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TECHNICAL MEMORANDUM

Date: June 21, 2016 **BKF Job Number:** 20056154

Deliver To: Heather Klein

From: Sravan Paladugu, P.E.,
Jacob Nguyen, P.E.,

Subject: **Oak Knoll Preliminary Water Master Plan (Draft) – Update to Demand Factors**

This technical memorandum is prepared to update the projected water demand analyses conducted as part of a study prepared by BKF to size the new water distribution system for the proposed project. The study, Oak Knoll Preliminary Water Master Plan, dated July 21, 2015, used the same unit demand factors to estimate the water demand from townhomes and single family homes.

The unit demand factor for any given landuse varies by unit type, geographically and also by agencies and/or utility districts which have different regulatory requirements. This technical memorandum is provided to refine the unit demand factor for townhomes from 250 gpd to 200 gpd to more accurately reflect that use and demand factors for that use when located within the East Bay Municipal Utility District. The revised demand is also within the industry standard unit demand factor range for townhomes. With this clarification, BKF estimates total project daily water usage would be 213,350 gpd.

OAK KNOLL
Preliminary Water Master Plan
(Draft)

July 21, 2015
20056154

FOR:
Oak Knoll Venture Acquisitions LLC
Irvine, California

ENGINEERS / SURVEYORS / PLANNERS

DESIGN ENGINEER:
BKF ENGINEERS
255 Shoreline Drive, Suite 200
Redwood City, CA 94065
Sravan Paladugu
P.E. CA 74343

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1. INTRODUCTION

Oak Knoll Venture Acquisitions LLC (OKVA) is proposing a mixed-use development in the City of Oakland (City) at the site of the Naval Medical Center Oakland (NMCO), also known as Oak Knoll Naval Hospital. The proposed site contains approximately 187 acres and is bounded by Mountain Boulevard on the west, Keller Avenue on the north and east, and approximately by Saint Andrews, Briar Cliff and Sequoyah Roads on the south. The site has been largely unused since the hospital discontinued operations in the 1990's. The site location and vicinity is shown on Figure 1.

Water service to the site is provided by the East Bay Municipal Utilities District (EBMUD). The Water Supply Assessment (WSA) prepared by EBMUD indicates that no additional offsite water facilities are necessary to accommodate the additional water demand due to the Project.

The proposed development will consist of multiple land uses including single-family and multi-family residential and mixed use parcels. A similar Project was proposed in 2007 and a Draft SEIR was published but the Project did not receive further entitlements.

This Preliminary Water Master Plan documents water service to the proposed development. In addition, this report will provide locations and sizes of proposed major water facilities necessary to serve the project site. This is intended to provide general concepts and guidelines to be followed by more detailed and comprehensive analyses. The design criteria and engineering analyses are presented in more detail under Appendix A.

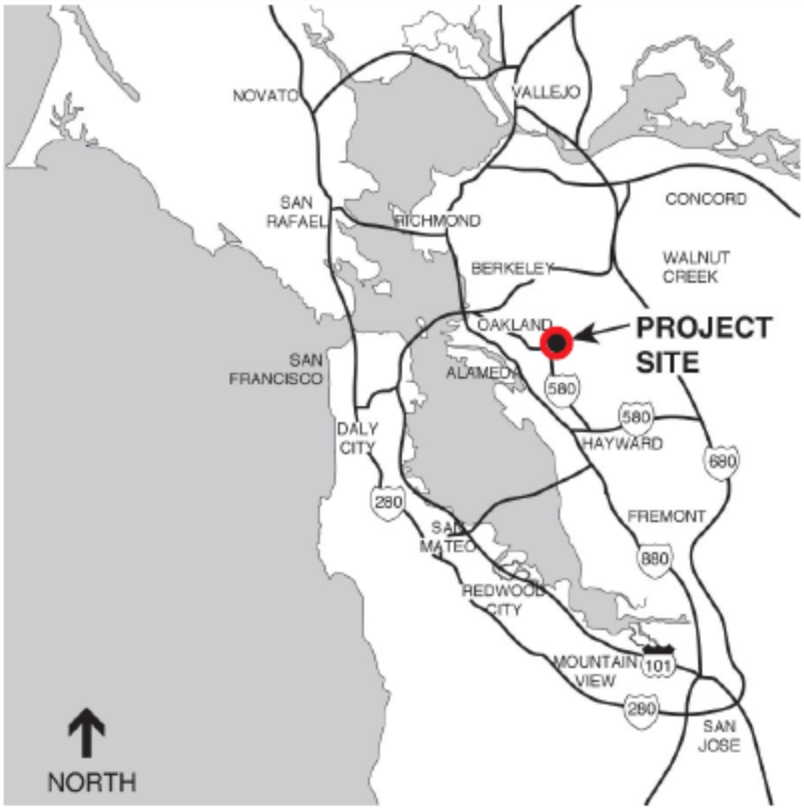
2. BACKGROUND

In 2005, Oak Knoll LLC proposed a mixed-use development at the former Oak Knoll Naval Medical Center property that was similar to the currently proposed mixed-use development. An Initial Study and Draft Supplemental Environmental Impact Report (SEIR) was prepared in 2006 and 2007, respectively, for the development proposed in 2005. No Final SEIR was published.

To supplement the 2007 Draft SEIR, BKF prepared a preliminary Water Master Plan in 2006 (2006 BKF Water Report) to evaluate backbone water facilities necessary to serve the proposed development. The 2006 BKF Water Report was prepared using the input received from the meetings held with the EBMUD, Oakland Fire Marshal and the City of Oakland representatives. The baseline data, criteria and design input received is provided is provided under Appendix B.

To the extent applicable, this report uses the same baseline data and design requirements to evaluate the water system necessary to serve the currently proposed development.

FIGURE 1 – Location and Vicinity Map



LOCATION MAP

VICINITY MAP

2.1 PROJECT DESCRIPTION

The Project site includes approximately 165 acres of the Oak Knoll Naval Medical Center (NMCO) property, approximately 15 acres of an adjacent property, and approximately 7 acres of City-owned property for a site with a total size of approximately 187 acres.

Much of the property consists of hilly terrain with oak, eucalyptus, Monterey pine, riparian, and annual grassland habitats. The center of the site adjacent to Mountain Boulevard is relatively flat where the partially-culverted Rifle Range Creek flow across the Project site from north to southwest. Surrounding uses are primarily residential development, small local commercial centers, and regional open space. All buildings on the Project site from the Naval Facility (closed in 1996) have been demolished except for the deteriorated 1925 former Oak Knoll Golf and Country Club clubhouse building (known as Club Knoll).

The modified Oak Knoll Project proposes a mixed-use residential community of: a) approximately 935 residential units of varying types; b) approximately 72,000 square feet of neighborhood commercial use; and c) approximately 77 acres of open space and recreation areas, including an improved creek corridor. Refer to attached Figure 2 for proposed Project site plan. Table 1 below lists proposed uses, unit count and anticipated construction phasing.

