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-903.97	-.51	.00	.00	-2.56	-2.44
253	236	204	-955.19	-.86	.00	.00	-2.71	-2.70
301	108	300	584.95	.40	.00	.00	1.66	1.09
303	200	376	-367.23	-1.11	.00	.00	-2.34	-3.31
304	376	302	-410.11	-.91	.00	.00	-2.62	-4.07
305	302	304	-218.64	-.50	.00	.00	-1.40	-1.27
309	304	308	-230.16	-1.19	.00	.00	-1.47	-1.39
312	112	308	493.71	.12	.00	.00	1.40	.80
313	308	312	252.03	.07	.00	.00	.71	.23
317	312	316	214.51	1.18	.00	.00	1.37	1.22
321	316	318	202.99	.18	.00	.00	1.30	1.11
325	320	324	211.16	.16	.00	.00	.60	.17
329	324	328	181.36	.05	.00	.00	.51	.12
333	328	364	-312.21	-.16	.00	.00	-.89	-.34
335	320	382	-3.52	.00	.00	.00	-.02	.00
337	332	320	237.44	.07	.00	.00	.67	.21
341	332	300	-584.95	-.45	.00	.00	-1.66	-1.09
357	352	364	252.88	.07	.00	.00	.72	.23
359	364	362	-59.33	-.01	.00	.00	-.38	-.11
361	362	360	-23.46	.00	.00	.00	-.15	-.02
363	360	358	-10.26	.00	.00	.00	-.07	.00
365	356	358	17.32	.00	.00	.00	.11	.01
367	354	356	44.64	.01	.00	.00	.28	.07
369	352	354	94.63	.03	.00	.00	.60	.27
371	356	360	20.26	.01	.00	.00	.13	.02
373	354	362	42.93	.02	.00	.00	.27	.06
387	332	352	347.51	.05	.00	.00	.99	.42
389	376	378	33.04	.02	.00	.00	.21	.04
393	302	318	-191.47	-.26	.00	.00	-1.22	-.99
399	382	378	-10.92	.00	.00	.00	-.07	.00
401	378	380	12.28	.00	.00	.00	.08	.01
403	382	380	-2.44	.00	.00	.00	-.02	.00
405	100	328	-463.77	-.87	.00	.00	-1.32	-.71

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.85	280.00	142.94
4	.00	609.70	292.00	137.67
6	.00	484.85	292.00	83.57
8	.00	609.79	290.00	138.57
10	.00	609.58	320.00	125.48
12	.00	484.79	320.00	71.41
13	2000.00	463.49	250.00	92.51
14	.00	624.99	335.00	125.66
15	2000.00	463.65	256.00	89.98
16	.00	624.97	328.00	128.69
17	10.06	474.22	261.00	92.40
18	.00	474.96	328.00	63.68
20	.00	474.62	262.00	92.13
22	74.16	474.24	273.00	87.20
24	121.38	474.25	273.00	87.21
32	79.16	474.42	300.00	75.58
36	121.38	474.42	298.00	76.45
40	44.66	474.84	317.00	68.40
44	.00	474.85	318.00	67.97
100	132.68	475.94	270.00	89.24
104	.00	477.59	294.00	79.56
108	.00	477.94	306.00	74.51
112	14.80	479.76	308.00	74.43
116	40.80	481.85	305.00	76.64
120	35.00	483.18	298.00	80.24
200	63.30	475.93	274.00	87.50
202	38.32	470.15	268.00	87.60
204	45.60	478.97	288.00	82.75
208	81.26	481.37	292.00	82.06
212	52.50	479.28	297.00	78.99
216	35.12	479.65	306.00	75.25
232	46.58	477.94	306.00	74.51
236	51.22	478.11	292.00	80.65
300	.00	477.54	314.00	70.87
302	.00	477.96	322.00	67.58
304	11.52	478.46	325.50	66.28
308	11.52	479.64	314.00	71.78
312	37.52	479.57	321.00	68.71
316	11.52	478.40	333.50	62.79
318	11.52	478.21	333.00	62.93
320	29.80	477.02	328.00	64.58
324	29.80	476.86	312.00	71.44
328	29.80	476.82	310.00	72.29
332	.00	477.09	322.00	67.21
352	.00	477.04	318.00	68.92
354	7.06	477.01	317.00	69.34
356	7.06	477.00	317.00	69.33
358	7.06	477.00	317.00	69.33
360	7.06	476.99	317.00	69.33
362	7.06	476.99	317.00	69.33
364	.00	476.98	317.00	69.32
376	9.84	477.04	328.00	64.58

378	9.84	477.02	328.00	64.58
380	9.84	477.02	326.00	65.44
382	9.84	477.02	326.00	65.44

MAXIMUM PRESSURES

2	.00	609.85	280.00	142.94
8	.00	609.79	290.00	138.57
4	.00	609.70	292.00	137.67
16	.00	624.97	328.00	128.69
14	.00	624.99	335.00	125.66

MINIMUM PRESSURES

316	11.52	478.40	333.50	62.79
318	11.52	478.21	333.00	62.93
18	.00	474.96	328.00	63.68
320	29.80	477.02	328.00	64.58
378	9.84	477.02	328.00	64.58

THE NET SYSTEM DEMAND = 5335.64

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	2137.21
2	2598.27
3	600.16

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 5335.64
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
316	2000.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.	LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
312	112 308	150.0	12.0	120.0	.00	.00

LINE 312 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00271

3Roots - Ultimate Water System
2000 GPM Fire Flow at Node 316
Source out of Service - Pipe 312 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1551.63	.08	.00	.00	2.48	1.63
2	0	8	1807.89	.11	.00	.00	2.88	2.17
3	0	14	.00	.00	.00	.00	.00	.00
4	2	4	1551.63	.08	.00	.00	2.48	1.63
5	0	6	1551.63	.08	.00	.00	6.34	16.12
6	8	10	1807.89	.11	.00	.00	2.88	2.17
7	0	12	1807.89	.11	.00	.00	7.38	21.40
8	14	16	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 9 IS CLOSED								
10	15	13	50.90	.01	.00	.00	.14	.01
11	15	17	-68.60	-.02	.00	.00	-.19	-.02
12	17	20	-519.40	-.03	.00	.00	-.83	-.22
13	17	24	440.74	.17	.00	.00	.70	.16
14	22	24	-74.16	.00	.00	.00	-.21	-.02
15	36	24	-245.20	-.09	.00	.00	-.39	-.05
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	-44.66	.00	.00	.00	-.07	.00
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	.00	.00	.00	.00	.00	.00
101	20	100	-519.40	-.10	.00	.00	-.83	-.22
105	100	104	-1211.83	-.77	.00	.00	-1.93	-1.03
109	104	108	-553.42	-.13	.00	.00	-.88	-.24
113	108	112	-1304.19	-1.30	.00	.00	-2.08	-1.18
117	116	112	1732.09	1.04	.00	.00	2.76	2.00
121	120	116	1772.89	.67	.00	.00	2.83	2.09
125	12	120	1807.89	.82	.00	.00	2.88	2.17
201	100	200	290.53	.16	.00	.00	.82	.30
202	202	200	-5.12	.00	.00	.00	-.01	.00
203	202	13	-33.20	.00	.00	.00	-.09	-.01
205	200	204	-1040.62	-1.71	.00	.00	-2.95	-3.17
207	6	208	1551.63	1.92	.00	.00	4.40	6.64
209	204	208	-1470.37	-1.29	.00	.00	-4.17	-6.01
211	204	212	-325.48	-.25	.00	.00	-.92	-.37
213	212	216	-377.98	-.31	.00	.00	-1.07	-.49
215	216	112	-413.10	-.10	.00	.00	-1.17	-.57
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-658.41	-.28	.00	.00	-1.87	-1.36
253	236	204	-709.63	-.50	.00	.00	-2.01	-1.56
301	108	300	704.19	.57	.00	.00	2.00	1.54
303	200	376	1262.73	10.93	.00	.00	8.06	32.64
304	376	302	2072.08	18.38	.00	.00	13.22	81.67
305	302	304	619.33	3.45	.00	.00	3.95	8.72
309	304	308	607.81	7.16	.00	.00	3.88	8.43
LINE 312 IS CLOSED								
313	308	312	596.29	.35	.00	.00	1.69	1.13
317	312	316	558.77	6.92	.00	.00	3.57	7.21
321	316	318	-1441.23	-6.88	.00	.00	-9.20	-41.69
325	320	324	-272.85	-.26	.00	.00	-.77	-.27
329	324	328	-302.65	-.12	.00	.00	-.86	-.32

333	328	364	-63.23	-.01	.00	.00	-.18	-.02
335	320	382	848.71	2.27	.00	.00	5.42	15.64
337	332	320	605.66	.40	.00	.00	1.72	1.16
341	332	300	-704.19	-.63	.00	.00	-2.00	-1.54
357	352	364	66.66	.01	.00	.00	.19	.02
359	364	362	3.43	.00	.00	.00	.02	.00
361	362	360	6.31	.00	.00	.00	.04	.00
363	360	358	2.69	.00	.00	.00	.02	.00
365	356	358	4.37	.00	.00	.00	.03	.00
367	354	356	14.87	.00	.00	.00	.09	.01
369	352	354	31.87	.00	.00	.00	.20	.04
371	356	360	3.44	.00	.00	.00	.02	.00
373	354	362	9.94	.00	.00	.00	.06	.00
387	332	352	98.53	.00	.00	.00	.28	.04
389	376	378	-819.19	-6.22	.00	.00	-5.23	-14.64
393	302	318	1452.75	11.00	.00	.00	9.27	42.31
399	382	378	488.10	1.91	.00	.00	3.12	5.61
401	378	380	-340.93	-.74	.00	.00	-2.18	-2.89
403	382	380	350.77	1.17	.00	.00	2.24	3.04
405	100	328	269.22	.32	.00	.00	.76	.26

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.92	280.00	142.96
4	.00	609.84	292.00	137.73
6	.00	484.92	292.00	83.60
8	.00	609.89	290.00	138.62
10	.00	609.78	320.00	125.57
12	.00	484.89	320.00	71.45
13	17.70	480.00	250.00	99.67
14	.00	625.00	335.00	125.67
15	17.70	480.01	256.00	97.07
16	.00	625.00	328.00	128.70
17	10.06	480.02	261.00	94.91
18	.00	479.76	328.00	65.76
20	.00	480.05	262.00	94.49
22	74.16	479.85	273.00	89.64
24	121.38	479.86	273.00	89.64
32	79.16	479.76	300.00	77.90
36	121.38	479.77	298.00	78.77
40	44.66	479.76	317.00	70.53
44	.00	479.76	318.00	70.10
100	132.68	480.16	270.00	91.07
104	.00	480.92	294.00	81.00
108	.00	481.05	306.00	75.86
112	14.80	482.36	308.00	75.55
116	40.80	483.40	305.00	77.31
120	35.00	484.07	298.00	80.63
200	63.30	479.99	274.00	89.26
202	38.32	479.99	268.00	91.86
204	45.60	481.70	288.00	83.94
208	81.26	483.00	292.00	82.76
212	52.50	481.95	297.00	80.15
216	35.12	482.26	306.00	76.38
232	46.58	481.05	306.00	75.86

236	51.22	481.21	292.00	81.99
300	.00	480.49	314.00	72.14
302	.00	450.69	322.00	55.76
304	11.52	447.24	325.50	52.75
308	11.52	440.08	314.00	54.63
312	37.52	439.73	321.00	51.45
316	2000.00	432.81	333.50	43.03
318	11.52	439.68	333.00	46.23
320	29.80	479.46	328.00	65.63
324	29.80	479.72	312.00	72.68
328	29.80	479.84	310.00	73.60
332	.00	479.86	322.00	68.40
352	.00	479.85	318.00	70.14
354	7.06	479.85	317.00	70.57
356	7.06	479.85	317.00	70.57
358	7.06	479.84	317.00	70.57
360	7.06	479.84	317.00	70.57
362	7.06	479.85	317.00	70.57
364	.00	479.85	317.00	70.57
376	9.84	469.06	328.00	61.13
378	9.84	475.28	328.00	63.82
380	9.84	476.02	326.00	65.01
382	9.84	477.19	326.00	65.52
	MAXIMUM PRESSURES			
2	.00	609.92	280.00	142.96
8	.00	609.89	290.00	138.62
4	.00	609.84	292.00	137.73
16	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67
	MINIMUM PRESSURES			
316	2000.00	432.81	333.50	43.03
318	11.52	439.68	333.00	46.23
312	37.52	439.73	321.00	51.45
304	11.52	447.24	325.50	52.75
308	11.52	440.08	314.00	54.63

THE NET SYSTEM DEMAND = 3359.52

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1551.63
2	1807.89
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3359.52
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
116	1500.00
120	1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.		LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
312	112	308	150.0	12.0	120.0	.00	.00
125	12	120	380.0	16.0	120.0	.00	.00

LINE 125 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00049

3Roots - Ultaimte Water System
3000 GPM Fire Flow split between Nodes 116 and 120
Source out of Service - Pipe 125 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	3125.71	.30	.00	.00	4.99	5.98
2	0	8	.00	.00	.00	.00	.00	.00
3	0	14	1169.53	.05	.00	.00	1.87	.97
4	2	4	3125.71	.30	.00	.00	4.99	5.98
5	0	6	3125.71	.29	.00	.00	12.77	58.99
6	8	10	.00	.00	.00	.00	.00	.00
7	0	12	.00	.00	.00	.00	.00	.00
8	14	16	1169.53	.05	.00	.00	1.87	.97
9	0	18	1169.53	.14	.00	.00	7.46	28.32
10	15	13	-9.60	.00	.00	.00	-.03	.00
11	15	17	-8.10	.00	.00	.00	-.02	.00
12	17	20	710.63	.05	.00	.00	1.13	.38
13	17	24	-728.79	-.42	.00	.00	-1.16	-.40
14	22	24	-74.16	.00	.00	.00	-.21	-.02
15	36	24	924.33	1.05	.00	.00	1.47	.63
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	1124.87	1.56	.00	.00	1.79	.90
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	1169.53	.39	.00	.00	1.87	.97
101	20	100	710.63	.18	.00	.00	1.13	.38
105	100	104	520.80	.16	.00	.00	.83	.22
109	104	108	1521.79	.87	.00	.00	2.43	1.58
113	108	112	1709.05	2.15	.00	.00	2.73	1.95
117	116	112	-3000.00	-2.88	.00	.00	-4.79	-5.54
121	120	116	-1500.00	-.49	.00	.00	-2.39	-1.54
LINE 125 IS CLOSED								
201	100	200	-368.75	-.25	.00	.00	-1.05	-.46
202	202	200	-65.62	-.01	.00	.00	-.19	-.02
203	202	13	27.30	.00	.00	.00	.08	.00
205	200	204	-875.85	-1.24	.00	.00	-2.48	-2.30

207	6	208	3125.71	7.04	.00	.00	8.87	24.27
209	204	208	-3044.45	-4.97	.00	.00	-8.64	-23.12
211	204	212	1070.77	2.27	.00	.00	3.04	3.34
213	212	216	1018.27	1.92	.00	.00	2.89	3.04
215	216	112	983.15	.48	.00	.00	2.79	2.85
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-1001.00	-.62	.00	.00	-2.84	-2.95
253	236	204	-1052.22	-1.03	.00	.00	-2.98	-3.23
301	108	300	-233.83	-.07	.00	.00	-.66	-.20
303	200	376	378.18	1.17	.00	.00	2.41	3.50
304	376	302	406.20	.90	.00	.00	2.59	3.99
305	302	304	204.87	.44	.00	.00	1.31	1.12
309	304	308	193.35	.86	.00	.00	1.23	1.01
312	112	308	-322.60	-.05	.00	.00	-.92	-.36
313	308	312	-140.77	-.02	.00	.00	-.40	-.08
317	312	316	-178.29	-.83	.00	.00	-1.14	-.87
321	316	318	-189.81	-.16	.00	.00	-1.21	-.98
325	320	324	-145.52	-.08	.00	.00	-.41	-.08
329	324	328	-175.32	-.04	.00	.00	-.50	-.12
333	328	364	220.79	.08	.00	.00	.63	.18
335	320	382	67.38	.02	.00	.00	.43	.14
337	332	320	-48.34	.00	.00	.00	-.14	-.01
341	332	300	233.83	.08	.00	.00	.66	.20
357	352	364	-156.91	-.03	.00	.00	-.45	-.10
359	364	362	63.88	.02	.00	.00	.41	.13
361	362	360	30.46	.01	.00	.00	.19	.03
363	360	358	11.51	.00	.00	.00	.07	.01
365	356	358	-4.45	.00	.00	.00	-.03	.00
367	354	356	-9.28	.00	.00	.00	-.06	.00
369	352	354	-28.58	.00	.00	.00	-.18	-.03
371	356	360	-11.89	.00	.00	.00	-.08	-.01
373	354	362	-26.36	-.01	.00	.00	-.17	-.03
387	332	352	-185.49	-.01	.00	.00	-.53	-.13
389	376	378	-37.86	-.02	.00	.00	-.24	-.05
393	302	318	201.33	.28	.00	.00	1.28	1.09
399	382	378	31.60	.01	.00	.00	.20	.04
401	378	380	-16.09	.00	.00	.00	-.10	-.01
403	382	380	25.93	.01	.00	.00	.17	.02
405	100	328	425.91	.74	.00	.00	1.21	.61

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.70	280.00	142.87
4	.00	609.40	292.00	137.54
6	.00	484.71	292.00	83.51
8	.00	610.00	290.00	138.67
10	.00	610.00	320.00	125.67
12	.00	485.00	320.00	71.50
13	17.70	471.44	250.00	95.96
14	.00	624.95	335.00	125.65
15	17.70	471.44	256.00	93.36
16	.00	624.90	328.00	128.66
17	10.06	471.44	261.00	91.19
18	.00	474.86	328.00	63.64
20	.00	471.38	262.00	90.73

22	74.16	471.86	273.00	86.17
24	121.38	471.86	273.00	86.17
32	79.16	472.90	300.00	74.93
36	121.38	472.91	298.00	75.80
40	44.66	474.47	317.00	68.24
44	.00	474.47	318.00	67.80
100	132.68	471.20	270.00	87.19
104	.00	471.04	294.00	76.72
108	.00	470.17	306.00	71.14
112	14.80	468.02	308.00	69.34
116	1500.00	465.14	305.00	69.40
120	1500.00	464.65	298.00	72.22
200	63.30	471.45	274.00	85.56
202	38.32	471.44	268.00	88.16
204	45.60	472.69	288.00	80.03
208	81.26	477.67	292.00	80.46
212	52.50	470.42	297.00	75.15
216	35.12	468.51	306.00	70.42
232	46.58	470.17	306.00	71.14
236	51.22	471.66	292.00	77.85
300	.00	470.25	314.00	67.71
302	.00	469.38	322.00	63.87
304	11.52	468.94	325.50	62.16
308	11.52	468.08	314.00	66.77
312	37.52	468.10	321.00	63.74
316	11.52	468.94	333.50	58.69
318	11.52	469.10	333.00	58.98
320	29.80	470.33	328.00	61.68
324	29.80	470.41	312.00	68.65
328	29.80	470.46	310.00	69.53
332	.00	470.33	322.00	64.28
352	.00	470.35	318.00	66.02
354	7.06	470.35	317.00	66.45
356	7.06	470.35	317.00	66.45
358	7.06	470.35	317.00	66.45
360	7.06	470.35	317.00	66.45
362	7.06	470.36	317.00	66.45
364	.00	470.37	317.00	66.46
376	9.84	470.28	328.00	61.65
378	9.84	470.30	328.00	61.66
380	9.84	470.30	326.00	62.53
382	9.84	470.31	326.00	62.54
	MAXIMUM PRESSURES			
2	.00	609.70	280.00	142.87
8	.00	610.00	290.00	138.67
4	.00	609.40	292.00	137.54
16	.00	624.90	328.00	128.66
10	.00	610.00	320.00	125.67
	MINIMUM PRESSURES			
316	11.52	468.94	333.50	58.69
318	11.52	469.10	333.00	58.98
376	9.84	470.28	328.00	61.65
378	9.84	470.30	328.00	61.66

320	29.80	470.33	328.00	61.68

THE NET SYSTEM DEMAND = 4295.24

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	3125.71
2	.00
3	1169.53

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4295.24
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
324	1500.00
328	1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.	LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
125	12 120	380.0	16.0	120.0	.00	.00
301	108 300	370.0	12.0	120.0	.00	.00

LINE 301 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00001

3Roots - Ultimate Water System
3000 GPM Fire Flow split between Nodes 324 and 328
Source out of Service - Pipe 301 Closed

PIPE NO.	NODE NOS.	FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0 2	1942.06	.12	.00	.00	3.10	2.48
2	0 8	2369.38	.18	.00	.00	3.78	3.58
3	0 14	.00	.00	.00	.00	.00	.00
4	2 4	1942.06	.12	.00	.00	3.10	2.48
5	0 6	1942.06	.12	.00	.00	7.93	24.43
6	8 10	2369.38	.18	.00	.00	3.78	3.58
7	0 12	2369.38	.18	.00	.00	9.68	35.31
8	14 16	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 9 IS CLOSED							
10	15 13	-205.25	-.13	.00	.00	-.58	-.16
11	15 17	187.55	.11	.00	.00	.53	.13

12	17	20	-263.25	-.01	.00	.00	-.42	-.06
13	17	24	440.74	.17	.00	.00	.70	.16
14	22	24	-74.16	.00	.00	.00	-.21	-.02
15	36	24	-245.20	-.09	.00	.00	-.39	-.05
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	-44.66	.00	.00	.00	-.07	.00
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	.00	.00	.00	.00	.00	.00
101	20	100	-263.25	-.03	.00	.00	-.42	-.06
105	100	104	-1991.17	-1.92	.00	.00	-3.18	-2.59
109	104	108	-1191.96	-.55	.00	.00	-1.90	-1.00
113	108	112	-1238.54	-1.18	.00	.00	-1.98	-1.08
117	116	112	2293.58	1.75	.00	.00	3.66	3.37
121	120	116	2334.38	1.11	.00	.00	3.72	3.48
125	12	120	2369.38	1.36	.00	.00	3.78	3.58
201	100	200	-537.35	-.50	.00	.00	-1.52	-.93
202	202	200	-261.27	-.16	.00	.00	-.74	-.24
203	202	13	222.95	.14	.00	.00	.63	.18
205	200	204	-1283.65	-2.52	.00	.00	-3.64	-4.67
207	6	208	1942.06	2.92	.00	.00	5.51	10.05
209	204	208	-1860.80	-2.00	.00	.00	-5.28	-9.29
211	204	212	-318.87	-.24	.00	.00	-.90	-.35
213	212	216	-371.37	-.30	.00	.00	-1.05	-.47
215	216	112	-406.49	-.09	.00	.00	-1.15	-.56
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-799.21	-.41	.00	.00	-2.27	-1.94
253	236	204	-850.43	-.70	.00	.00	-2.41	-2.18
LINE	301 IS CLOSED							
303	200	376	421.73	1.43	.00	.00	2.69	4.28
304	376	302	-550.14	-1.58	.00	.00	-3.51	-7.01
305	302	304	-291.22	-.85	.00	.00	-1.86	-2.16
309	304	308	-302.74	-1.97	.00	.00	-1.93	-2.32
312	112	308	633.74	.19	.00	.00	1.80	1.26
313	308	312	319.48	.11	.00	.00	.91	.36
317	312	316	281.96	1.95	.00	.00	1.80	2.03
321	316	318	270.44	.31	.00	.00	1.73	1.88
325	320	324	614.54	1.16	.00	.00	1.74	1.19
329	324	328	-885.46	-.87	.00	.00	-2.51	-2.35
333	328	364	-252.87	-.11	.00	.00	-.72	-.23
335	320	382	-932.51	-2.70	.00	.00	-5.95	-18.62
337	332	320	-288.17	-.10	.00	.00	-.82	-.29
341	332	300	.00	.00	.00	.00	.00	.00
357	352	364	207.86	.05	.00	.00	.59	.16
359	364	362	-45.01	-.01	.00	.00	-.29	-.07
361	362	360	-16.87	.00	.00	.00	-.11	-.01
363	360	358	-7.47	.00	.00	.00	-.05	.00
365	356	358	14.53	.00	.00	.00	.09	.01
367	354	356	38.05	.01	.00	.00	.24	.05
369	352	354	80.31	.02	.00	.00	.51	.20
371	356	360	16.46	.00	.00	.00	.11	.01
373	354	362	35.20	.01	.00	.00	.22	.04
387	332	352	288.17	.03	.00	.00	.82	.29
389	376	378	962.03	8.38	.00	.00	6.14	19.72
393	302	318	-258.92	-.45	.00	.00	-1.65	-1.73
399	382	378	-553.17	-2.41	.00	.00	-3.53	-7.08

401	378	380	399.02	.99	.00	.00	2.55	3.86
403	382	380	-389.18	-1.42	.00	.00	-2.48	-3.69
405	100	328	2132.59	14.71	.00	.00	6.05	11.96

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.88	280.00	142.95
4	.00	609.75	292.00	137.69
6	.00	484.88	292.00	83.58
8	.00	609.82	290.00	138.59
10	.00	609.64	320.00	125.51
12	.00	484.82	320.00	71.42
13	17.70	477.14	250.00	98.43
14	.00	625.00	335.00	125.67
15	17.70	477.01	256.00	95.77
16	.00	625.00	328.00	128.70
17	10.06	476.90	261.00	93.56
18	.00	476.64	328.00	64.41
20	.00	476.91	262.00	93.13
22	74.16	476.73	273.00	88.28
24	121.38	476.74	273.00	88.29
32	79.16	476.64	300.00	76.54
36	121.38	476.65	298.00	77.41
40	44.66	476.64	317.00	69.18
44	.00	476.64	318.00	68.74
100	132.68	476.94	270.00	89.67
104	.00	478.86	294.00	80.11
108	.00	479.41	306.00	75.14
112	14.80	480.60	308.00	74.79
116	40.80	482.35	305.00	76.85
120	35.00	483.46	298.00	80.37
200	63.30	477.44	274.00	88.16
202	38.32	477.28	268.00	90.69
204	45.60	479.96	288.00	83.18
208	81.26	481.96	292.00	82.32
212	52.50	480.21	297.00	79.39
216	35.12	480.50	306.00	75.62
232	46.58	479.41	306.00	75.14
236	51.22	479.27	292.00	81.15
300	.00	462.42	314.00	64.32
302	.00	477.58	322.00	67.42
304	11.52	478.44	325.50	66.27
308	11.52	480.41	314.00	72.11
312	37.52	480.30	321.00	69.03
316	11.52	478.35	333.50	62.77
318	11.52	478.04	333.00	62.85
320	29.80	462.52	328.00	58.29
324	1500.00	461.36	312.00	64.72
328	1500.00	462.23	310.00	65.97
332	.00	462.42	322.00	60.85
352	.00	462.39	318.00	62.57
354	7.06	462.36	317.00	62.99
356	7.06	462.35	317.00	62.99
358	7.06	462.35	317.00	62.99
360	7.06	462.35	317.00	62.99

362	7.06	462.35	317.00	62.98
364	.00	462.34	317.00	62.98
376	9.84	476.01	328.00	64.14
378	9.84	467.63	328.00	60.50
380	9.84	466.64	326.00	60.94
382	9.84	465.22	326.00	60.33

MAXIMUM PRESSURES

2	.00	609.88	280.00	142.95
8	.00	609.82	290.00	138.59
4	.00	609.75	292.00	137.69
16	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67

MINIMUM PRESSURES

320	29.80	462.52	328.00	58.29
382	9.84	465.22	326.00	60.33
378	9.84	467.63	328.00	60.50
332	.00	462.42	322.00	60.85
380	9.84	466.64	326.00	60.94

THE NET SYSTEM DEMAND = 4311.44

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1942.06
2	2369.38
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4311.44
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
20	1500.00
22	1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.	LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
301	108 300	370.0	12.0	120.0	.00	.00
13	17 24	1050.0	16.0	120.0	.00	.00

LINE 13 IS CLOSED

9	0 18	5.0	8.0	120.0	.00	475.00

THERE IS A CHECK VALVE IN LINE NUMBER 9

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00124

3Roots - Ultimate Water System
3000 GPM Fire Flow split between Nodes 22 and 24
Source out of Service - Pipe 13 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1085.75	.04	.00	.00	1.73	.84
2	0	8	1344.55	.06	.00	.00	2.15	1.25
3	0	14	1866.58	.12	.00	.00	2.98	2.30
4	2	4	1085.75	.04	.00	.00	1.73	.84
5	0	6	1085.75	.04	.00	.00	4.43	8.32
6	8	10	1344.55	.06	.00	.00	2.15	1.25
7	0	12	1344.55	.06	.00	.00	5.49	12.37
8	14	16	1866.58	.12	.00	.00	2.98	2.30
9	0	18	1866.58	.34	.00	.00	11.91	67.31
10	15	13	-246.62	-.18	.00	.00	-.70	-.22
11	15	17	228.92	.16	.00	.00	.65	.19
12	17	20	218.86	.01	.00	.00	.35	.04
LINE	13 IS	CLOSED						
14	22	24	-1500.00	-1.15	.00	.00	-4.25	-6.23
15	36	24	1621.38	2.98	.00	.00	2.59	1.77
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	1821.92	3.81	.00	.00	2.91	2.20
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	1866.58	.92	.00	.00	2.98	2.30
101	20	100	-1281.14	-.54	.00	.00	-2.04	-1.15
105	100	104	-874.82	-.42	.00	.00	-1.40	-.57
109	104	108	-426.03	-.08	.00	.00	-.68	-.15
113	108	112	-765.18	-.49	.00	.00	-1.22	-.44
117	116	112	1268.75	.59	.00	.00	2.02	1.13
121	120	116	1309.55	.38	.00	.00	2.09	1.19
125	12	120	1344.55	.48	.00	.00	2.15	1.25
201	100	200	-335.96	-.21	.00	.00	-.95	-.39
202	202	200	-302.64	-.21	.00	.00	-.86	-.32
203	202	13	264.32	.20	.00	.00	.75	.25
205	200	204	-595.78	-.61	.00	.00	-1.69	-1.13
207	6	208	1085.75	.99	.00	.00	3.08	3.43
209	204	208	-1004.49	-.64	.00	.00	-2.85	-2.97
211	204	212	-136.90	-.05	.00	.00	-.39	-.07
213	212	216	-189.40	-.09	.00	.00	-.54	-.13
215	216	112	-224.52	-.03	.00	.00	-.64	-.18
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-448.79	-.14	.00	.00	-1.27	-.67
253	236	204	-500.01	-.26	.00	.00	-1.42	-.81
301	108	300	292.57	.11	.00	.00	.83	.30
303	200	376	-106.12	-.11	.00	.00	-.68	-.33
304	376	302	-180.66	-.20	.00	.00	-1.15	-.89
305	302	304	-99.80	-.12	.00	.00	-.64	-.30
309	304	308	-111.32	-.31	.00	.00	-.71	-.36
312	112	308	264.26	.04	.00	.00	.75	.25
313	308	312	141.42	.02	.00	.00	.40	.08

317	312	316	103.90	.31	.00	.00	.66	.32
321	316	318	92.38	.04	.00	.00	.59	.26
325	320	324	112.25	.05	.00	.00	.32	.05
329	324	328	82.45	.01	.00	.00	.23	.03
333	328	364	-150.39	-.04	.00	.00	-.43	-.09
335	320	382	-35.17	-.01	.00	.00	-.22	-.04
337	332	320	106.88	.02	.00	.00	.30	.05
341	332	300	-292.57	-.12	.00	.00	-.83	-.30
357	352	364	130.59	.02	.00	.00	.37	.07
359	364	362	-19.80	.00	.00	.00	-.13	-.01
361	362	360	-5.01	.00	.00	.00	-.03	.00
363	360	358	-2.34	.00	.00	.00	-.01	.00
365	356	358	9.40	.00	.00	.00	.06	.00
367	354	356	26.19	.00	.00	.00	.17	.02
369	352	354	55.10	.01	.00	.00	.35	.10
371	356	360	9.72	.00	.00	.00	.06	.00
373	354	362	21.86	.01	.00	.00	.14	.02
387	332	352	185.69	.01	.00	.00	.53	.13
389	376	378	64.69	.06	.00	.00	.41	.13
393	302	318	-80.86	-.05	.00	.00	-.52	-.20
399	382	378	-28.89	-.01	.00	.00	-.18	-.03
401	378	380	25.96	.01	.00	.00	.17	.02
403	382	380	-16.12	.00	.00	.00	-.10	-.01
405	100	328	-203.04	-.19	.00	.00	-.58	-.15

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.96	280.00	142.98
4	.00	609.92	292.00	137.76
6	.00	484.96	292.00	83.62
8	.00	609.94	290.00	138.64
10	.00	609.87	320.00	125.61
12	.00	484.94	320.00	71.47
13	17.70	482.31	250.00	100.67
14	.00	624.88	335.00	125.62
15	17.70	482.13	256.00	97.99
16	.00	624.77	328.00	128.60
17	10.06	481.98	261.00	95.76
18	.00	474.66	328.00	63.55
20	1500.00	481.97	262.00	95.32
22	1500.00	465.80	273.00	83.55
24	121.38	466.96	273.00	84.05
32	79.16	469.93	300.00	73.64
36	121.38	469.94	298.00	74.51
40	44.66	473.74	317.00	67.92
44	.00	473.74	318.00	67.49
100	132.68	482.51	270.00	92.09
104	.00	482.93	294.00	81.87
108	.00	483.01	306.00	76.70
112	14.80	483.49	308.00	76.05
116	40.80	484.08	305.00	77.60
120	35.00	484.46	298.00	80.80
200	63.30	482.72	274.00	90.44
202	38.32	482.51	268.00	92.95
204	45.60	483.33	288.00	84.64

208	81.26	483.97	292.00	83.18
212	52.50	483.38	297.00	80.76
216	35.12	483.46	306.00	76.90
232	46.58	483.01	306.00	76.70
236	51.22	483.07	292.00	82.80
300	.00	482.90	314.00	73.19
302	.00	483.03	322.00	69.78
304	11.52	483.15	325.50	68.31
308	11.52	483.46	314.00	73.43
312	37.52	483.43	321.00	70.39
316	11.52	483.13	333.50	64.84
318	11.52	483.08	333.00	65.04
320	29.80	482.76	328.00	67.06
324	29.80	482.71	312.00	73.97
328	29.80	482.70	310.00	74.84
332	.00	482.77	322.00	69.67
352	.00	482.76	318.00	71.40
354	7.06	482.75	317.00	71.82
356	7.06	482.74	317.00	71.82
358	7.06	482.74	317.00	71.82
360	7.06	482.74	317.00	71.82
362	7.06	482.74	317.00	71.82
364	.00	482.74	317.00	71.82
376	9.84	482.83	328.00	67.09
378	9.84	482.77	328.00	67.07
380	9.84	482.77	326.00	67.93
382	9.84	482.76	326.00	67.93
	MAXIMUM PRESSURES			
2	.00	609.96	280.00	142.98
8	.00	609.94	290.00	138.64
4	.00	609.92	292.00	137.76
16	.00	624.77	328.00	128.60
14	.00	624.88	335.00	125.62
	MINIMUM PRESSURES			
18	.00	474.66	328.00	63.55
316	11.52	483.13	333.50	64.84
318	11.52	483.08	333.00	65.04
320	29.80	482.76	328.00	67.06
378	9.84	482.77	328.00	67.07

THE NET SYSTEM DEMAND = 4296.88

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1085.75
2	1344.55
3	1866.58

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4296.88
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
22	1500.00
32	1500.00

THE RESULTS ARE OBTAINED AFTER 3 TRIALS WITH AN ACCURACY = .00049

3Roots - Ultimate Water System
3000 GPM Fire Flow split between Nodes 22 and 32
Source out of Service - Pipe 13 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	411.60	.01	.00	.00	.66	.14
2	0	8	518.70	.01	.00	.00	.83	.21
3	0	14	3287.42	.33	.00	.00	5.25	6.57
4	2	4	411.60	.01	.00	.00	.66	.14
5	0	6	411.60	.01	.00	.00	1.68	1.38
6	8	10	518.70	.01	.00	.00	.83	.21
7	0	12	518.70	.01	.00	.00	2.12	2.12
8	14	16	3287.42	.33	.00	.00	5.25	6.57
9	0	18	3287.42	.96	.00	.00	20.98	191.99
10	15	13	7.71	.00	.00	.00	.02	.00
11	15	17	-25.41	.00	.00	.00	-.07	.00
12	17	20	-35.47	.00	.00	.00	-.06	.00
LINE	13 IS CLOSED							
14	22	24	-1500.00	-1.15	.00	.00	-4.25	-6.23
15	36	24	1621.38	2.98	.00	.00	2.59	1.77
27	36	32	1500.00	1.99	.00	.00	4.25	6.23
29	44	36	3242.76	11.07	.00	.00	5.17	6.40
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	3287.42	2.63	.00	.00	5.25	6.57
101	20	100	-35.47	.00	.00	.00	-.06	.00
105	100	104	-166.28	-.02	.00	.00	-.27	-.03
109	104	108	-75.96	.00	.00	.00	-.12	-.01
113	108	112	-214.36	-.05	.00	.00	-.34	-.04
117	116	112	442.90	.08	.00	.00	.71	.16
121	120	116	483.70	.06	.00	.00	.77	.19
125	12	120	518.70	.08	.00	.00	.83	.21
201	100	200	-37.91	.00	.00	.00	-.11	-.01
202	202	200	-48.31	-.01	.00	.00	-.14	-.01
203	202	13	9.99	.00	.00	.00	.03	.00
205	200	204	-151.17	-.05	.00	.00	-.43	-.09
207	6	208	411.60	.16	.00	.00	1.17	.57
209	204	208	-330.34	-.08	.00	.00	-.94	-.38
211	204	212	-7.97	.00	.00	.00	-.02	.00
213	212	216	-60.47	-.01	.00	.00	-.17	-.02