Table 1: Project Development Plan

No.	Area	Unit Type	Unit Count	Area (sq.ft)	Phasing
1	Town Center	Multifamily	134		3
2	Creekside North	Townhomes	140		3
3	Uplands North	Townhomes	60		3
4	Creekside Village 1	Townhomes	87		1
		Single Family 1	26		2
		Single Family 2	93		2
5	Creekside Village 2	Townhomes	70		1
6	Creekside South	Townhomes	76		1
		Single Family	53		2
7	Uplands South	Single Family	49		1
8	Uplands East	Single Family	147		2
9	Creekside Village	Commercial	-	72,000	1
10	Community Center			4,000	1
		Total	**935**	**76,000**	

Notes:

a) Phase 1 construction is anticipated to begin in Spring of 2017 and end in Fall of 2018.

b) Phase 2 construction is anticipated to begin in Summer of 2018 and end in Winter of 2019.

c) Phase 3 construction is anticipated to begin in Summer of 2020 and end in Winter of 2022.

3. WATER SYSTEM EVALUATION

Water supply for the Project site is provided by East Bay Municipal Utilities District (EBMUD). About 90 percent of the water delivered by EBMUD originates from the Mokelumne River watershed and 10 percent originates as local runoff from EBMUD's protected watersheds. The Mokelumne aqueducts convey the Mokelumne River supply from Pardee Resevoir across the Sacramento-San Joaquin River Delta to local storage and treatment facilties. After treatment, water is distributed to multiple cities in San Francisco East Bay Area. City of Oakland's water supply, distribution, operation, and maintenance is managed by EBMUD.

The Project area lies at the toe of the Oakland hills and generally slopes southwest towards the San Francisco Bay. The site elevations range between 250 and 600 with more than 90-percent of the Project site below elevation 500. The upper elevations, located along Keller Avenue and Briar Cliff Road on the eastern edge of the site, are steep and hilly. The lower elevations, located along Mountain Boulevard on the western edge of the site, are relatively flat.

The site encompasses two water service pressure zones due to its elevation range. The two pressure zones are Piedmont Pressure Zone and Country Club Pressure Zone and are designated by EBMUD as B3A and B5D, respectively. Pressure zone B3A serves elevations between 325 and 500 feet. Zone B5D serves elevations between 500 and 700 feet.

The Project site is in close proximity to three existing storage tanks in the two Pressure Zones. The Rilea Tank and Oak Knoll Tank in the Piedmont Zone (zone B3A) are located north and south of the Project, respectively. The Country Club Reservoir (zone B5D) is located to the east of the Project. EBMUD is considering removing Oak Knoll Tank from service. See attached Figure 3 for the pressure zone locations on the Oak Knoll site.

3.1 EXISTING FACILITIES

Existing offsite water distribution lines within the vicinity of the Project site that are in Pressure Zone B3A include a 12-inch water main under Keller Avenue and an 8-inch main under Mountain Road and Sequoyah Road. In addition to the 8-inch, a 24-inch transmission line also runs along Mountain Road and Sequoyah Road. Offsite main serving the Project from Pressure Zone B5D include a 6-inch line in east Keller Avenue.

The existing site is served through two meters: one located on north Keller Avenue and the other on Mountain Road. The existing pressure zones have single points of connection. EBMUD does not rely on water lines through the site to provide looping for water users outside the site limits.

Currently, much of the project site is abandoned and there is minimal on-site water use. Historically, water use would have included indoor usage associated with the hospital, support services and outdoor usage for landscape irrigation.

The existing water lines within the site are not consistent with site development plans and will be abandoned. These lines do not provide looping for the EBMUD system and therefore are not benefiting the existing system. There are several on-site water users. Water service to existing connections is adequate and must be maintained through the phasing process.

3.2 PROJECTED DEMANDS

The Project water consumption occurs indoor and outdoor. Indoor water consumption primarily includes water used in restrooms, bathrooms, kitchen, laundry, cleaning and by cooling appliances. Outdoor uses include water used for irrigating landscaped areas and for cleaning/washing-down hardscape areas. In addition to indoor and outdoor water uses, incidental water use occurs in an event of fire.

The average daily water demand for different land uses is calculated using a standard demand factor based on EBMUD Guidelines. The total average day water demand for the Project is projected to be approximately 234,000 gallons per day (gpd). A peaking factor of 2.0 and 4.0 were applied to the average day demand to calculate the maximum-day and peak-hour demands, respectively. Refer to Table C1 in Appendix C for average, maximum and peak hour demands.

The sizing of the on-site water system is primarily controlled by the requirements for fire suppression because domestic water usage, i.e., indoor and outdoor usage, is significantly less than the required fire flow for any building/structure. To illustrate this case even more, the peak hour demand for the entire Project is 651 gallons per minute (gpm) whereas the minimum fire flow requirement at any location shall be 1,500 gpm. The 2013 California Fire Code was used to estimate the fire flow requirement for different land uses based on gross area and the method of building construction. The required fire flow for each land use along with assumptions are presented in Table 2.

Table 2: Projected Fire Demand

Land Use	Maximum Area per Unit (sq.ft)	No. of Units Per Building	Total Building Area (sq.ft)	Fire Flow Demand (gpm)	Sprinkler Reduction	Fire Flow Required (gpm)
Single Family Detached	5,000	NA	5,000	2,000	NA	2,000
Townhomes	2,400	5 (assumed)	12,000	3,000	75%	1,500
Multifamily Apartments	1,000	10 (assumed)	10,000	2,500	75%	1,500
Commercial	15,000	NA	1,500	3,250	75%	1,500
Community Facility	4,000	NA	4,000	1,750	75%	1,500

Notes:

a) Fire Demands are based on 2013 California Fire Code Table B105.1 of Appendix B.
b) Single Family Detached homes are assumed to not include sprinkler system.
c) All proposed uses are assumed to be of Type V-B construction per California Building Code.
d) The largest commercial building is assumed to be the Oak Knoll Grocery store anticipated to be approximately 15,000 sq.ft.

3.3 CRITERIA

The system performance was evaluated based on the minimum pressure required during different demand scenarios. The Fire Marshall requires that the system shall provide a minimum pressure of 40 psi during maximum day demands and 20 psi during peak hour, both calculated without fire flow. The system shall also provide a minimum pressure of 20 psi during maximum day demand with fire flow and the maximum velocity in the water line cannot exceed 10 feet per second (fps) under any demand scenario.

3.4 HYDRAULIC MODEL

EBMUD maintains and updates the hydraulic computer model for the entire water distribution system. As part of the 2006 BKF Water Report analyses, BKF requested EBMUD and obtained flow and residual pressure data for the hydrants that are in the vicinity of the Project site to aid in building and calibrating a hydraulic model of the offsite existing water distribution system in the vicinity of the Project. EBMUD provided actual hydrant flow tests at three separate locations around Project. Additionally, EBMUD provided their hydraulic computer model results at these locations based on maximum day background scenario with fire flow.

The intent of building an independent Project hydraulic model is to verify if the existing water system within the Project can support the minimum pressure requirements for the proposed development. Since the Project hydraulic model does not represent distribution system beyond the Project limits, it cannot be used to determine the impact of the proposed Project water demand on the minimum pressure required elsewhere in the City. EBMUD may use the Project hydraulic model to supplement their hydraulic model to evaluate offsite impacts as a result of the Project.

A mathematical model of the existing EBMUD water system in the vicinity of the Project was prepared and calibrated based on the EBMUD's hydrant test and hydraulic model results. The mathematical model is build using WaterCAD V8i by Haestad Methods. The extent of the Project hydraulic model is shown in the attached Figure 3. Appendix A discusses in detail model calibration and the design parameters used.

3.5 ANALYSIS APPROACH

The approach to evaluating and sizing the system capacity to provide minimum pressure under different demand scenarios is by initially sizing for required residual pressure and velocity under fire flow condition. Since fire flow is significantly higher than the peak hour demand and because there is no dedicated water distribution system for fighting fire, if the residual pressure under fire flow demand scenario is greater than 20 psi and the velocity in pipe is less than 10 fps, then the system will generally meet the criteria for all other demand scenarios.

The fire flow scenario combines maximum day demands and fire demands at select nodes in the system. Maximum day water demands are uniformly distributed through the site using the anticipated water demands presented on Table C1 in Appendix C. The fire flow required for each land use as presented in Table 2 above are logically assigned at nodes that simulate worst case. EBMUD is considering removing Oak Knoll Tank from service. To be conservative, this analysis has not included the tank in these analyses.

The analyses included a pressure reducing valve (PRV) onsite connecting the two pressure zones B3A and B5D. The downstream operating point of the PRV was set to elevation 600.

The required pipe sizes onsite and connection points to offsite to support Project are shown in Figure 3. With the proposed layout, the required fire flow for different land uses can be provided simultaneous with maximum day demand with a residual pressure of at least 28 psi (including an 8 psi allowance for backflow prevention device) at all proposed on-site hydrant locations except for the row of single family homes along the eastern ridge line with pad elevations above 500. To meet the minimum pressure during fire flow scenario, these homes will need to be fitted with sprinkler system in order to reduce the minimum fire flow from 2,000 gpm to 1,000 gpm (based on assumed 5,000 sq.ft. home). Alternatively, upsizing of approximately 1,550 feet of off-site 6-inch line along Keller Avenue in Pressure Zone B5D to an 8-inch line is needed to maintain minimum pressure for these homes. Appendix C includes tables showing detailed hydraulic parameters and results for the various demand scenrios.

The Fire Marshal requested a review of system performance if only one connection point is active. Therefore, only Connection Point 4 is active in the B3A pressure zone, since connection point 4 has the poorest hydraulic conductivity from Rilea Tank. In the B5D pressure zone, the only Connection Point 5 was left active. The site can therefore be fed from any single connection point for each pressure zone, although for normal operations all 5 connections will function. The analyses showed that all modeled nodes can provide minimum fire flow with residual pressure in excess of 30 psi except for the single family homes with pad elevation above 500.

4. DEVELOPMENT NEEDS

The Project will need to abandon existing water lines within the site as they are not consistent with the site development plans and install new water system to support the proposed development. The new system will consist of water mains, laterals, hydrants, meters and backflow valves and pressure reducing valves. Onsite water mains consists of 8-inch diameter lines and the system will connect to offsite at five locations. Multiple feeds are provided for Pressure Zone B3A at connection points 1, 2, 3 and 4. Only one connection is made to Pressure Zone B5D. Refer to attached Figure 3 for proposed water system and connection points.

Single Family homes with pad elevations above 500 will need to be fitted with automatic sprinkler system to meet fire flow criteria. Otherwise the Project will need upsizing of approximately 1550 feet of off-site 6-inch line along Keller Avenue in Pressure Zone B5D to an 8-inch line to meet fire flow criteria.

The Project will need to install new hydrants. The number of hydrants required is based on building fire flow requirement and the California Fire Code. A preliminary location of hydrants is shown on Figure 3.

If EBMUD were to use the onsite water mains in the main corridors for looping their offsite system then they may require that each of the individual communities within the Project install a back flow preventer before connecting to onsite water mains within the main corridors.

A pressure reducing valves are needed through the site due to close proximity to storage tanks and the terrain. During maximum day and peak hour demands, the residual pressures are significantly higher than normal operating pressure of 40 psi to 60 psi. Additionally, the Project will need a pressure reducing station between existing Pressure Zones.

5. IMPACTS, MITIGATIONS, AND RECOMMENDATIONS

The proposed Project will increase EBMUD's domestic water usage by approximately 234,000 gallons per day. The Water Supply Assessment (WSA) prepared by EBMUD indicates that no additional offsite water facilities are necessary to accommodate this additional water demand.

The existing offsite water system has adequate capacity to serve the proposed Project. Therefore, upgrade to the existing system is not necessary.

The proposed site layout consists primarily of 8-inch diameter lines. Approximately 1550 feet of off-site pipe is proposed for Zone B5D along Keller Avenue to increase capacity at connection point 5 if the single family homes above elevation 500 are not fitted with automatic sprinkler systems. Multiple feeds are provided for Zone B3A at connection points 1, 2, 3 and 4. See Figure 3 for details.

The hydraulic model prepared as part of this study does not evaluate offsite impacts as a result of the proposed Project. However, based on the analyses conducted and the small variation in pressure observed during maximum day demand at Project points of connection, it can be reasonably stated that the proposed Project will not lower the residual pressure elsewhere in the offsite distribution system during maximum day demand. Therefore, the impact is less-than-significant. As such, the Project is not required to provide any offsite improvements to mitigate for impacts that are less-than-significant.

We recommend that the water distribution facilities presented on Figure 3 be implemented to serve the proposed development. The facilities shown include water line sizes and hydrant locations. The proposed water system meets the EBMUD and Oakland Fire Department Guidelines. The system can provide up to 2,000 gpm fire flow concurrent with maximum day demand with at least 20 psi residual for each of the on-site hydrants and an allowance of 8 psi for a backflow prevention device.

There are several on-site water users. Water service to existing connections is adequate and must be maintained through the phasing process. Phasing is not considered as a part of this report, and will be addressed as a part of later studies.

6. REFERENCES

BKF Engineers, Preliminary Water Master Plan, October 20, 2006.

ESA, Oak Knoll Mixed Use Community Plan Project Supplemental Environmental Impact Report, September 2007.