215	216	112	-95.59	-.01	.00	.00	-.27	-.04
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-90.32	-.01	.00	.00	-.26	-.03
253	236	204	-141.54	-.03	.00	.00	-.40	-.08
301	108	300	91.82	.01	.00	.00	.26	.04
303	200	376	1.65	.00	.00	.00	.01	.00
304	376	302	-34.54	-.01	.00	.00	-.22	-.04
305	302	304	-24.62	-.01	.00	.00	-.16	-.02
309	304	308	-36.14	-.04	.00	.00	-.23	-.05
312	112	308	118.14	.01	.00	.00	.34	.06
313	308	312	70.48	.01	.00	.00	.20	.02
317	312	316	32.96	.04	.00	.00	.21	.04
321	316	318	21.44	.00	.00	.00	.14	.02
325	320	324	10.31	.00	.00	.00	.03	.00
329	324	328	-19.49	.00	.00	.00	-.06	.00
333	328	364	-13.25	.00	.00	.00	-.04	.00
335	320	382	3.17	.00	.00	.00	.02	.00
337	332	320	43.28	.00	.00	.00	.12	.01
341	332	300	-91.82	-.01	.00	.00	-.26	-.04
357	352	364	27.70	.00	.00	.00	.08	.00
359	364	362	14.45	.00	.00	.00	.09	.01
361	362	360	10.14	.00	.00	.00	.06	.00
363	360	358	3.61	.00	.00	.00	.02	.00
365	356	358	3.45	.00	.00	.00	.02	.00
367	354	356	11.04	.00	.00	.00	.07	.01
369	352	354	20.85	.00	.00	.00	.13	.02
371	356	360	.53	.00	.00	.00	.00	.00
373	354	362	2.75	.00	.00	.00	.02	.00
387	332	352	48.55	.00	.00	.00	.14	.01
389	376	378	26.35	.01	.00	.00	.17	.03
393	302	318	-9.92	.00	.00	.00	-.06	.00
399	382	378	-7.58	.00	.00	.00	-.05	.00
401	378	380	8.93	.00	.00	.00	.06	.00
403	382	380	.91	.00	.00	.00	.01	.00
405	100	328	36.04	.01	.00	.00	.10	.01

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.99	280.00	143.00
4	.00	609.99	292.00	137.79
6	.00	484.99	292.00	83.63
8	.00	609.99	290.00	138.66
10	.00	609.98	320.00	125.66
12	.00	484.99	320.00	71.50
13	17.70	484.69	250.00	101.70
14	.00	624.67	335.00	125.52
15	17.70	484.69	256.00	99.10
16	.00	624.34	328.00	128.42
17	10.06	484.69	261.00	96.93
18	.00	474.04	328.00	63.28
20	.00	484.69	262.00	96.50
22	1500.00	456.21	273.00	79.39
24	121.38	457.36	273.00	79.89
32	1500.00	458.35	300.00	68.62
36	121.38	460.34	298.00	70.35

40	44.66	471.41	317.00	66.91
44	.00	471.41	318.00	66.48
100	132.68	484.70	270.00	93.03
104	.00	484.71	294.00	82.64
108	.00	484.72	306.00	77.44
112	14.80	484.76	308.00	76.60
116	40.80	484.85	305.00	77.93
120	35.00	484.91	298.00	80.99
200	63.30	484.70	274.00	91.30
202	38.32	484.69	268.00	93.90
204	45.60	484.75	288.00	85.26
208	81.26	484.83	292.00	83.56
212	52.50	484.75	297.00	81.36
216	35.12	484.76	306.00	77.46
232	46.58	484.71	306.00	77.44
236	51.22	484.72	292.00	83.51
300	.00	484.70	314.00	73.97
302	.00	484.71	322.00	70.51
304	11.52	484.72	325.50	68.99
308	11.52	484.76	314.00	73.99
312	37.52	484.75	321.00	70.96
316	11.52	484.71	333.50	65.53
318	11.52	484.71	333.00	65.74
320	29.80	484.69	328.00	67.90
324	29.80	484.69	312.00	74.83
328	29.80	484.69	310.00	75.70
332	.00	484.69	322.00	70.50
352	.00	484.69	318.00	72.23
354	7.06	484.69	317.00	72.66
356	7.06	484.69	317.00	72.66
358	7.06	484.69	317.00	72.66
360	7.06	484.69	317.00	72.66
362	7.06	484.69	317.00	72.66
364	.00	484.69	317.00	72.66
376	9.84	484.70	328.00	67.90
378	9.84	484.69	328.00	67.90
380	9.84	484.69	326.00	68.76
382	9.84	484.69	326.00	68.76
	MAXIMUM PRESSURES			
2	.00	609.99	280.00	143.00
8	.00	609.99	290.00	138.66
4	.00	609.99	292.00	137.79
16	.00	624.34	328.00	128.42
10	.00	609.98	320.00	125.66
	MINIMUM PRESSURES			
18	.00	474.04	328.00	63.28
316	11.52	484.71	333.50	65.53
318	11.52	484.71	333.00	65.74
44	.00	471.41	318.00	66.48
40	44.66	471.41	317.00	66.91

THE NET SYSTEM DEMAND = 4217.72

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	411.60
2	518.70
3	3287.42

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4217.72
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
40	1500.00
44	1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.		LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
13	17	24	1050.0	16.0	120.0	.00	.00
37	18	44	400.0	16.0	120.0	.00	.00

LINE 37 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 3 TRIALS WITH AN ACCURACY = .00467

3Roots - Ultimate Water System
3000 GPM Fire Flow split between Nodes 40 and 44
Source out of Service - Pipe 37 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1941.70	.12	.00	.00	3.10	2.48
2	0	8	2384.69	.18	.00	.00	3.80	3.62
3	0	14	.00	.00	.00	.00	.00	.00
4	2	4	1941.70	.12	.00	.00	3.10	2.48
5	0	6	1941.70	.12	.00	.00	7.93	24.42
6	8	10	2384.69	.18	.00	.00	3.80	3.62
7	0	12	2384.69	.18	.00	.00	9.74	35.74
8	14	16	.00	.00	.00	.00	.00	.00
9	0	18	.00	.00	.00	.00	.00	.00
10	15	13	-613.12	-.96	.00	.00	-1.74	-1.19
11	15	17	595.42	.91	.00	.00	1.69	1.13
12	17	20	-2810.72	-.69	.00	.00	-4.48	-4.91
13	17	24	3396.08	7.32	.00	.00	5.42	6.97
14	22	24	-74.16	.00	.00	.00	-.21	-.02
15	36	24	-3200.54	-10.50	.00	.00	-5.11	-6.25

27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	-3000.00	-9.59	.00	.00	-4.79	-5.54
33	44	40	1500.00	1.87	.00	.00	4.25	6.23
LINE	37 IS	CLOSED						
101	20	100	-2810.72	-2.31	.00	.00	-4.48	-4.91
105	100	104	-1782.51	-1.56	.00	.00	-2.84	-2.11
109	104	108	-887.65	-.32	.00	.00	-1.42	-.58
113	108	112	-1460.89	-1.61	.00	.00	-2.33	-1.46
117	116	112	2308.89	1.77	.00	.00	3.68	3.41
121	120	116	2349.69	1.13	.00	.00	3.75	3.53
125	12	120	2384.69	1.38	.00	.00	3.80	3.62
201	100	200	-685.97	-.79	.00	.00	-1.95	-1.46
202	202	200	-669.14	-.92	.00	.00	-1.90	-1.40
203	202	13	630.82	.99	.00	.00	1.79	1.25
205	200	204	-1170.45	-2.13	.00	.00	-3.32	-3.94
207	6	208	1941.70	2.91	.00	.00	5.51	10.05
209	204	208	-1860.44	-2.00	.00	.00	-5.28	-9.29
211	204	212	-301.70	-.22	.00	.00	-.86	-.32
213	212	216	-354.20	-.27	.00	.00	-1.00	-.43
215	216	112	-389.32	-.09	.00	.00	-1.10	-.51
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-894.86	-.50	.00	.00	-2.54	-2.39
253	236	204	-946.08	-.85	.00	.00	-2.68	-2.65
301	108	300	526.66	.33	.00	.00	1.49	.90
303	200	376	-247.96	-.54	.00	.00	-1.58	-1.60
304	376	302	-360.28	-.72	.00	.00	-2.30	-3.20
305	302	304	-192.81	-.40	.00	.00	-1.23	-1.00
309	304	308	-204.33	-.95	.00	.00	-1.30	-1.12
312	112	308	443.88	.10	.00	.00	1.26	.65
313	308	312	228.03	.06	.00	.00	.65	.19
317	312	316	190.51	.94	.00	.00	1.22	.98
321	316	318	178.99	.14	.00	.00	1.14	.88
325	320	324	224.01	.18	.00	.00	.64	.18
329	324	328	194.21	.05	.00	.00	.55	.14
333	328	364	-310.51	-.16	.00	.00	-.88	-.34
335	320	382	-72.96	-.02	.00	.00	-.47	-.17
337	332	320	180.85	.04	.00	.00	.51	.12
341	332	300	-526.66	-.37	.00	.00	-1.49	-.90
357	352	364	251.07	.07	.00	.00	.71	.23
359	364	362	-59.44	-.01	.00	.00	-.38	-.11
361	362	360	-24.30	.00	.00	.00	-.16	-.02
363	360	358	-11.43	.00	.00	.00	-.07	-.01
365	356	358	18.49	.01	.00	.00	.12	.01
367	354	356	45.48	.01	.00	.00	.29	.07
369	352	354	94.74	.03	.00	.00	.60	.27
371	356	360	19.93	.01	.00	.00	.13	.02
373	354	362	42.20	.02	.00	.00	.27	.06
387	332	352	345.81	.05	.00	.00	.98	.41
389	376	378	102.48	.13	.00	.00	.65	.31
393	302	318	-167.47	-.20	.00	.00	-1.07	-.77
399	382	378	-50.69	-.03	.00	.00	-.32	-.08
401	378	380	41.94	.02	.00	.00	.27	.06
403	382	380	-32.10	-.01	.00	.00	-.20	-.04
405	100	328	-474.92	-.91	.00	.00	-1.35	-.74

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.88	280.00	142.95
4	.00	609.75	292.00	137.69
6	.00	484.88	292.00	83.58
8	.00	609.82	290.00	138.59
10	.00	609.64	320.00	125.51
12	.00	484.82	320.00	71.42
13	17.70	475.93	250.00	97.90
14	.00	625.00	335.00	125.67
15	17.70	474.97	256.00	94.89
16	.00	625.00	328.00	128.70
17	10.06	474.05	261.00	92.32
18	.00	475.00	328.00	63.70
20	.00	474.74	262.00	92.19
22	74.16	466.73	273.00	83.95
24	121.38	466.73	273.00	83.95
32	79.16	456.23	300.00	67.70
36	121.38	456.24	298.00	68.57
40	1500.00	444.78	317.00	55.37
44	1500.00	446.65	318.00	55.75
100	132.68	477.05	270.00	89.72
104	.00	478.61	294.00	80.00
108	.00	478.93	306.00	74.94
112	14.80	480.54	308.00	74.77
116	40.80	482.32	305.00	76.84
120	35.00	483.44	298.00	80.36
200	63.30	477.84	274.00	88.33
202	38.32	476.92	268.00	90.53
204	45.60	479.97	288.00	83.19
208	81.26	481.96	292.00	82.32
212	52.50	480.18	297.00	79.38
216	35.12	480.45	306.00	75.60
232	46.58	478.93	306.00	74.94
236	51.22	479.12	292.00	81.08
300	.00	478.60	314.00	71.33
302	.00	479.10	322.00	68.08
304	11.52	479.49	325.50	66.73
308	11.52	480.44	314.00	72.13
312	37.52	480.39	321.00	69.07
316	11.52	479.44	333.50	63.24
318	11.52	479.30	333.00	63.40
320	29.80	478.19	328.00	65.08
324	29.80	478.01	312.00	71.94
328	29.80	477.96	310.00	72.78
332	.00	478.23	322.00	67.70
352	.00	478.19	318.00	69.41
354	7.06	478.15	317.00	69.83
356	7.06	478.14	317.00	69.83
358	7.06	478.14	317.00	69.83
360	7.06	478.14	317.00	69.83
362	7.06	478.13	317.00	69.82
364	.00	478.12	317.00	69.82
376	9.84	478.38	328.00	65.16
378	9.84	478.24	328.00	65.11

380	9.84	478.23	326.00	65.97
382	9.84	478.22	326.00	65.96

MAXIMUM PRESSURES

2	.00	609.88	280.00	142.95
8	.00	609.82	290.00	138.59
4	.00	609.75	292.00	137.69
16	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67

MINIMUM PRESSURES

40	1500.00	444.78	317.00	55.37
44	1500.00	446.65	318.00	55.75
316	11.52	479.44	333.50	63.24
318	11.52	479.30	333.00	63.40
18	.00	475.00	328.00	63.70

THE NET SYSTEM DEMAND = 4326.38

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1941.70
2	2384.69
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4326.38
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
13	2000.00
15	2000.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.		LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
37	18	44	400.0	16.0	120.0	.00	.00
207	6	208	215.0	12.0	120.0	.00	.00

LINE 207 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00005

3Roots - Ultimate Water System
4000 GPM Fire Flow split between Nodes 13 and 15
Source out of Service - Pipe 207 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	.00	.00	.00	.00	.00	.00
2	0	8	3802.68	.43	.00	.00	6.07	8.60
3	0	14	1532.96	.08	.00	.00	2.45	1.60
4	2	4	.00	.00	.00	.00	.00	.00
5	0	6	.00	.00	.00	.00	.00	.00
6	8	10	3802.68	.43	.00	.00	6.07	8.60
7	0	12	3802.68	.42	.00	.00	15.53	84.81
8	14	16	1532.96	.08	.00	.00	2.45	1.60
9	0	18	1532.96	.23	.00	.00	9.78	46.74
10	15	13	298.74	.25	.00	.00	.85	.31
11	15	17	-2298.74	-11.13	.00	.00	-6.52	-13.74
12	17	20	-1216.58	-.15	.00	.00	-1.94	-1.04
13	17	24	-1092.22	-.90	.00	.00	-1.74	-.85
14	22	24	-74.16	.00	.00	.00	-.21	-.02
15	36	24	1287.76	1.94	.00	.00	2.05	1.16
27	36	32	79.16	.01	.00	.00	.22	.03
29	44	36	1488.30	2.62	.00	.00	2.37	1.51
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	1532.96	.64	.00	.00	2.45	1.60
101	20	100	-1216.58	-.49	.00	.00	-1.94	-1.04
105	100	104	-1367.94	-.96	.00	.00	-2.18	-1.29
109	104	108	-1518.76	-.86	.00	.00	-2.42	-1.57
113	108	112	-2107.73	-3.17	.00	.00	-3.36	-2.88
117	116	112	3726.88	4.31	.00	.00	5.95	8.28
121	120	116	3767.68	2.70	.00	.00	6.01	8.45
125	12	120	3802.68	3.27	.00	.00	6.07	8.60
201	100	200	469.05	.39	.00	.00	1.33	.72
202	202	200	-1739.58	-5.41	.00	.00	-4.93	-8.20
203	202	13	1701.26	6.22	.00	.00	4.83	7.87
205	200	204	-903.82	-1.32	.00	.00	-2.56	-2.44
LINE	207 IS	CLOSED						
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	-931.07	-1.75	.00	.00	-2.64	-2.58
213	212	216	-983.57	-1.80	.00	.00	-2.79	-2.85
215	216	112	-1018.69	-.52	.00	.00	-2.89	-3.04
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	150.83	.02	.00	.00	.43	.09
253	236	204	99.61	.01	.00	.00	.28	.04
301	108	300	542.39	.35	.00	.00	1.54	.95
303	200	376	-430.02	-1.49	.00	.00	-2.74	-4.44
304	376	302	-502.06	-1.33	.00	.00	-3.20	-5.91
305	302	304	-266.30	-.72	.00	.00	-1.70	-1.83
309	304	308	-277.82	-1.68	.00	.00	-1.77	-1.98
312	112	308	585.66	.16	.00	.00	1.66	1.09
313	308	312	296.32	.10	.00	.00	.84	.31
317	312	316	258.80	1.66	.00	.00	1.65	1.73
321	316	318	247.28	.26	.00	.00	1.58	1.59
325	320	324	209.64	.16	.00	.00	.59	.16

329	324	328	179.84	.05	.00	.00	.51	.12
333	328	364	-300.33	-.15	.00	.00	-.85	-.32
335	320	382	-32.67	-.01	.00	.00	-.21	-.04
337	332	320	206.76	.05	.00	.00	.59	.16
341	332	300	-542.39	-.39	.00	.00	-1.54	-.95
357	352	364	243.86	.06	.00	.00	.69	.22
359	364	362	-56.47	-.01	.00	.00	-.36	-.10
361	362	360	-22.15	.00	.00	.00	-.14	-.02
363	360	358	-9.71	.00	.00	.00	-.06	.00
365	356	358	16.77	.00	.00	.00	.11	.01
367	354	356	43.33	.01	.00	.00	.28	.06
369	352	354	91.77	.03	.00	.00	.59	.25
371	356	360	19.50	.01	.00	.00	.12	.01
373	354	362	41.38	.02	.00	.00	.26	.06
387	332	352	335.63	.04	.00	.00	.95	.39
389	376	378	62.19	.05	.00	.00	.40	.12
393	302	318	-235.76	-.38	.00	.00	-1.50	-1.46
399	382	378	-27.44	-.01	.00	.00	-.18	-.03
401	378	380	24.91	.01	.00	.00	.16	.02
403	382	380	-15.07	.00	.00	.00	-.10	-.01
405	100	328	-450.37	-.83	.00	.00	-1.28	-.67

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	610.00	280.00	143.00
4	.00	610.00	292.00	137.80
6	.00	485.00	292.00	83.63
8	.00	609.57	290.00	138.48
10	.00	609.14	320.00	125.29
12	.00	484.58	320.00	71.32
13	2000.00	457.29	250.00	89.82
14	.00	624.92	335.00	125.63
15	2000.00	457.54	256.00	87.33
16	.00	624.84	328.00	128.63
17	10.06	468.67	261.00	89.99
18	.00	474.77	328.00	63.60
20	.00	468.81	262.00	89.62
22	74.16	469.56	273.00	85.18
24	121.38	469.56	273.00	85.18
32	79.16	471.50	300.00	74.32
36	121.38	471.51	298.00	75.19
40	44.66	474.12	317.00	68.09
44	.00	474.13	318.00	67.66
100	132.68	469.30	270.00	86.37
104	.00	470.26	294.00	76.38
108	.00	471.13	306.00	71.55
112	14.80	474.30	308.00	72.06
116	40.80	478.60	305.00	75.23
120	35.00	481.31	298.00	79.43
200	63.30	468.91	274.00	84.46
202	38.32	463.50	268.00	84.72
204	45.60	470.23	288.00	78.97
208	81.26	470.22	292.00	77.23
212	52.50	471.98	297.00	75.83
216	35.12	473.78	306.00	72.70

232	46.58	471.12	306.00	71.55
236	51.22	470.24	292.00	77.24
300	.00	470.78	314.00	67.94
302	.00	471.73	322.00	64.88
304	11.52	472.45	325.50	63.68
308	11.52	474.13	314.00	69.39
312	37.52	474.04	321.00	66.32
316	11.52	472.37	333.50	60.18
318	11.52	472.11	333.00	60.28
320	29.80	470.33	328.00	61.68
324	29.80	470.18	312.00	68.54
328	29.80	470.13	310.00	69.39
332	.00	470.39	322.00	64.30
352	.00	470.34	318.00	66.02
354	7.06	470.31	317.00	66.43
356	7.06	470.30	317.00	66.43
358	7.06	470.30	317.00	66.43
360	7.06	470.30	317.00	66.43
362	7.06	470.29	317.00	66.43
364	.00	470.28	317.00	66.42
376	9.84	470.40	328.00	61.71
378	9.84	470.35	328.00	61.68
380	9.84	470.34	326.00	62.55
382	9.84	470.34	326.00	62.55
	MAXIMUM PRESSURES			
2	.00	610.00	280.00	143.00
8	.00	609.57	290.00	138.48
4	.00	610.00	292.00	137.80
16	.00	624.84	328.00	128.63
14	.00	624.92	335.00	125.63
	MINIMUM PRESSURES			
316	11.52	472.37	333.50	60.18
318	11.52	472.11	333.00	60.28
320	29.80	470.33	328.00	61.68
378	9.84	470.35	328.00	61.68
376	9.84	470.40	328.00	61.71

THE NET SYSTEM DEMAND = 5335.64

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	.00
2	3802.68
3	1532.96

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 5335.64
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
212	1500.00
204	1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.		LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
207	6	208	290.0	12.0	120.0	.00	.00
209	204	208	215.0	12.0	120.0	.00	.00

LINE 209 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00391

3Roots - Ultimate Water System
3000 GPM Fire Flow split between Node 204 and 212
Source out of Service - Pipe 209 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	40.63	.00	.00	.00	.06	.00
2	0	8	3239.26	.32	.00	.00	5.17	6.39
3	0	14	356.58	.01	.00	.00	.57	.11
4	2	4	40.63	.00	.00	.00	.06	.00
5	0	6	40.63	.00	.00	.00	.17	.02
6	8	10	3239.26	.32	.00	.00	5.17	6.39
7	0	12	3239.26	.32	.00	.00	13.23	63.02
8	14	16	356.58	.01	.00	.00	.57	.11
9	0	18	356.58	.02	.00	.00	2.28	3.14
10	15	13	163.07	.08	.00	.00	.46	.10
11	15	17	-171.92	-.09	.00	.00	-.49	-.11
12	17	20	-40.74	.00	.00	.00	-.07	.00
13	17	24	-136.21	-.02	.00	.00	-.22	-.02
14	22	24	-37.08	.00	.00	.00	-.11	-.01
15	36	24	233.98	.08	.00	.00	.37	.05
27	36	32	39.58	.00	.00	.00	.11	.01
29	44	36	334.25	.16	.00	.00	.53	.10
33	44	40	22.33	.00	.00	.00	.06	.00
37	18	44	356.58	.04	.00	.00	.57	.11
101	20	100	-40.74	.00	.00	.00	-.07	.00
105	100	104	-252.33	-.04	.00	.00	-.40	-.06
109	104	108	-1200.92	-.56	.00	.00	-1.92	-1.02
113	108	112	-1508.01	-1.71	.00	.00	-2.41	-1.55
117	116	112	3201.36	3.25	.00	.00	5.11	6.25
121	120	116	3221.76	2.02	.00	.00	5.14	6.32
125	12	120	3239.26	2.43	.00	.00	5.17	6.39
201	100	200	402.28	.29	.00	.00	1.14	.54
202	202	200	135.06	.05	.00	.00	.38	.07
203	202	13	-154.22	-.07	.00	.00	-.44	-.09

205	200	204	793.82	1.04	.00	.00	2.25	1.92
207	6	208	40.63	.00	.00	.00	.12	.01
LINE 209 IS CLOSED								
211	204	212	216.79	.12	.00	.00	.61	.17
213	212	216	-1283.21	-2.94	.00	.00	-3.64	-4.67
215	216	112	-1300.77	-.81	.00	.00	-3.69	-4.79
241	108	232	23.29	.00	.00	.00	.07	.00
249	104	236	948.59	.56	.00	.00	2.69	2.67
253	236	204	922.98	.81	.00	.00	2.62	2.54
301	108	300	283.80	.11	.00	.00	.81	.29
303	200	376	-288.12	-.71	.00	.00	-1.84	-2.11
304	376	302	-343.38	-.66	.00	.00	-2.19	-2.93
305	302	304	-181.02	-.35	.00	.00	-1.16	-.89
309	304	308	-186.78	-.81	.00	.00	-1.19	-.95
312	112	308	385.18	.08	.00	.00	1.09	.50
313	308	312	192.64	.04	.00	.00	.55	.14
317	312	316	173.88	.80	.00	.00	1.11	.83
321	316	318	168.12	.13	.00	.00	1.07	.78
325	320	324	119.66	.06	.00	.00	.34	.06
329	324	328	104.76	.02	.00	.00	.30	.05
333	328	364	-167.17	-.05	.00	.00	-.47	-.11
335	320	382	-35.58	-.01	.00	.00	-.23	-.04
337	332	320	98.98	.01	.00	.00	.28	.04
341	332	300	-283.80	-.12	.00	.00	-.81	-.29
357	352	364	134.85	.02	.00	.00	.38	.07
359	364	362	-32.32	.00	.00	.00	-.21	-.04
361	362	360	-12.95	.00	.00	.00	-.08	-.01
363	360	358	-5.64	.00	.00	.00	-.04	.00
365	356	358	9.17	.00	.00	.00	.06	.00
367	354	356	23.54	.00	.00	.00	.15	.02
369	352	354	49.97	.01	.00	.00	.32	.08
371	356	360	10.83	.00	.00	.00	.07	.00
373	354	362	22.91	.01	.00	.00	.15	.02
387	332	352	184.82	.01	.00	.00	.52	.13
389	376	378	50.34	.04	.00	.00	.32	.08
393	302	318	-162.36	-.19	.00	.00	-1.04	-.73
399	382	378	-24.90	-.01	.00	.00	-.16	-.02
401	378	380	20.52	.00	.00	.00	.13	.02
403	382	380	-15.60	.00	.00	.00	-.10	-.01
405	100	328	-257.03	-.29	.00	.00	-.73	-.24

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	610.00	280.00	143.00
4	.00	610.00	292.00	137.80
6	.00	485.00	292.00	83.63
8	.00	609.68	290.00	138.53
10	.00	609.36	320.00	125.39
12	.00	484.68	320.00	71.36
13	8.85	474.50	250.00	97.28
14	.00	624.99	335.00	125.66
15	8.85	474.58	256.00	94.72
16	.00	624.99	328.00	128.70
17	5.03	474.68	261.00	92.59
18	.00	474.98	328.00	63.69

20	.00	474.68	262.00	92.16
22	37.08	474.69	273.00	87.40
24	60.69	474.69	273.00	87.40
32	39.58	474.77	300.00	75.74
36	60.69	474.78	298.00	76.60
40	22.33	474.94	317.00	68.44
44	.00	474.94	318.00	68.01
100	66.34	474.68	270.00	88.69
104	.00	474.72	294.00	78.31
108	.00	475.28	306.00	73.35
112	7.40	476.98	308.00	73.23
116	20.40	480.23	305.00	75.93
120	17.50	482.26	298.00	79.84
200	31.65	474.38	274.00	86.83
202	19.16	474.43	268.00	89.45
204	1500.00	473.35	288.00	80.32
208	40.63	485.00	292.00	83.63
212	1500.00	473.23	297.00	76.37
216	17.56	476.17	306.00	73.74
232	23.29	475.28	306.00	73.35
236	25.61	474.16	292.00	78.94
300	.00	475.17	314.00	69.84
302	.00	475.75	322.00	66.62
304	5.76	476.10	325.50	65.26
308	5.76	476.91	314.00	70.59
312	18.76	476.86	321.00	67.54
316	5.76	476.07	333.50	61.78
318	5.76	475.94	333.00	61.94
320	14.90	475.04	328.00	63.72
324	14.90	474.99	312.00	70.63
328	14.90	474.97	310.00	71.49
332	.00	475.05	322.00	66.32
352	.00	475.04	318.00	68.05
354	3.53	475.03	317.00	68.48
356	3.53	475.03	317.00	68.48
358	3.53	475.03	317.00	68.48
360	3.53	475.02	317.00	68.48
362	3.53	475.02	317.00	68.48
364	.00	475.02	317.00	68.47
376	4.92	475.09	328.00	63.74
378	4.92	475.06	328.00	63.72
380	4.92	475.05	326.00	64.59
382	4.92	475.05	326.00	64.59
	MAXIMUM PRESSURES			
2	.00	610.00	280.00	143.00
8	.00	609.68	290.00	138.53
4	.00	610.00	292.00	137.80
16	.00	624.99	328.00	128.70
14	.00	624.99	335.00	125.66
	MINIMUM PRESSURES			
316	5.76	476.07	333.50	61.78
318	5.76	475.94	333.00	61.94
18	.00	474.98	328.00	63.69

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       320             14.90      475.04      328.00       63.72
       378              4.92      475.06      328.00       63.72

 THE NET SYSTEM DEMAND =   3636.47

 SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

    PIPE NUMBER    FLOWRATE
         1           40.63
         2         3239.26
         3          356.58

 THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES =   3636.47
 THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES =       .00
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APPENDIX D

COMPUTER MODELING OUTPUT
3ROOTS
PHASE 1 WATER SYSTEM

NODE AND PIPE DIAGRAM REFERENCE:

Exhibit A.1 in the back of the report.

CONDITIONS MODELED:

1. Average Day Demands
2. Peak Hour Demands
3. Maximum Day Demands plus 2,000 gpm Fire Flow at Node 316
4. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 324 and 328
5. Maximum Day Demands plus 2,000 gpm Fire Flow at Node 316, Pipe 312 Closed
6. Maximum Day Demands plus 3,000 gpm Fire Flow at Node 120, Pipe 125 Closed
7. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 324 and 328, Pipe 301 Closed
8. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 204 and 212, Pipe 209 Closed

Project: 3Roots Phase 1 **Velocity Check**
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Average Day Demands

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	219.97	0.35
2	16	222.45	0.35
4	16	219.97	0.35
6	16	222.45	0.35
52	4	219.97	5.62
54	4 - PRV	219.97	5.62
56	4	219.97	5.62
58	10	0	0
60	10 - PRV	CLOSED	CLOSED
62	10	0	0
64	4	222.45	5.68
66	4 - PRV	222.45	5.68
68	4	222.45	5.68
70	10	0	0
72	10 - PRV	CLOSED	CLOSED
74	10	0	0
105	16	-68.73	-0.11
109	16	-22.28	-0.04
113	16	-92.34	-0.15
117	16	184.55	0.29
121	16	204.95	0.33
125	16	222.45	0.35
201	12	-20.38	-0.06
202	12	-19.16	-0.05
205	12	-71.19	-0.2
207	12	219.97	0.62
209	12	-179.34	-0.51
211	12	13.29	0.04
213	12	-12.96	-0.04
215	12	-30.52	-0.09
241	12	23.29	0.07
249	12	-46.45	-0.13
253	12	-72.06	-0.2
301	12	46.77	0.13
303	12	6.65	0.02
304	12	-12.49	-0.04
305	8	-11.82	-0.08
307	8	4.8	0.03
309	8	-16.62	-0.11
312	12	54.29	0.15
313	12	32.87	0.09
317	8	15.07	0.1
321	8	10.27	0.07
325	12	3.98	0.01
329	12	-10.92	-0.03
333	12	-3.05	-0.01
335	8	0.54	0
337	12	19.42	0.06
341	12	-40.12	-0.11
357	12	11.88	0.03
387	12	20.7	0.06
389	8	14.22	0.09
393	8	-5.47	-0.03
399	8	-4.29	-0.03
401	8	5.01	0.03
403	8	-0.09	0
405	12	22.77	0.06

Project: 3Roots Phase 1
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Peak Hour Demands

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	947.99	1.51
2	16	1175.62	1.88
4	16	947.99	1.51
6	16	1175.62	1.88
52	4	613.84	15.67
54	4 - PRV	613.84	15.67
56	4	613.84	15.67
58	10	334.15	1.36
60	10 - PRV	334.15	1.36
62	10	334.15	1.36
64	4	615.83	15.72
66	4 - PRV	615.83	15.72
68	4	615.83	15.72
70	10	559.8	2.29
72	10 - PRV	559.8	2.29
74	10	559.8	2.29
105	16	-339	-0.54
109	16	-142.92	-0.23
113	16	-477.31	-0.76
117	16	993.7	1.59
121	16	1091.62	1.74
125	16	1175.62	1.88
201	12	-82.93	-0.24
202	12	-91.97	-0.26
205	12	-326.82	-0.93
207	12	947.99	2.69
209	12	-752.97	-2.14
211	12	-2.31	-0.01
213	12	-128.31	-0.36
215	12	-212.6	-0.6
241	12	111.79	0.32
249	12	-196.09	-0.56
253	12	-319.01	-0.9
301	12	222.6	0.63
303	12	25.78	0.07
304	12	-67.64	-0.19
305	8	-60.51	-0.39
307	8	23.04	0.15
309	8	-83.55	-0.53
312	12	268.28	0.76
313	12	161.68	0.46
317	8	76.24	0.49
321	8	53.2	0.34
325	12	21.47	0.06
329	12	-50.05	-0.14
333	12	-18.06	-0.05
335	8	1.05	0.01
337	12	94.04	0.27
341	12	-196.82	-0.56
357	12	60.45	0.17
387	12	102.78	0.29
389	8	69.8	0.45
393	8	-30.16	-0.19
399	8	-21.34	-0.14
401	8	24.85	0.16
403	8	-1.23	-0.01
405	12	103.51	0.29

Project: 3Roots Phase 1
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands Plus 2000 gpm at Node 316

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1239.92	1.98
2	16	1635.32	2.61
4	16	1239.92	1.98
6	16	1635.32	2.61
52	4	616.53	15.74
54	4 - PRV	616.53	15.74
56	4	616.53	15.74
58	10	623.39	2.55
60	10 - PRV	623.39	2.55
62	10	623.39	2.55
64	4	622.22	15.89
66	4 - PRV	622.22	15.89
68	4	622.22	15.89
70	10	1013.1	4.14
72	10 - PRV	1013.1	4.14
74	10	1013.1	4.14
105	16	-211.16	-0.34
109	16	251.02	0.4
113	16	-571.91	-0.91
117	16	1559.52	2.49
121	16	1600.32	2.55
125	16	1635.32	2.61
201	12	-294.88	-0.84
202	12	-38.32	-0.11
205	12	-396.5	-1.12
207	12	1239.92	3.52
209	12	-1158.66	-3.29
211	12	203.16	0.58
213	12	150.66	0.43
215	12	115.54	0.33
241	12	46.58	0.13
249	12	-462.18	-1.31
253	12	-513.4	-1.46
301	12	776.35	2.2
303	12	817	2.32
304	12	985.65	2.8
305	8	-225.94	-1.44
307	8	9.6	0.06
309	8	-235.54	-1.5
312	12	1088.35	3.09
313	12	843.22	2.39
317	8	807.62	5.15
321	8	-1192.38	-7.61
325	12	-135.76	-0.39
329	12	-165.56	-0.47
333	12	178	0.5
335	8	208.01	1.33
337	12	102.05	0.29
341	12	40.65	0.12
357	12	-160.34	-0.45
387	12	-142.7	-0.4
389	8	-178.49	-1.14
393	8	1201.98	7.67
399	8	113.62	0.73
401	8	-74.71	-0.48
403	8	84.55	0.54
405	12	373.36	1.06

Project: 3Roots Phase 1
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands Plus 3000 gpm Split Between Nodes 324 and 328

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1694.08	2.7
2	16	2131.16	3.4
4	16	1694.08	2.7
6	16	2131.16	3.4
52	4	623.25	15.91
54	4 - PRV	623.25	15.91
56	4	623.25	15.91
58	10	1070.83	4.37
60	10 - PRV	1070.83	4.37
62	10	1070.83	4.37
64	4	632.34	16.14
66	4 - PRV	632.34	16.14
68	4	632.34	16.14
70	10	1498.82	6.12
72	10 - PRV	1498.82	6.12
74	10	1498.82	6.12
105	16	-784.24	-1.25
109	16	58.88	0.09
113	16	-1287.29	-2.05
117	16	2055.36	3.28
121	16	2096.16	3.34
125	16	2131.16	3.4
201	12	-628.14	-1.78
202	12	-38.32	-0.11
205	12	-729.76	-2.07
207	12	1694.08	4.81
209	12	-1612.82	-4.57
211	12	-56.88	-0.16
213	12	-109.38	-0.31
215	12	-144.5	-0.41
241	12	46.58	0.13
249	12	-843.12	-2.39
253	12	-894.34	-2.54
301	12	1299.59	3.69
303	12	-114.19	-0.32
304	12	-525.17	-1.49
305	8	-282.32	-1.8
307	8	9.6	0.06
309	8	-291.92	-1.86
312	12	608.77	1.73
313	12	307.25	0.87
317	8	271.65	1.73
321	8	262.05	1.67
325	12	862.32	2.45
329	12	-637.68	-1.81
333	12	-857.98	-2.43
335	8	-371.62	-2.37
337	12	520.49	1.48
341	12	-1413.78	-4.01
357	12	875.64	2.48
387	12	893.28	2.53
389	8	401.14	2.56
393	8	-252.45	-1.61
399	8	-225.32	-1.44
401	8	165.99	1.06
403	8	-156.15	-1
405	12	1279.7	3.63