California Building Standards Commission, 2013 California Fire Code, January 2014.

FIGURES

RESIDENTIAL DEVELOPMENT PROGRAM	
Type	Units
Multifamily Apartments	134
Townhomes	433
Single Family Detached	368
TOTAL	935

COMMERCIAL DEVELOPMENT PROGRAM	
Use	Area (sf)
Retail (Gross Leasable)	72,000
Community Facility	4,000
TOTAL	76,000

LAND USE SUMMARY (APPROX.)	
Use	Area (ac.)
Developed Area	92
Major Streets (approx)	17
Parks and Open Space	77
TOTAL	187

Trails & Paths +/- 4.3 miles

Site Entrance

Pedestrian Bike Access

GRAPHIC SCALE
400 0 400 800

FIGURE 2: PROJECT SITE PLAN

DRAWING NAME: J:\2015\150163_Oak_Knoll\DOCS\06-Design\E-Water_System\Figure-2.dwg
PLOT DATE: 07-20-15 PLOTTED BY: tayl

OAK KNOLL
Oakland, California

BKF

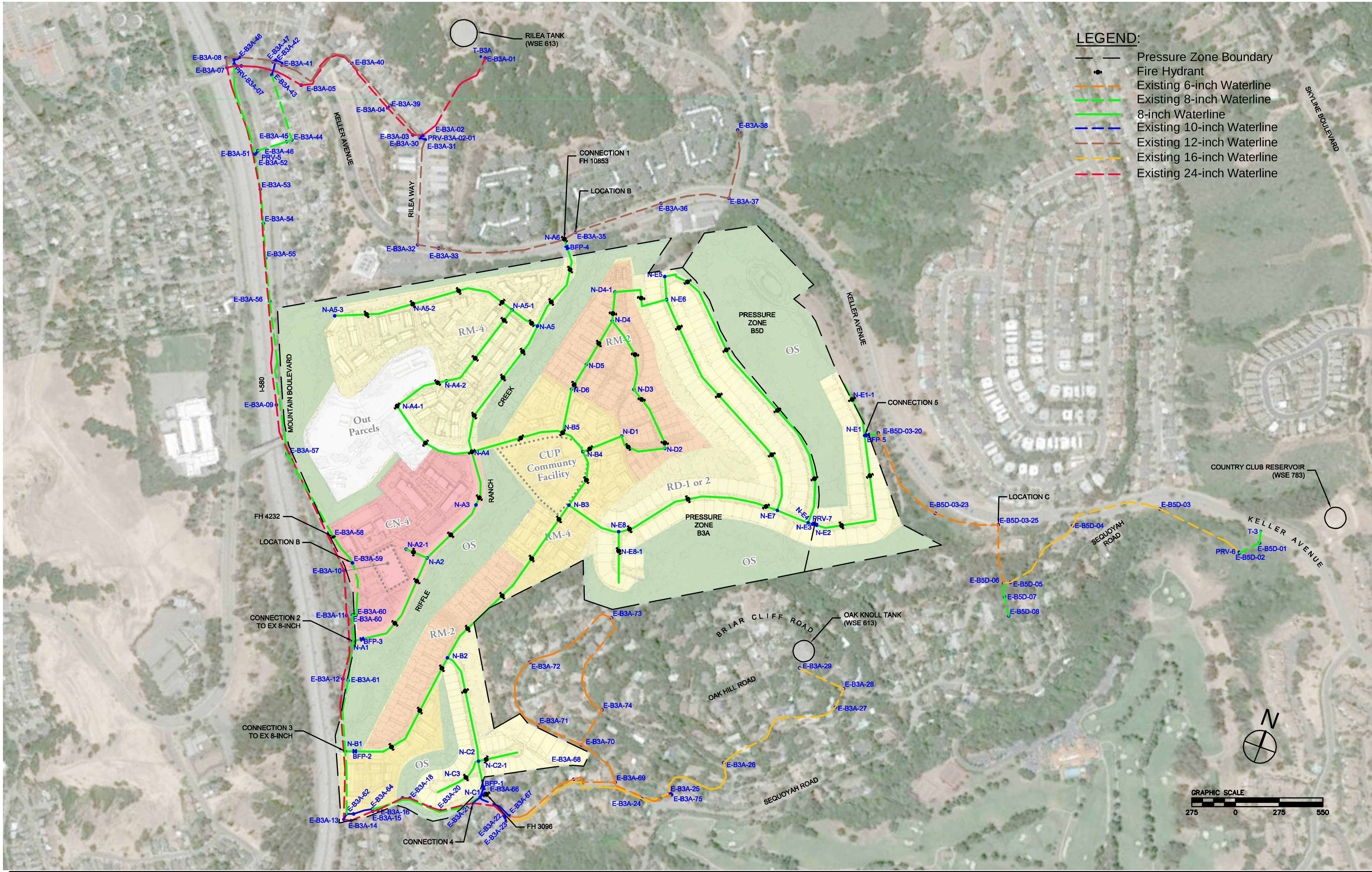


FIGURE 3: DOMESTIC WATER AND FIRE PROTECTION SYSTEM / MODEL
OAK KNOLL DEVELOPMENT

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PLOT DATE: 07-20-15 PLOTTED BY: tayl

OAK KNOLL Oakland, California

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APPENDIX A

Design Criteria and Engineering Analyses

A.1 Design Criteria

The water system will be sized to meet the following design criteria, which conforms to the regulations of EBMUD and the Oakland Fire Department (Oakland Fire):

General

- Zone gates may be required between the service zones.
- If larger meters/services are required, existing meters/services cannot be upsized with a parallel meter, but must be removed
- The 6" main on Keller Ave (near Ridgemoor) will need to be extended for residential services
- Each building must have its own meter (e.g. an individual townhouse or a cluster of condominiums within one building)
- Creek-crossings: all pipes may be hung under or on the side of a bridge.
  - Bridge design must be approved by EBMUD; crossing details can hold up approval process

Hydrant Design Specifications

- Spacing is determined by the 2001 California Fire Code (CFC) App. III-B; generally 500' for single family homes and 300' for commercial, mixed-use or high density.
- Exceptions include dead-ends and roads without structures. Dead-ends require 400' between hydrants and a hydrant is required within 200' of dead end. Roadways without structures require 1000' between hydrants.
- Minimum connections on hydrants are one 2.5-inch outlet and one 4.5-inch connection.