Project: 3Roots Phase 1
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 312 CLOSED - Max Day Demands Plus 2000 gpm at Node 316

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1299.61	2.07
2	16	1575.63	2.51
4	16	1299.61	2.07
6	16	1575.63	2.51
52	4	617.24	15.76
54	4 - PRV	617.24	15.76
56	4	617.24	15.76
58	10	682.36	2.79
60	10 - PRV	682.36	2.79
62	10	682.36	2.79
64	4	621.22	15.86
66	4 - PRV	621.22	15.86
68	4	621.22	15.86
70	10	954.41	3.9
72	10 - PRV	954.41	3.9
74	10	954.41	3.9
105	16	-367.77	-0.59
109	16	341.77	0.55
113	16	-1231.18	-1.96
117	16	1499.83	2.39
121	16	1540.63	2.46
125	16	1575.63	2.51
201	12	-476.6	-1.35
202	12	-38.32	-0.11
205	12	-578.22	-1.64
207	12	1299.61	3.69
209	12	-1218.35	-3.46
211	12	-166.24	-0.47
213	12	-218.74	-0.62
215	12	-253.86	-0.72
241	12	46.58	0.13
249	12	-709.54	-2.01
253	12	-760.76	-2.16
301	12	1526.37	4.33
303	12	1697.58	4.82
304	12	2074	5.88
305	8	615.07	3.93
307	8	9.6	0.06
309	8	605.47	3.86
312	12	CLOSED	CLOSED
313	12	595.87	1.69
317	8	560.27	3.58
321	8	-1439.73	-9.19
325	12	-287.01	-0.81
329	12	-316.81	-0.9
333	12	365.08	1.04
335	8	415.78	2.65
337	12	158.57	0.45
341	12	171.21	0.49
357	12	-347.42	-0.99
387	12	-329.78	-0.94
389	8	-386.26	-2.47
393	8	1449.33	9.25
399	8	235.04	1.5
401	8	-161.06	-1.03
403	8	170.9	1.09
405	12	711.69	2.02

Project: 3Roots Phase 1
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm at Node 120

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	3849.84	6.14
2	16	0	0
4	16	3849.84	6.14
6	16	0	0
52	4	688.34	17.57
54	4 - PRV	688.34	17.57
56	4	688.34	17.57
58	10	3161.5	12.91
60	10 - PRV	3161.5	12.91
62	10	3161.5	12.91
64	4	0	0
66	4 - PRV	0	0
68	4	0	0
70	10	0	0
72	10 - PRV	CLOSED	CLOSED
74	10	0	0
105	16	312.26	0.5
109	16	1732.03	2.76
113	16	1565.95	2.5
117	16	-3040.8	-4.85
121	16	-3000	-4.79
125	16	CLOSED	CLOSED
201	12	-925.22	-2.62
202	12	-38.32	-0.11
205	12	-1026.84	-2.91
207	12	3849.84	10.92
209	12	-3768.58	-10.69
211	12	1225.15	3.48
213	12	1172.65	3.33
215	12	1137.54	3.23
241	12	46.58	0.13
249	12	-1419.76	-4.03
253	12	-1470.98	-4.17
301	12	119.5	0.34
303	12	351.14	1
304	12	435.71	1.24
305	8	216.07	1.38
307	8	9.6	0.06
309	8	206.47	1.32
312	12	-352.11	-1
313	12	-155.24	-0.44
317	8	-190.84	-1.22
321	8	-200.44	-1.28
325	12	-176.91	-0.5
329	12	-206.71	-0.59
333	12	243.77	0.69
335	8	123.94	0.79
337	12	-23.17	-0.07
341	12	231.64	0.66
357	12	-226.11	-0.64
387	12	-208.47	-0.59
389	8	-94.42	-0.6
393	8	210.04	1.34
399	8	64.53	0.41
401	8	-39.73	-0.25
403	8	49.57	0.32
405	12	480.28	1.36

Project: 3Roots Phase 1
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 301 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 324 and 328

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	1685.82	2.69
2	16	2139.42	3.41
4	16	1685.82	2.69
6	16	2139.42	3.41
52	4	623.11	15.91
54	4 - PRV	623.11	15.91
56	4	623.11	15.91
58	10	1062.72	4.34
60	10 - PRV	1062.72	4.34
62	10	1062.72	4.34
64	4	632.53	16.15
66	4 - PRV	632.53	16.15
68	4	632.53	16.15
70	10	1506.89	6.16
72	10 - PRV	1506.89	6.16
74	10	1506.89	6.16
105	16	-1405.59	-2.24
109	16	-751.1	-1.2
113	16	-797.68	-1.27
117	16	2063.62	3.29
121	16	2104.42	3.36
125	16	2139.42	3.41
201	12	-679.69	-1.93
202	12	-38.32	-0.11
205	12	-781.31	-2.22
207	12	1685.82	4.78
209	12	-1604.56	-4.55
211	12	71.95	0.2
213	12	19.45	0.06
215	12	-15.67	-0.04
241	12	46.58	0.13
249	12	-654.48	-1.86
253	12	-705.7	-2
301	12	CLOSED	CLOSED
303	12	-823.01	-2.33
304	12	-1151.86	-3.27
305	8	-607.23	-3.88
307	8	9.6	0.06
309	8	-616.83	-3.94
312	12	1235.46	3.5
313	12	609.03	1.73
317	8	573.43	3.66
321	8	563.83	3.6
325	12	630.86	1.79
329	12	-869.14	-2.47
333	12	-416.54	-1.18
335	8	-289.49	-1.85
337	12	371.17	1.05
341	12	-823.01	-2.33
357	12	434.2	1.23
387	12	451.84	1.28
389	8	319.01	2.04
393	8	-554.23	-3.54
399	8	-177.32	-1.13
401	8	131.86	0.84
403	8	-122.02	-0.78
405	12	1952.6	5.54

Project: 3Roots Phase 1
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 209 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 204 and 212

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
1	16	81.26	0.13
2	16	3705.48	5.91
4	16	81.26	0.13
6	16	3705.48	5.91
52	4	81.26	2.07
54	4 - PRV	81.26	2.07
56	4	81.26	2.07
58	10	0	0
60	10 - PRV	CLOSED	CLOSED
62	10	0	0
64	4	682.57	17.43
66	4 - PRV	682.57	17.43
68	4	682.57	17.43
70	10	3022.91	12.35
72	10 - PRV	3022.91	12.35
74	10	3022.91	12.35
105	16	-468.92	-0.75
109	16	-1505.8	-2.4
113	16	-1669.97	-2.66
117	16	3629.68	5.79
121	16	3670.48	5.86
125	16	3705.48	5.91
201	12	702.69	1.99
202	12	-38.32	-0.11
205	12	601.07	1.71
207	12	81.26	0.23
209	12	CLOSED	CLOSED
211	12	86.74	0.25
213	12	-1413.26	-4.01
215	12	-1448.38	-4.11
241	12	46.58	0.13
249	12	1036.88	2.94
253	12	985.66	2.8
301	12	117.6	0.33
303	12	-269.54	-0.76
304	12	-412.92	-1.17
305	8	-224.14	-1.43
307	8	9.6	0.06
309	8	-233.74	-1.49
312	12	496.52	1.41
313	12	253.19	0.72
317	8	217.59	1.39
321	8	207.99	1.33
325	12	192.41	0.55
329	12	162.61	0.46
333	12	-233.65	-0.66
335	8	-104.02	-0.66
337	12	118.19	0.34
341	12	-387.14	-1.1
357	12	251.31	0.71
387	12	268.95	0.76
389	8	133.54	0.85
393	8	-198.39	-1.27
399	8	-68.97	-0.44
401	8	54.73	0.35
403	8	-44.89	-0.29
405	12	-366.46	-1.04

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Average Day Demands

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	143	-0.02
4	292	610	137.78	137.8	-0.02
6	292	485	83.62	82.98	0.64
8	290	610	138.65	138.67	-0.02
10	320	610	125.65	125.66	-0.01
12	320	485	71.49	70.84	0.65
53	292	610	137.78	137.47	0.31
55	292	485	83.62	83.31	0.31
59	292	610	137.78	137.8	-0.02
61	292	485	83.62	82.98	0.64
65	320	610	125.65	125.33	0.32
67	320	485	71.49	71.17	0.32
71	320	610	125.65	125.66	-0.01
73	320	485	71.49	70.84	0.65
100	270	485	93.15	92.48	0.67
104	294	485	82.76	82.08	0.68
108	306	485	77.56	76.88	0.68
112	308	485	76.69	76.02	0.67
116	305	485	77.99	77.32	0.67
120	298	485	81.02	80.36	0.66
200	274	485	91.42	90.74	0.68
202	268	485	94.02	93.34	0.68
204	288	485	85.36	84.68	0.68
208	292	485	83.62	82.96	0.66
212	297	485	81.46	80.78	0.68
216	306	485	77.56	76.88	0.68
232	306	485	77.56	76.88	0.68
236	292	485	83.62	82.95	0.67
300	314	485	74.09	73.41	0.68
302	322	485	70.62	69.94	0.68
304	325.5	485	69.11	68.43	0.68
306	317	485	72.79	72.11	0.68
308	314	485	74.09	73.42	0.67
312	321	485	71.06	70.38	0.68
316	333.5	485	65.64	64.96	0.68
318	333	485	65.86	65.18	0.68
320	328	485	68.02	67.34	0.68
324	312	485	74.96	74.28	0.68
328	310	485	75.82	75.14	0.68
332	322	485	70.62	69.94	0.68
352	318	485	72.36	71.68	0.68
364	317	485	72.79	72.11	0.68
376	328	485	68.02	67.34	0.68
378	328	485	68.02	67.34	0.68
380	326	485	68.89	68.21	0.68
382	326	485	68.89	68.21	0.68

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Peak Hour Demands

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	142.99	-0.01
4	292	610	137.78	137.77	0.01
6	292	485	83.62	79.28	4.34
8	290	610	138.65	138.65	0.00
10	320	610	125.65	125.62	0.03
12	320	485	71.49	67.12	4.37
53	292	610	137.78	135.6	2.18
55	292	485	83.62	81.46	2.16
59	292	610	137.78	137.76	0.02
61	292	485	83.62	79.29	4.33
65	320	610	125.65	123.44	2.21
67	320	485	71.49	69.31	2.18
71	320	610	125.65	125.6	0.05
73	320	485	71.49	67.15	4.34
100	270	485	93.15	88.23	4.92
104	294	485	82.76	77.86	4.90
108	306	485	77.56	72.66	4.90
112	308	485	76.69	71.88	4.81
116	305	485	77.99	73.35	4.64
120	298	485	81.02	76.5	4.52
200	274	485	91.42	86.5	4.92
202	268	485	94.02	89.09	4.93
204	288	485	85.36	80.52	4.84
208	292	485	83.62	78.95	4.67
212	297	485	81.46	76.62	4.84
216	306	485	77.56	72.74	4.82
232	306	485	77.56	72.66	4.90
236	292	485	83.62	78.74	4.88
300	314	485	74.09	69.17	4.92
302	322	485	70.62	65.7	4.92
304	325.5	485	69.11	64.21	4.90
306	317	485	72.79	67.87	4.92
308	314	485	74.09	69.27	4.82
312	321	485	71.06	66.22	4.84
316	333.5	485	65.64	60.73	4.91
318	333	485	65.86	60.94	4.92
320	328	485	68.02	63.07	4.95
324	312	485	74.96	70	4.96
328	310	485	75.82	70.87	4.95
332	322	485	70.62	65.67	4.95
352	318	485	72.36	67.41	4.95
364	317	485	72.79	67.84	4.95
376	328	485	68.02	63.1	4.92
378	328	485	68.02	63.07	4.95
380	326	485	68.89	63.94	4.95
382	326	485	68.89	63.94	4.95

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Max Day Demands Plus 2000 gpm at Node 316

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	142.98	0.00
4	292	610	137.78	137.75	0.03
6	292	485	83.62	79.25	4.37
8	290	610	138.65	138.63	0.02
10	320	610	125.65	125.59	0.06
12	320	485	71.49	67.04	4.45
53	292	610	137.78	135.56	2.22
55	292	485	83.62	81.44	2.18
59	292	610	137.78	137.73	0.05
61	292	485	83.62	79.27	4.35
65	320	610	125.65	123.36	2.29
67	320	485	71.49	69.27	2.22
71	320	610	125.65	125.53	0.12
73	320	485	71.49	67.1	4.39
100	270	485	93.15	87.68	5.47
104	294	485	82.76	77.29	5.47
108	306	485	77.56	72.08	5.48
112	308	485	76.69	71.33	5.36
116	305	485	77.99	73	4.99
120	298	485	81.02	76.28	4.74
200	274	485	91.42	86.01	5.41
202	268	485	94.02	88.61	5.41
204	288	485	85.36	80.07	5.29
208	292	485	83.62	78.7	4.92
212	297	485	81.46	76.13	5.33
216	306	485	77.56	72.2	5.36
232	306	485	77.56	72.07	5.49
236	292	485	83.62	78.22	5.40
300	314	485	74.09	68.31	5.78
302	322	485	70.62	64.27	6.35
304	325.5	485	69.11	62.99	6.12
306	317	485	72.79	66.44	6.35
308	314	485	74.09	68.51	5.58
312	321	485	71.06	65.19	5.87
316	333.5	485	65.64	53.84	11.80
318	333	485	65.86	56.15	9.71
320	328	485	68.02	62.24	5.78
324	312	485	74.96	69.21	5.75
328	310	485	75.82	70.09	5.73
332	322	485	70.62	64.85	5.77
352	318	485	72.36	66.59	5.77
364	317	485	72.79	67.03	5.76
376	328	485	68.02	61.95	6.07
378	328	485	68.02	62.11	5.91
380	326	485	68.89	63	5.89
382	326	485	68.89	63.04	5.85

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Max Day Demands Plus 3000 gpm Split Between Nodes 324 and 328

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	142.96	0.02
4	292	610	137.78	137.72	0.06
6	292	485	83.62	79.16	4.46
8	290	610	138.65	138.6	0.05
10	320	610	125.65	125.54	0.11
12	320	485	71.49	66.9	4.59
53	292	610	137.78	135.48	2.30
55	292	485	83.62	81.4	2.22
59	292	610	137.78	137.65	0.13
61	292	485	83.62	79.23	4.39
65	320	610	125.65	123.24	2.41
67	320	485	71.49	69.2	2.29
71	320	610	125.65	125.41	0.24
73	320	485	71.49	67.04	4.45
100	270	485	93.15	86.37	6.78
104	294	485	82.76	76.12	6.64
108	306	485	77.56	70.92	6.64
112	308	485	76.69	70.6	6.09
116	305	485	77.99	72.52	5.47
120	298	485	81.02	75.95	5.07
200	274	485	91.42	84.93	6.49
202	268	485	94.02	87.53	6.49
204	288	485	85.36	79.25	6.11
208	292	485	83.62	78.18	5.44
212	297	485	81.46	75.35	6.11
216	306	485	77.56	71.47	6.09
232	306	485	77.56	70.92	6.64
236	292	485	83.62	77.18	6.44
300	314	485	74.09	66.69	7.40
302	322	485	70.62	63.32	7.30
304	325.5	485	69.11	62.15	6.96
306	317	485	72.79	65.48	7.31
308	314	485	74.09	67.93	6.16
312	321	485	71.06	64.85	6.21
316	333.5	485	65.64	58.65	6.99
318	333	485	65.86	58.73	7.13
320	328	485	68.02	59.5	8.52
324	312	485	74.96	65.49	9.47
328	310	485	75.82	66.56	9.26
332	322	485	70.62	62.23	8.39
352	318	485	72.36	63.84	8.52
364	317	485	72.79	63.98	8.81
376	328	485	68.02	60.63	7.39
378	328	485	68.02	59.91	8.11
380	326	485	68.89	60.69	8.20
382	326	485	68.89	60.58	8.31

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 312 CLOSED - Max Day Demands Plus 2000 gpm at Node 316

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	142.97	0.01
4	292	610	137.78	137.75	0.03
6	292	485	83.62	79.24	4.38
8	290	610	138.65	138.63	0.02
10	320	610	125.65	125.59	0.06
12	320	485	71.49	67.05	4.44
53	292	610	137.78	135.55	2.23
55	292	485	83.62	81.44	2.18
59	292	610	137.78	137.72	0.06
61	292	485	83.62	79.27	4.35
65	320	610	125.65	123.37	2.28
67	320	485	71.49	69.28	2.21
71	320	610	125.65	125.54	0.11
73	320	485	71.49	67.11	4.38
100	270	485	93.15	87.35	5.80
104	294	485	82.76	76.99	5.77
108	306	485	77.56	71.77	5.79
112	308	485	76.69	71.41	5.28
116	305	485	77.99	73.05	4.94
120	298	485	81.02	76.31	4.71
200	274	485	91.42	85.79	5.63
202	268	485	94.02	88.39	5.63
204	288	485	85.36	79.98	5.38
208	292	485	83.62	78.64	4.98
212	297	485	81.46	76.11	5.35
216	306	485	77.56	72.26	5.30
232	306	485	77.56	71.76	5.80
236	292	485	83.62	78	5.62
300	314	485	74.09	67.27	6.82
302	322	485	70.62	61.56	9.06
304	325.5	485	69.11	58.56	10.55
306	317	485	72.79	63.72	9.07
308	314	485	74.09	60.47	13.62
312	321	485	71.06	57.28	13.78
316	333.5	485	65.64	48.85	16.79
318	333	485	65.86	52.04	13.82
320	328	485	68.02	61.21	6.81
324	312	485	74.96	68.26	6.70
328	310	485	75.82	69.18	6.64
332	322	485	70.62	63.82	6.80
352	318	485	72.36	65.57	6.79
364	317	485	72.79	66.06	6.73
376	328	485	68.02	60.06	7.96
378	328	485	68.02	60.73	7.29
380	326	485	68.89	61.68	7.21
382	326	485	68.89	61.81	7.08

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm at Node 120

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	142.81	0.17
4	292	610	137.78	137.42	0.36
6	292	485	83.62	78.26	5.36
8	290	610	138.65	138.67	-0.02
10	320	610	125.65	125.67	-0.02
12	320	485	71.49	71.5	-0.01
53	292	610	137.78	134.73	3.05
55	292	485	83.62	80.94	2.68
59	292	610	137.78	136.9	0.88
61	292	485	83.62	78.78	4.84
65	320	610	125.65	125.67	-0.02
67	320	485	71.49	71.5	-0.01
71	320	610	125.65	125.67	-0.02
73	320	485	71.49	71.5	-0.01
100	270	485	93.15	78.79	14.36
104	294	485	82.76	68.36	14.40
108	306	485	77.56	62.68	14.88
112	308	485	76.69	61.02	15.67
116	305	485	77.99	61.04	16.95
120	298	485	81.02	63.31	17.71
200	274	485	91.42	77.65	13.77
202	268	485	94.02	80.25	13.77
204	288	485	85.36	72.3	13.06
208	292	485	83.62	73.77	9.85
212	297	485	81.46	67.14	14.32
216	306	485	77.56	62.16	15.40
232	306	485	77.56	62.68	14.88
236	292	485	83.62	69.74	13.88
300	314	485	74.09	59.21	14.88
302	322	485	70.62	55.62	15.00
304	325.5	485	69.11	53.89	15.22
306	317	485	72.79	57.78	15.01
308	314	485	74.09	58.45	15.64
312	321	485	71.06	55.43	15.63
316	333.5	485	65.64	50.42	15.22
318	333	485	65.86	50.72	15.14
320	328	485	68.02	53.17	14.85
324	312	485	74.96	60.16	14.80
328	310	485	75.82	61.05	14.77
332	322	485	70.62	55.77	14.85
352	318	485	72.36	57.51	14.85
364	317	485	72.79	57.97	14.82
376	328	485	68.02	53.08	14.94
378	328	485	68.02	53.13	14.89
380	326	485	68.89	54	14.89
382	326	485	68.89	54.01	14.88

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 301 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 324 and 328

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	142.96	0.02
4	292	610	137.78	137.72	0.06
6	292	485	83.62	79.16	4.46
8	290	610	138.65	138.6	0.05
10	320	610	125.65	125.54	0.11
12	320	485	71.49	66.9	4.59
53	292	610	137.78	135.48	2.30
55	292	485	83.62	81.4	2.22
59	292	610	137.78	137.65	0.13
61	292	485	83.62	79.23	4.39
65	320	610	125.65	123.24	2.41
67	320	485	71.49	69.2	2.29
71	320	610	125.65	125.41	0.24
73	320	485	71.49	67.03	4.46
100	270	485	93.15	86.29	6.86
104	294	485	82.76	76.33	6.43
108	306	485	77.56	71.23	6.33
112	308	485	76.69	70.59	6.10
116	305	485	77.99	72.52	5.47
120	298	485	81.02	75.95	5.07
200	274	485	91.42	84.9	6.52
202	268	485	94.02	87.49	6.53
204	288	485	85.36	79.26	6.10
208	292	485	83.62	78.19	5.43
212	297	485	81.46	75.36	6.10
216	306	485	77.56	71.46	6.10
232	306	485	77.56	71.23	6.33
236	292	485	83.62	77.32	6.30
300	314	485	74.09	62.41	11.68
302	322	485	70.62	59.61	11.01
304	325.5	485	69.11	59.54	9.57
306	317	485	72.79	61.78	11.01
308	314	485	74.09	67.71	6.38
312	321	485	71.06	64.52	6.54
316	333.5	485	65.64	55.95	9.69
318	333	485	65.86	55.65	10.21
320	328	485	68.02	55.91	12.11
324	312	485	74.96	62.32	12.64
328	310	485	75.82	63.55	12.27
332	322	485	70.62	58.58	12.04
352	318	485	72.36	60.28	12.08
364	317	485	72.79	60.63	12.16
376	328	485	68.02	56.64	11.38
378	328	485	68.02	56.17	11.85
380	326	485	68.89	56.98	11.91
382	326	485	68.89	56.91	11.98

3Roots Phase 1
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 209 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 204 and 212

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
2	280	610	142.98	143	-0.02
4	292	610	137.78	137.8	-0.02
6	292	485	83.62	83.53	0.09
8	290	610	138.65	138.49	0.16
10	320	610	125.65	125.31	0.34
12	320	485	71.49	66.21	5.28
53	292	610	137.78	137.75	0.03
55	292	485	83.62	83.58	0.04
59	292	610	137.78	137.8	-0.02
61	292	485	83.62	83.53	0.09
65	320	610	125.65	122.66	2.99
67	320	485	71.49	68.85	2.64
71	320	610	125.65	124.83	0.82
73	320	485	71.49	66.69	4.80
100	270	485	93.15	82.31	10.84
104	294	485	82.76	71.97	10.79
108	306	485	77.56	67.14	10.42
112	308	485	76.69	67.16	9.53
116	305	485	77.99	70.24	7.75
120	298	485	81.02	74.39	6.63
200	274	485	91.42	80.22	11.20
202	268	485	94.02	82.82	11.20
204	288	485	85.36	73.88	11.48
208	292	485	83.62	83.53	0.09
212	297	485	81.46	69.98	11.48
216	306	485	77.56	67.6	9.96
232	306	485	77.56	67.13	10.43
236	292	485	83.62	72.55	11.07
300	314	485	74.09	63.66	10.43
302	322	485	70.62	60.29	10.33
304	325.5	485	69.11	59	10.11
306	317	485	72.79	62.45	10.34
308	314	485	74.09	64.51	9.58
312	321	485	71.06	61.45	9.61
316	333.5	485	65.64	55.51	10.13
318	333	485	65.86	55.64	10.22
320	328	485	68.02	57.5	10.52
324	312	485	74.96	64.37	10.59
328	310	485	75.82	65.22	10.60
332	322	485	70.62	60.1	10.52
352	318	485	72.36	61.82	10.54
364	317	485	72.79	62.23	10.56
376	328	485	68.02	57.63	10.39
378	328	485	68.02	57.54	10.48
380	326	485	68.89	58.39	10.50
382	326	485	68.89	58.38	10.51

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

A SUMMARY OF THE ORIGINAL DATA FOLLOWS

THERE IS A PRV AT JUNCTION 59 FOR LINE 60 SET AT A GRADE OF 475.00
THERE IS A PRV AT JUNCTION 65 FOR LINE 66 SET AT A GRADE OF 485.00
THERE IS A PRV AT JUNCTION 53 FOR LINE 54 SET AT A GRADE OF 485.00
THERE IS A PRV AT JUNCTION 71 FOR LINE 72 SET AT A GRADE OF 475.00

PIPE NO.	NODE NOS.		LENGTH (FEET)	DIAMETER (INCHES)	ROUGHNESS	MINOR LOSS K	FIXED GRADE
1	0	2	50.0	16.0	120.0	.00	610.00
2	0	8	50.0	16.0	120.0	.00	610.00
4	2	4	50.0	16.0	120.0	.00	
6	8	10	50.0	16.0	120.0	.00	
52	4	53	20.0	4.0	120.0	.00	
54	53	55	20.0	4.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 54							
56	55	6	20.0	4.0	120.0	.00	
58	4	59	20.0	10.0	120.0	.00	
60	59	61	20.0	10.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 60							
62	61	6	20.0	10.0	120.0	.00	
64	10	65	20.0	4.0	120.0	.00	
66	65	67	20.0	4.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 66							
68	67	12	20.0	4.0	120.0	.00	
70	10	71	20.0	10.0	120.0	.00	
72	71	73	20.0	10.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 72							
74	73	12	20.0	10.0	120.0	.00	
105	100	104	740.0	16.0	120.0	.00	
109	104	108	550.0	16.0	120.0	.00	
113	108	112	1100.0	16.0	120.0	.00	
117	116	112	520.0	16.0	120.0	.00	
121	120	116	320.0	16.0	120.0	.00	
125	12	120	380.0	16.0	120.0	.00	
201	100	200	540.0	12.0	120.0	.00	
202	202	200	660.0	12.0	120.0	.00	
205	200	204	540.0	12.0	120.0	.00	
207	6	208	290.0	12.0	120.0	.00	
209	204	208	215.0	12.0	120.0	.00	
211	204	212	680.0	12.0	120.0	.00	
213	212	216	630.0	12.0	120.0	.00	
215	216	112	170.0	12.0	120.0	.00	
241	108	232	300.0	12.0	120.0	.00	
249	104	236	210.0	12.0	120.0	.00	
253	236	204	320.0	12.0	120.0	.00	
301	108	300	370.0	12.0	120.0	.00	
303	300	376	335.0	12.0	120.0	.00	
304	376	302	225.0	12.0	120.0	.00	
305	302	304	395.0	8.0	120.0	.00	
307	302	306	250.0	8.0	120.0	.00	
309	304	308	850.0	8.0	120.0	.00	
312	112	308	150.0	12.0	120.0	.00	
313	308	312	310.0	12.0	120.0	.00	
317	312	316	960.0	8.0	120.0	.00	
321	316	318	165.0	8.0	120.0	.00	

325	320	324	970.0	12.0	120.0	.00
329	324	328	370.0	12.0	120.0	.00
333	328	364	470.0	12.0	120.0	.00
335	320	382	145.0	8.0	120.0	.00
337	332	320	340.0	12.0	120.0	.00
341	332	300	410.0	12.0	120.0	.00
357	352	364	295.0	12.0	120.0	.00
387	332	352	115.0	12.0	120.0	.00
389	376	378	425.0	8.0	120.0	.00
393	302	318	260.0	8.0	120.0	.00
399	382	378	340.0	8.0	120.0	.00
401	378	380	255.0	8.0	120.0	.00
403	382	380	385.0	8.0	120.0	.00
405	100	328	1230.0	12.0	120.0	.00

JUNCTION NUMBER	DEMAND	ELEVATION	CONNECTING PIPES			
2	.00	280.00	1	4		
4	.00	292.00	4	52	58	
6	.00	292.00	56	62	207	
8	.00	290.00	2	6		
10	.00	320.00	6	64	70	
12	.00	320.00	68	74	125	
53	.00	292.00	52	54		
55	.00	292.00	54	56		
59	.00	292.00	58	60		
61	.00	292.00	60	62		
65	.00	320.00	64	66		
67	.00	320.00	66	68		
71	.00	320.00	70	72		
73	.00	320.00	72	74		
100	66.34	270.00	105	201	405	
104	.00	294.00	105	109	249	
108	.00	306.00	109	113	241	301
112	7.40	308.00	113	117	215	312
116	20.40	305.00	117	121		
120	17.50	298.00	121	125		
200	31.65	274.00	201	202	205	
202	19.16	268.00	202			
204	22.80	288.00	205	209	211	253
208	40.63	292.00	207	209		
212	26.25	297.00	211	213		
216	17.56	306.00	213	215		
232	23.29	306.00	241			
236	25.61	292.00	249	253		
300	.00	314.00	301	303	341	
302	.00	322.00	304	305	307	393
304	4.80	325.50	305	309		
306	4.80	317.00	307			
308	4.80	314.00	309	312	313	
312	17.80	321.00	313	317		
316	4.80	333.50	317	321		
318	4.80	333.00	321	393		
320	14.90	328.00	325	335	337	
324	14.90	312.00	325	329		
328	14.90	310.00	329	333	405	
332	.00	322.00	337	341	387	
352	8.82	318.00	357	387		
364	8.83	317.00	333	357		
376	4.92	328.00	303	304	389	
378	4.92	328.00	389	399	401	

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       380           4.92       326.00      401  403
       382           4.92       326.00      335  399  403


 OUTPUT SELECTION:  ALL RESULTS ARE OUTPUT EACH PERIOD
    5 VALUES ARE OUTPUT FOR MAXIMUM AND MINIMUM PRESSURES

THIS SYSTEM HAS MULTIPLE SUPPLY ZONES


ZONE NO.   1 IS SUPPLIED THROUGH THESE PIPES:
   54
   60
   66
   72


    THIS SYSTEM HAS  57 PIPES WITH  46 JUNCTIONS ,   7 LOOPS AND   6 FGNS



 THE RESULTS ARE OBTAINED AFTER  8 TRIALS WITH AN ACCURACY =  .00362
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3Roots - Phase 1 Water System **File: 537012P1**
Water System Analysis
Average Day Demands

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	219.97	.00	.00	.00	.35	.04
2	0	8	222.45	.00	.00	.00	.35	.04
4	2	4	219.97	.00	.00	.00	.35	.04
6	8	10	222.45	.00	.00	.00	.35	.04
52	4	53	219.97	.75	.00	.00	5.62	37.51
54	0	55	219.97	.75	.00	.00	5.62	37.51
56	55	6	219.97	.75	.00	.00	5.62	37.51
58	4	59	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 60 IS CLOSED								
62	61	6	.00	.00	.00	.00	.00	.00
64	10	65	222.45	.77	.00	.00	5.68	38.30
66	0	67	222.45	.77	.00	.00	5.68	38.30
68	67	12	222.45	.77	.00	.00	5.68	38.30
70	10	71	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 72 IS CLOSED								
74	73	12	.00	.00	.00	.00	.00	.00
105	100	104	-68.73	.00	.00	.00	-.11	-.01
109	104	108	-22.28	.00	.00	.00	-.04	.00
113	108	112	-92.34	-.01	.00	.00	-.15	-.01
117	116	112	184.55	.02	.00	.00	.29	.03
121	120	116	204.95	.01	.00	.00	.33	.04
125	12	120	222.45	.02	.00	.00	.35	.04
201	100	200	-20.38	.00	.00	.00	-.06	.00
202	202	200	-19.16	.00	.00	.00	-.05	.00
205	200	204	-71.19	-.01	.00	.00	-.20	-.02
207	6	208	219.97	.05	.00	.00	.62	.18
209	204	208	-179.34	-.03	.00	.00	-.51	-.12
211	204	212	13.29	.00	.00	.00	.04	.00
213	212	216	-12.96	.00	.00	.00	-.04	.00

215	216	112	-30.52	.00	.00	.00	-.09	.00
241	108	232	23.29	.00	.00	.00	.07	.00
249	104	236	-46.45	.00	.00	.00	-.13	-.01
253	236	204	-72.06	-.01	.00	.00	-.20	-.02
301	108	300	46.77	.00	.00	.00	.13	.01
303	300	376	6.65	.00	.00	.00	.02	.00
304	376	302	-12.49	.00	.00	.00	-.04	.00
305	302	304	-11.82	.00	.00	.00	-.08	-.01
307	302	306	4.80	.00	.00	.00	.03	.00
309	304	308	-16.62	-.01	.00	.00	-.11	-.01
312	112	308	54.29	.00	.00	.00	.15	.01
313	308	312	32.87	.00	.00	.00	.09	.01
317	312	316	15.07	.01	.00	.00	.10	.01
321	316	318	10.27	.00	.00	.00	.07	.00
325	320	324	3.98	.00	.00	.00	.01	.00
329	324	328	-10.92	.00	.00	.00	-.03	.00
333	328	364	-3.05	.00	.00	.00	-.01	.00
335	320	382	.54	.00	.00	.00	.00	.00
337	332	320	19.42	.00	.00	.00	.06	.00
341	332	300	-40.12	.00	.00	.00	-.11	-.01
357	352	364	11.88	.00	.00	.00	.03	.00
387	332	352	20.70	.00	.00	.00	.06	.00
389	376	378	14.22	.00	.00	.00	.09	.01
393	302	318	-5.47	.00	.00	.00	-.03	.00
399	382	378	-4.29	.00	.00	.00	-.03	.00
401	378	380	5.01	.00	.00	.00	.03	.00
403	382	380	-.09	.00	.00	.00	.00	.00
405	100	328	22.77	.00	.00	.00	.06	.00

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	610.00	280.00	143.00
4	.00	610.00	292.00	137.80
6	.00	483.50	292.00	82.98
8	.00	610.00	290.00	138.67
10	.00	610.00	320.00	125.66
12	.00	483.47	320.00	70.84
53	.00	609.25	292.00	137.47
55	.00	484.25	292.00	83.31
59	.00	610.00	292.00	137.80
61	.00	483.50	292.00	82.98
65	.00	609.23	320.00	125.33
67	.00	484.23	320.00	71.17
71	.00	610.00	320.00	125.66
73	.00	483.47	320.00	70.84
100	66.34	483.41	270.00	92.48
104	.00	483.41	294.00	82.08
108	.00	483.41	306.00	76.88
112	7.40	483.42	308.00	76.02
116	20.40	483.44	305.00	77.32
120	17.50	483.45	298.00	80.36
200	31.65	483.41	274.00	90.74
202	19.16	483.41	268.00	93.34
204	22.80	483.42	288.00	84.68
208	40.63	483.45	292.00	82.96
212	26.25	483.42	297.00	80.78
216	17.56	483.42	306.00	76.88
232	23.29	483.41	306.00	76.88
236	25.61	483.41	292.00	82.95
300	.00	483.41	314.00	73.41
302	.00	483.41	322.00	69.94

304	4.80	483.41	325.50	68.43
306	4.80	483.41	317.00	72.11
308	4.80	483.42	314.00	73.42
312	17.80	483.42	321.00	70.38
316	4.80	483.41	333.50	64.96
318	4.80	483.41	333.00	65.18
320	14.90	483.41	328.00	67.34
324	14.90	483.41	312.00	74.28
328	14.90	483.41	310.00	75.14
332	.00	483.41	322.00	69.94
352	8.82	483.41	318.00	71.68
364	8.83	483.41	317.00	72.11
376	4.92	483.41	328.00	67.34
378	4.92	483.41	328.00	67.34
380	4.92	483.41	326.00	68.21
382	4.92	483.41	326.00	68.21

MAXIMUM PRESSURES

2	.00	610.00	280.00	143.00
8	.00	610.00	290.00	138.67
4	.00	610.00	292.00	137.80
59	.00	610.00	292.00	137.80
53	.00	609.25	292.00	137.47

MINIMUM PRESSURES

316	4.80	483.41	333.50	64.96
318	4.80	483.41	333.00	65.18
320	14.90	483.41	328.00	67.34
378	4.92	483.41	328.00	67.34
376	4.92	483.41	328.00	67.34

THE NET SYSTEM DEMAND = 442.42

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	219.97
2	222.45

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 442.42
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 4.80

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00196

3Roots - Phase 1 Water System
Water System Analysis
Peak Hour Demands

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	947.99	.03	.00	.00	1.51	.66
2	0	8	1175.62	.05	.00	.00	1.88	.98
4	2	4	947.99	.03	.00	.00	1.51	.66
6	8	10	1175.62	.05	.00	.00	1.88	.98
52	4	53	613.84	5.02	.00	.00	15.67	250.94
54	0	55	613.84	5.02	.00	.00	15.67	250.94
56	55	6	613.84	5.02	.00	.00	15.67	250.94
58	4	59	334.15	.02	.00	.00	1.36	.94
60	0	61	334.15	.02	.00	.00	1.36	.94
62	61	6	334.15	.02	.00	.00	1.36	.94
64	10	65	615.83	5.05	.00	.00	15.72	252.45
66	0	67	615.83	5.05	.00	.00	15.72	252.45
68	67	12	615.83	5.05	.00	.00	15.72	252.45
70	10	71	559.80	.05	.00	.00	2.29	2.44
72	0	73	559.80	.05	.00	.00	2.29	2.44
74	73	12	559.80	.05	.00	.00	2.29	2.44
105	100	104	-339.00	-.07	.00	.00	-.54	-.10
109	104	108	-142.92	-.01	.00	.00	-.23	-.02
113	108	112	-477.31	-.20	.00	.00	-.76	-.18
117	116	112	993.70	.37	.00	.00	1.59	.72
121	120	116	1091.62	.27	.00	.00	1.74	.85
125	12	120	1175.62	.37	.00	.00	1.88	.98
201	100	200	-82.93	-.02	.00	.00	-.24	-.03
202	202	200	-91.97	-.02	.00	.00	-.26	-.04
205	200	204	-326.82	-.20	.00	.00	-.93	-.37
207	6	208	947.99	.77	.00	.00	2.69	2.66
209	204	208	-752.97	-.37	.00	.00	-2.14	-1.74
211	204	212	-2.31	.00	.00	.00	-.01	.00
213	212	216	-128.31	-.04	.00	.00	-.36	-.07
215	216	112	-212.60	-.03	.00	.00	-.60	-.17
241	108	232	111.79	.02	.00	.00	.32	.05
249	104	236	-196.09	-.03	.00	.00	-.56	-.14
253	236	204	-319.01	-.11	.00	.00	-.90	-.35
301	108	300	222.60	.07	.00	.00	.63	.18
303	300	376	25.78	.00	.00	.00	.07	.00
304	376	302	-67.64	.00	.00	.00	-.19	-.02
305	302	304	-60.51	-.05	.00	.00	-.39	-.12
307	302	306	23.04	.00	.00	.00	.15	.02
309	304	308	-83.55	-.18	.00	.00	-.53	-.21
312	112	308	268.28	.04	.00	.00	.76	.26
313	308	312	161.68	.03	.00	.00	.46	.10
317	312	316	76.24	.17	.00	.00	.49	.18
321	316	318	53.20	.02	.00	.00	.34	.09
325	320	324	21.47	.00	.00	.00	.06	.00
329	324	328	-50.05	.00	.00	.00	-.14	-.01
333	328	364	-18.06	.00	.00	.00	-.05	.00
335	320	382	1.05	.00	.00	.00	.01	.00
337	332	320	94.04	.01	.00	.00	.27	.04
341	332	300	-196.82	-.06	.00	.00	-.56	-.14
357	352	364	60.45	.00	.00	.00	.17	.02
387	332	352	102.78	.01	.00	.00	.29	.04
389	376	378	69.80	.07	.00	.00	.45	.15
393	302	318	-30.16	-.01	.00	.00	-.19	-.03
399	382	378	-21.34	-.01	.00	.00	-.14	-.02
401	378	380	24.85	.01	.00	.00	.16	.02

403	382	380	-1.23	.00	.00	.00	-.01	.00
405	100	328	103.51	.05	.00	.00	.29	.04

JUNCTION	NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2		.00	609.97	280.00	142.99
4		.00	609.93	292.00	137.77
6		.00	474.96	292.00	79.28
8		.00	609.95	290.00	138.65
10		.00	609.90	320.00	125.62
12		.00	474.90	320.00	67.12
53		.00	604.92	292.00	135.60
55		.00	479.98	292.00	81.46
59		.00	609.92	292.00	137.76
61		.00	474.98	292.00	79.29
65		.00	604.85	320.00	123.44
67		.00	479.95	320.00	69.31
71		.00	609.85	320.00	125.60
73		.00	474.95	320.00	67.15
100		318.43	473.60	270.00	88.23
104		.00	473.67	294.00	77.86
108		.00	473.68	306.00	72.66
112		35.52	473.89	308.00	71.88
116		97.92	474.26	305.00	73.35
120		84.00	474.53	298.00	76.50
200		151.92	473.62	274.00	86.50
202		91.97	473.59	268.00	89.09
204		109.44	473.82	288.00	80.52
208		195.02	474.19	292.00	78.95
212		126.00	473.82	297.00	76.62
216		84.29	473.86	306.00	72.74
232		111.79	473.67	306.00	72.66
236		122.93	473.70	292.00	78.74
300		.00	473.62	314.00	69.17
302		.00	473.62	322.00	65.70
304		23.04	473.67	325.50	64.21
306		23.04	473.61	317.00	67.87
308		23.04	473.85	314.00	69.27
312		85.44	473.82	321.00	66.22
316		23.04	473.64	333.50	60.73
318		23.04	473.63	333.00	60.94
320		71.52	473.54	328.00	63.07
324		71.52	473.54	312.00	70.00
328		71.52	473.55	310.00	70.87
332		.00	473.56	322.00	65.67
352		42.34	473.55	318.00	67.41
364		42.38	473.55	317.00	67.84
376		23.62	473.61	328.00	63.10
378		23.62	473.55	328.00	63.07
380		23.62	473.54	326.00	63.94
382		23.62	473.54	326.00	63.94
		MAXIMUM PRESSURES			
2		.00	609.97	280.00	142.99
8		.00	609.95	290.00	138.65
4		.00	609.93	292.00	137.77
59		.00	609.92	292.00	137.76
53		.00	604.92	292.00	135.60
		MINIMUM PRESSURES			
316		23.04	473.64	333.50	60.73

318	23.04	473.63	333.00	60.94
320	71.52	473.54	328.00	63.07
378	23.62	473.55	328.00	63.07
376	23.62	473.61	328.00	63.10

THE NET SYSTEM DEMAND = 2123.62

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	947.99
2	1175.62

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 2123.62
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
316	2000.00

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00029

3Roots - Phase 1 Water System
Maximum Day Demands plus Fire Flow
2000 GPM Fire Flow at Node 316

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1239.92	.05	.00	.00	1.98	1.08
2	0	8	1635.32	.09	.00	.00	2.61	1.80
4	2	4	1239.92	.05	.00	.00	1.98	1.08
6	8	10	1635.32	.09	.00	.00	2.61	1.80
52	4	53	616.53	5.06	.00	.00	15.74	252.98
54	0	55	616.53	5.06	.00	.00	15.74	252.98
56	55	6	616.53	5.06	.00	.00	15.74	252.98
58	4	59	623.39	.06	.00	.00	2.55	2.98
60	0	61	623.39	.06	.00	.00	2.55	2.98
62	61	6	623.39	.06	.00	.00	2.55	2.98
64	10	65	622.22	5.15	.00	.00	15.89	257.32
66	0	67	622.22	5.15	.00	.00	15.89	257.32
68	67	12	622.22	5.15	.00	.00	15.89	257.32
70	10	71	1013.10	.15	.00	.00	4.14	7.32
72	0	73	1013.10	.15	.00	.00	4.14	7.32
74	73	12	1013.10	.15	.00	.00	4.14	7.32
105	100	104	-211.16	-.03	.00	.00	-.34	-.04
109	104	108	251.02	.03	.00	.00	.40	.06
113	108	112	-571.91	-.28	.00	.00	-.91	-.26
117	116	112	1559.52	.86	.00	.00	2.49	1.65
121	120	116	1600.32	.55	.00	.00	2.55	1.73
125	12	120	1635.32	.68	.00	.00	2.61	1.80

201	100	200	-294.88	-.17	.00	.00	-.84	-.31
202	202	200	-38.32	.00	.00	.00	-.11	-.01
205	200	204	-396.50	-.29	.00	.00	-1.12	-.53
207	6	208	1239.92	1.27	.00	.00	3.52	4.38
209	204	208	-1158.66	-.83	.00	.00	-3.29	-3.86
211	204	212	203.16	.10	.00	.00	.58	.15
213	212	216	150.66	.06	.00	.00	.43	.09
215	216	112	115.54	.01	.00	.00	.33	.05
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-462.18	-.15	.00	.00	-1.31	-.70
253	236	204	-513.40	-.27	.00	.00	-1.46	-.86
301	108	300	776.35	.68	.00	.00	2.20	1.84
303	300	376	817.00	.68	.00	.00	2.32	2.02
304	376	302	985.65	.64	.00	.00	2.80	2.86
305	302	304	-225.94	-.53	.00	.00	-1.44	-1.35
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-235.54	-1.24	.00	.00	-1.50	-1.46
312	112	308	1088.35	.52	.00	.00	3.09	3.44
313	308	312	843.22	.66	.00	.00	2.39	2.14
317	312	316	807.62	13.69	.00	.00	5.15	14.26
321	316	318	-1192.38	-4.84	.00	.00	-7.61	-29.35
325	320	324	-135.76	-.07	.00	.00	-.39	-.07
329	324	328	-165.56	-.04	.00	.00	-.47	-.11
333	328	364	178.00	.06	.00	.00	.50	.12
335	320	382	208.01	.17	.00	.00	1.33	1.16
337	332	320	102.05	.01	.00	.00	.29	.04
341	332	300	40.65	.00	.00	.00	.12	.01
357	352	364	-160.34	-.03	.00	.00	-.45	-.10
387	332	352	-142.70	-.01	.00	.00	-.40	-.08
389	376	378	-178.49	-.37	.00	.00	-1.14	-.87
393	302	318	1201.98	7.74	.00	.00	7.67	29.79
399	382	378	113.62	.13	.00	.00	.73	.38
401	378	380	-74.71	-.04	.00	.00	-.48	-.17
403	382	380	84.55	.08	.00	.00	.54	.22
405	100	328	373.36	.58	.00	.00	1.06	.47

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.95	280.00	142.98
4	.00	609.89	292.00	137.75
6	.00	474.88	292.00	79.25
8	.00	609.91	290.00	138.63
10	.00	609.82	320.00	125.59
12	.00	474.71	320.00	67.04
53	.00	604.83	292.00	135.56
55	.00	479.94	292.00	81.44
59	.00	609.83	292.00	137.73
61	.00	474.94	292.00	79.27
65	.00	604.67	320.00	123.36
67	.00	479.85	320.00	69.27
71	.00	609.67	320.00	125.53
73	.00	474.85	320.00	67.10
100	132.68	472.33	270.00	87.68
104	.00	472.36	294.00	77.29
108	.00	472.33	306.00	72.08
112	14.80	472.61	308.00	71.33
116	40.80	473.47	305.00	73.00
120	35.00	474.02	298.00	76.28
200	63.30	472.49	274.00	86.01
202	38.32	472.49	268.00	88.61
204	45.60	472.78	288.00	80.07

208	81.26	473.61	292.00	78.70
212	52.50	472.68	297.00	76.13
216	35.12	472.62	306.00	72.20
232	46.58	472.32	306.00	72.07
236	51.22	472.51	292.00	78.22
300	.00	471.65	314.00	68.31
302	.00	470.32	322.00	64.27
304	9.60	470.86	325.50	62.99
306	9.60	470.32	317.00	66.44
308	9.60	472.09	314.00	68.51
312	35.60	471.43	321.00	65.19
316	2000.00	457.74	333.50	53.84
318	9.60	462.58	333.00	56.15
320	29.80	471.64	328.00	62.24
324	29.80	471.71	312.00	69.21
328	29.80	471.74	310.00	70.09
332	.00	471.65	322.00	64.85
352	17.64	471.66	318.00	66.59
364	17.66	471.69	317.00	67.03
376	9.84	470.97	328.00	61.95
378	9.84	471.34	328.00	62.11
380	9.84	471.38	326.00	63.00
382	9.84	471.47	326.00	63.04

MAXIMUM PRESSURES

2	.00	609.95	280.00	142.98
8	.00	609.91	290.00	138.63
4	.00	609.89	292.00	137.75
59	.00	609.83	292.00	137.73
53	.00	604.83	292.00	135.56

MINIMUM PRESSURES

316	2000.00	457.74	333.50	53.84
318	9.60	462.58	333.00	56.15
376	9.84	470.97	328.00	61.95
378	9.84	471.34	328.00	62.11
320	29.80	471.64	328.00	62.24

THE NET SYSTEM DEMAND = 2875.24

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1239.92
2	1635.32

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 2875.24
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
324	1500.00
328	1500.00

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00019

3Roots - Phase 1 Water System
Maximum Day Demands plus Fire Flow
3000 GPM Fire Flow split between Nodes 324 and 328

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1694.08	.10	.00	.00	2.70	1.92
2	0	8	2131.16	.15	.00	.00	3.40	2.94
4	2	4	1694.08	.10	.00	.00	2.70	1.92
6	8	10	2131.16	.15	.00	.00	3.40	2.94
52	4	53	623.25	5.16	.00	.00	15.91	258.11
54	0	55	623.25	5.16	.00	.00	15.91	258.11
56	55	6	623.25	5.16	.00	.00	15.91	258.11
58	4	59	1070.83	.16	.00	.00	4.37	8.11
60	0	61	1070.83	.16	.00	.00	4.37	8.11
62	61	6	1070.83	.16	.00	.00	4.37	8.11
64	10	65	632.34	5.30	.00	.00	16.14	265.12
66	0	67	632.34	5.30	.00	.00	16.14	265.12
68	67	12	632.34	5.30	.00	.00	16.14	265.12
70	10	71	1498.82	.30	.00	.00	6.12	15.12
72	0	73	1498.82	.30	.00	.00	6.12	15.12
74	73	12	1498.82	.30	.00	.00	6.12	15.12
105	100	104	-784.24	-.34	.00	.00	-1.25	-.46
109	104	108	58.88	.00	.00	.00	.09	.00
113	108	112	-1287.29	-1.27	.00	.00	-2.05	-1.16
117	116	112	2055.36	1.43	.00	.00	3.28	2.75
121	120	116	2096.16	.91	.00	.00	3.34	2.85
125	12	120	2131.16	1.12	.00	.00	3.40	2.94
201	100	200	-628.14	-.67	.00	.00	-1.78	-1.24
202	202	200	-38.32	.00	.00	.00	-.11	-.01
205	200	204	-729.76	-.89	.00	.00	-2.07	-1.64
207	6	208	1694.08	2.26	.00	.00	4.81	7.81
209	204	208	-1612.82	-1.53	.00	.00	-4.57	-7.13
211	204	212	-56.88	-.01	.00	.00	-.16	-.01
213	212	216	-109.38	-.03	.00	.00	-.31	-.05
215	216	112	-144.50	-.01	.00	.00	-.41	-.08
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-843.12	-.45	.00	.00	-2.39	-2.14
253	236	204	-894.34	-.77	.00	.00	-2.54	-2.39
301	108	300	1299.59	1.77	.00	.00	3.69	4.78
303	300	376	-114.19	-.02	.00	.00	-.32	-.05
304	376	302	-525.17	-.20	.00	.00	-1.49	-.89
305	302	304	-282.32	-.80	.00	.00	-1.80	-2.04
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-291.92	-1.84	.00	.00	-1.86	-2.17
312	112	308	608.77	.18	.00	.00	1.73	1.17
313	308	312	307.25	.10	.00	.00	.87	.33
317	312	316	271.65	1.82	.00	.00	1.73	1.90
321	316	318	262.05	.29	.00	.00	1.67	1.77
325	320	324	862.32	2.17	.00	.00	2.45	2.24
329	324	328	-637.68	-.47	.00	.00	-1.81	-1.28
333	328	364	-857.98	-1.04	.00	.00	-2.43	-2.21
335	320	382	-371.62	-.49	.00	.00	-2.37	-3.39
337	332	320	520.49	.30	.00	.00	1.48	.88
341	332	300	-1413.78	-2.29	.00	.00	-4.01	-5.58
357	352	364	875.64	.68	.00	.00	2.48	2.30

387	332	352	893.28	.27	.00	.00	2.53	2.39
389	376	378	401.14	1.66	.00	.00	2.56	3.90
393	302	318	-252.45	-.43	.00	.00	-1.61	-1.66
399	382	378	-225.32	-.46	.00	.00	-1.44	-1.34
401	378	380	165.99	.19	.00	.00	1.06	.76
403	382	380	-156.15	-.26	.00	.00	-1.00	-.68
405	100	328	1279.70	5.71	.00	.00	3.63	4.64

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.90	280.00	142.96
4	.00	609.81	292.00	137.72
6	.00	474.68	292.00	79.16
8	.00	609.85	290.00	138.60
10	.00	609.71	320.00	125.54
12	.00	474.40	320.00	66.90
53	.00	604.65	292.00	135.48
55	.00	479.84	292.00	81.40
59	.00	609.65	292.00	137.65
61	.00	474.84	292.00	79.23
65	.00	604.40	320.00	123.24
67	.00	479.70	320.00	69.20
71	.00	609.40	320.00	125.41
73	.00	474.70	320.00	67.04
100	132.68	469.32	270.00	86.37
104	.00	469.66	294.00	76.12
108	.00	469.66	306.00	70.92
112	14.80	470.93	308.00	70.60
116	40.80	472.36	305.00	72.52
120	35.00	473.28	298.00	75.95
200	63.30	469.99	274.00	84.93
202	38.32	469.99	268.00	87.53
204	45.60	470.88	288.00	79.25
208	81.26	472.41	292.00	78.18
212	52.50	470.89	297.00	75.35
216	35.12	470.92	306.00	71.47
232	46.58	469.66	306.00	70.92
236	51.22	470.11	292.00	77.18
300	.00	467.89	314.00	66.69
302	.00	468.11	322.00	63.32
304	9.60	468.92	325.50	62.15
306	9.60	468.11	317.00	65.48
308	9.60	470.76	314.00	67.93
312	35.60	470.66	321.00	64.85
316	9.60	468.83	333.50	58.65
318	9.60	468.54	333.00	58.73
320	29.80	465.31	328.00	59.50
324	1500.00	463.14	312.00	65.49
328	1500.00	463.61	310.00	66.56
332	.00	465.60	322.00	62.23
352	17.64	465.33	318.00	63.84
364	17.66	464.65	317.00	63.98
376	9.84	467.91	328.00	60.63
378	9.84	466.25	328.00	59.91
380	9.84	466.06	326.00	60.69
382	9.84	465.80	326.00	60.58
	MAXIMUM PRESSURES			
2	.00	609.90	280.00	142.96
8	.00	609.85	290.00	138.60
4	.00	609.81	292.00	137.72

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        59              .00      609.65      292.00      137.65
        53              .00      604.65      292.00      135.48

                    MINIMUM PRESSURES
       316             9.60      468.83      333.50       58.65
       318             9.60      468.54      333.00       58.73
       320            29.80      465.31      328.00       59.50
       378             9.84      466.25      328.00       59.91
       382             9.84      465.80      326.00       60.58

THE NET SYSTEM DEMAND =   3825.24

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

   PIPE NUMBER    FLOWRATE
        1        1694.08
        2        2131.16

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES =   3825.24
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES =       .00



A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS


THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR =   2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :
JUNCTION NUMBER       DEMAND
      316           2000.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED


   PIPE NO. NODE NOS. LENGTH  DIAMETER  ROUGHNESS  MINOR LOSS K  FIXED GRADE
   312    112  308      150.0    12.0      120.0         .00          .00
LINE  312 IS CLOSED


THE RESULTS ARE OBTAINED AFTER  4 TRIALS WITH AN ACCURACY =  .00419
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3Roots - Phase 1 Water System
2000 GPM Fire Flow at Node 316
Source out of Service - Pipe 312 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1299.61	.06	.00	.00	2.07	1.18
2	0	8	1575.63	.08	.00	.00	2.51	1.68
4	2	4	1299.61	.06	.00	.00	2.07	1.18
6	8	10	1575.63	.08	.00	.00	2.51	1.68
52	4	53	617.24	5.07	.00	.00	15.76	253.52
54	0	55	617.24	5.07	.00	.00	15.76	253.52
56	55	6	617.24	5.07	.00	.00	15.76	253.52
58	4	59	682.36	.07	.00	.00	2.79	3.52
60	0	61	682.36	.07	.00	.00	2.79	3.52
62	61	6	682.36	.07	.00	.00	2.79	3.52
64	10	65	621.22	5.13	.00	.00	15.86	256.56

66	0	67	621.22	5.13	.00	.00	15.86	256.56
68	67	12	621.22	5.13	.00	.00	15.86	256.56
70	10	71	954.41	.13	.00	.00	3.90	6.56
72	0	73	954.41	.13	.00	.00	3.90	6.56
74	73	12	954.41	.13	.00	.00	3.90	6.56
105	100	104	-367.77	-.08	.00	.00	-.59	-.11
109	104	108	341.77	.05	.00	.00	.55	.10
113	108	112	-1231.18	-1.17	.00	.00	-1.96	-1.06
117	116	112	1499.83	.80	.00	.00	2.39	1.53
121	120	116	1540.63	.52	.00	.00	2.46	1.61
125	12	120	1575.63	.64	.00	.00	2.51	1.68
201	100	200	-476.60	-.40	.00	.00	-1.35	-.75
202	202	200	-38.32	.00	.00	.00	-.11	-.01
205	200	204	-578.22	-.58	.00	.00	-1.64	-1.07
207	6	208	1299.61	1.39	.00	.00	3.69	4.78
209	204	208	-1218.35	-.91	.00	.00	-3.46	-4.24
211	204	212	-166.24	-.07	.00	.00	-.47	-.11
213	212	216	-218.74	-.11	.00	.00	-.62	-.18
215	216	112	-253.86	-.04	.00	.00	-.72	-.23
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-709.54	-.33	.00	.00	-2.01	-1.56
253	236	204	-760.76	-.57	.00	.00	-2.16	-1.77
301	108	300	1526.37	2.38	.00	.00	4.33	6.44
303	300	376	1697.58	2.63	.00	.00	4.82	7.84
304	376	302	2074.00	2.56	.00	.00	5.88	11.36
305	302	304	615.07	3.40	.00	.00	3.93	8.61
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	605.47	7.11	.00	.00	3.86	8.37
LINE	312 IS	CLOSED						
313	308	312	595.87	.35	.00	.00	1.69	1.13
317	312	316	560.27	6.96	.00	.00	3.58	7.25
321	316	318	-1439.73	-6.87	.00	.00	-9.19	-41.61
325	320	324	-287.01	-.28	.00	.00	-.81	-.29
329	324	328	-316.81	-.13	.00	.00	-.90	-.35
333	328	364	365.08	.21	.00	.00	1.04	.46
335	320	382	415.78	.60	.00	.00	2.65	4.17
337	332	320	158.57	.03	.00	.00	.45	.10
341	332	300	171.21	.05	.00	.00	.49	.11
357	352	364	-347.42	-.12	.00	.00	-.99	-.42
387	332	352	-329.78	-.04	.00	.00	-.94	-.38
389	376	378	-386.26	-1.55	.00	.00	-2.47	-3.64
393	302	318	1449.33	10.95	.00	.00	9.25	42.13
399	382	378	235.04	.49	.00	.00	1.50	1.45
401	378	380	-161.06	-.18	.00	.00	-1.03	-.72
403	382	380	170.90	.31	.00	.00	1.09	.80
405	100	328	711.69	1.93	.00	.00	2.02	1.57

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.94	280.00	142.97
4	.00	609.88	292.00	137.75
6	.00	474.86	292.00	79.24
8	.00	609.92	290.00	138.63
10	.00	609.83	320.00	125.59
12	.00	474.74	320.00	67.05
53	.00	604.81	292.00	135.55
55	.00	479.93	292.00	81.44
59	.00	609.81	292.00	137.72
61	.00	474.93	292.00	79.27
65	.00	604.70	320.00	123.37
67	.00	479.87	320.00	69.28

71	.00	609.70	320.00	125.54
73	.00	474.87	320.00	67.11
100	132.68	471.58	270.00	87.35
104	.00	471.67	294.00	76.99
108	.00	471.61	306.00	71.77
112	14.80	472.78	308.00	71.41
116	40.80	473.58	305.00	73.05
120	35.00	474.10	298.00	76.31
200	63.30	471.99	274.00	85.79
202	38.32	471.98	268.00	88.39
204	45.60	472.56	288.00	79.98
208	81.26	473.47	292.00	78.64
212	52.50	472.63	297.00	76.11
216	35.12	472.74	306.00	72.26
232	46.58	471.61	306.00	71.76
236	51.22	471.99	292.00	78.00
300	.00	469.23	314.00	67.27
302	.00	464.05	322.00	61.56
304	9.60	460.65	325.50	58.56
306	9.60	464.05	317.00	63.72
308	9.60	453.54	314.00	60.47
312	35.60	453.19	321.00	57.28
316	2000.00	446.23	333.50	48.85
318	9.60	453.10	333.00	52.04
320	29.80	469.24	328.00	61.21
324	29.80	469.53	312.00	68.26
328	29.80	469.66	310.00	69.18
332	.00	469.28	322.00	63.82
352	17.64	469.32	318.00	65.57
364	17.66	469.44	317.00	66.06
376	9.84	466.61	328.00	60.06
378	9.84	468.15	328.00	60.73
380	9.84	468.34	326.00	61.68
382	9.84	468.64	326.00	61.81

MAXIMUM PRESSURES

2	.00	609.94	280.00	142.97
8	.00	609.92	290.00	138.63
4	.00	609.88	292.00	137.75
59	.00	609.81	292.00	137.72
53	.00	604.81	292.00	135.55

MINIMUM PRESSURES

316	2000.00	446.23	333.50	48.85
318	9.60	453.10	333.00	52.04
312	35.60	453.19	321.00	57.28
304	9.60	460.65	325.50	58.56
376	9.84	466.61	328.00	60.06

THE NET SYSTEM DEMAND = 2875.24

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1299.61
2	1575.63

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 2875.24
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
120	3000.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.		LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
312	112	308	150.0	12.0	120.0	.00	.00
125	12	120	380.0	16.0	120.0	.00	.00

LINE 125 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00021

3Roots - Phase 1 Water System
3000 GPM Fire Flow at Node 120
Source out of Service - Pipe 125 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	3849.84	.44	.00	.00	6.14	8.80
2	0	8	.00	.00	.00	.00	.00	.00
4	2	4	3849.84	.44	.00	.00	6.14	8.80
6	8	10	.00	.00	.00	.00	.00	.00
52	4	53	688.34	6.20	.00	.00	17.57	310.25
54	0	55	688.34	6.20	.00	.00	17.57	310.25
56	55	6	688.34	6.20	.00	.00	17.57	310.25
58	4	59	3161.50	1.20	.00	.00	12.91	60.25
60	0	61	3161.50	1.20	.00	.00	12.91	60.25
62	61	6	3161.50	1.20	.00	.00	12.91	60.25
64	10	65	.00	.00	.00	.00	.00	.00
66	0	67	.00	.00	.00	.00	.00	.00
68	67	12	.00	.00	.00	.00	.00	.00
70	10	71	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 72 IS CLOSED								
74	73	12	.00	.00	.00	.00	.00	.00
105	100	104	312.26	.06	.00	.00	.50	.08
109	104	108	1732.03	1.10	.00	.00	2.76	2.00
113	108	112	1565.95	1.83	.00	.00	2.50	1.66
117	116	112	-3040.80	-2.95	.00	.00	-4.85	-5.68
121	120	116	-3000.00	-1.77	.00	.00	-4.79	-5.54
LINE 125 IS CLOSED								
201	100	200	-925.22	-1.38	.00	.00	-2.62	-2.55
202	202	200	-38.32	.00	.00	.00	-.11	-.01
205	200	204	-1026.84	-1.67	.00	.00	-2.91	-3.09
207	6	208	3849.84	10.35	.00	.00	10.92	35.71
209	204	208	-3768.58	-7.38	.00	.00	-10.69	-34.32
211	204	212	1225.15	2.91	.00	.00	3.48	4.28
213	212	216	1172.65	2.49	.00	.00	3.33	3.95
215	216	112	1137.54	.63	.00	.00	3.23	3.73
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-1419.76	-1.18	.00	.00	-4.03	-5.63

253	236	204	-1470.98	-1.92	.00	.00	-4.17	-6.01
301	108	300	119.50	.02	.00	.00	.34	.06
303	300	376	351.14	.14	.00	.00	1.00	.42
304	376	302	435.71	.14	.00	.00	1.24	.63
305	302	304	216.07	.49	.00	.00	1.38	1.24
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	206.47	.97	.00	.00	1.32	1.14
312	112	308	-352.11	-.06	.00	.00	-1.00	-.43
313	308	312	-155.24	-.03	.00	.00	-.44	-.09
317	312	316	-190.84	-.95	.00	.00	-1.22	-.99
321	316	318	-200.44	-.18	.00	.00	-1.28	-1.08
325	320	324	-176.91	-.12	.00	.00	-.50	-.12
329	324	328	-206.71	-.06	.00	.00	-.59	-.16
333	328	364	243.77	.10	.00	.00	.69	.22
335	320	382	123.94	.06	.00	.00	.79	.44
337	332	320	-23.17	.00	.00	.00	-.07	.00
341	332	300	231.64	.08	.00	.00	.66	.20
357	352	364	-226.11	-.06	.00	.00	-.64	-.19
387	332	352	-208.47	-.02	.00	.00	-.59	-.16
389	376	378	-94.42	-.11	.00	.00	-.60	-.27
393	302	318	210.04	.31	.00	.00	1.34	1.18
399	382	378	64.53	.05	.00	.00	.41	.13
401	378	380	-39.73	-.01	.00	.00	-.25	-.05
403	382	380	49.57	.03	.00	.00	.32	.08
405	100	328	480.28	.93	.00	.00	1.36	.76

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.56	280.00	142.81
4	.00	609.12	292.00	137.42
6	.00	472.59	292.00	78.26
8	.00	610.00	290.00	138.67
10	.00	610.00	320.00	125.67
12	.00	485.00	320.00	71.50
53	.00	602.92	292.00	134.73
55	.00	478.80	292.00	80.94
59	.00	607.92	292.00	136.90
61	.00	473.80	292.00	78.78
65	.00	610.00	320.00	125.67
67	.00	485.00	320.00	71.50
71	.00	610.00	320.00	125.67
73	.00	485.00	320.00	71.50
100	132.68	451.81	270.00	78.79
104	.00	451.75	294.00	68.36
108	.00	450.65	306.00	62.68
112	14.80	448.82	308.00	61.02
116	40.80	445.86	305.00	61.04
120	3000.00	444.09	298.00	63.31
200	63.30	453.19	274.00	77.65
202	38.32	453.18	268.00	80.25
204	45.60	454.86	288.00	72.30
208	81.26	462.24	292.00	73.77
212	52.50	451.94	297.00	67.14
216	35.12	449.45	306.00	62.16
232	46.58	450.65	306.00	62.68
236	51.22	452.93	292.00	69.74
300	.00	450.63	314.00	59.21
302	.00	450.34	322.00	55.62
304	9.60	449.85	325.50	53.89
306	9.60	450.34	317.00	57.78
308	9.60	448.88	314.00	58.45

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       312              35.60      448.91      321.00       55.43
       316               9.60      449.86      333.50       50.42
       318               9.60      450.04      333.00       50.72
       320              29.80      450.71      328.00       53.17
       324              29.80      450.82      312.00       60.16
       328              29.80      450.88      310.00       61.05
       332                .00      450.71      322.00       55.77
       352              17.64      450.73      318.00       57.51
       364              17.66      450.78      317.00       57.97
       376               9.84      450.49      328.00       53.08
       378               9.84      450.60      328.00       53.13
       380               9.84      450.61      326.00       54.00
       382               9.84      450.64      326.00       54.01

                      MAXIMUM PRESSURES
         2                .00      609.56      280.00      142.81
         8                .00      610.00      290.00      138.67
         4                .00      609.12      292.00      137.42
        59                .00      607.92      292.00      136.90
        53                .00      602.92      292.00      134.73

                      MINIMUM PRESSURES
       316               9.60      449.86      333.50       50.42
       318               9.60      450.04      333.00       50.72
       376               9.84      450.49      328.00       53.08
       378               9.84      450.60      328.00       53.13
       320              29.80      450.71      328.00       53.17

 THE NET SYSTEM DEMAND =   3849.84

 SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

    PIPE NUMBER    FLOWRATE
         1        3849.84
         2            .00

 THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES =   3849.84
 THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES =       .00



 A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS


 THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR =   2.00

 THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :
 JUNCTION NUMBER       DEMAND
       324           1500.00
       328           1500.00

 THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED


    PIPE NO. NODE NOS. LENGTH  DIAMETER  ROUGHNESS  MINOR LOSS K  FIXED GRADE
    125     12  120      380.0    16.0      120.0         .00          .00
    301    108  300      370.0    12.0      120.0         .00          .00
 LINE  301 IS CLOSED
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THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00025

3Roots - Phase 1 Water System
3000 GPM Fire Flow split between Nodes 324 and 328
Source out of Service - Pipe 301 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0	2	1685.82	.10	.00	.00	2.69	1.91
2	0	8	2139.42	.15	.00	.00	3.41	2.96
4	2	4	1685.82	.10	.00	.00	2.69	1.91
6	8	10	2139.42	.15	.00	.00	3.41	2.96
52	4	53	623.11	5.16	.00	.00	15.91	258.00
54	0	55	623.11	5.16	.00	.00	15.91	258.00
56	55	6	623.11	5.16	.00	.00	15.91	258.00
58	4	59	1062.72	.16	.00	.00	4.34	8.00
60	0	61	1062.72	.16	.00	.00	4.34	8.00
62	61	6	1062.72	.16	.00	.00	4.34	8.00
64	10	65	632.53	5.31	.00	.00	16.15	265.27
66	0	67	632.53	5.31	.00	.00	16.15	265.27
68	67	12	632.53	5.31	.00	.00	16.15	265.27
70	10	71	1506.89	.31	.00	.00	6.16	15.27
72	0	73	1506.89	.31	.00	.00	6.16	15.27
74	73	12	1506.89	.31	.00	.00	6.16	15.27
105	100	104	-1405.59	-1.01	.00	.00	-2.24	-1.36
109	104	108	-751.10	-.23	.00	.00	-1.20	-.43
113	108	112	-797.68	-.52	.00	.00	-1.27	-.48
117	116	112	2063.62	1.44	.00	.00	3.29	2.77
121	120	116	2104.42	.92	.00	.00	3.36	2.87
125	12	120	2139.42	1.13	.00	.00	3.41	2.96
201	100	200	-679.69	-.78	.00	.00	-1.93	-1.44
202	202	200	-38.32	.00	.00	.00	-.11	-.01
205	200	204	-781.31	-1.01	.00	.00	-2.22	-1.86
207	6	208	1685.82	2.24	.00	.00	4.78	7.74
209	204	208	-1604.56	-1.52	.00	.00	-4.55	-7.06
211	204	212	71.95	.02	.00	.00	.20	.02
213	212	216	19.45	.00	.00	.00	.06	.00
215	216	112	-15.67	.00	.00	.00	-.04	.00
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-654.48	-.28	.00	.00	-1.86	-1.34
253	236	204	-705.70	-.49	.00	.00	-2.00	-1.54
LINE	301 IS	CLOSED						
303	300	376	-823.01	-.69	.00	.00	-2.33	-2.05
304	376	302	-1151.86	-.86	.00	.00	-3.27	-3.82
305	302	304	-607.23	-3.32	.00	.00	-3.88	-8.41
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-616.83	-7.36	.00	.00	-3.94	-8.66
312	112	308	1235.46	.65	.00	.00	3.50	4.35
313	308	312	609.03	.36	.00	.00	1.73	1.17
317	312	316	573.43	7.26	.00	.00	3.66	7.56
321	316	318	563.83	1.21	.00	.00	3.60	7.33
325	320	324	630.86	1.22	.00	.00	1.79	1.25
329	324	328	-869.14	-.84	.00	.00	-2.47	-2.27
333	328	364	-416.54	-.27	.00	.00	-1.18	-.58
335	320	382	-289.49	-.31	.00	.00	-1.85	-2.13
337	332	320	371.17	.16	.00	.00	1.05	.47
341	332	300	-823.01	-.84	.00	.00	-2.33	-2.05
357	352	364	434.20	.19	.00	.00	1.23	.63
387	332	352	451.84	.08	.00	.00	1.28	.68
389	376	378	319.01	1.09	.00	.00	2.04	2.55