Piping, Required Flow Rate and Duration

- Flows and duration are determined by CFC Table III-A. Minimum residual is 20 psi for all fire flows.
- Typical pipe sizes are 6", 8", and 12" pipe sizes (no 10" pipes); for 12" or larger; pipe material shall be steel
- Minimum pipe diameter is 6 inches.
- For single family residences, 1000 gpm @ 20 psi for 120 minutes is acceptable.
- Reduction in flow determined by CFC III-A.
- Required duration of flow determined by category that reduced flow falls into on CFC Table III-A.
- EBMUD is considering removing Oak Knoll tank. Analyses are to be conducted as if the tank were not in place.
- For a private system, the developer shall calculate flow for the worst case. Calculations shall be made with only one connection to public system available: the one with smallest capacity. Backflow devices are required at EBMUD tie-in points.

Street Layout, Bridges and Gates

- o Roads must be all-weather and a minimum width of 20 feet. Asphaltic concrete is preferred, but gravel is acceptable. Minimum turning diameter for all fire access roads is 70 feet. Slopes of roads shall ideally be up to 15% with a maximum slope of 18%.
- o Maximum allowed length of cul de sac (without variance) is 600 feet, or 150 feet without a hammerhead or turnaround.
- o See attached figure for minimum hammerhead and turnaround dimensions.
- o Bridges must support a fire vehicle that weighs 65,000 lbs., has two tires in front, four in the back, and two more on the attached trailer.
- o Gated communities require key boxes at all points of entry. Entry from Keller into the top of site (northeastern edge of site) is desirable for better fire access.

Structures and Other Utilities

- o A variance is required for all structures containing more than one level of underground parking.
- o Standpipes are required for structures with 4 or more stories (see CBC Table 9-A)
- o All electrical service shall be installed underground for fire safety.

The following right-of-way restrictions will be used for locating improvements.

- o EBMUD requires 25' minimum rights-of-way (ROW)
- o EBMUD easements—no structures are allowed within easements, including trees
- o Proposed landscaping must be approved by EBMUD
- o Alleyways will require minimum 6" mains

The Project phasing must address the following EBMUD concerns.

- o EBMUD requires that each project phase be "self-sufficient". Lines within future phasing zones may need to be constructed as a part of an earlier phase to meet level of service standards.
- o Services to remaining customers (e.g. Seneca and Credit Union) must be provided at all times.
  - ▪ Service must be maintained during the interim condition
  - ▪ A single feed for each is acceptable to EBMUD
- o Site must provide adequate access (e.g. paved road) to EBMUD at all times to allow EBMUD to service existing customers.

A.2 Engineering Analyses

Engineering Analyses was conducted using WaterCAD V8i by Bentley Systems (formerly Haestad Methods). WaterCAD is a water distribution system analysis program that is based on the Hazen-Williams equation. A skeleton model of the EBMUD system was first constructed. Figure 3 shows the portion of the EBMUD system constructed and used as the basis for the analyses.

Hydrant flow and pressure test data (Flow Data) were provided by EBMUD for hydrants and mains surrounding the project area. This data is summarized in Table C2. Two sets of data were provided. The first set of data is based on computer model simulations with fire flow provided simultaneous with a maximum day demand. The other set of data is based on hydrant flow tests simultaneous with unknown water usage.

Model Calibration

The Project site is in close proximity to three existing storage tanks in the two Pressure Zones. The Rilea Tank and Oak Knoll Tank in the Piedmont Zone (zone B3A) are located north and south of the Project, respectively. The Country Club Reservoir (zone B5D) is located to the east of the Project. Therefore, offsite lines connecting the three tanks to the project are included in the skeleton model built for calibration.

The tank elevations were set according to a best fit of the static pressures at the test nodes, taking into account their elevations. Test nodes are those for which Flow Data is available. Demand at each test node in turn was then placed to mimic the Flow Data. Flows and the calculated residual pressure at each test hydrant were then compared with Flow Data. The best fit achieved a residual pressure for the EBMUD Data that was within 2 psi of the observed residual. The roughness coefficients used for the off-site system are adjusted and include a demand component such that the modeled residual pressure at the site matches information presented by EBMUD for conditions concurrent with a maximum day demand. The calibration resulted in tank elevation of 613 for Pressure Zone B3A and 783 for Pressure Zone B5D.

Proposed System Analyses

The proposed system analyses was conducted by adding onsite pipe network to the calibrated model. EBMUD is considering removing Oak Knoll Tank from service. To be conservative, the proposed system did not included the tank in these analyses. A pressure reducing valve (PRV) was added to the proposed system onsite connecting the two pressure zones B3A and B5D. The downstream operating point of the PRV was set to elevation 600.

On-site losses were calculated with the Hazen-Williams equation with a coefficient of 130 for all pipes to account for all anticipated future conditions. Minor losses were ignored at this level of analysis. More detailed water distribution system analyses should be conducted as a part of final design.

The maximum day and peak hour water demand for the proposed development was uniformly distributed throughout the site at select nodes onsite. Anticipated water demands and node allocation are presented in Table C2 in Appendix C. Both the scenarios were analyzed separately for minimum residual pressure. The analyses showed that the residual pressure are significantly higher than required 40 psi and 20 psi during maximum day and peak hour scenarios suggesting that individual PRVs will be needed to bring the pressure down to normal operating range of 40 psi to 60 psi.

The fire flow scenario combines maximum day demands and fire demands at select nodes in the system. The required fire flow was established on criteria provided by the Oakland Fire, based on the Table B105.1 of 2013 California Fire Code, Appendix B. The Fire Marshal requires that the water distribution system be capable of fighting one fire at a time, and that the residual pressure be 20 psi. The fire flow required for each land use as presented in Table 2 was assigned to remote hydrant locations based on the largest anticipated fire flow at an adjacent building.

An analysis is included in which all connections from the public system are disconnected except the one with the smallest capacity. This analysis was made at the request of the Fire Marshal. The connection point on Sequoyah Road was left open for the B3A system and the other three were closed off, simulating breaks in these lines. Rilea tank alone provided flow to the system in Pressure Zone B3A. The system in Pressure Zone B5D with only one connection to the public system was not affected by this scenario. An 8 psi pressure drop was included to account for the installation of a double detector check valve at the tie-in point to the EBMUD system. Therefore, the target residual for the Fire Flow Report is 28 psi.

With the proposed layout, the required fire flow for different land uses can be provided simultaneous with maximum day demand with a residual pressure of at least 28 psi at all proposed on-site hydrant locations except for the row of single family homes along the eastern ridge line with pad elevations above 500. To meet the minimum pressure during fire flow scenario, these homes will need to be fitted with sprinkler system in order to reduce the minimum fire flow from 2,000 gpm to 1,000 gpm. Alternatively, upsizing of approximately 1550 feet of off-site 6-inch line along Keller Avenue in Pressure Zone B5D to an 8-inch line is needed to maintain minimum pressure for these homes. Appendix C includes tables showing detailed hydraulic parameters and results.