393	302	318	-554.23	-1.85	.00	.00	-3.54	-7.10
399	382	378	-177.32	-.29	.00	.00	-1.13	-.86
401	378	380	131.86	.13	.00	.00	.84	.50
403	382	380	-122.02	-.17	.00	.00	-.78	-.43
405	100	328	1952.60	12.49	.00	.00	5.54	10.16

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	609.90	280.00	142.96
4	.00	609.81	292.00	137.72
6	.00	474.68	292.00	79.16
8	.00	609.85	290.00	138.60
10	.00	609.70	320.00	125.54
12	.00	474.39	320.00	66.90
53	.00	604.65	292.00	135.48
55	.00	479.84	292.00	81.40
59	.00	609.65	292.00	137.65
61	.00	474.84	292.00	79.23
65	.00	604.40	320.00	123.24
67	.00	479.69	320.00	69.20
71	.00	609.40	320.00	125.41
73	.00	474.69	320.00	67.03
100	132.68	469.14	270.00	86.29
104	.00	470.14	294.00	76.33
108	.00	470.38	306.00	71.23
112	14.80	470.90	308.00	70.59
116	40.80	472.34	305.00	72.52
120	35.00	473.26	298.00	75.95
200	63.30	469.91	274.00	84.90
202	38.32	469.91	268.00	87.49
204	45.60	470.92	288.00	79.26
208	81.26	472.44	292.00	78.19
212	52.50	470.90	297.00	75.36
216	35.12	470.90	306.00	71.46
232	46.58	470.37	306.00	71.23
236	51.22	470.42	292.00	77.32
300	.00	458.02	314.00	62.41
302	.00	459.57	322.00	59.61
304	9.60	462.89	325.50	59.54
306	9.60	459.57	317.00	61.78
308	9.60	470.25	314.00	67.71
312	35.60	469.89	321.00	64.52
316	9.60	462.62	333.50	55.95
318	9.60	461.41	333.00	55.65
320	29.80	457.02	328.00	55.91
324	1500.00	455.80	312.00	62.32
328	1500.00	456.64	310.00	63.55
332	.00	457.18	322.00	58.58
352	17.64	457.10	318.00	60.28
364	17.66	456.92	317.00	60.63
376	9.84	458.71	328.00	56.64
378	9.84	457.62	328.00	56.17
380	9.84	457.50	326.00	56.98
382	9.84	457.33	326.00	56.91
	MAXIMUM PRESSURES			
2	.00	609.90	280.00	142.96
8	.00	609.85	290.00	138.60
4	.00	609.81	292.00	137.72
59	.00	609.65	292.00	137.65
53	.00	604.65	292.00	135.48

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                    MINIMUM PRESSURES
      318              9.60      461.41      333.00       55.65
      320             29.80      457.02      328.00       55.91
      316              9.60      462.62      333.50       55.95
      378              9.84      457.62      328.00       56.17
      376              9.84      458.71      328.00       56.64

THE NET SYSTEM DEMAND =   3825.24

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

   PIPE NUMBER    FLOWRATE
        1        1685.82
        2        2139.42

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES =   3825.24
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES =       .00



A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS


THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR =   2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :
JUNCTION NUMBER       DEMAND
      212           1500.00
      204           1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED


   PIPE NO. NODE NOS. LENGTH  DIAMETER  ROUGHNESS  MINOR LOSS K  FIXED GRADE
   301    108  300      370.0    12.0      120.0         .00          .00
   209    204  208      215.0    12.0      120.0         .00          .00
LINE  209 IS CLOSED


THE RESULTS ARE OBTAINED AFTER  5 TRIALS WITH AN ACCURACY =  .00280
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3Roots - Phase 1 Water System
3000 GPM Fire Flow split between Node 204 and 212
Source out of Service - Pipe 209 Closed

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 PIPE NO. NODE NOS.   FLOWRATE  HEAD LOSS PUMP HEAD MINOR LOSS VELOCITY HL/1000
    1      0     2      81.26       .00       .00       .00       .13      .01
    2      0     8    3705.48       .41       .00       .00      5.91     8.20
    4      2     4      81.26       .00       .00       .00       .13      .01
    6      8    10    3705.48       .41       .00       .00      5.91     8.20
   52      4    53      81.26       .12       .00       .00      2.07     5.93
   54      0    55      81.26       .12       .00       .00      2.07     5.93
   56     55     6      81.26       .12       .00       .00      2.07     5.93
   58      4    59        .00       .00       .00       .00       .00      .00
   THE CHECK VALVE IN LINE NUMBER  60 IS CLOSED
   62     61     6        .00       .00       .00       .00       .00      .00
   64     10    65     682.57      6.11       .00       .00     17.43   305.45
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66	0	67	682.57	6.11	.00	.00	17.43	305.45
68	67	12	682.57	6.11	.00	.00	17.43	305.45
70	10	71	3022.91	1.11	.00	.00	12.35	55.45
72	0	73	3022.91	1.11	.00	.00	12.35	55.45
74	73	12	3022.91	1.11	.00	.00	12.35	55.45
105	100	104	-468.92	-.13	.00	.00	-.75	-.18
109	104	108	-1505.80	-.85	.00	.00	-2.40	-1.55
113	108	112	-1669.97	-2.06	.00	.00	-2.66	-1.87
117	116	112	3629.68	4.10	.00	.00	5.79	7.89
121	120	116	3670.48	2.58	.00	.00	5.86	8.05
125	12	120	3705.48	3.11	.00	.00	5.91	8.20
201	100	200	702.69	.83	.00	.00	1.99	1.53
202	202	200	-38.32	.00	.00	.00	-.11	-.01
205	200	204	601.07	.62	.00	.00	1.71	1.15
207	6	208	81.26	.01	.00	.00	.23	.03
LINE	209 IS	CLOSED						
211	204	212	86.74	.02	.00	.00	.25	.03
213	212	216	-1413.26	-3.52	.00	.00	-4.01	-5.58
215	216	112	-1448.38	-.99	.00	.00	-4.11	-5.84
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	1036.88	.66	.00	.00	2.94	3.15
253	236	204	985.66	.92	.00	.00	2.80	2.86
301	108	300	117.60	.02	.00	.00	.33	.06
303	300	376	-269.54	-.09	.00	.00	-.76	-.26
304	376	302	-412.92	-.13	.00	.00	-1.17	-.57
305	302	304	-224.14	-.52	.00	.00	-1.43	-1.33
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-233.74	-1.22	.00	.00	-1.49	-1.44
312	112	308	496.52	.12	.00	.00	1.41	.80
313	308	312	253.19	.07	.00	.00	.72	.23
317	312	316	217.59	1.21	.00	.00	1.39	1.26
321	316	318	207.99	.19	.00	.00	1.33	1.16
325	320	324	192.41	.13	.00	.00	.55	.14
329	324	328	162.61	.04	.00	.00	.46	.10
333	328	364	-233.65	-.09	.00	.00	-.66	-.20
335	320	382	-104.02	-.05	.00	.00	-.66	-.32
337	332	320	118.19	.02	.00	.00	.34	.06
341	332	300	-387.14	-.21	.00	.00	-1.10	-.51
357	352	364	251.31	.07	.00	.00	.71	.23
387	332	352	268.95	.03	.00	.00	.76	.26
389	376	378	133.54	.22	.00	.00	.85	.51
393	302	318	-198.39	-.28	.00	.00	-1.27	-1.06
399	382	378	-68.97	-.05	.00	.00	-.44	-.15
401	378	380	54.73	.02	.00	.00	.35	.10
403	382	380	-44.89	-.03	.00	.00	-.29	-.07
405	100	328	-366.46	-.56	.00	.00	-1.04	-.46

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	610.00	280.00	143.00
4	.00	610.00	292.00	137.80
6	.00	484.76	292.00	83.53
8	.00	609.59	290.00	138.49
10	.00	609.18	320.00	125.31
12	.00	472.78	320.00	66.21
53	.00	609.88	292.00	137.75
55	.00	484.88	292.00	83.58
59	.00	610.00	292.00	137.80
61	.00	484.76	292.00	83.53
65	.00	603.07	320.00	122.66
67	.00	478.89	320.00	68.85

71	.00	608.07	320.00	124.83
73	.00	473.89	320.00	66.69
100	132.68	459.95	270.00	82.31
104	.00	460.08	294.00	71.97
108	.00	460.93	306.00	67.14
112	14.80	462.99	308.00	67.16
116	40.80	467.09	305.00	70.24
120	35.00	469.67	298.00	74.39
200	63.30	459.12	274.00	80.22
202	38.32	459.12	268.00	82.82
204	1500.00	458.50	288.00	73.88
208	81.26	484.75	292.00	83.53
212	1500.00	458.48	297.00	69.98
216	35.12	462.00	306.00	67.60
232	46.58	460.93	306.00	67.13
236	51.22	459.42	292.00	72.55
300	.00	460.91	314.00	63.66
302	.00	461.12	322.00	60.29
304	9.60	461.65	325.50	59.00
306	9.60	461.12	317.00	62.45
308	9.60	462.87	314.00	64.51
312	35.60	462.80	321.00	61.45
316	9.60	461.59	333.50	55.51
318	9.60	461.40	333.00	55.64
320	29.80	460.68	328.00	57.50
324	29.80	460.55	312.00	64.37
328	29.80	460.51	310.00	65.22
332	.00	460.70	322.00	60.10
352	17.64	460.67	318.00	61.82
364	17.66	460.60	317.00	62.23
376	9.84	461.00	328.00	57.63
378	9.84	460.78	328.00	57.54
380	9.84	460.75	326.00	58.39
382	9.84	460.73	326.00	58.38

MAXIMUM PRESSURES

2	.00	610.00	280.00	143.00
8	.00	609.59	290.00	138.49
4	.00	610.00	292.00	137.80
59	.00	610.00	292.00	137.80
53	.00	609.88	292.00	137.75

MINIMUM PRESSURES

316	9.60	461.59	333.50	55.51
318	9.60	461.40	333.00	55.64
320	29.80	460.68	328.00	57.50
378	9.84	460.78	328.00	57.54
376	9.84	461.00	328.00	57.63

THE NET SYSTEM DEMAND = 3786.74

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	81.26
2	3705.48

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3786.74
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

APPENDIX E

COMPUTER MODELING OUTPUT
3ROOTS
PHASE 2 WATER SYSTEM WITH ONLY TWO (2) PR STATIONS

NODE AND PIPE DIAGRAM REFERENCE:

Exhibit A.2 in the back of the report.

CONDITIONS MODELED:

1. Average Day Demands
2. Peak Hour Demands
3. Maximum Day Demands plus 2,000 gpm Fire Flow at Node 316
4. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 324 and 328
5. Maximum Day Demands plus 4,000 gpm Fire Flow split between Nodes 13 and 15
6. Maximum Day Demands plus 3,000 gpm Fire Flow at Node 120, Pipe 125 Closed
7. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 40 and 44, Pipe 37 Closed
8. Maximum Day Demands plus 3,000 gpm Fire Flow split between Nodes 204 and 212, Pipe 125 Closed
9. Maximum Day Demands plus 4,000 gpm Fire Flow split between Nodes 13 and 15, Pipe 125 Closed
10. Maximum Day Demands plus 4,000 gpm Fire Flow split between Nodes 13 and 15, Pipe 37 Closed

Project: 3Roots Phase 2 **Velocity Check**
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Average Day Demands

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	346.49	0.55
3	16	346.03	0.55
6	16	346.49	0.55
8	16	346.03	0.55
10	16	32.97	0.05
11	16	-42.82	-0.07
12	16	72.81	0.12
13	20	-121.66	-0.12
14	12	-39.08	-0.11
15	18	221.43	0.28
27	12	41.58	0.12
29	18	323.7	0.41
33	12	22.33	0.06
37	18	346.03	0.44
64	4	346.49	8.85
66	4 - PRV	346.49	8.85
68	4	346.49	8.85
70	10	0	0
72	10 - PRV	CLOSED	CLOSED
74	10	0	0
76	4	346.03	8.83
78	4 - PRV	346.03	8.83
80	4	346.03	8.83
82	10	0	0
84	10 - PRV	CLOSED	CLOSED
86	10	0	0
101	16	72.81	0.12
105	16	-35.63	-0.06
109	16	-80.65	-0.13
113	16	-143.32	-0.23
117	16	308.59	0.49
121	16	328.99	0.52
125	16	346.49	0.55
201	12	23.75	0.07
202	12	3.96	0.01
203	12	-23.12	-0.07
205	12	-3.94	-0.01
209	12	40.63	0.12
211	12	-47.96	-0.14
213	12	-74.21	-0.21
215	12	-91.77	-0.26
241	12	23.29	0.07
249	12	45.02	0.13
253	12	19.41	0.06
301	12	39.39	0.11
303	12	-3.95	-0.01
304	12	-24.29	-0.07
305	8	-17.81	-0.11
307	8	4.8	0.03
309	8	-22.61	-0.14
312	12	66.09	0.19
313	12	38.68	0.11
317	8	20.88	0.13
321	8	16.08	0.1
325	12	5.86	0.02
329	12	-9.04	-0.03
333	12	-5.6	-0.02
335	8	-0.67	0
337	12	20.09	0.06
341	12	-43.33	-0.12
357	12	14.43	0.04
387	12	23.25	0.07
389	8	15.43	0.1
393	8	-11.28	-0.07
399	8	-4.89	-0.03
401	8	5.62	0.04
403	8	-0.7	0
405	12	18.35	0.05

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Peak Hour Demands

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	1681.84	2.68
3	16	1642.25	2.62
6	16	1681.84	2.68
8	16	1642.25	2.62
10	16	153.89	0.25
11	16	-201.17	-0.32
12	16	335.17	0.53
13	20	-565.28	-0.58
14	12	-187.58	-0.53
15	18	1044.17	1.32
27	12	199.58	0.57
29	18	1535.07	1.94
33	12	107.18	0.3
37	18	1642.25	2.07
64	4	623.09	15.91
66	4 - PRV	623.09	15.91
68	4	623.09	15.91
70	10	1058.75	4.32
72	10 - PRV	1058.75	4.32
74	10	1058.75	4.32
76	4	622.39	15.89
78	4 - PRV	622.39	15.89
80	4	622.39	15.89
82	10	1019.86	4.17
84	10 - PRV	1019.86	4.17
86	10	1019.86	4.17
101	16	335.17	0.53
105	16	-180.1	-0.29
109	16	-397.18	-0.63
113	16	-698.6	-1.11
117	16	1499.92	2.39
121	16	1597.84	2.55
125	16	1681.84	2.68
201	12	112.19	0.32
202	12	14.64	0.04
203	12	-106.61	-0.3
205	12	-25.09	-0.07
209	12	195.02	0.55
211	12	-235.4	-0.67
213	12	-361.4	-1.03
215	12	-445.69	-1.26
241	12	111.79	0.32
249	12	217.08	0.62
253	12	94.15	0.27
301	12	189.63	0.54
303	12	-20.95	-0.06
304	12	-119.47	-0.34
305	8	-86.97	-0.56
307	8	23.04	0.15
309	8	-110.01	-0.7
312	12	320.11	0.91
313	12	187.06	0.53
317	8	101.62	0.65
321	8	78.58	0.5
325	12	29.59	0.08
329	12	-41.93	-0.12
333	12	-28.8	-0.08
335	8	-4.05	-0.03
337	12	97.06	0.28
341	12	-210.58	-0.6
357	12	71.18	0.2
387	12	113.52	0.32
389	8	74.9	0.48
393	8	-55.54	-0.35
399	8	-23.91	-0.15
401	8	27.37	0.17
403	8	-3.76	-0.02
405	12	84.65	0.24

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands Plus 2000 gpm at Node 316

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	1882.48	3
3	16	1492.96	2.38
6	16	1882.48	3
8	16	1492.96	2.38
10	16	227.88	0.36
11	16	-247.58	-0.4
12	16	784.58	1.25
13	20	-1044.22	-1.07
14	12	-78.16	-0.22
15	18	1243.76	1.57
27	12	83.16	0.24
29	18	1448.3	1.83
33	12	44.66	0.13
37	18	1492.96	1.88
64	4	626.87	16
66	4 - PRV	626.87	16
68	4	626.87	16
70	10	1255.6	5.13
72	10 - PRV	1255.6	5.13
74	10	1255.6	5.13
76	4	619.92	15.83
78	4 - PRV	619.92	15.83
80	4	619.92	15.83
82	10	873.05	3.57
84	10 - PRV	873.05	3.57
86	10	873.05	3.57
101	16	784.58	1.25
105	16	258.95	0.41
109	16	315.98	0.5
113	16	-494.36	-0.79
117	16	1806.68	2.88
121	16	1847.48	2.95
125	16	1882.48	3
201	12	0.92	0
202	12	169.86	0.48
203	12	-208.18	-0.59
205	12	107.49	0.3
209	12	81.26	0.23
211	12	-127.62	-0.36
213	12	-180.12	-0.51
215	12	-215.24	-0.61
241	12	46.58	0.13
249	12	-57.02	-0.16
253	12	-108.24	-0.31
301	12	763.75	2.17
303	12	821.34	2.33
304	12	991.71	2.81
305	8	-221.16	-1.41
307	8	9.6	0.06
309	8	-230.76	-1.47
312	12	1082.29	3.07
313	12	841.92	2.39
317	8	806.32	5.15
321	8	-1193.68	-7.62
325	12	-143.17	-0.41
329	12	-172.97	-0.49
333	12	189.25	0.54
335	8	209.73	1.34
337	12	96.37	0.27
341	12	57.58	0.16
357	12	-171.59	-0.49
387	12	-153.95	-0.44
389	8	-180.21	-1.15
393	8	1203.28	7.68
399	8	114.58	0.73
401	8	-75.47	-0.48
403	8	85.31	0.54
405	12	392.02	1.11

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands Plus 3000 gpm Split Between Nodes 324 and 328

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	2357.21	3.76
3	16	1968.23	3.14
6	16	2357.21	3.76
8	16	1968.23	3.14
10	16	303.78	0.48
11	16	-323.48	-0.52
12	16	1183.95	1.89
13	20	-1519.49	-1.55
14	12	-78.16	-0.22
15	18	1719.03	2.17
27	12	83.16	0.24
29	18	1923.57	2.43
33	12	44.66	0.13
37	18	1968.23	2.48
64	4	637.95	16.29
66	4 - PRV	637.95	16.29
68	4	637.95	16.29
70	10	1719.26	7.02
72	10 - PRV	1719.26	7.02
74	10	1719.26	7.02
76	4	628.67	16.05
78	4 - PRV	628.67	16.05
80	4	628.67	16.05
82	10	1339.56	5.47
84	10 - PRV	1339.56	5.47
86	10	1339.56	5.47
101	16	1183.95	1.89
105	16	-33.2	-0.05
109	16	161.24	0.26
113	16	-1179.53	-1.88
117	16	2281.41	3.64
121	16	2322.21	3.71
125	16	2357.21	3.76
201	12	-220.84	-0.63
202	12	245.76	0.7
203	12	-284.08	-0.81
205	12	-38.38	-0.11
209	12	81.26	0.23
211	12	-410.91	-1.17
213	12	-463.41	-1.31
215	12	-498.53	-1.41
241	12	46.58	0.13
249	12	-194.45	-0.55
253	12	-245.67	-0.7
301	12	1294.19	3.67
303	12	-99.56	-0.28
304	12	-504.95	-1.43
305	8	-271.84	-1.73
307	8	9.6	0.06
309	8	-281.44	-1.8
312	12	588.55	1.67
313	12	297.51	0.84
317	8	261.91	1.67
321	8	252.31	1.61
325	12	852.22	2.42
329	12	-647.78	-1.84
333	12	-842.46	-2.39
335	8	-366.03	-2.34
337	12	516	1.46
341	12	-1393.76	-3.95
357	12	860.12	2.44
387	12	877.76	2.49
389	8	395.55	2.52
393	8	-242.71	-1.55
399	8	-222.05	-1.42
401	8	163.66	1.04
403	8	-153.82	-0.98
405	12	1305.32	3.7

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: All Pipes Open - Max Day Demands Plus 4000 gpm Split Between Nodes 13 and 15

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	2740.4	4.37
3	16	2605.24	4.16
6	16	2740.4	4.37
8	16	2605.24	4.16
10	16	949.44	1.51
11	16	-2949.44	-4.71
12	16	-805	-1.28
13	20	-2156.5	-2.2
14	12	-78.16	-0.22
15	18	2356.04	2.97
27	12	83.16	0.24
29	18	2560.58	3.23
33	12	44.66	0.13
37	18	2605.24	3.28
64	4	648.78	16.56
66	4 - PRV	648.78	16.56
68	4	648.78	16.56
70	10	2091.62	8.54
72	10 - PRV	2091.62	8.54
74	10	2091.62	8.54
76	4	644.78	16.46
78	4 - PRV	644.78	16.46
80	4	644.78	16.46
82	10	1960.46	8.01
84	10 - PRV	1960.46	8.01
86	10	1960.46	8.01
101	16	-805	-1.28
105	16	-1000.28	-1.6
109	16	-1216.74	-1.94
113	16	-1453.08	-2.32
117	16	2664.6	4.25
121	16	2705.4	4.32
125	16	2740.4	4.37
201	12	449.07	1.27
202	12	-1088.88	-3.09
203	12	1050.56	2.98
205	12	-703.11	-1.99
209	12	81.26	0.23
211	12	-664.73	-1.89
213	12	-717.23	-2.03
215	12	-752.35	-2.13
241	12	46.58	0.13
249	12	216.46	0.61
253	12	165.24	0.47
301	12	189.76	0.54
303	12	-218.22	-0.62
304	12	-360.77	-1.02
305	8	-197.11	-1.26
307	8	9.6	0.06
309	8	-206.71	-1.32
312	12	444.37	1.26
313	12	228.06	0.65
317	8	192.46	1.23
321	8	182.86	1.17
325	12	200.36	0.57
329	12	170.56	0.48
333	12	-245.71	-0.7
335	8	-103.19	-0.66
337	12	126.97	0.36
341	12	-407.99	-1.16
357	12	263.37	0.75
387	12	281.01	0.8
389	8	132.71	0.85
393	8	-173.26	-1.11
399	8	-68.48	-0.44
401	8	54.39	0.35
403	8	-44.55	-0.28
405	12	-386.47	-1.1

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm at Node 120

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	0	0
3	16	4350.04	6.94
6	16	0	0
8	16	4350.04	6.94
10	16	829.49	1.32
11	16	-849.19	-1.35
12	16	3040.05	4.85
13	20	-3901.3	-3.98
14	12	-78.16	-0.22
15	18	4100.84	5.17
27	12	83.16	0.24
29	18	4305.38	5.43
33	12	44.66	0.13
37	18	4350.04	5.48
64	4	0	0
66	4 - PRV	0	0
68	4	0	0
70	10	0	0
72	10 - PRV	CLOSED	CLOSED
74	10	0	0
76	4	709.61	18.12
78	4 - PRV	709.61	18.12
80	4	709.61	18.12
82	10	3640.43	14.87
84	10 - PRV	3640.43	14.87
86	10	3640.43	14.87
101	16	3040.05	4.85
105	16	1871.86	2.99
109	16	1766.6	2.82
113	16	1801.77	2.87
117	16	-3040.8	-4.85
121	16	-3000	-4.79
125	16	CLOSED	CLOSED
201	12	285.62	0.81
202	12	771.47	2.19
203	12	-809.79	-2.3
205	12	993.79	2.82
209	12	81.26	0.23
211	12	920.97	2.61
213	12	868.47	2.46
215	12	833.35	2.36
241	12	46.58	0.13
249	12	105.26	0.3
253	12	54.04	0.15
301	12	-81.75	-0.23
303	12	371.66	1.05
304	12	504.08	1.43
305	8	251.51	1.61
307	8	9.6	0.06
309	8	241.91	1.54
312	12	-420.48	-1.19
313	12	-188.17	-0.53
317	8	-223.77	-1.43
321	8	-233.37	-1.49
325	12	-294.26	-0.83
329	12	-324.06	-0.92
333	12	396.04	1.12
335	8	171.78	1.1
337	12	-92.68	-0.26
341	12	453.41	1.29
357	12	-378.38	-1.07
387	12	-360.74	-1.02
389	8	-142.26	-0.91
393	8	242.97	1.55
399	8	92.46	0.59
401	8	-59.64	-0.38
403	8	69.48	0.44
405	12	749.89	2.13

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 37 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 40 and 44

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	4340.38	6.93
3	16	0	0
6	16	4340.38	6.93
8	16	0	0
10	16	-692.72	-1.11
11	16	673.02	1.07
12	16	-2743.12	-4.38
13	20	3404.08	3.48
14	12	-78.16	-0.22
15	18	-3204.54	-4.04
27	12	83.16	0.24
29	18	-3000	-3.78
33	12	1500	4.25
37	18	CLOSED	CLOSED
64	4	710.91	18.15
66	4 - PRV	710.91	18.15
68	4	710.91	18.15
70	10	3629.47	14.83
72	10 - PRV	3629.47	14.83
74	10	3629.47	14.83
76	4	0	0
78	4 - PRV	0	0
80	4	0	0
82	10	0	0
84	10 - PRV	CLOSED	CLOSED
86	10	0	0
101	16	-2743.12	-4.38
105	16	-1925.13	-3.07
109	16	-2039.88	-3.25
113	16	-2374.05	-3.79
117	16	4264.58	6.8
121	16	4305.38	6.87
125	16	4340.38	6.93
201	12	-220.16	-0.62
202	12	-750.74	-2.13
203	12	712.42	2.02
205	12	-1034.2	-2.93
209	12	81.26	0.23
211	12	-1097.54	-3.11
213	12	-1150.04	-3.26
215	12	-1185.16	-3.36
241	12	46.58	0.13
249	12	114.74	0.33
253	12	63.52	0.18
301	12	287.59	0.82
303	12	-382.58	-1.09
304	12	-606.97	-1.72
305	8	-324.73	-2.07
307	8	9.6	0.06
309	8	-334.33	-2.13
312	12	690.57	1.96
313	12	346.64	0.98
317	8	311.04	1.99
321	8	301.44	1.92
325	12	350.54	0.99
329	12	320.74	0.91
333	12	-439.56	-1.25
335	8	-185.03	-1.18
337	12	195.31	0.55
341	12	-670.18	-1.9
357	12	457.22	1.3
387	12	474.86	1.35
389	8	214.55	1.37
393	8	-291.84	-1.86
399	8	-116.28	-0.74
401	8	88.43	0.56
403	8	-78.59	-0.5
405	12	-730.51	-2.07

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 204 and 212

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	0	0
3	16	4286.94	6.84
6	16	0	0
8	16	4286.94	6.84
10	16	850.8	1.36
11	16	-870.5	-1.39
12	16	2955.64	4.72
13	20	-3838.2	-3.92
14	12	-78.16	-0.22
15	18	4037.74	5.09
27	12	83.16	0.24
29	18	4242.28	5.35
33	12	44.66	0.13
37	18	4286.94	6.84
64	4	0	0
66	4 - PRV	0	0
68	4	0	0
70	10	0	0
72	10 - PRV	CLOSED	CLOSED
74	10	0	0
76	4	706.83	18.04
78	4 - PRV	706.83	18.04
80	4	706.83	18.04
82	10	3580.11	14.62
84	10 - PRV	3580.11	14.62
86	10	3580.11	14.62
101	16	2955.64	4.72
105	16	1718.72	2.74
109	16	697.52	1.11
113	16	800.84	1.28
117	16	-75.8	-0.12
121	16	-35	-0.06
125	16	CLOSED	CLOSED
201	12	542.87	1.54
202	12	792.78	2.25
203	12	-831.1	-2.36
205	12	1272.35	3.61
209	12	81.26	0.23
211	12	661.07	1.88
213	12	-838.93	-2.38
215	12	-874.05	-2.48
241	12	46.58	0.13
249	12	1021.2	2.9
253	12	969.98	2.75
301	12	-149.9	-0.43
303	12	171.22	0.49
304	12	247.41	0.7
305	8	118.52	0.76
307	8	9.6	0.06
309	8	108.92	0.7
312	12	-163.81	-0.46
313	12	-64.48	-0.18
317	8	-100.08	-0.64
321	8	-109.68	-0.7
325	12	-211.39	-0.6
329	12	-241.19	-0.68
333	12	290.37	0.82
335	8	115.54	0.74
337	12	-66.05	-0.19
341	12	321.12	0.91
357	12	-272.71	-0.77
387	12	-255.07	-0.72
389	8	-86.02	-0.55
393	8	119.28	0.76
399	8	59.64	0.38
401	8	-36.23	-0.23
403	8	46.07	0.29
405	12	561.37	1.59

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 4000 gpm Split Between Nodes 13 and 15

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	0	0
3	16	5345.64	8.53
6	16	0	0
8	16	5345.64	8.53
10	16	1115.28	1.78
11	16	-3115.28	-4.97
12	16	1769.56	2.82
13	20	-4896.9	-5
14	12	-78.16	-0.22
15	18	5096.44	6.43
27	12	83.16	0.24
29	18	5300.98	6.68
33	12	44.66	0.13
37	18	5345.64	8.53
64	4	0	0
66	4 - PRV	0	0
68	4	0	0
70	10	0	0
72	10 - PRV	CLOSED	CLOSED
74	10	0	0
76	4	757.13	19.33
78	4 - PRV	757.13	19.33
80	4	757.13	19.33
82	10	4588.51	18.74
84	10 - PRV	4588.51	18.74
86	10	4588.51	18.74
101	16	1769.56	2.82
105	16	721.76	1.15
109	16	325.58	0.52
113	16	273.29	0.44
117	16	-75.8	-0.12
121	16	-35	-0.06
125	16	CLOSED	CLOSED
201	12	659.68	1.87
202	12	-923.04	-2.62
203	12	884.72	2.51
205	12	-326.66	-0.93
209	12	81.26	0.23
211	12	-108.57	-0.31
213	12	-161.07	-0.46
215	12	-196.19	-0.56
241	12	46.58	0.13
249	12	396.17	1.12
253	12	344.95	0.98
301	12	5.71	0.02
303	12	87.89	0.25
304	12	97.09	0.28
305	8	41	0.26
307	8	9.6	0.06
309	8	31.4	0.2
312	12	-13.49	-0.04
313	12	8.31	0.02
317	8	-27.29	-0.17
321	8	-36.89	-0.24
325	12	-77.39	-0.22
329	12	-107.19	-0.3
333	12	118.45	0.34
335	8	48.56	0.31
337	12	0.97	0
341	12	82.18	0.23
357	12	-100.79	-0.29
387	12	-83.15	-0.24
389	8	-19.04	-0.12
393	8	46.49	0.3
399	8	20.75	0.13
401	8	-8.13	-0.05
403	8	17.97	0.11
405	12	255.45	0.72

Project: 3Roots Phase 2
Date: 12/20/2018
Job Number: 537-012

Scenario: Pipe 37 CLOSED - Max Day Demands Plus 4000 gpm Split Between Nodes 13 and 15

Pipe No.	Pipe Size (inches)	Model Run Flow (gpm)	Model Run Velocity (fps)
2	16	5345.64	8.53
3	16	0	0
6	16	5345.64	8.53
8	16	0	0
10	16	661.95	1.06
11	16	-2661.95	-4.25
12	16	-3122.75	-4.98
13	20	448.74	0.46
14	12	-78.16	-0.22
15	18	-249.2	-0.31
27	12	83.16	0.24
29	18	-44.66	-0.06
33	12	44.66	0.13
37	18	CLOSED	CLOSED
64	4	757.14	19.33
66	4 - PRV	757.14	19.33
68	4	757.14	19.33
70	10	4588.5	18.74
72	10 - PRV	4588.5	18.74
74	10	4588.5	18.74
76	4	0	0
78	4 - PRV	0	0
80	4	0	0
82	10	0	0
84	10 - PRV	CLOSED	CLOSED
86	10	0	0
101	16	-3122.75	-4.98
105	16	-2420.5	-3.86
109	16	-2566.48	-4.1
113	16	-2948.04	-4.7
117	16	5269.84	8.41
121	16	5310.64	8.47
125	16	5345.64	8.53
201	12	95.4	0.27
202	12	-1376.37	-3.9
203	12	1338.05	3.8
205	12	-1344.27	-3.81
209	12	81.26	0.23
211	12	-1376.37	-3.9
213	12	-1428.87	-4.05
215	12	-1463.99	-4.15
241	12	46.58	0.13
249	12	145.98	0.41
253	12	94.76	0.27
301	12	334.98	0.95
303	12	-486.73	-1.38
304	12	-759.41	-2.15
305	8	-403.76	-2.58
307	8	9.6	0.06
309	8	-413.36	-2.64
312	12	843.01	2.39
313	12	420.06	1.19
317	8	384.46	2.45
321	8	374.86	2.39
325	12	437.76	1.24
329	12	407.96	1.16
333	12	-552.17	-1.57
335	8	-233.33	-1.49
337	12	234.23	0.66
341	12	-821.7	-2.33
357	12	569.83	1.62
387	12	587.47	1.67
389	8	262.85	1.68
393	8	-365.26	-2.33
399	8	-144.5	-0.92
401	8	108.51	0.69
403	8	-98.67	-0.63
405	12	-930.33	-2.64

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Average Day Demands

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.66	-0.01
10	320	610	125.65	125.66	-0.01
12	320	485	71.49	69.99	1.50
13	250	485	101.82	100.27	1.55
14	335	625	125.65	125.66	-0.01
15	256	485	99.22	97.67	1.55
16	328	625	128.68	128.7	-0.02
17	261	485	97.05	95.5	1.55
18	328	485	68.02	66.53	1.49
20	262	485	96.62	95.07	1.55
22	280	485	88.82	87.27	1.55
24	280	485	88.82	87.27	1.55
32	300	485	80.16	78.61	1.55
36	298	485	81.02	79.48	1.54
40	317	485	72.79	71.29	1.50
44	318	485	72.36	70.85	1.51
65	320	610	125.65	124.91	0.74
67	320	485	71.49	70.75	0.74
71	320	610	125.65	125.66	-0.01
73	320	485	71.49	69.99	1.50
77	328	625	128.68	127.94	0.74
79	328	485	68.02	67.28	0.74
83	328	625	128.68	128.7	-0.02
85	328	485	68.02	66.53	1.49
100	270	485	93.15	91.6	1.55
104	294	485	82.76	81.2	1.56
108	306	485	77.56	76	1.56
112	308	485	76.69	75.14	1.55
116	305	485	77.99	76.46	1.53
120	298	485	81.02	79.51	1.51
200	274	485	91.42	89.86	1.56
202	268	485	94.02	92.46	1.56
204	288	485	85.36	83.8	1.56
208	292	485	83.62	82.06	1.56
212	297	485	81.46	79.9	1.56
216	306	485	77.56	76.01	1.55
232	306	485	77.56	76	1.56
236	292	485	83.62	82.07	1.55
300	314	485	74.09	72.53	1.56
302	322	485	70.62	69.07	1.55
304	325.5	485	69.11	67.55	1.56
306	317	485	72.79	71.23	1.56
308	314	485	74.09	72.54	1.55
312	321	485	71.06	69.51	1.55
316	333.5	485	65.64	64.08	1.56
318	333	485	65.86	64.3	1.56
320	328	485	68.02	66.46	1.56
324	312	485	74.96	73.4	1.56
328	310	485	75.82	74.26	1.56
332	322	485	70.62	69.06	1.56
352	318	485	72.36	70.8	1.56
364	317	485	72.79	71.23	1.56
376	328	485	68.02	66.47	1.55
378	328	485	68.02	66.46	1.56
380	326	485	68.89	67.33	1.56
382	326	485	68.89	67.33	1.56

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Peak Hour Demands

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.63	0.02
10	320	610	125.65	125.58	0.07
12	320	485	71.49	67.03	4.46
13	250	485	101.82	96.25	5.57
14	335	625	125.65	125.63	0.02
15	256	485	99.22	93.66	5.56
16	328	625	128.68	128.62	0.06
17	261	485	97.05	91.5	5.55
18	328	485	68.02	63.57	4.45
20	262	485	96.62	91.06	5.56
22	280	485	88.82	83.32	5.50
24	280	485	88.82	83.34	5.48
32	300	485	80.16	74.83	5.33
36	298	485	81.02	75.72	5.30
40	317	485	72.79	68.15	4.64
44	318	485	72.36	67.73	4.63
65	320	610	125.65	123.35	2.30
67	320	485	71.49	69.26	2.23
71	320	610	125.65	125.52	0.13
73	320	485	71.49	67.1	4.39
77	328	625	128.68	126.39	2.29
79	328	485	68.02	65.8	2.22
83	328	625	128.68	128.56	0.12
85	328	485	68.02	63.64	4.38
100	270	485	93.15	87.58	5.57
104	294	485	82.76	77.19	5.57
108	306	485	77.56	72.02	5.54
112	308	485	76.69	71.33	5.36
116	305	485	77.99	72.98	5.01
120	298	485	81.02	76.25	4.77
200	274	485	91.42	85.83	5.59
202	268	485	94.02	88.43	5.59
204	288	485	85.36	79.77	5.59
208	292	485	83.62	78.02	5.60
212	297	485	81.46	75.93	5.53
216	306	485	77.56	72.15	5.41
232	306	485	77.56	72.01	5.55
236	292	485	83.62	78.04	5.58
300	314	485	74.09	68.53	5.56
302	322	485	70.62	65.07	5.55
304	325.5	485	69.11	63.59	5.52
306	317	485	72.79	67.23	5.56
308	314	485	74.09	68.71	5.38
312	321	485	71.06	65.66	5.40
316	333.5	485	65.64	60.11	5.53
318	333	485	65.86	60.32	5.54
320	328	485	68.02	62.43	5.59
324	312	485	74.96	69.36	5.60
328	310	485	75.82	70.23	5.59
332	322	485	70.62	65.04	5.58
352	318	485	72.36	66.77	5.59
364	317	485	72.79	67.2	5.59
376	328	485	68.02	62.46	5.56
378	328	485	68.02	62.43	5.59
380	326	485	68.89	63.3	5.59
382	326	485	68.89	63.3	5.59

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Max Day Demands Plus 2000 gpm at Node 316

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.62	0.03
10	320	610	125.65	125.57	0.08
12	320	485	71.49	66.98	4.51
13	250	485	101.82	96.16	5.66
14	335	625	125.65	125.63	0.02
15	256	485	99.22	93.57	5.65
16	328	625	128.68	128.63	0.05
17	261	485	97.05	91.43	5.62
18	328	485	68.02	63.6	4.42
20	262	485	96.62	90.96	5.66
22	280	485	88.82	83.39	5.43
24	280	485	88.82	83.4	5.42
32	300	485	80.16	74.98	5.18
36	298	485	81.02	75.85	5.17
40	317	485	72.79	68.22	4.57
44	318	485	72.36	67.79	4.57
65	320	610	125.65	123.3	2.35
67	320	485	71.49	69.24	2.25
71	320	610	125.65	125.47	0.18
73	320	485	71.49	67.07	4.42
77	328	625	128.68	126.42	2.26
79	328	485	68.02	65.82	2.20
83	328	625	128.68	128.59	0.09
85	328	485	68.02	63.65	4.37
100	270	485	93.15	87.4	5.75
104	294	485	82.76	76.98	5.78
108	306	485	77.56	71.76	5.80
112	308	485	76.69	70.99	5.70
116	305	485	77.99	72.78	5.21
120	298	485	81.02	76.13	4.89
200	274	485	91.42	85.67	5.75
202	268	485	94.02	88.3	5.72
204	288	485	85.36	79.59	5.77
208	292	485	83.62	77.86	5.76
212	297	485	81.46	75.71	5.75
216	306	485	77.56	71.85	5.71
232	306	485	77.56	71.76	5.80
236	292	485	83.62	77.85	5.77
300	314	485	74.09	68.01	6.08
302	322	485	70.62	63.97	6.65
304	325.5	485	69.11	62.67	6.44
306	317	485	72.79	66.13	6.66
308	314	485	74.09	68.17	5.92
312	321	485	71.06	64.85	6.21
316	333.5	485	65.64	53.52	12.12
318	333	485	65.86	55.84	10.02
320	328	485	68.02	61.94	6.08
324	312	485	74.96	68.91	6.05
328	310	485	75.82	69.79	6.03
332	322	485	70.62	64.55	6.07
352	318	485	72.36	66.29	6.07
364	317	485	72.79	66.73	6.06
376	328	485	68.02	61.65	6.37
378	328	485	68.02	61.81	6.21
380	326	485	68.89	62.7	6.19
382	326	485	68.89	62.73	6.16

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Max Day Demands Plus 3000 gpm Split Between Nodes 324 and 328

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.59	0.06
10	320	610	125.65	125.51	0.14
12	320	485	71.49	66.83	4.66
13	250	485	101.82	95.09	6.73
14	335	625	125.65	125.61	0.04
15	256	485	99.22	92.51	6.71
16	328	625	128.68	128.59	0.09
17	261	485	97.05	90.38	6.67
18	328	485	68.02	63.49	4.53
20	262	485	96.62	89.89	6.73
22	280	485	88.82	82.55	6.27
24	280	485	88.82	82.56	6.26
32	300	485	80.16	74.34	5.82
36	298	485	81.02	75.21	5.81
40	317	485	72.79	68	4.79
44	318	485	72.36	67.57	4.79
65	320	610	125.65	123.18	2.47
67	320	485	71.49	69.16	2.33
71	320	610	125.65	125.34	0.31
73	320	485	71.49	67	4.49
77	328	625	128.68	126.32	2.36
79	328	485	68.02	65.76	2.26
83	328	625	128.68	128.48	0.20
85	328	485	68.02	63.59	4.43
100	270	485	93.15	86.22	6.93
104	294	485	82.76	75.82	6.94
108	306	485	77.56	70.61	6.95
112	308	485	76.69	70.21	6.48
116	305	485	77.99	72.27	5.72
120	298	485	81.02	75.78	5.24
200	274	485	91.42	84.53	6.89
202	268	485	94.02	87.19	6.83
204	288	485	85.36	78.46	6.90
208	292	485	83.62	76.73	6.89
212	297	485	81.46	74.73	6.73
216	306	485	77.56	71.02	6.54
232	306	485	77.56	70.61	6.95
236	292	485	83.62	76.7	6.92
300	314	485	74.09	66.39	7.70
302	322	485	70.62	63.01	7.61
304	325.5	485	69.11	61.81	7.30
306	317	485	72.79	65.17	7.62
308	314	485	74.09	67.54	6.55
312	321	485	71.06	64.47	6.59
316	333.5	485	65.64	58.31	7.33
318	333	485	65.86	58.41	7.45
320	328	485	68.02	59.23	8.79
324	312	485	74.96	65.24	9.72
328	310	485	75.82	66.32	9.50
332	322	485	70.62	61.95	8.67
352	318	485	72.36	63.57	8.79
364	317	485	72.79	63.72	9.07
376	328	485	68.02	60.32	7.70
378	328	485	68.02	59.62	8.40
380	326	485	68.89	60.41	8.48
382	326	485	68.89	60.3	8.59

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: All Pipes Open - Max Day Demands Plus 4000 gpm Split Between Nodes 13 and 15

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.57	0.08
10	320	610	125.65	125.46	0.19
12	320	485	71.49	66.68	4.81
13	250	485	101.82	91.19	10.63
14	335	625	125.65	125.57	0.08
15	256	485	99.22	88.82	10.40
16	328	625	128.68	128.52	0.16
17	261	485	97.05	88.54	8.51
18	328	485	68.02	63.27	4.75
20	262	485	96.62	88.14	8.48
22	280	485	88.82	81.09	7.73
24	280	485	88.82	81.09	7.73
32	300	485	80.16	73.24	6.92
36	298	485	81.02	74.11	6.91
40	317	485	72.79	67.62	5.17
44	318	485	72.36	67.19	5.17
65	320	610	125.65	123.05	2.60
67	320	485	71.49	69.09	2.40
71	320	610	125.65	125.22	0.43
73	320	485	71.49	66.92	4.57
77	328	625	128.68	126.13	2.55
79	328	485	68.02	65.65	2.37
83	328	625	128.68	128.3	0.38
85	328	485	68.02	63.48	4.54
100	270	485	93.15	84.77	8.38
104	294	485	82.76	74.6	8.16
108	306	485	77.56	69.65	7.91
112	308	485	76.69	69.47	7.22
116	305	485	77.99	71.77	6.22
120	298	485	81.02	75.44	5.58
200	274	485	91.42	82.88	8.54
202	268	485	94.02	84.49	9.53
204	288	485	85.36	77.17	8.19
208	292	485	83.62	75.43	8.19
212	297	485	81.46	73.68	7.78
216	306	485	77.56	70.21	7.35
232	306	485	77.56	69.65	7.91
236	292	485	83.62	75.45	8.17
300	314	485	74.09	66.16	7.93
302	322	485	70.62	62.76	7.86
304	325.5	485	69.11	61.42	7.69
306	317	485	72.79	64.93	7.86
308	314	485	74.09	66.83	7.26
312	321	485	71.06	63.77	7.29
316	333.5	485	65.64	57.94	7.70
318	333	485	65.86	58.09	7.77
320	328	485	68.02	59.98	8.04
324	312	485	74.96	66.85	8.11
328	310	485	75.82	67.7	8.12
332	322	485	70.62	62.59	8.03
352	318	485	72.36	64.31	8.05
364	317	485	72.79	64.71	8.08
376	328	485	68.02	60.12	7.90
378	328	485	68.02	60.03	7.99
380	326	485	68.89	60.88	8.01
382	326	485	68.89	60.87	8.02

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm at Node 120

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.67	-0.02
10	320	610	125.65	125.67	-0.02
12	320	485	71.49	71.5	-0.01
13	250	485	101.82	85.5	16.32
14	335	625	125.65	125.43	0.22
15	256	485	99.22	83.08	16.14
16	328	625	128.68	128.22	0.46
17	261	485	97.05	81.1	15.95
18	328	485	68.02	62.34	5.68
20	262	485	96.62	80.32	16.30
22	280	485	88.82	75.22	13.60
24	280	485	88.82	75.23	13.59
32	300	485	80.16	68.83	11.33
36	298	485	81.02	69.7	11.32
40	317	485	72.79	66.03	6.76
44	318	485	72.36	65.6	6.76
65	320	610	125.65	125.67	-0.02
67	320	485	71.49	71.5	-0.01
71	320	610	125.65	125.67	-0.02
73	320	485	71.49	71.5	-0.01
77	328	625	128.68	125.38	3.30
79	328	485	68.02	65.19	2.83
83	328	625	128.68	127.54	1.14
85	328	485	68.02	63.02	5.00
100	270	485	93.15	75.7	17.45
104	294	485	82.76	64.56	18.20
108	306	485	77.56	58.86	18.70
112	308	485	76.69	56.97	19.72
116	305	485	77.99	56.99	21.00
120	298	485	81.02	59.25	21.77
200	274	485	91.42	73.9	17.52
202	268	485	94.02	77.02	17.00
204	288	485	85.36	67.15	18.21
208	292	485	83.62	65.42	18.20
212	297	485	81.46	62.51	18.95
216	306	485	77.56	57.99	19.57
232	306	485	77.56	58.86	18.70
236	292	485	83.62	65.42	18.20
300	314	485	74.09	55.4	18.69
302	322	485	70.62	51.78	18.84
304	325.5	485	69.11	49.99	19.12
306	317	485	72.79	53.95	18.84
308	314	485	74.09	54.41	19.68
312	321	485	71.06	51.39	19.67
316	333.5	485	65.64	46.53	19.11
318	333	485	65.86	46.84	19.02
320	328	485	68.02	49.46	18.56
324	312	485	74.96	56.52	18.44
328	310	485	75.82	57.45	18.37
332	322	485	70.62	52.05	18.57
352	318	485	72.36	53.81	18.55
364	317	485	72.79	54.31	18.48
376	328	485	68.02	49.27	18.75
378	328	485	68.02	49.37	18.65
380	326	485	68.89	50.25	18.64
382	326	485	68.89	50.28	18.61

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 37 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 40 and 44

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.43	0.22
10	320	610	125.65	125.19	0.46
12	320	485	71.49	65.79	5.70
13	250	485	101.82	86.32	15.50
14	335	625	125.65	125.67	-0.02
15	256	485	99.22	83.59	15.63
16	328	625	128.68	128.7	-0.02
17	261	485	97.05	81.3	15.75
18	328	485	68.02	68.03	-0.01
20	262	485	96.62	81.15	15.47
22	280	485	88.82	71.23	17.59
24	280	485	88.82	71.23	17.59
32	300	485	80.16	61.12	19.04
36	298	485	81.02	62	19.02
40	317	485	72.79	50.61	22.18
44	318	485	72.36	50.99	21.37
65	320	610	125.65	122.34	3.31
67	320	485	71.49	68.65	2.84
71	320	610	125.65	124.52	1.13
73	320	485	71.49	66.49	5.00
77	328	625	128.68	128.7	-0.02
79	328	485	68.02	68.03	-0.01
83	328	625	128.68	128.7	-0.02
85	328	485	68.02	68.03	-0.01
100	270	485	93.15	78.61	14.54
104	294	485	82.76	68.99	13.77
108	306	485	77.56	64.44	13.12
112	308	485	76.69	65.29	11.40
116	305	485	77.99	68.98	9.01
120	298	485	81.02	73.52	7.50
200	274	485	91.42	76.92	14.50
202	268	485	94.02	79.05	14.97
204	288	485	85.36	71.59	13.77
208	292	485	83.62	69.85	13.77
212	297	485	81.46	68.72	12.74
216	306	485	77.56	65.86	11.70
232	306	485	77.56	64.44	13.12
236	292	485	83.62	69.86	13.76
300	314	485	74.09	60.93	13.16
302	322	485	70.62	57.65	12.97
304	325.5	485	69.11	56.58	12.53
306	317	485	72.79	59.81	12.98
308	314	485	74.09	62.59	11.50
312	321	485	71.06	59.5	11.56
316	333.5	485	65.64	53.07	12.57
318	333	485	65.86	53.12	12.74
320	328	485	68.02	54.59	13.43
324	312	485	74.96	61.35	13.61
328	310	485	75.82	62.16	13.66
332	322	485	70.62	57.21	13.41
352	318	485	72.36	58.91	13.45
364	317	485	72.79	59.25	13.54
376	328	485	68.02	54.93	13.09
378	328	485	68.02	54.71	13.31
380	326	485	68.89	55.55	13.34
382	326	485	68.89	55.52	13.37

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 3000 gpm Split Between Nodes 204 and 212

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.67	-0.02
10	320	610	125.65	125.67	-0.02
12	320	485	71.49	71.5	-0.01
13	250	485	101.82	85	16.82
14	335	625	125.65	125.43	0.22
15	256	485	99.22	82.59	16.63
16	328	625	128.68	128.23	0.45
17	261	485	97.05	80.62	16.43
18	328	485	68.02	62.39	5.63
20	262	485	96.62	79.86	16.76
22	280	485	88.82	74.67	14.15
24	280	485	88.82	74.67	14.15
32	300	485	80.16	68.21	11.95
36	298	485	81.02	69.08	11.94
40	317	485	72.79	65.29	7.50
44	318	485	72.36	64.86	7.50
65	320	610	125.65	125.67	-0.02
67	320	485	71.49	71.5	-0.01
71	320	610	125.65	125.67	-0.02
73	320	485	71.49	71.5	-0.01
77	328	625	128.68	125.41	3.27
79	328	485	68.02	65.21	2.81
83	328	625	128.68	127.58	1.10
85	328	485	68.02	63.04	4.98
100	270	485	93.15	75.29	17.86
104	294	485	82.76	64.26	18.50
108	306	485	77.56	58.97	18.59
112	308	485	76.69	57.87	18.82
116	305	485	77.99	59.17	18.82
120	298	485	81.02	62.21	18.81
200	274	485	91.42	73.34	18.08
202	268	485	94.02	76.48	17.54
204	288	485	85.36	66.19	19.17
208	292	485	83.62	64.46	19.16
212	297	485	81.46	61.89	19.57
216	306	485	77.56	58.57	18.99
232	306	485	77.56	58.97	18.59
236	292	485	83.62	64.85	18.77
300	314	485	74.09	55.52	18.57
302	322	485	70.62	52.01	18.61
304	325.5	485	69.11	50.43	18.68
306	317	485	72.79	54.18	18.61
308	314	485	74.09	55.28	18.81
312	321	485	71.06	52.25	18.81
316	333.5	485	65.64	46.96	18.68
318	333	485	65.86	47.2	18.66
320	328	485	68.02	49.52	18.50
324	312	485	74.96	56.52	18.44
328	310	485	75.82	57.42	18.40
332	322	485	70.62	52.11	18.51
352	318	485	72.36	53.86	18.50
364	317	485	72.79	54.33	18.46
376	328	485	68.02	49.43	18.59
378	328	485	68.02	49.48	18.54
380	326	485	68.89	50.35	18.54
382	326	485	68.89	50.36	18.53

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 125 CLOSED - Max Day Demands Plus 4000 gpm Split Between Nodes 13 and 15

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.67	-0.02
10	320	610	125.65	125.67	-0.02
12	320	485	71.49	71.5	-0.01
13	250	485	101.82	76.51	25.31
14	335	625	125.65	125.32	0.33
15	256	485	99.22	74.23	24.99
16	328	625	128.68	128	0.68
17	261	485	97.05	74.14	22.91
18	328	485	68.02	61.62	6.40
20	262	485	96.62	73.58	23.04
22	280	485	88.82	69.5	19.32
24	280	485	88.82	69.5	19.32
32	300	485	80.16	64.23	15.93
36	298	485	81.02	65.1	15.92
40	317	485	72.79	63.58	9.21
44	318	485	72.36	63.15	9.21
65	320	610	125.65	125.67	-0.02
67	320	485	71.49	71.5	-0.01
71	320	610	125.65	125.67	-0.02
73	320	485	71.49	71.5	-0.01
77	328	625	128.68	124.79	3.89
79	328	485	68.02	64.83	3.19
83	328	625	128.68	126.96	1.72
85	328	485	68.02	62.66	5.36
100	270	485	93.15	69.69	23.46
104	294	485	82.76	59.17	23.59
108	306	485	77.56	53.94	23.62
112	308	485	76.69	53.05	23.64
116	305	485	77.99	54.35	23.64
120	298	485	81.02	57.38	23.64
200	274	485	91.42	67.64	23.78
202	268	485	94.02	69.52	24.50
204	288	485	85.36	61.66	23.70
208	292	485	83.62	59.93	23.69
212	297	485	81.46	57.78	23.68
216	306	485	77.56	53.9	23.66
232	306	485	77.56	53.94	23.62
236	292	485	83.62	59.98	23.64
300	314	485	74.09	50.48	23.61
302	322	485	70.62	47	23.62
304	325.5	485	69.11	45.48	23.63
306	317	485	72.79	49.17	23.62
308	314	485	74.09	50.45	23.64
312	321	485	71.06	47.41	23.65
316	333.5	485	65.64	42.01	23.63
318	333	485	65.86	42.23	23.63
320	328	485	68.02	44.42	23.60
324	312	485	74.96	51.36	23.60
328	310	485	75.82	52.23	23.59
332	322	485	70.62	47.02	23.60
352	318	485	72.36	48.75	23.61
364	317	485	72.79	49.19	23.60
376	328	485	68.02	44.41	23.61
378	328	485	68.02	44.41	23.61
380	326	485	68.89	45.28	23.61
382	326	485	68.89	45.28	23.61

3Roots Phase 2
Date: 12/20/2018
Job No. 537-012

Scenario: Pipe 37 CLOSED - Max Day Demands Plus 4000 gpm Split Between Nodes 13 and 15

Node No.	Node El. Ft.	HGL Zone Ft. (Static)	Static P psi	Model Run P, psi	Delta P from Static
8	290	610	138.65	138.32	0.33
10	320	610	125.65	124.97	0.68
12	320	485	71.49	65.08	6.41
13	250	485	101.82	79	22.82
14	335	625	125.65	125.67	-0.02
15	256	485	99.22	76.52	22.70
16	328	625	128.68	128.7	-0.02
17	261	485	97.05	75.91	21.14
18	328	485	68.02	68.03	-0.01
20	262	485	96.62	75.84	20.78
22	280	485	88.82	67.63	21.19
24	280	485	88.82	67.64	21.18
32	300	485	80.16	58.95	21.21
36	298	485	81.02	59.82	21.20
40	317	485	72.79	51.59	21.20
44	318	485	72.36	51.16	21.20
65	320	610	125.65	121.76	3.89
67	320	485	71.49	68.29	3.20
71	320	610	125.65	123.93	1.72
73	320	485	71.49	66.13	5.36
77	328	625	128.68	128.7	-0.02
79	328	485	68.02	68.03	-0.01
83	328	625	128.68	128.7	-0.02
85	328	485	68.02	68.03	-0.01
100	270	485	93.15	73.59	19.56
104	294	485	82.76	64.39	18.37
108	306	485	77.56	60.18	17.38
112	308	485	76.69	61.87	14.82
116	305	485	77.99	66.71	11.28
120	298	485	81.02	71.96	9.06
200	274	485	91.42	71.85	19.57
202	268	485	94.02	72.93	21.09
204	288	485	85.36	66.97	18.39
208	292	485	83.62	65.24	18.38
212	297	485	81.46	64.64	16.82
216	306	485	77.56	62.29	15.27
232	306	485	77.56	60.17	17.39
236	292	485	83.62	65.24	18.38
300	314	485	74.09	56.65	17.44
302	322	485	70.62	53.46	17.16
304	325.5	485	69.11	52.62	16.49
306	317	485	72.79	55.63	17.16
308	314	485	74.09	59.13	14.96
312	321	485	71.06	56.01	15.05
316	333.5	485	65.64	49.1	16.54
318	333	485	65.86	49.07	16.79
320	328	485	68.02	50.19	17.83
324	312	485	74.96	56.85	18.11
328	310	485	75.82	57.63	18.19
332	322	485	70.62	52.82	17.80
352	318	485	72.36	54.5	17.86
364	317	485	72.79	54.8	17.99
376	328	485	68.02	50.69	17.33
378	328	485	68.02	50.36	17.66
380	326	485	68.89	51.19	17.70
382	326	485	68.89	51.14	17.75

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

A SUMMARY OF THE ORIGINAL DATA FOLLOWS

THERE IS A PRV AT JUNCTION 65 FOR LINE 66 SET AT A GRADE OF 485.00
THERE IS A PRV AT JUNCTION 71 FOR LINE 72 SET AT A GRADE OF 475.00
THERE IS A PRV AT JUNCTION 77 FOR LINE 78 SET AT A GRADE OF 485.00
THERE IS A PRV AT JUNCTION 83 FOR LINE 84 SET AT A GRADE OF 475.00

PIPE NO.	NODE NOS.		LENGTH (FEET)	DIAMETER (INCHES)	ROUGHNESS	MINOR LOSS K	FIXED GRADE
2	0	8	50.0	16.0	120.0	.00	610.00
3	0	14	50.0	16.0	120.0	.00	625.00
6	8	10	50.0	16.0	120.0	.00	
8	14	16	50.0	16.0	120.0	.00	
10	15	13	810.0	16.0	120.0	.00	
11	15	17	810.0	16.0	120.0	.00	
12	17	20	140.0	16.0	120.0	.00	
13	17	24	1790.0	20.0	120.0	.00	
14	22	24	318.0	12.0	120.0	.00	
15	36	24	940.0	18.0	120.0	.00	
27	36	32	320.0	12.0	120.0	.00	
29	44	36	1730.0	18.0	120.0	.00	
33	44	40	300.0	12.0	120.0	.00	
37	18	44	400.0	18.0	120.0	.00	
64	10	65	20.0	4.0	120.0	.00	
66	65	67	20.0	4.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 66							
68	67	12	20.0	4.0	120.0	.00	
70	10	71	20.0	10.0	120.0	.00	
72	71	73	20.0	10.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 72							
74	73	12	20.0	10.0	120.0	.00	
76	16	77	20.0	4.0	120.0	.00	
78	77	79	20.0	4.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 78							
80	79	18	20.0	4.0	120.0	.00	
82	16	83	20.0	10.0	120.0	.00	
84	83	85	20.0	10.0	120.0	.00	
THERE IS A CHECK VALVE IN LINE NUMBER 84							
86	85	18	20.0	10.0	120.0	.00	
101	20	100	470.0	16.0	120.0	.00	
105	100	104	740.0	16.0	120.0	.00	
109	104	108	550.0	16.0	120.0	.00	
113	108	112	1100.0	16.0	120.0	.00	
117	116	112	520.0	16.0	120.0	.00	
121	120	116	320.0	16.0	120.0	.00	
125	12	120	380.0	16.0	120.0	.00	
201	100	200	540.0	12.0	120.0	.00	
202	202	200	660.0	12.0	120.0	.00	
203	202	13	790.0	12.0	120.0	.00	
205	200	204	540.0	12.0	120.0	.00	
209	204	208	215.0	12.0	120.0	.00	
211	204	212	680.0	12.0	120.0	.00	
213	212	216	630.0	12.0	120.0	.00	
215	216	112	170.0	12.0	120.0	.00	
241	108	232	300.0	12.0	120.0	.00	
249	104	236	210.0	12.0	120.0	.00	

253	236	204	320.0	12.0	120.0	.00
301	108	300	370.0	12.0	120.0	.00
303	300	376	335.0	12.0	120.0	.00
304	376	302	225.0	12.0	120.0	.00
305	302	304	395.0	8.0	120.0	.00
307	302	306	250.0	8.0	120.0	.00
309	304	308	850.0	8.0	120.0	.00
312	112	308	150.0	12.0	120.0	.00
313	308	312	310.0	12.0	120.0	.00
317	312	316	960.0	8.0	120.0	.00
321	316	318	165.0	8.0	120.0	.00
325	320	324	970.0	12.0	120.0	.00
329	324	328	370.0	12.0	120.0	.00
333	328	364	470.0	12.0	120.0	.00
335	320	382	145.0	8.0	120.0	.00
337	332	320	340.0	12.0	120.0	.00
341	332	300	410.0	12.0	120.0	.00
357	352	364	295.0	12.0	120.0	.00
387	332	352	115.0	12.0	120.0	.00
389	376	378	425.0	8.0	120.0	.00
393	302	318	260.0	8.0	120.0	.00
399	382	378	340.0	8.0	120.0	.00
401	378	380	255.0	8.0	120.0	.00
403	382	380	385.0	8.0	120.0	.00
405	100	328	1230.0	12.0	120.0	.00

JUNCTION NUMBER	DEMAND	ELEVATION	CONNECTING PIPES			
8	.00	290.00	2	6		
10	.00	320.00	6	64	70	
12	.00	320.00	68	74	125	
13	9.85	250.00	10	203		
14	.00	335.00	3	8		
15	9.85	256.00	10	11		
16	.00	328.00	8	76	82	
17	6.03	261.00	11	12	13	
18	.00	328.00	37	80	86	
20	.00	262.00	12	101		
22	39.08	280.00	14			
24	60.69	280.00	13	14	15	
32	41.58	300.00	27			
36	60.69	298.00	15	27	29	
40	22.33	317.00	33			
44	.00	318.00	29	33	37	
65	.00	320.00	64	66		
67	.00	320.00	66	68		
71	.00	320.00	70	72		
73	.00	320.00	72	74		
77	.00	328.00	76	78		
79	.00	328.00	78	80		
83	.00	328.00	82	84		
85	.00	328.00	84	86		
100	66.34	270.00	101	105	201	405
104	.00	294.00	105	109	249	
108	.00	306.00	109	113	241	301
112	7.40	308.00	113	117	215	312
116	20.40	305.00	117	121		
120	17.50	298.00	121	125		
200	31.65	274.00	201	202	205	
202	19.16	268.00	202	203		
204	22.80	288.00	205	209	211	253

208	40.63	292.00	209			
212	26.25	297.00	211	213		
216	17.56	306.00	213	215		
232	23.29	306.00	241			
236	25.61	292.00	249	253		
300	.00	314.00	301	303	341	
302	.00	322.00	304	305	307	393
304	4.80	325.50	305	309		
306	4.80	317.00	307			
308	4.80	314.00	309	312	313	
312	17.80	321.00	313	317		
316	4.80	333.50	317	321		
318	4.80	333.00	321	393		
320	14.90	328.00	325	335	337	
324	14.90	312.00	325	329		
328	14.90	310.00	329	333	405	
332	.00	322.00	337	341	387	
352	8.82	318.00	357	387		
364	8.83	317.00	333	357		
376	4.92	328.00	303	304	389	
378	4.92	328.00	389	399	401	
380	4.92	326.00	401	403		
382	4.92	326.00	335	399	403	

OUTPUT SELECTION: ALL RESULTS ARE OUTPUT EACH PERIOD
5 VALUES ARE OUTPUT FOR MAXIMUM AND MINIMUM PRESSURES

THIS SYSTEM HAS MULTIPLE SUPPLY ZONES

ZONE NO. 1 IS SUPPLIED THROUGH THESE PIPES:
66
72
78
84

THIS SYSTEM HAS 68 PIPES WITH 56 JUNCTIONS , 8 LOOPS AND 6 FGNS

THE RESULTS ARE OBTAINED AFTER 8 TRIALS WITH AN ACCURACY = .00047

3Roots - Phase 2 Water System with only Two PR stations File: 537012P2
Water System Analysis
Average Day Demands

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	346.49	.01	.00	.00	.55	.10
3	0	14	346.03	.01	.00	.00	.55	.10
6	8	10	346.49	.01	.00	.00	.55	.10
8	14	16	346.03	.01	.00	.00	.55	.10
10	15	13	32.97	.00	.00	.00	.05	.00
11	15	17	-42.82	.00	.00	.00	-.07	.00
12	17	20	72.81	.00	.00	.00	.12	.01
13	17	24	-121.66	-.01	.00	.00	-.12	.00
14	22	24	-39.08	.00	.00	.00	-.11	-.01

15	36	24	221.43	.02	.00	.00	.28	.03
27	36	32	41.58	.00	.00	.00	.12	.01
29	44	36	323.70	.09	.00	.00	.41	.05
33	44	40	22.33	.00	.00	.00	.06	.00
37	18	44	346.03	.02	.00	.00	.44	.06
64	10	65	346.49	1.74	.00	.00	8.85	87.01
66	0	67	346.49	1.74	.00	.00	8.85	87.01
68	67	12	346.49	1.74	.00	.00	8.85	87.01
70	10	71	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 72 IS CLOSED								
74	73	12	.00	.00	.00	.00	.00	.00
76	16	77	346.03	1.74	.00	.00	8.83	86.80
78	0	79	346.03	1.74	.00	.00	8.83	86.80
80	79	18	346.03	1.74	.00	.00	8.83	86.80
82	16	83	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 84 IS CLOSED								
86	85	18	.00	.00	.00	.00	.00	.00
101	20	100	72.81	.00	.00	.00	.12	.01
105	100	104	-35.63	.00	.00	.00	-.06	.00
109	104	108	-80.65	.00	.00	.00	-.13	-.01
113	108	112	-143.32	-.02	.00	.00	-.23	-.02
117	116	112	308.59	.04	.00	.00	.49	.08
121	120	116	328.99	.03	.00	.00	.52	.09
125	12	120	346.49	.04	.00	.00	.55	.10
201	100	200	23.75	.00	.00	.00	.07	.00
202	202	200	3.96	.00	.00	.00	.01	.00
203	202	13	-23.12	.00	.00	.00	-.07	.00
205	200	204	-3.94	.00	.00	.00	-.01	.00
209	204	208	40.63	.00	.00	.00	.12	.01
211	204	212	-47.96	-.01	.00	.00	-.14	-.01
213	212	216	-74.21	-.01	.00	.00	-.21	-.02
215	216	112	-91.77	-.01	.00	.00	-.26	-.04
241	108	232	23.29	.00	.00	.00	.07	.00
249	104	236	45.02	.00	.00	.00	.13	.01
253	236	204	19.41	.00	.00	.00	.06	.00
301	108	300	39.39	.00	.00	.00	.11	.01
303	300	376	-3.95	.00	.00	.00	-.01	.00
304	376	302	-24.29	.00	.00	.00	-.07	.00
305	302	304	-17.81	.00	.00	.00	-.11	-.01
307	302	306	4.80	.00	.00	.00	.03	.00
309	304	308	-22.61	-.02	.00	.00	-.14	-.02
312	112	308	66.09	.00	.00	.00	.19	.02
313	308	312	38.68	.00	.00	.00	.11	.01
317	312	316	20.88	.02	.00	.00	.13	.02
321	316	318	16.08	.00	.00	.00	.10	.01
325	320	324	5.86	.00	.00	.00	.02	.00
329	324	328	-9.04	.00	.00	.00	-.03	.00
333	328	364	-5.60	.00	.00	.00	-.02	.00
335	320	382	-.67	.00	.00	.00	.00	.00
337	332	320	20.09	.00	.00	.00	.06	.00
341	332	300	-43.33	.00	.00	.00	-.12	-.01
357	352	364	14.43	.00	.00	.00	.04	.00
387	332	352	23.25	.00	.00	.00	.07	.00
389	376	378	15.43	.00	.00	.00	.10	.01
393	302	318	-11.28	.00	.00	.00	-.07	-.01
399	382	378	-4.89	.00	.00	.00	-.03	.00
401	378	380	5.62	.00	.00	.00	.04	.00
403	382	380	-.70	.00	.00	.00	.00	.00
405	100	328	18.35	.00	.00	.00	.05	.00

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	609.99	290.00	138.66
10	.00	609.99	320.00	125.66
12	.00	481.52	320.00	69.99
13	9.85	481.38	250.00	100.27
14	.00	624.99	335.00	125.66
15	9.85	481.38	256.00	97.67
16	.00	624.99	328.00	128.70
17	6.03	481.39	261.00	95.50
18	.00	481.53	328.00	66.53
20	.00	481.38	262.00	95.07
22	39.08	481.39	280.00	87.27
24	60.69	481.39	280.00	87.27
32	41.58	481.41	300.00	78.61
36	60.69	481.42	298.00	79.48
40	22.33	481.50	317.00	71.29
44	.00	481.51	318.00	70.85
65	.00	608.25	320.00	124.91
67	.00	483.26	320.00	70.75
71	.00	609.99	320.00	125.66
73	.00	481.52	320.00	69.99
77	.00	623.25	328.00	127.94
79	.00	483.26	328.00	67.28
83	.00	624.99	328.00	128.70
85	.00	481.53	328.00	66.53
100	66.34	481.38	270.00	91.60
104	.00	481.38	294.00	81.20
108	.00	481.39	306.00	76.00
112	7.40	481.41	308.00	75.14
116	20.40	481.45	305.00	76.46
120	17.50	481.48	298.00	79.51
200	31.65	481.38	274.00	89.86
202	19.16	481.38	268.00	92.46
204	22.80	481.38	288.00	83.80
208	40.63	481.38	292.00	82.06
212	26.25	481.39	297.00	79.90
216	17.56	481.40	306.00	76.01
232	23.29	481.39	306.00	76.00
236	25.61	481.38	292.00	82.07
300	.00	481.38	314.00	72.53
302	.00	481.38	322.00	69.07
304	4.80	481.39	325.50	67.55
306	4.80	481.38	317.00	71.23
308	4.80	481.41	314.00	72.54
312	17.80	481.40	321.00	69.51
316	4.80	481.39	333.50	64.08
318	4.80	481.39	333.00	64.30
320	14.90	481.38	328.00	66.46
324	14.90	481.38	312.00	73.40
328	14.90	481.38	310.00	74.26
332	.00	481.38	322.00	69.06
352	8.82	481.38	318.00	70.80
364	8.83	481.38	317.00	71.23
376	4.92	481.38	328.00	66.47
378	4.92	481.38	328.00	66.46
380	4.92	481.38	326.00	67.33
382	4.92	481.38	326.00	67.33
	MAXIMUM PRESSURES			
8	.00	609.99	290.00	138.66
16	.00	624.99	328.00	128.70

83	.00	624.99	328.00	128.70
77	.00	623.25	328.00	127.94
14	.00	624.99	335.00	125.66

MINIMUM PRESSURES

316	4.80	481.39	333.50	64.08
318	4.80	481.39	333.00	64.30
320	14.90	481.38	328.00	66.46
378	4.92	481.38	328.00	66.46
376	4.92	481.38	328.00	66.47

THE NET SYSTEM DEMAND = 692.52

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	346.49
3	346.03

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 692.52
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 4.80

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00334

3Roots - Phase 2 Water System with only Two PR Stations
Water System Analysis
Peak Hour Demands

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	1681.84	.09	.00	.00	2.68	1.90
3	0	14	1642.25	.09	.00	.00	2.62	1.82
6	8	10	1681.84	.09	.00	.00	2.68	1.90
8	14	16	1642.25	.09	.00	.00	2.62	1.82
10	15	13	153.89	.02	.00	.00	.25	.02
11	15	17	-201.17	-.03	.00	.00	-.32	-.04
12	17	20	335.17	.01	.00	.00	.53	.10
13	17	24	-565.28	-.15	.00	.00	-.58	-.08
14	22	24	-187.58	-.04	.00	.00	-.53	-.13
15	36	24	1044.17	.42	.00	.00	1.32	.44
27	36	32	199.58	.05	.00	.00	.57	.15
29	44	36	1535.07	1.56	.00	.00	1.94	.90
33	44	40	107.18	.01	.00	.00	.30	.05
37	18	44	1642.25	.41	.00	.00	2.07	1.02
64	10	65	623.09	5.16	.00	.00	15.91	257.99
66	0	67	623.09	5.16	.00	.00	15.91	257.99
68	67	12	623.09	5.16	.00	.00	15.91	257.99
70	10	71	1058.75	.16	.00	.00	4.32	7.94
72	0	73	1058.75	.16	.00	.00	4.32	7.94
74	73	12	1058.75	.16	.00	.00	4.32	7.94
76	16	77	622.39	5.15	.00	.00	15.89	257.45