APPENDIX B

MEETING NOTES

EBMUD FLOW DATA

CALIFORNIA FIRE CODE

BKF
ENGINEERS / SURVEYORS / PLANNERS

981 Ridder Park Drive, Suite 100
San Jose, CA 95131-2305
Ph: (408) 467-9100, Fax: (408) 467-9199

MEETING NOTES

Date: Wednesday March 22, 2006 **BKF No.:** 056154-10

Meeting Date: Tuesday March 21, 2006 **Location:** **EBMUD Office, Oakland**

Prepared By: Jacob Nguyen

Attendees:
Bill McGowan (EBMUD)
Jose Rios (EBMUD)
Susan Miller (EBMUD)
David Rehnstrom (EBMUD)
Ed Boscacci (BKF)
Jacob Nguyen (BKF)

Subject: EBMUD Design Design/Service Requirements

REMARKS:

The purpose of the meeting was to discuss EBMUD's water facilities, application and design requirements. Specifically, the following items were discussed:

- Current service zones
  - Two-thirds of the Oak Knoll site will be served from the Rilea Tank by the Piedmont Zone (zone B3a); and one-third of the site will be served by the reservoir (zone ___)
- New Business:
  - EBMUD considers this project as a new business, which will require a water supply assessment (WSA). They have available supply and do not anticipate problems serving the site.
  - Estimated EBMUD planning and engineering fees will be based on number of units, per schedule M (available on EBMUD website)
    - $10K minimum for project w/ > __ units
    - Additional fees may be required for projects with multiple phases
    - Estimates are good for one year; after that, owner must reapply and pay new application fees
  - EBMUD will perform planning and/or engineering for one project phase at a time.

There may be delays between phases.
  - If development contains more than 500 units, it will require environmental review through the lead agency—here being the City of Oakland. This could take approx. 90 days to complete.
  - Development may get a credit for existing services

- Project phasing
  - EBMUD requires that each project phase be "self-sufficient". Lines within future phasing zones may need to be constructed as a part of an earlier phase to meet level of service standards.
  - Services to remaining customers (e.g. Seneca and Credit Union) must be provided at all times.
    - Service must be maintained during the interim condition
    - A single feed for each is acceptable to EBMUD
  - Site must provide adequate access (e.g. paved road) to EBMUD at all times to allow EBMUD to service existing customers.

- Timing
  - Typically, EBMUD will require 8 to 12 months to complete the conceptual planning, and 6 to 8 months to complete the engineering design

- Design requirements
  - EBMUD requires a 25' minimum rights-of-way (ROW)
  - EBMUD easements—no structures are allowed within easements, including trees
  - Proposed landscaping must be approved by EBMUD
  - Alleyways will require minimum 6" mains
  - Typical pipe sizes are 6", 8", and 12" pipe sizes (no 10" pipes); for 12" or larger, pipe material shall be steel
  - Zone gates may be required between the Rilea and Piedmont service zones.
  - If larger meters/services are required, existing meters/services cannot be upsized with a parallel mater, but must be removed
  - If new development contains more than 1,000 feet of piping, owner can perform the installation; EBMUD will perform the installation for developments with less than 1,000 feet.
  - EBMUD will perform all wet taps
  - Developer must pay for all improvements to off-site lines that are necessary to provide the required level of service to on-site structures
  - The 6" main on Keller Ave (near Ridgemoor) will need to be extended for residential services
    - This may require a system capacity charge
  - Each building must have its own meter (e.g. an individual townhouse or a cluster

of condos w/in one building)
- Creek-crossings: all pipes may be hung under or on the side of a bridge.
  - Bridge design must be approved by EBMUD; crossing details can hold up approval process

- Additional Coordination Items
  - Fire Dept must provide an approval letter for the project that states the required fire flow.
  - Requested fire service sizes must match those specifically approved by the Fire Dept.
  - For backflow requirements, contact EBMUD backflow/cross-connection specialist Rudy Bamburger (510.287.0416)
  - EBMUD uses AutoCAD 2006
  - Additional information is available on EBMUD website (www.ebmud.com)

The above notes reflect the author's understanding of the general discussion and specific agreements or actions taken at this meeting. If you have any comments or corrections, please forward them to the author within three days of receipt.

Location: Oakland Fire Department: Fire Marshal's Office

Date of Meeting: 19 July 2006

Attendees:

Philip Basada, City of Oakland
Eric Biland, BKF Engineers
Mike Miller, BKF Engineers

Author of Meeting Notes:

Mike Miller, BKF Engineers

Subjects Discussed

Hydrant Design Specifications

- Spacing is determined by CFC App. III-B; generally 500' for single family homes and 300' for commercial, mixed-use or high density.
- Exceptions include dead-ends and roads without structures. Dead-ends require 400' between hydrants and a hydrant is required within 200' of dead end. Roadways without structures require 1000' between hydrants.
- Minimum connections on hydrants are one 2.5-inch outlet and one 4.5-inch connection.

Required Flow and Duration

- Flows and duration are determined by 2001 California Fire Code Table III-A. Minimum residual is 20 psi for all fire flows.
- Minimum pipe diameter is 6 inches.
- For single family residences, 1000 gpm @ 20 psi for 120 minutes is acceptable.
- Reduction in flow determined by California Fire Code Table III-A.
- Required duration of flow determined by category that reduced flow falls into on California Fire Code Table III-A.

Street Layout, Bridges and Gates

- Roads must be all-weather and a minimum width of 20 feet. Asphaltic concrete is preferred, but gravel is acceptable. Minimum turning diameter for all fire access roads is 70 feet. Slopes of roads shall ideally be less than 15% with a maximum slope of 18%.
- Maximum allowed length of cul de sac (without variance) is 600 feet, or 150 feet without a hammerhead or turnaround.
- See attached figure for minimum hammerhead and turnaround dimensions.

- Bridges must support a fire vehicle that weighs 65,000 lbs., has two tires in front, four in the back, and two more on the attached trailer.
- Gated communities require key boxes at all points of entry. Entry from Keller into the top of site (northeastern edge of site) is desirable for better fire access.

Structures and Other Utilities

- A variance is required for all structures containing more than one level of underground parking.
- Standpipes are required for structures with 4 or more stories. (CBC, Table 9-A)
- All electrical service shall be installed underground for fire safety.

Public vs Private Water Delivery System

- EBMUD must design any public water system. The developer specifies where flows of various sizes are required to facilitate the design.
- For a private system, the developer shall calculate flow for the worst case. Calculations shall be made with only one connection to public system available: the one with smallest capacity. Backflow devices are required at EBMUD tie-in points.

Permitting: Hazmat and Vegetation Management

- Assistant Fire Marshal Leroy Griffin (lgriffin@oaklandnet.com) handles permitting of fuel tank removal and other hazardous materials (Hazmat), which may be required for demolition of the existing hospital on site.
- Mr. Griffin also handles vegetation management. The Oak Knoll development will require a vegetation management plan.