78	0	79	622.39	5.15	.00	.00	15.89	257.45
80	79	18	622.39	5.15	.00	.00	15.89	257.45
82	16	83	1019.86	.15	.00	.00	4.17	7.41
84	0	85	1019.86	.15	.00	.00	4.17	7.41
86	85	18	1019.86	.15	.00	.00	4.17	7.41
101	20	100	335.17	.04	.00	.00	.53	.10
105	100	104	-180.10	-.02	.00	.00	-.29	-.03
109	104	108	-397.18	-.07	.00	.00	-.63	-.13
113	108	112	-698.60	-.41	.00	.00	-1.11	-.37
117	116	112	1499.92	.80	.00	.00	2.39	1.54
121	120	116	1597.84	.55	.00	.00	2.55	1.73
125	12	120	1681.84	.72	.00	.00	2.68	1.90
201	100	200	112.19	.03	.00	.00	.32	.05
202	202	200	14.64	.00	.00	.00	.04	.00
203	202	13	-106.61	-.04	.00	.00	-.30	-.05
205	200	204	-25.09	.00	.00	.00	-.07	.00
209	204	208	195.02	.03	.00	.00	.55	.14
211	204	212	-235.40	-.14	.00	.00	-.67	-.20
213	212	216	-361.40	-.28	.00	.00	-1.03	-.45
215	216	112	-445.69	-.11	.00	.00	-1.26	-.66
241	108	232	111.79	.02	.00	.00	.32	.05
249	104	236	217.08	.04	.00	.00	.62	.17
253	236	204	94.15	.01	.00	.00	.27	.04
301	108	300	189.63	.05	.00	.00	.54	.14
303	300	376	-20.95	.00	.00	.00	-.06	.00
304	376	302	-119.47	-.01	.00	.00	-.34	-.06
305	302	304	-86.97	-.09	.00	.00	-.56	-.23
307	302	306	23.04	.00	.00	.00	.15	.02
309	304	308	-110.01	-.30	.00	.00	-.70	-.36
312	112	308	320.11	.05	.00	.00	.91	.36
313	308	312	187.06	.04	.00	.00	.53	.13
317	312	316	101.62	.29	.00	.00	.65	.31
321	316	318	78.58	.03	.00	.00	.50	.19
325	320	324	29.59	.00	.00	.00	.08	.00
329	324	328	-41.93	.00	.00	.00	-.12	-.01
333	328	364	-28.80	.00	.00	.00	-.08	.00
335	320	382	-4.05	.00	.00	.00	-.03	.00
337	332	320	97.06	.01	.00	.00	.28	.04
341	332	300	-210.58	-.07	.00	.00	-.60	-.16
357	352	364	71.18	.01	.00	.00	.20	.02
387	332	352	113.52	.01	.00	.00	.32	.05
389	376	378	74.90	.07	.00	.00	.48	.17
393	302	318	-55.54	-.03	.00	.00	-.35	-.10
399	382	378	-23.91	-.01	.00	.00	-.15	-.02
401	378	380	27.37	.01	.00	.00	.17	.03
403	382	380	-3.76	.00	.00	.00	-.02	.00
405	100	328	84.65	.04	.00	.00	.24	.03

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	609.91	290.00	138.63
10	.00	609.81	320.00	125.58
12	.00	474.68	320.00	67.03
13	47.28	472.11	250.00	96.25
14	.00	624.91	335.00	125.63
15	47.28	472.13	256.00	93.66
16	.00	624.82	328.00	128.62
17	28.94	472.16	261.00	91.50
18	.00	474.70	328.00	63.57
20	.00	472.15	262.00	91.06
22	187.58	472.27	280.00	83.32

24	291.31	472.31	280.00	83.34
32	199.58	472.68	300.00	74.83
36	291.31	472.73	298.00	75.72
40	107.18	474.28	317.00	68.15
44	.00	474.29	318.00	67.73
65	.00	604.65	320.00	123.35
67	.00	479.84	320.00	69.26
71	.00	609.65	320.00	125.52
73	.00	474.84	320.00	67.10
77	.00	619.67	328.00	126.39
79	.00	479.85	328.00	65.80
83	.00	624.67	328.00	128.56
85	.00	474.85	328.00	63.64
100	318.43	472.10	270.00	87.58
104	.00	472.13	294.00	77.19
108	.00	472.20	306.00	72.02
112	35.52	472.61	308.00	71.33
116	97.92	473.41	305.00	72.98
120	84.00	473.96	298.00	76.25
200	151.92	472.08	274.00	85.83
202	91.97	472.08	268.00	88.43
204	109.44	472.08	288.00	79.77
208	195.02	472.05	292.00	78.02
212	126.00	472.22	297.00	75.93
216	84.29	472.50	306.00	72.15
232	111.79	472.18	306.00	72.01
236	122.93	472.09	292.00	78.04
300	.00	472.15	314.00	68.53
302	.00	472.16	322.00	65.07
304	23.04	472.25	325.50	63.59
306	23.04	472.16	317.00	67.23
308	23.04	472.56	314.00	68.71
312	85.44	472.51	321.00	65.66
316	23.04	472.22	333.50	60.11
318	23.04	472.19	333.00	60.32
320	71.52	472.07	328.00	62.43
324	71.52	472.06	312.00	69.36
328	71.52	472.07	310.00	70.23
332	.00	472.08	322.00	65.04
352	42.34	472.08	318.00	66.77
364	42.38	472.07	317.00	67.20
376	23.62	472.15	328.00	62.46
378	23.62	472.08	328.00	62.43
380	23.62	472.07	326.00	63.30
382	23.62	472.07	326.00	63.30
	MAXIMUM PRESSURES			
8	.00	609.91	290.00	138.63
16	.00	624.82	328.00	128.62
83	.00	624.67	328.00	128.56
77	.00	619.67	328.00	126.39
14	.00	624.91	335.00	125.63
	MINIMUM PRESSURES			
316	23.04	472.22	333.50	60.11
318	23.04	472.19	333.00	60.32
320	71.52	472.07	328.00	62.43
378	23.62	472.08	328.00	62.43
376	23.62	472.15	328.00	62.46

THE NET SYSTEM DEMAND = 3324.10

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	1681.84
3	1642.25

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3324.10
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
316	2000.00

THE RESULTS ARE OBTAINED AFTER 3 TRIALS WITH AN ACCURACY = .00365

3Roots - Phase 2 Water System with only Two PR Stations
Maximum Day Demands plus Fire Flow
2000 GPM Fire Flow at Node 316

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	1882.48	.12	.00	.00	3.00	2.34
3	0	14	1492.96	.08	.00	.00	2.38	1.52
6	8	10	1882.48	.12	.00	.00	3.00	2.34
8	14	16	1492.96	.08	.00	.00	2.38	1.52
10	15	13	227.88	.04	.00	.00	.36	.05
11	15	17	-247.58	-.04	.00	.00	-.40	-.05
12	17	20	784.58	.06	.00	.00	1.25	.46
13	17	24	-1044.22	-.47	.00	.00	-1.07	-.26
14	22	24	-78.16	-.01	.00	.00	-.22	-.03
15	36	24	1243.76	.57	.00	.00	1.57	.61
27	36	32	83.16	.01	.00	.00	.24	.03
29	44	36	1448.30	1.40	.00	.00	1.83	.81
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	1492.96	.34	.00	.00	1.88	.86
64	10	65	626.87	5.22	.00	.00	16.00	260.89
66	0	67	626.87	5.22	.00	.00	16.00	260.89
68	67	12	626.87	5.22	.00	.00	16.00	260.89
70	10	71	1255.60	.22	.00	.00	5.13	10.89
72	0	73	1255.60	.22	.00	.00	5.13	10.89
74	73	12	1255.60	.22	.00	.00	5.13	10.89
76	16	77	619.92	5.11	.00	.00	15.83	255.56
78	0	79	619.92	5.11	.00	.00	15.83	255.56
80	79	18	619.92	5.11	.00	.00	15.83	255.56
82	16	83	873.05	.11	.00	.00	3.57	5.56
84	0	85	873.05	.11	.00	.00	3.57	5.56
86	85	18	873.05	.11	.00	.00	3.57	5.56
101	20	100	784.58	.22	.00	.00	1.25	.46
105	100	104	258.95	.04	.00	.00	.41	.06

109	104	108	315.98	.05	.00	.00	.50	.09
113	108	112	-494.36	-.22	.00	.00	-.79	-.20
117	116	112	1806.68	1.13	.00	.00	2.88	2.17
121	120	116	1847.48	.72	.00	.00	2.95	2.26
125	12	120	1882.48	.89	.00	.00	3.00	2.34
201	100	200	.92	.00	.00	.00	.00	.00
202	202	200	169.86	.07	.00	.00	.48	.11
203	202	13	-208.18	-.13	.00	.00	-.59	-.16
205	200	204	107.49	.03	.00	.00	.30	.05
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	-127.62	-.04	.00	.00	-.36	-.06
213	212	216	-180.12	-.08	.00	.00	-.51	-.12
215	216	112	-215.24	-.03	.00	.00	-.61	-.17
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-57.02	.00	.00	.00	-.16	-.01
253	236	204	-108.24	-.02	.00	.00	-.31	-.05
301	108	300	763.75	.66	.00	.00	2.17	1.79
303	300	376	821.34	.68	.00	.00	2.33	2.04
304	376	302	991.71	.65	.00	.00	2.81	2.90
305	302	304	-221.16	-.51	.00	.00	-1.41	-1.30
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-230.76	-1.19	.00	.00	-1.47	-1.40
312	112	308	1082.29	.51	.00	.00	3.07	3.40
313	308	312	841.92	.66	.00	.00	2.39	2.14
317	312	316	806.32	13.65	.00	.00	5.15	14.22
321	316	318	-1193.68	-4.85	.00	.00	-7.62	-29.41
325	320	324	-143.17	-.08	.00	.00	-.41	-.08
329	324	328	-172.97	-.04	.00	.00	-.49	-.11
333	328	364	189.25	.06	.00	.00	.54	.13
335	320	382	209.73	.17	.00	.00	1.34	1.17
337	332	320	96.37	.01	.00	.00	.27	.04
341	332	300	57.58	.01	.00	.00	.16	.01
357	352	364	-171.59	-.03	.00	.00	-.49	-.11
387	332	352	-153.95	-.01	.00	.00	-.44	-.09
389	376	378	-180.21	-.38	.00	.00	-1.15	-.89
393	302	318	1203.28	7.76	.00	.00	7.68	29.85
399	382	378	114.58	.13	.00	.00	.73	.38
401	378	380	-75.47	-.05	.00	.00	-.48	-.18
403	382	380	85.31	.09	.00	.00	.54	.22
405	100	328	392.02	.64	.00	.00	1.11	.52

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	609.88	290.00	138.62
10	.00	609.77	320.00	125.57
12	.00	474.56	320.00	66.98
13	19.70	471.90	250.00	96.16
14	.00	624.92	335.00	125.63
15	19.70	471.94	256.00	93.57
16	.00	624.85	328.00	128.63
17	12.06	471.98	261.00	91.43
18	.00	474.78	328.00	63.60
20	.00	471.92	262.00	90.96
22	78.16	472.45	280.00	83.39
24	121.38	472.46	280.00	83.40
32	83.16	473.02	300.00	74.98
36	121.38	473.03	298.00	75.85
40	44.66	474.43	317.00	68.22
44	.00	474.43	318.00	67.79
65	.00	604.55	320.00	123.30
67	.00	479.78	320.00	69.24

71	.00	609.55	320.00	125.47
73	.00	474.78	320.00	67.07
77	.00	619.74	328.00	126.42
79	.00	479.89	328.00	65.82
83	.00	624.74	328.00	128.59
85	.00	474.89	328.00	63.65
100	132.68	471.70	270.00	87.40
104	.00	471.66	294.00	76.98
108	.00	471.61	306.00	71.76
112	14.80	471.83	308.00	70.99
116	40.80	472.95	305.00	72.78
120	35.00	473.68	298.00	76.13
200	63.30	471.70	274.00	85.67
202	38.32	471.77	268.00	88.30
204	45.60	471.68	288.00	79.59
208	81.26	471.67	292.00	77.86
212	52.50	471.72	297.00	75.71
216	35.12	471.80	306.00	71.85
232	46.58	471.61	306.00	71.76
236	51.22	471.66	292.00	77.85
300	.00	470.95	314.00	68.01
302	.00	469.61	322.00	63.97
304	9.60	470.12	325.50	62.67
306	9.60	469.61	317.00	66.13
308	9.60	471.32	314.00	68.17
312	35.60	470.65	321.00	64.85
316	2000.00	457.00	333.50	53.52
318	9.60	461.85	333.00	55.84
320	29.80	470.94	328.00	61.94
324	29.80	471.02	312.00	68.91
328	29.80	471.06	310.00	69.79
332	.00	470.96	322.00	64.55
352	17.64	470.97	318.00	66.29
364	17.66	471.00	317.00	66.73
376	9.84	470.27	328.00	61.65
378	9.84	470.64	328.00	61.81
380	9.84	470.69	326.00	62.70
382	9.84	470.77	326.00	62.73

MAXIMUM PRESSURES

8	.00	609.88	290.00	138.62
16	.00	624.85	328.00	128.63
83	.00	624.74	328.00	128.59
77	.00	619.74	328.00	126.42
14	.00	624.92	335.00	125.63

MINIMUM PRESSURES

316	2000.00	457.00	333.50	53.52
318	9.60	461.85	333.00	55.84
376	9.84	470.27	328.00	61.65
378	9.84	470.64	328.00	61.81
320	29.80	470.94	328.00	61.94

THE NET SYSTEM DEMAND = 3375.44

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	1882.48
3	1492.96

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3375.44
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
324	1500.00
328	1500.00

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00019

3Roots - Phase 2 Water System with only Two PR Stations
Maximum Day Demands plus Fire Flow
3000 GPM Fire Flow split between Nodes 324 and 328

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	2357.21	.18	.00	.00	3.76	3.55
3	0	14	1968.23	.13	.00	.00	3.14	2.54
6	8	10	2357.21	.18	.00	.00	3.76	3.55
8	14	16	1968.23	.13	.00	.00	3.14	2.54
10	15	13	303.78	.06	.00	.00	.48	.08
11	15	17	-323.48	-.07	.00	.00	-.52	-.09
12	17	20	1183.95	.14	.00	.00	1.89	.99
13	17	24	-1519.49	-.95	.00	.00	-1.55	-.53
14	22	24	-78.16	-.01	.00	.00	-.22	-.03
15	36	24	1719.03	1.05	.00	.00	2.17	1.11
27	36	32	83.16	.01	.00	.00	.24	.03
29	44	36	1923.57	2.37	.00	.00	2.43	1.37
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	1968.23	.57	.00	.00	2.48	1.43
64	10	65	637.95	5.39	.00	.00	16.29	269.50
66	0	67	637.95	5.39	.00	.00	16.29	269.50
68	67	12	637.95	5.39	.00	.00	16.29	269.50
70	10	71	1719.26	.39	.00	.00	7.02	19.50
72	0	73	1719.26	.39	.00	.00	7.02	19.50
74	73	12	1719.26	.39	.00	.00	7.02	19.50
76	16	77	628.67	5.25	.00	.00	16.05	262.28
78	0	79	628.67	5.25	.00	.00	16.05	262.28
80	79	18	628.67	5.25	.00	.00	16.05	262.28
82	16	83	1339.56	.25	.00	.00	5.47	12.28
84	0	85	1339.56	.25	.00	.00	5.47	12.28
86	85	18	1339.56	.25	.00	.00	5.47	12.28
101	20	100	1183.95	.47	.00	.00	1.89	.99
105	100	104	-33.20	.00	.00	.00	-.05	.00
109	104	108	161.24	.01	.00	.00	.26	.02
113	108	112	-1179.53	-1.08	.00	.00	-1.88	-.98
117	116	112	2281.41	1.74	.00	.00	3.64	3.34
121	120	116	2322.21	1.10	.00	.00	3.71	3.45
125	12	120	2357.21	1.35	.00	.00	3.76	3.55
201	100	200	-220.84	-.10	.00	.00	-.63	-.18

202	202	200	245.76	.14	.00	.00	.70	.22
203	202	13	-284.08	-.23	.00	.00	-.81	-.29
205	200	204	-38.38	.00	.00	.00	-.11	-.01
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	-410.91	-.39	.00	.00	-1.17	-.57
213	212	216	-463.41	-.45	.00	.00	-1.31	-.71
215	216	112	-498.53	-.14	.00	.00	-1.41	-.81
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	-194.45	-.03	.00	.00	-.55	-.14
253	236	204	-245.67	-.07	.00	.00	-.70	-.22
301	108	300	1294.19	1.75	.00	.00	3.67	4.74
303	300	376	-99.56	-.01	.00	.00	-.28	-.04
304	376	302	-504.95	-.19	.00	.00	-1.43	-.83
305	302	304	-271.84	-.75	.00	.00	-1.73	-1.90
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-281.44	-1.72	.00	.00	-1.80	-2.02
312	112	308	588.55	.17	.00	.00	1.67	1.10
313	308	312	297.51	.10	.00	.00	.84	.31
317	312	316	261.91	1.70	.00	.00	1.67	1.77
321	316	318	252.31	.27	.00	.00	1.61	1.65
325	320	324	852.22	2.12	.00	.00	2.42	2.19
329	324	328	-647.78	-.49	.00	.00	-1.84	-1.32
333	328	364	-842.46	-1.01	.00	.00	-2.39	-2.14
335	320	382	-366.03	-.48	.00	.00	-2.34	-3.29
337	332	320	516.00	.29	.00	.00	1.46	.86
341	332	300	-1393.76	-2.23	.00	.00	-3.95	-5.44
357	352	364	860.12	.66	.00	.00	2.44	2.22
387	332	352	877.76	.27	.00	.00	2.49	2.31
389	376	378	395.55	1.62	.00	.00	2.52	3.80
393	302	318	-242.71	-.40	.00	.00	-1.55	-1.54
399	382	378	-222.05	-.44	.00	.00	-1.42	-1.31
401	378	380	163.66	.19	.00	.00	1.04	.74
403	382	380	-153.82	-.25	.00	.00	-.98	-.66
405	100	328	1305.32	5.93	.00	.00	3.70	4.82

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	609.82	290.00	138.59
10	.00	609.65	320.00	125.51
12	.00	474.22	320.00	66.83
13	19.70	469.43	250.00	95.09
14	.00	624.87	335.00	125.61
15	19.70	469.50	256.00	92.51
16	.00	624.75	328.00	128.59
17	12.06	469.57	261.00	90.38
18	.00	474.51	328.00	63.49
20	.00	469.43	262.00	89.89
22	78.16	470.51	280.00	82.55
24	121.38	470.52	280.00	82.56
32	83.16	471.55	300.00	74.34
36	121.38	471.56	298.00	75.21
40	44.66	473.93	317.00	68.00
44	.00	473.94	318.00	67.57
65	.00	604.26	320.00	123.18
67	.00	479.61	320.00	69.16
71	.00	609.26	320.00	125.34
73	.00	474.61	320.00	67.00
77	.00	619.50	328.00	126.32
79	.00	479.75	328.00	65.76
83	.00	624.50	328.00	128.48
85	.00	474.75	328.00	63.59

100	132.68	468.96	270.00	86.22
104	.00	468.96	294.00	75.82
108	.00	468.95	306.00	70.61
112	14.80	470.03	308.00	70.21
116	40.80	471.77	305.00	72.27
120	35.00	472.87	298.00	75.78
200	63.30	469.06	274.00	84.53
202	38.32	469.20	268.00	87.19
204	45.60	469.06	288.00	78.46
208	81.26	469.06	292.00	76.73
212	52.50	469.45	297.00	74.73
216	35.12	469.90	306.00	71.02
232	46.58	468.95	306.00	70.61
236	51.22	468.99	292.00	76.70
300	.00	467.20	314.00	66.39
302	.00	467.40	322.00	63.01
304	9.60	468.15	325.50	61.81
306	9.60	467.40	317.00	65.17
308	9.60	469.87	314.00	67.54
312	35.60	469.77	321.00	64.47
316	9.60	468.07	333.50	58.31
318	9.60	467.80	333.00	58.41
320	29.80	464.67	328.00	59.23
324	1500.00	462.55	312.00	65.24
328	1500.00	463.04	310.00	66.32
332	.00	464.97	322.00	61.95
352	17.64	464.70	318.00	63.57
364	17.66	464.04	317.00	63.72
376	9.84	467.21	328.00	60.32
378	9.84	465.59	328.00	59.62
380	9.84	465.41	326.00	60.41
382	9.84	465.15	326.00	60.30

MAXIMUM PRESSURES

8	.00	609.82	290.00	138.59
16	.00	624.75	328.00	128.59
83	.00	624.50	328.00	128.48
77	.00	619.50	328.00	126.32
14	.00	624.87	335.00	125.61

MINIMUM PRESSURES

316	9.60	468.07	333.50	58.31
318	9.60	467.80	333.00	58.41
320	29.80	464.67	328.00	59.23
378	9.84	465.59	328.00	59.62
382	9.84	465.15	326.00	60.30

THE NET SYSTEM DEMAND = 4325.44

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	2357.21
3	1968.23

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4325.44
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
13	2000.00
15	2000.00

THE RESULTS ARE OBTAINED AFTER 5 TRIALS WITH AN ACCURACY = .00053

3Roots - Phase 2 Water System with only Two PR Stations
Maximum Day Demands plus Fire Flow
4000 GPM Fire Flow split between Nodes 13 and 15

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	2740.40	.23	.00	.00	4.37	4.69
3	0	14	2605.24	.21	.00	.00	4.16	4.27
6	8	10	2740.40	.23	.00	.00	4.37	4.69
8	14	16	2605.24	.21	.00	.00	4.16	4.27
10	15	13	949.44	.53	.00	.00	1.51	.66
11	15	17	-2949.44	-4.35	.00	.00	-4.71	-5.37
12	17	20	-805.00	-.07	.00	.00	-1.28	-.48
13	17	24	-2156.50	-1.82	.00	.00	-2.20	-1.01
14	22	24	-78.16	-.01	.00	.00	-.22	-.03
15	36	24	2356.04	1.88	.00	.00	2.97	2.00
27	36	32	83.16	.01	.00	.00	.24	.03
29	44	36	2560.58	4.03	.00	.00	3.23	2.33
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	2605.24	.96	.00	.00	3.28	2.40
64	10	65	648.78	5.56	.00	.00	16.56	278.03
66	0	67	648.78	5.56	.00	.00	16.56	278.03
68	67	12	648.78	5.56	.00	.00	16.56	278.03
70	10	71	2091.62	.56	.00	.00	8.54	28.03
72	0	73	2091.62	.56	.00	.00	8.54	28.03
74	73	12	2091.62	.56	.00	.00	8.54	28.03
76	16	77	644.78	5.50	.00	.00	16.46	274.86
78	0	79	644.78	5.50	.00	.00	16.46	274.86
80	79	18	644.78	5.50	.00	.00	16.46	274.86
82	16	83	1960.46	.50	.00	.00	8.01	24.86
84	0	85	1960.46	.50	.00	.00	8.01	24.86
86	85	18	1960.46	.50	.00	.00	8.01	24.86
101	20	100	-805.00	-.23	.00	.00	-1.28	-.48
105	100	104	-1000.28	-.54	.00	.00	-1.60	-.72
109	104	108	-1216.74	-.57	.00	.00	-1.94	-1.04
113	108	112	-1453.08	-1.59	.00	.00	-2.32	-1.45
117	116	112	2664.60	2.31	.00	.00	4.25	4.45
121	120	116	2705.40	1.46	.00	.00	4.32	4.58
125	12	120	2740.40	1.78	.00	.00	4.37	4.69
201	100	200	449.07	.36	.00	.00	1.27	.67
202	202	200	-1088.88	-2.27	.00	.00	-3.09	-3.44
203	202	13	1050.56	2.55	.00	.00	2.98	3.22
205	200	204	-703.11	-.83	.00	.00	-1.99	-1.53
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	-664.73	-.94	.00	.00	-1.89	-1.38
213	212	216	-717.23	-1.00	.00	.00	-2.03	-1.59

215	216	112	-752.35	-.30	.00	.00	-2.13	-1.74
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	216.46	.04	.00	.00	.61	.17
253	236	204	165.24	.03	.00	.00	.47	.10
301	108	300	189.76	.05	.00	.00	.54	.14
303	300	376	-218.22	-.06	.00	.00	-.62	-.18
304	376	302	-360.77	-.10	.00	.00	-1.02	-.45
305	302	304	-197.11	-.41	.00	.00	-1.26	-1.05
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-206.71	-.97	.00	.00	-1.32	-1.14
312	112	308	444.37	.10	.00	.00	1.26	.65
313	308	312	228.06	.06	.00	.00	.65	.19
317	312	316	192.46	.96	.00	.00	1.23	1.00
321	316	318	182.86	.15	.00	.00	1.17	.91
325	320	324	200.36	.15	.00	.00	.57	.15
329	324	328	170.56	.04	.00	.00	.48	.11
333	328	364	-245.71	-.10	.00	.00	-.70	-.22
335	320	382	-103.19	-.05	.00	.00	-.66	-.32
337	332	320	126.97	.02	.00	.00	.36	.06
341	332	300	-407.99	-.23	.00	.00	-1.16	-.56
357	352	364	263.37	.07	.00	.00	.75	.25
387	332	352	281.01	.03	.00	.00	.80	.28
389	376	378	132.71	.21	.00	.00	.85	.50
393	302	318	-173.26	-.21	.00	.00	-1.11	-.82
399	382	378	-68.48	-.05	.00	.00	-.44	-.15
401	378	380	54.39	.02	.00	.00	.35	.10
403	382	380	-44.55	-.03	.00	.00	-.28	-.07
405	100	328	-386.47	-.62	.00	.00	-1.10	-.51

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	609.77	290.00	138.57
10	.00	609.53	320.00	125.46
12	.00	473.88	320.00	66.68
13	2000.00	460.44	250.00	91.19
14	.00	624.79	335.00	125.57
15	2000.00	460.97	256.00	88.82
16	.00	624.57	328.00	128.52
17	12.06	465.32	261.00	88.54
18	.00	474.01	328.00	63.27
20	.00	465.39	262.00	88.14
22	78.16	467.13	280.00	81.09
24	121.38	467.14	280.00	81.09
32	83.16	469.00	300.00	73.24
36	121.38	469.01	298.00	74.11
40	44.66	473.04	317.00	67.62
44	.00	473.04	318.00	67.19
65	.00	603.97	320.00	123.05
67	.00	479.44	320.00	69.09
71	.00	608.97	320.00	125.22
73	.00	474.44	320.00	66.92
77	.00	619.08	328.00	126.13
79	.00	479.50	328.00	65.65
83	.00	624.08	328.00	128.30
85	.00	474.50	328.00	63.48
100	132.68	465.62	270.00	84.77
104	.00	466.15	294.00	74.60
108	.00	466.73	306.00	69.65
112	14.80	468.32	308.00	69.47
116	40.80	470.63	305.00	71.77
120	35.00	472.10	298.00	75.44

200	63.30	465.26	274.00	82.88
202	38.32	462.98	268.00	84.49
204	45.60	466.08	288.00	77.17
208	81.26	466.08	292.00	75.43
212	52.50	467.02	297.00	73.68
216	35.12	468.02	306.00	70.21
232	46.58	466.72	306.00	69.65
236	51.22	466.12	292.00	75.45
300	.00	466.68	314.00	66.16
302	.00	466.84	322.00	62.76
304	9.60	467.25	325.50	61.42
306	9.60	466.83	317.00	64.93
308	9.60	468.22	314.00	66.83
312	35.60	468.16	321.00	63.77
316	9.60	467.20	333.50	57.94
318	9.60	467.05	333.00	58.09
320	29.80	466.43	328.00	59.98
324	29.80	466.28	312.00	66.85
328	29.80	466.24	310.00	67.70
332	.00	466.45	322.00	62.59
352	17.64	466.42	318.00	64.31
364	17.66	466.34	317.00	64.71
376	9.84	466.74	328.00	60.12
378	9.84	466.52	328.00	60.03
380	9.84	466.50	326.00	60.88
382	9.84	466.47	326.00	60.87
	MAXIMUM PRESSURES			
8	.00	609.77	290.00	138.57
16	.00	624.57	328.00	128.52
83	.00	624.08	328.00	128.30
77	.00	619.08	328.00	126.13
14	.00	624.79	335.00	125.57
	MINIMUM PRESSURES			
316	9.60	467.20	333.50	57.94
318	9.60	467.05	333.00	58.09
320	29.80	466.43	328.00	59.98
378	9.84	466.52	328.00	60.03
376	9.84	466.74	328.00	60.12

THE NET SYSTEM DEMAND = 5345.64

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	2740.40
3	2605.24

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 5345.64
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

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JUNCTION NUMBER       DEMAND
      120           3000.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED


   PIPE NO. NODE NOS. LENGTH  DIAMETER  ROUGHNESS  MINOR LOSS K  FIXED GRADE
   125     12  120      380.0    16.0      120.0         .00          .00
LINE  125 IS CLOSED


THE RESULTS ARE OBTAINED AFTER  4 TRIALS WITH AN ACCURACY =  .00130
```

3Roots - Phase 2 Water System with only Two PR Stations
3000 GPM Fire Flow at Node 120
Source out of Service - Pipe 125 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	.00	.00	.00	.00	.00	.00
3	0	14	4350.04	.55	.00	.00	6.94	11.03
6	8	10	.00	.00	.00	.00	.00	.00
8	14	16	4350.04	.55	.00	.00	6.94	11.03
10	15	13	829.49	.42	.00	.00	1.32	.51
11	15	17	-849.19	-.43	.00	.00	-1.35	-.54
12	17	20	3040.05	.80	.00	.00	4.85	5.68
13	17	24	-3901.30	-5.44	.00	.00	-3.98	-3.04
14	22	24	-78.16	-.01	.00	.00	-.22	-.03
15	36	24	4100.84	5.24	.00	.00	5.17	5.57
27	36	32	83.16	.01	.00	.00	.24	.03
29	44	36	4305.38	10.55	.00	.00	5.43	6.10
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	4350.04	2.49	.00	.00	5.48	6.21
64	10	65	.00	.00	.00	.00	.00	.00
66	0	67	.00	.00	.00	.00	.00	.00
68	67	12	.00	.00	.00	.00	.00	.00
70	10	71	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 72 IS CLOSED								
74	73	12	.00	.00	.00	.00	.00	.00
76	16	77	709.61	6.56	.00	.00	18.12	328.23
78	0	79	709.61	6.56	.00	.00	18.12	328.23
80	79	18	709.61	6.56	.00	.00	18.12	328.23
82	16	83	3640.43	1.56	.00	.00	14.87	78.23
84	0	85	3640.43	1.56	.00	.00	14.87	78.23
86	85	18	3640.43	1.56	.00	.00	14.87	78.23
101	20	100	3040.05	2.67	.00	.00	4.85	5.68
105	100	104	1871.86	1.71	.00	.00	2.99	2.31
109	104	108	1766.60	1.14	.00	.00	2.82	2.08
113	108	112	1801.77	2.37	.00	.00	2.87	2.16
117	116	112	-3040.80	-2.95	.00	.00	-4.85	-5.68
121	120	116	-3000.00	-1.77	.00	.00	-4.79	-5.54
LINE 125 IS CLOSED								
201	100	200	285.62	.16	.00	.00	.81	.29
202	202	200	771.47	1.20	.00	.00	2.19	1.82
203	202	13	-809.79	-1.57	.00	.00	-2.30	-1.99
205	200	204	993.79	1.57	.00	.00	2.82	2.91
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	920.97	1.72	.00	.00	2.61	2.53
213	212	216	868.47	1.43	.00	.00	2.46	2.27
215	216	112	833.35	.36	.00	.00	2.36	2.10

241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	105.26	.01	.00	.00	.30	.05
253	236	204	54.04	.00	.00	.00	.15	.01
301	108	300	-81.75	-.01	.00	.00	-.23	-.03
303	300	376	371.66	.16	.00	.00	1.05	.47
304	376	302	504.08	.19	.00	.00	1.43	.83
305	302	304	251.51	.65	.00	.00	1.61	1.64
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	241.91	1.30	.00	.00	1.54	1.53
312	112	308	-420.48	-.09	.00	.00	-1.19	-.59
313	308	312	-188.17	-.04	.00	.00	-.53	-.13
317	312	316	-223.77	-1.27	.00	.00	-1.43	-1.32
321	316	318	-233.37	-.24	.00	.00	-1.49	-1.43
325	320	324	-294.26	-.30	.00	.00	-.83	-.31
329	324	328	-324.06	-.14	.00	.00	-.92	-.36
333	328	364	396.04	.25	.00	.00	1.12	.53
335	320	382	171.78	.12	.00	.00	1.10	.81
337	332	320	-92.68	-.01	.00	.00	-.26	-.04
341	332	300	453.41	.28	.00	.00	1.29	.68
357	352	364	-378.38	-.14	.00	.00	-1.07	-.49
387	332	352	-360.74	-.05	.00	.00	-1.02	-.45
389	376	378	-142.26	-.24	.00	.00	-.91	-.57
393	302	318	242.97	.40	.00	.00	1.55	1.54
399	382	378	92.46	.09	.00	.00	.59	.26
401	378	380	-59.64	-.03	.00	.00	-.38	-.11
403	382	380	69.48	.06	.00	.00	.44	.15
405	100	328	749.89	2.12	.00	.00	2.13	1.73

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	610.00	290.00	138.67
10	.00	610.00	320.00	125.67
12	.00	485.00	320.00	71.50
13	19.70	447.31	250.00	85.50
14	.00	624.45	335.00	125.43
15	19.70	447.72	256.00	83.08
16	.00	623.90	328.00	128.22
17	12.06	448.16	261.00	81.10
18	.00	471.87	328.00	62.34
20	.00	447.36	262.00	80.32
22	78.16	453.59	280.00	75.22
24	121.38	453.60	280.00	75.23
32	83.16	458.83	300.00	68.83
36	121.38	458.84	298.00	69.70
40	44.66	469.38	317.00	66.03
44	.00	469.38	318.00	65.60
65	.00	610.00	320.00	125.67
67	.00	485.00	320.00	71.50
71	.00	610.00	320.00	125.67
73	.00	485.00	320.00	71.50
77	.00	617.33	328.00	125.38
79	.00	478.44	328.00	65.19
83	.00	622.33	328.00	127.54
85	.00	473.44	328.00	63.02
100	132.68	444.69	270.00	75.70
104	.00	442.98	294.00	64.56
108	.00	441.84	306.00	58.86
112	14.80	439.46	308.00	56.97
116	40.80	436.51	305.00	56.99
120	3000.00	434.74	298.00	59.25
200	63.30	444.54	274.00	73.90

202	38.32	445.74	268.00	77.02
204	45.60	442.97	288.00	67.15
208	81.26	442.96	292.00	65.42
212	52.50	441.25	297.00	62.51
216	35.12	439.82	306.00	57.99
232	46.58	441.83	306.00	58.86
236	51.22	442.97	292.00	65.42
300	.00	441.85	314.00	55.40
302	.00	441.50	322.00	51.78
304	9.60	440.85	325.50	49.99
306	9.60	441.50	317.00	53.95
308	9.60	439.55	314.00	54.41
312	35.60	439.59	321.00	51.39
316	9.60	440.87	333.50	46.53
318	9.60	441.10	333.00	46.84
320	29.80	442.14	328.00	49.46
324	29.80	442.43	312.00	56.52
328	29.80	442.57	310.00	57.45
332	.00	442.12	322.00	52.05
352	17.64	442.18	318.00	53.81
364	17.66	442.32	317.00	54.31
376	9.84	441.69	328.00	49.27
378	9.84	441.93	328.00	49.37
380	9.84	441.96	326.00	50.25
382	9.84	442.02	326.00	50.28
	MAXIMUM PRESSURES			
8	.00	610.00	290.00	138.67
16	.00	623.90	328.00	128.22
83	.00	622.33	328.00	127.54
10	.00	610.00	320.00	125.67
65	.00	610.00	320.00	125.67
	MINIMUM PRESSURES			
316	9.60	440.87	333.50	46.53
318	9.60	441.10	333.00	46.84
376	9.84	441.69	328.00	49.27
378	9.84	441.93	328.00	49.37
320	29.80	442.14	328.00	49.46

THE NET SYSTEM DEMAND = 4350.04

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	.00
3	4350.04

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4350.04
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :
JUNCTION NUMBER DEMAND

```
        40           1500.00
        44           1500.00

 THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED


    PIPE NO. NODE NOS. LENGTH  DIAMETER  ROUGHNESS  MINOR LOSS K  FIXED GRADE
    125     12  120      380.0    16.0      120.0         .00          .00
     37     18   44      400.0    16.0      120.0         .00          .00
 LINE   37 IS CLOSED


 THE RESULTS ARE OBTAINED AFTER  5 TRIALS WITH AN ACCURACY =  .00450
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3Roots - Phase 2 Water System with only Two PR Stations
3000 GPM Fire Flow split between Nodes 40 and 44
Source out of Service - Pipe 37 Closed

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 PIPE NO. NODE NOS.   FLOWRATE  HEAD LOSS PUMP HEAD MINOR LOSS VELOCITY HL/1000
    2      0     8    4340.38       .55       .00       .00      6.93    10.98
    3      0    14        .00       .00       .00       .00       .00      .00
    6      8    10    4340.38       .55       .00       .00      6.93    10.98
    8     14    16        .00       .00       .00       .00       .00      .00
   10     15    13    -692.72      -.30       .00       .00     -1.11     -.37
   11     15    17     673.02       .28       .00       .00      1.07      .35
   12     17    20   -2743.12      -.66       .00       .00     -4.38    -4.70
   13     17    24    3404.08      4.23       .00       .00      3.48     2.36
   14     22    24     -78.16      -.01       .00       .00      -.22     -.03
   15     36    24   -3204.54     -3.32       .00       .00     -4.04    -3.53
   27     36    32      83.16       .01       .00       .00       .24      .03
   29     44    36   -3000.00     -5.40       .00       .00     -3.78    -3.12
   33     44    40    1500.00      1.87       .00       .00      4.25     6.23
LINE   37 IS CLOSED
   64     10    65     710.91      6.59       .00       .00     18.15   329.34
   66      0    67     710.91      6.59       .00       .00     18.15   329.34
   68     67    12     710.91      6.59       .00       .00     18.15   329.34
   70     10    71    3629.47      1.56       .00       .00     14.83    77.79
   72      0    73    3629.47      1.56       .00       .00     14.83    77.79
   74     73    12    3629.47      1.56       .00       .00     14.83    77.79
   76     16    77        .00       .00       .00       .00       .00      .00
   78      0    79        .00       .00       .00       .00       .00      .00
   80     79    18        .00       .00       .00       .00       .00      .00
   82     16    83        .00       .00       .00       .00       .00      .00
   THE CHECK VALVE IN LINE NUMBER  84 IS CLOSED
   86     85    18        .00       .00       .00       .00       .00      .00
  101     20   100   -2743.12     -2.21       .00       .00     -4.38    -4.70
  105    100   104   -1925.13     -1.80       .00       .00     -3.07    -2.44
  109    104   108   -2039.88     -1.49       .00       .00     -3.25    -2.71
  113    108   112   -2374.05     -3.95       .00       .00     -3.79    -3.59
  117    116   112    4264.58      5.53       .00       .00      6.80    10.63
  121    120   116    4305.38      3.46       .00       .00      6.87    10.82
  125     12   120    4340.38      4.17       .00       .00      6.93    10.98
  201    100   200    -220.16      -.10       .00       .00      -.62     -.18
  202    202   200    -750.74     -1.14       .00       .00     -2.13    -1.73
  203    202    13     712.42      1.24       .00       .00      2.02     1.57
  205    200   204   -1034.20     -1.69       .00       .00     -2.93    -3.13
  209    204   208      81.26       .01       .00       .00       .23      .03
  211    204   212   -1097.54     -2.38       .00       .00     -3.11    -3.49
  213    212   216   -1150.04     -2.40       .00       .00     -3.26    -3.81
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215	216	112	-1185.16	-.68	.00	.00	-3.36	-4.03
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	114.74	.01	.00	.00	.33	.05
253	236	204	63.52	.01	.00	.00	.18	.02
301	108	300	287.59	.11	.00	.00	.82	.29
303	300	376	-382.58	-.17	.00	.00	-1.09	-.50
304	376	302	-606.97	-.26	.00	.00	-1.72	-1.17
305	302	304	-324.73	-1.04	.00	.00	-2.07	-2.64
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-334.33	-2.37	.00	.00	-2.13	-2.79
312	112	308	690.57	.22	.00	.00	1.96	1.48
313	308	312	346.64	.13	.00	.00	.98	.41
317	312	316	311.04	2.34	.00	.00	1.99	2.44
321	316	318	301.44	.38	.00	.00	1.92	2.30
325	320	324	350.54	.41	.00	.00	.99	.42
329	324	328	320.74	.13	.00	.00	.91	.36
333	328	364	-439.56	-.30	.00	.00	-1.25	-.64
335	320	382	-185.03	-.14	.00	.00	-1.18	-.93
337	332	320	195.31	.05	.00	.00	.55	.14
341	332	300	-670.18	-.57	.00	.00	-1.90	-1.40
357	352	364	457.22	.20	.00	.00	1.30	.69
387	332	352	474.86	.09	.00	.00	1.35	.74
389	376	378	214.55	.52	.00	.00	1.37	1.22
393	302	318	-291.84	-.56	.00	.00	-1.86	-2.17
399	382	378	-116.28	-.13	.00	.00	-.74	-.39
401	378	380	88.43	.06	.00	.00	.56	.24
403	382	380	-78.59	-.07	.00	.00	-.50	-.19
405	100	328	-730.51	-2.02	.00	.00	-2.07	-1.64

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	609.45	290.00	138.43
10	.00	608.90	320.00	125.19
12	.00	471.83	320.00	65.79
13	19.70	449.19	250.00	86.32
14	.00	625.00	335.00	125.67
15	19.70	448.89	256.00	83.59
16	.00	625.00	328.00	128.70
17	12.06	448.61	261.00	81.30
18	.00	485.00	328.00	68.03
20	.00	449.27	262.00	81.15
22	78.16	444.37	280.00	71.23
24	121.38	444.38	280.00	71.23
32	83.16	441.06	300.00	61.12
36	121.38	441.07	298.00	62.00
40	1500.00	433.79	317.00	50.61
44	1500.00	435.66	318.00	50.99
65	.00	602.31	320.00	122.34
67	.00	478.41	320.00	68.65
71	.00	607.35	320.00	124.52
73	.00	473.44	320.00	66.49
77	.00	625.00	328.00	128.70
79	.00	485.00	328.00	68.03
83	.00	625.00	328.00	128.70
85	.00	485.00	328.00	68.03
100	132.68	451.41	270.00	78.61
104	.00	453.22	294.00	68.99
108	.00	454.71	306.00	64.44
112	14.80	458.66	308.00	65.29
116	40.80	464.19	305.00	68.98
120	35.00	467.65	298.00	73.52

200	63.30	451.51	274.00	76.92
202	38.32	450.43	268.00	79.05
204	45.60	453.20	288.00	71.59
208	81.26	453.19	292.00	69.85
212	52.50	455.58	297.00	68.72
216	35.12	457.98	306.00	65.86
232	46.58	454.71	306.00	64.44
236	51.22	453.21	292.00	69.86
300	.00	454.60	314.00	60.93
302	.00	455.03	322.00	57.65
304	9.60	456.07	325.50	56.58
306	9.60	455.03	317.00	59.81
308	9.60	458.44	314.00	62.59
312	35.60	458.31	321.00	59.50
316	9.60	455.97	333.50	53.07
318	9.60	455.59	333.00	53.12
320	29.80	453.98	328.00	54.59
324	29.80	453.57	312.00	61.35
328	29.80	453.44	310.00	62.16
332	.00	454.03	322.00	57.21
352	17.64	453.94	318.00	58.91
364	17.66	453.74	317.00	59.25
376	9.84	454.77	328.00	54.93
378	9.84	454.25	328.00	54.71
380	9.84	454.19	326.00	55.55
382	9.84	454.11	326.00	55.52
	MAXIMUM PRESSURES			
8	.00	609.45	290.00	138.43
16	.00	625.00	328.00	128.70
77	.00	625.00	328.00	128.70
83	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67
	MINIMUM PRESSURES			
40	1500.00	433.79	317.00	50.61
44	1500.00	435.66	318.00	50.99
316	9.60	455.97	333.50	53.07
318	9.60	455.59	333.00	53.12
320	29.80	453.98	328.00	54.59

THE NET SYSTEM DEMAND = 4340.38

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	4340.38
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4340.38
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
212	1500.00
204	1500.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.		LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
37	18	44	400.0	16.0	120.0	.00	.00
125	12	120	380.0	16.0	120.0	.00	.00

LINE 125 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00016

3Roots - Phase 2 Water System with only Two PR Stations
3000 GPM Fire Flow split between Nodes 204 and 212
Source out of Service - Pipe 125 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	.00	.00	.00	.00	.00	.00
3	0	14	4286.94	.54	.00	.00	6.84	10.73
6	8	10	.00	.00	.00	.00	.00	.00
8	14	16	4286.94	.54	.00	.00	6.84	10.73
10	15	13	850.80	.44	.00	.00	1.36	.54
11	15	17	-870.50	-.45	.00	.00	-1.39	-.56
12	17	20	2955.64	.75	.00	.00	4.72	5.39
13	17	24	-3838.20	-5.28	.00	.00	-3.92	-2.95
14	22	24	-78.16	-.01	.00	.00	-.22	-.03
15	36	24	4037.74	5.09	.00	.00	5.09	5.41
27	36	32	83.16	.01	.00	.00	.24	.03
29	44	36	4242.28	10.26	.00	.00	5.35	5.93
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	4286.94	4.29	.00	.00	6.84	10.73
64	10	65	.00	.00	.00	.00	.00	.00
66	0	67	.00	.00	.00	.00	.00	.00
68	67	12	.00	.00	.00	.00	.00	.00
70	10	71	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 72 IS CLOSED								
74	73	12	.00	.00	.00	.00	.00	.00
76	16	77	706.83	6.52	.00	.00	18.04	325.85
78	0	79	706.83	6.52	.00	.00	18.04	325.85
80	79	18	706.83	6.52	.00	.00	18.04	325.85
82	16	83	3580.11	1.52	.00	.00	14.62	75.85
84	0	85	3580.11	1.52	.00	.00	14.62	75.85
86	85	18	3580.11	1.52	.00	.00	14.62	75.85
101	20	100	2955.64	2.53	.00	.00	4.72	5.39
105	100	104	1718.72	1.46	.00	.00	2.74	1.98
109	104	108	697.52	.20	.00	.00	1.11	.37
113	108	112	800.84	.53	.00	.00	1.28	.48
117	116	112	-75.80	.00	.00	.00	-.12	-.01
121	120	116	-35.00	.00	.00	.00	-.06	.00
LINE 125 IS CLOSED								
201	100	200	542.87	.51	.00	.00	1.54	.95
202	202	200	792.78	1.26	.00	.00	2.25	1.91
203	202	13	-831.10	-1.65	.00	.00	-2.36	-2.09
205	200	204	1272.35	2.48	.00	.00	3.61	4.59
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	661.07	.93	.00	.00	1.88	1.37

213	212	216	-838.93	-1.34	.00	.00	-2.38	-2.12
215	216	112	-874.05	-.39	.00	.00	-2.48	-2.29
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	1021.20	.64	.00	.00	2.90	3.06
253	236	204	969.98	.89	.00	.00	2.75	2.78
301	108	300	-149.90	-.03	.00	.00	-.43	-.09
303	300	376	171.22	.04	.00	.00	.49	.11
304	376	302	247.41	.05	.00	.00	.70	.22
305	302	304	118.52	.16	.00	.00	.76	.41
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	108.92	.30	.00	.00	.70	.35
312	112	308	-163.81	-.02	.00	.00	-.46	-.10
313	308	312	-64.48	-.01	.00	.00	-.18	-.02
317	312	316	-100.08	-.29	.00	.00	-.64	-.30
321	316	318	-109.68	-.06	.00	.00	-.70	-.35
325	320	324	-211.39	-.16	.00	.00	-.60	-.17
329	324	328	-241.19	-.08	.00	.00	-.68	-.21
333	328	364	290.37	.14	.00	.00	.82	.30
335	320	382	115.54	.06	.00	.00	.74	.39
337	332	320	-66.05	-.01	.00	.00	-.19	-.02
341	332	300	321.12	.15	.00	.00	.91	.36
357	352	364	-272.71	-.08	.00	.00	-.77	-.27
387	332	352	-255.07	-.03	.00	.00	-.72	-.23
389	376	378	-86.02	-.10	.00	.00	-.55	-.23
393	302	318	119.28	.11	.00	.00	.76	.41
399	382	378	59.64	.04	.00	.00	.38	.11
401	378	380	-36.23	-.01	.00	.00	-.23	-.05
403	382	380	46.07	.03	.00	.00	.29	.07
405	100	328	561.37	1.24	.00	.00	1.59	1.01

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	610.00	290.00	138.67
10	.00	610.00	320.00	125.67
12	.00	485.00	320.00	71.50
13	19.70	446.15	250.00	85.00
14	.00	624.46	335.00	125.43
15	19.70	446.58	256.00	82.59
16	.00	623.93	328.00	128.23
17	12.06	447.04	261.00	80.62
18	.00	471.97	328.00	62.39
20	.00	446.28	262.00	79.86
22	78.16	452.31	280.00	74.67
24	121.38	452.32	280.00	74.67
32	83.16	457.40	300.00	68.21
36	121.38	457.41	298.00	69.08
40	44.66	467.67	317.00	65.29
44	.00	467.67	318.00	64.86
65	.00	610.00	320.00	125.67
67	.00	485.00	320.00	71.50
71	.00	610.00	320.00	125.67
73	.00	485.00	320.00	71.50
77	.00	617.41	328.00	125.41
79	.00	478.48	328.00	65.21
83	.00	622.41	328.00	127.58
85	.00	473.48	328.00	63.04
100	132.68	443.75	270.00	75.29
104	.00	442.29	294.00	64.26
108	.00	442.08	306.00	58.97
112	14.80	441.55	308.00	57.87
116	40.80	441.55	305.00	59.17

120	35.00	441.55	298.00	62.21
200	63.30	443.24	274.00	73.34
202	38.32	444.50	268.00	76.48
204	1500.00	440.76	288.00	66.19
208	81.26	440.75	292.00	64.46
212	1500.00	439.83	297.00	61.89
216	35.12	441.16	306.00	58.57
232	46.58	442.08	306.00	58.97
236	51.22	441.65	292.00	64.85
300	.00	442.12	314.00	55.52
302	.00	442.03	322.00	52.01
304	9.60	441.87	325.50	50.43
306	9.60	442.03	317.00	54.18
308	9.60	441.57	314.00	55.28
312	35.60	441.58	321.00	52.25
316	9.60	441.86	333.50	46.96
318	9.60	441.92	333.00	47.20
320	29.80	442.27	328.00	49.52
324	29.80	442.43	312.00	56.52
328	29.80	442.51	310.00	57.42
332	.00	442.26	322.00	52.11
352	17.64	442.29	318.00	53.86
364	17.66	442.37	317.00	54.33
376	9.84	442.08	328.00	49.43
378	9.84	442.17	328.00	49.48
380	9.84	442.19	326.00	50.35
382	9.84	442.21	326.00	50.36

MAXIMUM PRESSURES

8	.00	610.00	290.00	138.67
16	.00	623.93	328.00	128.23
83	.00	622.41	328.00	127.58
10	.00	610.00	320.00	125.67
65	.00	610.00	320.00	125.67

MINIMUM PRESSURES

316	9.60	441.86	333.50	46.96
318	9.60	441.92	333.00	47.20
376	9.84	442.08	328.00	49.43
378	9.84	442.17	328.00	49.48
320	29.80	442.27	328.00	49.52

THE NET SYSTEM DEMAND = 4286.94

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	.00
3	4286.94

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 4286.94
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
13	2000.00
15	2000.00

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00188

3Roots - Phase 2 Water System with only Two PR Stations
4000 GPM Fire Flow split between Nodes 13 and 15
Source out of Service - Pipe 125 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	.00	.00	.00	.00	.00	.00
3	0	14	5345.64	.81	.00	.00	8.53	16.16
6	8	10	.00	.00	.00	.00	.00	.00
8	14	16	5345.64	.81	.00	.00	8.53	16.16
10	15	13	1115.28	.72	.00	.00	1.78	.89
11	15	17	-3115.28	-4.81	.00	.00	-4.97	-5.94
12	17	20	1769.56	.29	.00	.00	2.82	2.08
13	17	24	-4896.90	-8.29	.00	.00	-5.00	-4.63
14	22	24	-78.16	-.01	.00	.00	-.22	-.03
15	36	24	5096.44	7.83	.00	.00	6.43	8.33
27	36	32	83.16	.01	.00	.00	.24	.03
29	44	36	5300.98	15.51	.00	.00	6.68	8.96
33	44	40	44.66	.00	.00	.00	.13	.01
37	18	44	5345.64	6.46	.00	.00	8.53	16.16
64	10	65	.00	.00	.00	.00	.00	.00
66	0	67	.00	.00	.00	.00	.00	.00
68	67	12	.00	.00	.00	.00	.00	.00
70	10	71	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 72 IS CLOSED								
74	73	12	.00	.00	.00	.00	.00	.00
76	16	77	757.13	7.40	.00	.00	19.33	370.10
78	0	79	757.13	7.40	.00	.00	19.33	370.10
80	79	18	757.13	7.40	.00	.00	19.33	370.10
82	16	83	4588.51	2.40	.00	.00	18.74	120.10
84	0	85	4588.51	2.40	.00	.00	18.74	120.10
86	85	18	4588.51	2.40	.00	.00	18.74	120.10
101	20	100	1769.56	.98	.00	.00	2.82	2.08
105	100	104	721.76	.29	.00	.00	1.15	.40
109	104	108	325.58	.05	.00	.00	.52	.09
113	108	112	273.29	.07	.00	.00	.44	.07
117	116	112	-75.80	.00	.00	.00	-.12	-.01
121	120	116	-35.00	.00	.00	.00	-.06	.00
LINE 125 IS CLOSED								
201	100	200	659.68	.74	.00	.00	1.87	1.36
202	202	200	-923.04	-1.67	.00	.00	-2.62	-2.54
203	202	13	884.72	1.85	.00	.00	2.51	2.34
205	200	204	-326.66	-.20	.00	.00	-.93	-.37
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	-108.57	-.03	.00	.00	-.31	-.05
213	212	216	-161.07	-.06	.00	.00	-.46	-.10
215	216	112	-196.19	-.02	.00	.00	-.56	-.14
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	396.17	.11	.00	.00	1.12	.53
253	236	204	344.95	.13	.00	.00	.98	.41
301	108	300	5.71	.00	.00	.00	.02	.00
303	300	376	87.89	.01	.00	.00	.25	.03

304	376	302	97.09	.01	.00	.00	.28	.04
305	302	304	41.00	.02	.00	.00	.26	.06
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	31.40	.03	.00	.00	.20	.03
312	112	308	-13.49	.00	.00	.00	-.04	.00
313	308	312	8.31	.00	.00	.00	.02	.00
317	312	316	-27.29	-.03	.00	.00	-.17	-.03
321	316	318	-36.89	-.01	.00	.00	-.24	-.05
325	320	324	-77.39	-.02	.00	.00	-.22	-.03
329	324	328	-107.19	-.02	.00	.00	-.30	-.05
333	328	364	118.45	.03	.00	.00	.34	.06
335	320	382	48.56	.01	.00	.00	.31	.08
337	332	320	.97	.00	.00	.00	.00	.00
341	332	300	82.18	.01	.00	.00	.23	.03
357	352	364	-100.79	-.01	.00	.00	-.29	-.04
387	332	352	-83.15	.00	.00	.00	-.24	-.03
389	376	378	-19.04	-.01	.00	.00	-.12	-.01
393	302	318	46.49	.02	.00	.00	.30	.07
399	382	378	20.75	.01	.00	.00	.13	.02
401	378	380	-8.13	.00	.00	.00	-.05	.00
403	382	380	17.97	.00	.00	.00	.11	.01
405	100	328	255.45	.29	.00	.00	.72	.23

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	610.00	290.00	138.67
10	.00	610.00	320.00	125.67
12	.00	485.00	320.00	71.50
13	2000.00	426.57	250.00	76.51
14	.00	624.19	335.00	125.32
15	2000.00	427.29	256.00	74.23
16	.00	623.38	328.00	128.00
17	12.06	432.10	261.00	74.14
18	.00	470.20	328.00	61.62
20	.00	431.81	262.00	73.58
22	78.16	440.39	280.00	69.50
24	121.38	440.40	280.00	69.50
32	83.16	448.22	300.00	64.23
36	121.38	448.23	298.00	65.10
40	44.66	463.73	317.00	63.58
44	.00	463.73	318.00	63.15
65	.00	610.00	320.00	125.67
67	.00	485.00	320.00	71.50
71	.00	610.00	320.00	125.67
73	.00	485.00	320.00	71.50
77	.00	615.98	328.00	124.79
79	.00	477.60	328.00	64.83
83	.00	620.98	328.00	126.96
85	.00	472.60	328.00	62.66
100	132.68	430.83	270.00	69.69
104	.00	430.54	294.00	59.17
108	.00	430.49	306.00	53.94
112	14.80	430.42	308.00	53.05
116	40.80	430.41	305.00	54.35
120	35.00	430.41	298.00	57.38
200	63.30	430.10	274.00	67.64
202	38.32	428.42	268.00	69.52
204	45.60	430.30	288.00	61.66
208	81.26	430.29	292.00	59.93
212	52.50	430.33	297.00	57.78
216	35.12	430.39	306.00	53.90

232	46.58	430.48	306.00	53.94
236	51.22	430.43	292.00	59.98
300	.00	430.49	314.00	50.48
302	.00	430.47	322.00	47.00
304	9.60	430.45	325.50	45.48
306	9.60	430.47	317.00	49.17
308	9.60	430.42	314.00	50.45
312	35.60	430.42	321.00	47.41
316	9.60	430.44	333.50	42.01
318	9.60	430.45	333.00	42.23
320	29.80	430.50	328.00	44.42
324	29.80	430.52	312.00	51.36
328	29.80	430.54	310.00	52.23
332	.00	430.50	322.00	47.02
352	17.64	430.50	318.00	48.75
364	17.66	430.52	317.00	49.19
376	9.84	430.48	328.00	44.41
378	9.84	430.48	328.00	44.41
380	9.84	430.48	326.00	45.28
382	9.84	430.49	326.00	45.28

MAXIMUM PRESSURES

8	.00	610.00	290.00	138.67
16	.00	623.38	328.00	128.00
83	.00	620.98	328.00	126.96
10	.00	610.00	320.00	125.67
65	.00	610.00	320.00	125.67

MINIMUM PRESSURES

316	9.60	430.44	333.50	42.01
318	9.60	430.45	333.00	42.23
376	9.84	430.48	328.00	44.41
378	9.84	430.48	328.00	44.41
320	29.80	430.50	328.00	44.42

THE NET SYSTEM DEMAND = 5345.64

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	.00
3	5345.64

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 5345.64
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
13	2000.00
15	2000.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

PIPE NO.	NODE NOS.		LENGTH	DIAMETER	ROUGHNESS	MINOR LOSS K	FIXED GRADE
125	12	120	380.0	16.0	120.0	.00	.00
37	18	44	400.0	16.0	120.0	.00	.00

LINE 37 IS CLOSED

THE RESULTS ARE OBTAINED AFTER 6 TRIALS WITH AN ACCURACY = .00031

3Roots - Phase 2 Water System with only Two PR Stations
4000 GPM Fire Flow split between Nodes 13 and 15
Source out of Service - Pipe 37 Closed

PIPE NO.	NODE NOS.		FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
2	0	8	5345.64	.81	.00	.00	8.53	16.16
3	0	14	.00	.00	.00	.00	.00	.00
6	8	10	5345.64	.81	.00	.00	8.53	16.16
8	14	16	.00	.00	.00	.00	.00	.00
10	15	13	661.95	.27	.00	.00	1.06	.34
11	15	17	-2661.95	-3.60	.00	.00	-4.25	-4.44
12	17	20	-3122.75	-.84	.00	.00	-4.98	-5.97
13	17	24	448.74	.10	.00	.00	.46	.06
14	22	24	-78.16	-.01	.00	.00	-.22	-.03
15	36	24	-249.20	-.03	.00	.00	-.31	-.03
27	36	32	83.16	.01	.00	.00	.24	.03
29	44	36	-44.66	.00	.00	.00	-.06	.00
33	44	40	44.66	.00	.00	.00	.13	.01
LINE 37 IS CLOSED								
64	10	65	757.14	7.40	.00	.00	19.33	370.11
66	0	67	757.14	7.40	.00	.00	19.33	370.11
68	67	12	757.14	7.40	.00	.00	19.33	370.11
70	10	71	4588.50	2.40	.00	.00	18.74	120.10
72	0	73	4588.50	2.40	.00	.00	18.74	120.10
74	73	12	4588.50	2.40	.00	.00	18.74	120.10
76	16	77	.00	.00	.00	.00	.00	.00
78	0	79	.00	.00	.00	.00	.00	.00
80	79	18	.00	.00	.00	.00	.00	.00
82	16	83	.00	.00	.00	.00	.00	.00
THE CHECK VALVE IN LINE NUMBER 84 IS CLOSED								
86	85	18	.00	.00	.00	.00	.00	.00
101	20	100	-3122.75	-2.81	.00	.00	-4.98	-5.97
105	100	104	-2420.50	-2.76	.00	.00	-3.86	-3.72
109	104	108	-2566.48	-2.28	.00	.00	-4.10	-4.15
113	108	112	-2948.04	-5.90	.00	.00	-4.70	-5.37
117	116	112	5269.84	8.18	.00	.00	8.41	15.73
121	120	116	5310.64	5.11	.00	.00	8.47	15.96
125	12	120	5345.64	6.14	.00	.00	8.53	16.16
201	100	200	95.40	.02	.00	.00	.27	.04
202	202	200	-1376.37	-3.51	.00	.00	-3.90	-5.31
203	202	13	1338.05	3.98	.00	.00	3.80	5.04
205	200	204	-1344.27	-2.75	.00	.00	-3.81	-5.09
209	204	208	81.26	.01	.00	.00	.23	.03
211	204	212	-1376.37	-3.61	.00	.00	-3.90	-5.31
213	212	216	-1428.87	-3.59	.00	.00	-4.05	-5.70
215	216	112	-1463.99	-1.01	.00	.00	-4.15	-5.96
241	108	232	46.58	.00	.00	.00	.13	.01
249	104	236	145.98	.02	.00	.00	.41	.08
253	236	204	94.76	.01	.00	.00	.27	.04
301	108	300	334.98	.14	.00	.00	.95	.39

303	300	376	-486.73	-.26	.00	.00	-1.38	-.78
304	376	302	-759.41	-.40	.00	.00	-2.15	-1.77
305	302	304	-403.76	-1.56	.00	.00	-2.58	-3.95
307	302	306	9.60	.00	.00	.00	.06	.00
309	304	308	-413.36	-3.51	.00	.00	-2.64	-4.13
312	112	308	843.01	.32	.00	.00	2.39	2.14
313	308	312	420.06	.18	.00	.00	1.19	.59
317	312	316	384.46	3.46	.00	.00	2.45	3.61
321	316	318	374.86	.57	.00	.00	2.39	3.44
325	320	324	437.76	.62	.00	.00	1.24	.64
329	324	328	407.96	.21	.00	.00	1.16	.56
333	328	364	-552.17	-.46	.00	.00	-1.57	-.98
335	320	382	-233.33	-.21	.00	.00	-1.49	-1.43
337	332	320	234.23	.07	.00	.00	.66	.20
341	332	300	-821.70	-.84	.00	.00	-2.33	-2.04
357	352	364	569.83	.31	.00	.00	1.62	1.04
387	332	352	587.47	.13	.00	.00	1.67	1.10
389	376	378	262.85	.76	.00	.00	1.68	1.78
393	302	318	-365.26	-.85	.00	.00	-2.33	-3.28
399	382	378	-144.50	-.20	.00	.00	-.92	-.59
401	378	380	108.51	.09	.00	.00	.69	.35
403	382	380	-98.67	-.11	.00	.00	-.63	-.29
405	100	328	-930.33	-3.16	.00	.00	-2.64	-2.57

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
8	.00	609.19	290.00	138.32
10	.00	608.38	320.00	124.97
12	.00	470.20	320.00	65.08
13	2000.00	432.31	250.00	79.00
14	.00	625.00	335.00	125.67
15	2000.00	432.59	256.00	76.52
16	.00	625.00	328.00	128.70
17	12.06	436.19	261.00	75.91
18	.00	485.00	328.00	68.03
20	.00	437.02	262.00	75.84
22	78.16	436.08	280.00	67.63
24	121.38	436.09	280.00	67.64
32	83.16	436.05	300.00	58.95
36	121.38	436.06	298.00	59.82
40	44.66	436.05	317.00	51.59
44	.00	436.06	318.00	51.16
65	.00	600.98	320.00	121.76
67	.00	477.60	320.00	68.29
71	.00	605.98	320.00	123.93
73	.00	472.60	320.00	66.13
77	.00	625.00	328.00	128.70
79	.00	485.00	328.00	68.03
83	.00	625.00	328.00	128.70
85	.00	485.00	328.00	68.03
100	132.68	439.83	270.00	73.59
104	.00	442.58	294.00	64.39
108	.00	444.87	306.00	60.18
112	14.80	450.77	308.00	61.87
116	40.80	458.95	305.00	66.71
120	35.00	464.06	298.00	71.96
200	63.30	439.81	274.00	71.85
202	38.32	436.30	268.00	72.93
204	45.60	442.55	288.00	66.97
208	81.26	442.55	292.00	65.24
212	52.50	446.17	297.00	64.64

216	35.12	449.76	306.00	62.29
232	46.58	444.86	306.00	60.17
236	51.22	442.57	292.00	65.24
300	.00	444.72	314.00	56.65
302	.00	445.38	322.00	53.46
304	9.60	446.94	325.50	52.62
306	9.60	445.38	317.00	55.63
308	9.60	450.45	314.00	59.13
312	35.60	450.26	321.00	56.01
316	9.60	446.80	333.50	49.10
318	9.60	446.23	333.00	49.07
320	29.80	443.82	328.00	50.19
324	29.80	443.20	312.00	56.85
328	29.80	442.99	310.00	57.63
332	.00	443.88	322.00	52.82
352	17.64	443.76	318.00	54.50
364	17.66	443.45	317.00	54.80
376	9.84	444.98	328.00	50.69
378	9.84	444.22	328.00	50.36
380	9.84	444.14	326.00	51.19
382	9.84	444.02	326.00	51.14
	MAXIMUM PRESSURES			
8	.00	609.19	290.00	138.32
16	.00	625.00	328.00	128.70
77	.00	625.00	328.00	128.70
83	.00	625.00	328.00	128.70
14	.00	625.00	335.00	125.67
	MINIMUM PRESSURES			
318	9.60	446.23	333.00	49.07
316	9.60	446.80	333.50	49.10
320	29.80	443.82	328.00	50.19
378	9.84	444.22	328.00	50.36
376	9.84	444.98	328.00	50.69

THE NET SYSTEM DEMAND = 5345.64

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
2	5345.64
3	.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 5345.64
THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

EXHIBIT A

BUILDOUT WATER SYSTEM
NODE AND PIPE DIAGRAM

N

SCALE: 1" = 150'

0 150 FEET

PROJECT BOUNDARY

OSGOOD WAY

PARKDALE AVENUE

LEGEND

- PROJECT BOUNDARY
- EXISTING WATER
- PROPOSED PRESSURE REDUCING STATION
- PROPOSED PUBLIC WATER
- PROPOSED PRIVATE WATER
- EXISTING PRESSURE REDUCING STATION
- (40) COMPUTER MODEL NODE NUMBER
- [8] COMPUTER MODEL PIPE NUMBER

PROPOSED 610/485 PRESSURE REDUCING STATION

PROPOSED 610/485 PRESSURE REDUCING STATION

EXISTING 712/610 PRESSURE REDUCING STATION

PROPOSED 625/485 PRESSURE REDUCING STATION

SPINE ROAD

STREET A

STREET B

STREET C

STREET D

STREET E

STREET F

STREET I

VILLAGE ENTRY

URBAN CORRIDOR ST.

CAMINO SANTA FE

SUMMERS RIDGE RD.

CARROLL CANYON RD

ARJONS DRIVE

TRADE PLACE

COMMUNITY PARK

PA1 PA2 PA3 PA4 PA5 PA6 PA7 PA8 PA9 PA10 PA11 PA12 PA13 PA14 PA15 PA16 PA17 PA18 PA19 MU PA20 MM

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
2234 FARADAY AVENUE
CARLSBAD, CA 92008
(760) 438-4422

EXHIBIT A

BUILDOUT WATER SYSTEM
NODE AND PIPE DIAGRAM
3ROOTS

V:\ARTIC\DWG\537012\WATER\3ROOTS_EXHIBIT-A-W_36X48.DWG 04-10-19 14:14:54 LAYOUT: LAYOUT

EXHIBIT A.1

PHASE 1 WATER SYSTEM
NODE AND PIPE DIAGRAM

N

SCALE: 1" = 150'

0 150 FEET

PROJECT BOUNDARY

OSGOOD WAY

PARKDALE AVENUE

LEGEND

- PROJECT BOUNDARY
- EXISTING WATER
- PROPOSED PRESSURE REDUCING STATION
- PROPOSED PUBLIC WATER
- PROPOSED PRIVATE WATER
- EXISTING PRESSURE REDUCING STATION
- (40) COMPUTER MODEL NODE NUMBER
- [8] COMPUTER MODEL PIPE NUMBER

PROPOSED 610/485 PRESSURE REDUCING STATION, SEE DETAIL 'A'

PROPOSED 610/485 PRESSURE REDUCING STATION, SEE DETAIL 'B'

EXISTING 712/610 PRESSURE REDUCING STATION

PHASE 1 BOUNDARY

SPINE ROAD

STREET A

STREET B

STREET C

STREET D

STREET E

STREET I

VILLAGE ENTRY

URBAN CORRIDOR ST.

CAMINO SANTA FE

SUMMERS RIDGE RD.

CARROLL CANYON RD

ARJONS DRIVE

TRADE PLACE

PA1 PA2 PA3 PA4 PA5 PA6 PA7 PA8 PA9 PA10 PA11 PA12 PA13 PA14 PA15 PA16 PA17 PA18 PA19 MU PA20 MM

COMMUNITY PARK

BASIN 1 BASIN 2 BASIN 3 BASIN 4 BASIN 5 BASIN 6 BASIN 7 BASIN 8 BASIN 9

DETAIL 'A'
NO SCALE

DETAIL 'B'
NO SCALE

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CONSULTING ENGINEERS
2234 FARADAY AVENUE
CARLSBAD, CA 92008
(760) 438-4422

EXHIBIT A.1

PHASE 1 WATER SYSTEM NODE AND PIPE DIAGRAM

3ROOTS

\\ARTIC\DWG\537012\WATER\3ROOTS_EXHIBIT-A-W_P1_36X48.DWG 04-10-19 14:16:43 LAYOUT: LAYOUT

EXHIBIT A.2

TWO PRS ANALYSIS
NODE AND PIPE DIAGRAM

N

SCALE: 1" = 150'
0 150 FEET

PROJECT BOUNDARY

OSGOOD WAY

PARKDALE AVENUE

LEGEND

- PROJECT BOUNDARY
- EXISTING WATER
- PROPOSED PRESSURE REDUCING STATION
- PROPOSED PUBLIC WATER
- PROPOSED PRIVATE WATER
- EXISTING PRESSURE REDUCING STATION
- (40) COMPUTER MODEL NODE NUMBER
- [8] COMPUTER MODEL PIPE NUMBER

PROPOSED 610/485 PRESSURE REDUCING STATION, SEE DETAIL 'A'

EXISTING 712/610 PRESSURE REDUCING STATION

PROPOSED 625/485 PRESSURE REDUCING STATION, SEE DETAIL 'B'

SPINE ROAD

STREET A

STREET B

STREET C

STREET D

STREET E

STREET I

VILLAGE ENTRY

URBAN CORRIDOR ST.

CAMINO SANTA FE

SUMMERS RIDGE RD.

CARROLL CANYON RD

ARJONS DRIVE

TRADE PLACE

COMMUNITY PARK

PA1 PA2 PA3 PA4 PA5 PA6 PA7 PA8 PA9 PA10 PA11 PA12 PA13 PA14 PA15 PA16 PA17 PA18 PA19 MU PA20 MM

DETAIL 'A'
NO SCALE

DETAIL 'B'
NO SCALE

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2234 FARADAY AVENUE
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EXHIBIT A.2

TWO PRS ANALYSIS
NODE AND PIPE DIAGRAM
3ROOTS

\\ARTIC\DWG\3370\2\WATER\3ROOTS_EXHIBIT-A-W_P2_36X48.DWG 04-10-19 14:22:50 LAYOUT: LAYOUT