Guidelines for Submitted Figures

- Submitted figures should include building usage types and slopes on streets (in percent). Processing by the Oakland Fire Department includes review of road and pipe network layout, available flows and residual pressures. Processing backlog is currently 3 to 4 weeks.

The above notes reflect the author's understanding of the general discussion and specific agreements or actions taken at this meeting. If you have any comments or corrections, please forward them to the author within three days of receipt.

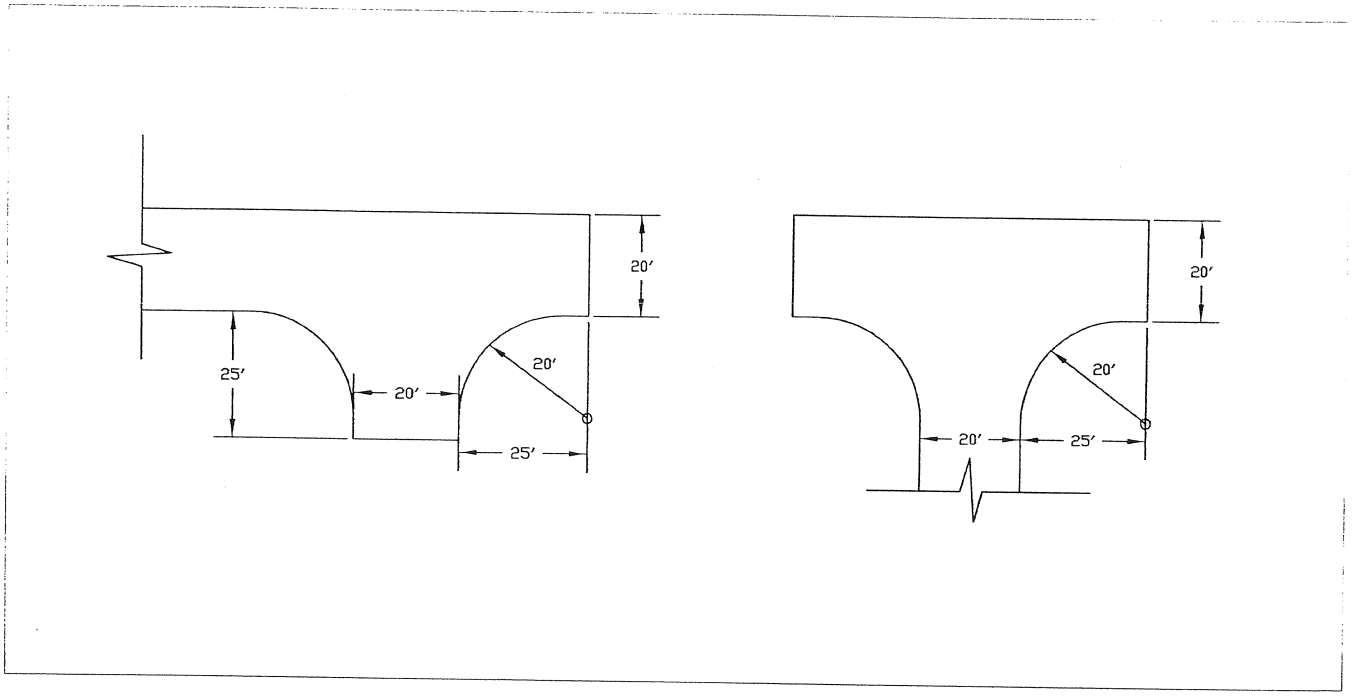

Figure 1: Minimum Dimensions on Hammerheads and Turnarounds

EBMUD

Elev. 310

SUBJECT: ***Requested Water Flow Data*** **DATE:** 4-10-06

CONTACT/COMPANY NAME: Jacob Nguyen		FAX NUMBER: 408-467-9199
ADDRESS REQUESTED: 8750 Mountain Bl		CITY: Oak
DATE OF TEST: 7-27-05	SIZE, TYPE OF MAIN SERVICING TEST HYDRANT: 6" CI 1930	
TEST HYDRANT NO: ☐ H- ☐ FH- 3096 ☑ NO PREFIX	LOCATION: @ Corner - Sequoyah / Barcelona	
STATIC PRESSURE: 134	PITOT: 74	GPM: 1443

Note: *Secondary readings are taken from a* ***non-flowing*** *hydrant (or hydrants) within the distribution system during the flow test of the hydrant noted above.*

SECONDARY READING TEST LOCATION	
☐ HYDRANT/NO. ☑ HOSEBIB	LOCATION: 3950 Sequoyah
STATIC: 133	RESIDUAL: 122

Note: *The information above is provided as a courtesy and is based on a flow test through a 2-1/2" orifice, representing a set of specific distribution system conditions at the time of the test. These conditions are subject to continuous change and* ***may not be conservative enough*** *for fire protection system design.*

Please use this hydrant flow information as a guideline of the approximate availability of flow. You should take into account **any difference in elevation** (negligible) and **any changes in pipeline size/condition** between the hydrant (point of flow test information) and the service connection for the fire service.

It is further recommended that a design allowance be made for possible reductions in pressure and/or flow.

Additional information:

Meter fed by 8" steel main @ 156 psi 1½" mtr.

Approximate # of Gallons Used:	
Pressure Zone: 133 A	
Inspection No: 152 305	
Employee No: 10483	Initial BT
Map Number: 1534-462	
FAXED ☒	MAILED ☐

Debra Shraton

Water Distribution Supervisor
System Water Quality
East Bay Municipal Utility District
1-866-403-2683

Joe Lyons

From: Jacob Nguyen
Sent: Tuesday, April 11, 2006 8:52 AM
To: Joe Lyons
Cc: Michael Miller; Ed Boscacci
Subject: RE: oak knoll photos
Attachments: Fire Hydrant #3950 data-Sequoyah.pdf

Joe, here's the hydrant flow data for FH # 3096 on Sequoyah...
thanks!

Jacob Nguyen, PE
BKF Engineers
408.467.9143 (direct)
408.467.9100 (office)

From: Jacob Nguyen
Sent: Monday, April 10, 2006 12:49 PM
To: Joe Lyons
Cc: Michael Miller
Subject: RE: oak knoll photos

Joe: here are the pressures:

✓ FH # 4232 (by entrance to Naval Hospital on Mountain Blvd)

static = 150
residual = 127 Elev. 276
pitot = 120
flow at 20 psi = 4682 gpm

✓ FH # H-10853 (by entrance to Naval Hosp. on Keller Ave)

static = 112
residual = 100 Elev. 354
pitot = 95
flow at 20 psi = 4911 gpm

I thought I had a third hydrant on Sequayah--but I don't. Will get them from EBMUD asap (probably tomorrow).

Jacob Nguyen, PE
BKF Engineers
408.467.9143 (direct)
408.467.9100 (office)

From: Jacob Nguyen
Sent: Friday, April 07, 2006 11:10 AM

To: Joe Lyons; Michael Miller
Cc: Ed Boscacci; Scott Schork
Subject: RE: oak knoll photos

Joe/Mike:

Bill McGowan w/ EBMUD gave me these hydrant flow data:

For the Piedmont Zone (Rilea Tank north of Keller Ave, see attached block map):

FH # 4232 (by entrance to Naval Hospital on Mountain Blvd)
FH # H-10853 (by entrance to Naval Hosp. on Keller Ave)

For the Country Club Zone:

He couldn't give me flow data for any nearby hydrants in this zone because he said they have have not been tested.

However, I just received a call from a EBMUD Modeling dept. and they are working on getting us actual pipe pressure at these three locations. Hopefully we'll get them soon (optimistically by Monday).

Regarding sanitary sewer, I have not had any luck getting flow data from City of Oakland, despite my numerous calls to several contacts. No one has called back.

Scott/Ed: Do you know anyone we can call?

Thanks,

Jacob Nguyen, PE
BKF Engineers
408.467.9143 (direct)
408.467.9100 (office)

From: Joe Lyons
Sent: Thursday, April 06, 2006 11:14 AM
To: Jacob Nguyen
Subject: RE: oak knoll photos

thanks...

The photos taken on my phone have been added to that directory as well.

Joe Lyons
****
Hydraulics
BKF Engineers
255 Shoreline Drive, Suite 200
Redwood City, CA 94065
650.482.6338 direct
650.482.6450 fax
www.bkf.com

Mike Miller

From: Ed Boscacci
Sent: Monday, May 08, 2006 1:08 PM
To: Mike Miller
Subject: FW: EBMUD Fire Service Available Flow and Pressure.htm

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From: Jacob Nguyen
Sent: Thursday, April 20, 2006 9:27 AM
To: Joe Lyons
Cc: Ed Boscacci; Scott Schork
Subject: FW: EBMUD Fire Service Available Flow and Pressure.htm

Joe,

Here's the fire flow data from EBMUD. Please review and incorporate into your model as appropriate. Let me know if you think we need anything else from EBMUD (water only).

Thanks,

Jacob Nguyen, PE
BKF Engineers
408.467.9143 (direct)
408.467.9100 (office)

From: Thomas, Evelyn [mailto:ethomas@ebmud.com]
Sent: Thursday, April 20, 2006 8:21 AM
To: Jacob Nguyen
Subject: EBMUD Fire Service Available Flow and Pressure.htm

FIRE SERVICE AVAILABLE FLOW & PRESSURE INFORMATION

Contact Information:

JACOB NGUYEN
BKF Engineers
981 Ridder Park Dr, 100
San Jose, 95131

Request Number: 2521

E-mail: jnguyen@bkf.com
Phone: 408-467-9100
Cell:
Fax:

Property Information:

Naval Hospital Mountain Blvd
OAKLAND, CA 94627

Approximate Elevation (feet): 265

The following available flow and pressure information is based on a Maximum Day Demand Hydraulic Model Analysis of EBMUD's water distribution system. This information should be used as a guideline of the approximate available flow. It is recommended that a design allowance be made for possible reductions in pressure and/or flow that could occur under other possible scenarios. Applicant understands that the District cannot guarantee any specific values for pressure and flow. If you have any questions, please contact us at nbo@ebmud.com or call (510)287-1008.

Available flow and pressure at the street main location for the above property information:

Possible Fire Service Connection #1
Off of the 12-inch main (12SMB73) in Keller Avenue, on the north side of Keller Avenue, approximately 5 feet west of Canyon Oaks Drive Entrance.

Pressure Zone: PIEDMONT/CCCLUB
Connection Point Elevation (feet): 358
Connection Point Static Pressure (psi): 104
Residual Pressure at 750 gpm (psi): 103
Residual Pressure at 1500 gpm (psi): 100

Possible Fire Service Connection #2
Off of the 8-inch main (8C27) in Mountain Blvd., on the west side of Mountain Blvd., approximately 1570 feet north of Sequoyah Road.

Pressure Zone: PIEDMONT/CCCLUB
Connection Point Elevation (feet): 270
Connection Point Static Pressure (psi): 142
Residual Pressure at 750 gpm (psi): 139
Residual Pressure at 1500 gpm (psi): 132

Possible Fire Service Connection #3
Off of the 6-inch main (6A69) in Keller Avenue, on the south side of Keller Avenue, approximately 460 feet north of Sequoyah Road.

Pressure Zone: PIEDMONT/CCCLUB
Connection Point Elevation (feet): 669
Connection Point Static Pressure (psi): 50
Residual Pressure at 750 gpm (psi): 41
Residual Pressure at 1450 gpm (psi): 20

Engineer's Comments: The pressure and flow stated is available at the street main connection on Keller Avenue and Mountain Blvd.. Flow of 1500 gpm at 20 psi is not available at Connection Point 3 (Keller Ave and Ridgemoor Rd). The available flow off of the 6-inch main is 1450 gpm at 20 psi.

The above connection point is at the street main location.

The flow and pressure (static and residual) is available at the street main connection. It is recommended that the fire sprinkler designer incorporate a design allowance for pressure losses through the fire service meter, backflow prevention, and the lateral from the street main to the fire service meter.

Flow and pressure data are valid for one year after the approval date.

NBO: ETHOMAS **Engineer:** DCHIU **Supervisor:** DREHNSTR **Date:** 19-APR-06

STATEMENT OF DESIGN CRITERIA USED FOR FIRE SPRINKLER DESIGN

Request Number: 2521

I,____________________________________, designer of the fire sprinkler system located at the above property address, used the following flow and pressure information to design the fire sprinkler system:

*Static Pressure (psi):*________________

Flow (gpm): ___________________ *Residual Pressure (psi):*___________________

The fire sprinkler design complies with EBMUD's standard backflow requirements, as described in the Private Fire Service pamphlet.

The fire sprinkler design has been approved by the _____________________________ *(Fire Agency with Jurisdiction) Fire Marshal, and a copy of the signed and approved fire sprinkler design plans is attached.*

____

Fire Sprinkler Designer Signature *Date*

Please return a copy of EBMUD's Fire Service Available Flow And Pressure Information with the Statement of Design Criteria Used For Fire Sprinkler Design when applying for a fire service.

CALIFORNIA FIRE CODE – MATRIX ADOPTION TABLE
APPENDIX B – FIRE-FLOW REQUIREMENTS FOR BUILDINGS

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user. See Chapter 1 for state agency authority and building applications.)

Adopting Agency	BSC	SFM		HCD			DSA		OSHPD				BSCC	DHS	AGR	DWR	CEC	CA	SL	SLC
		T-24	T-19*	1	2	1/AC	AC	SS	1	2	3	4								
Adopt Entire Chapter																				
Adopt Entire Chapter as amended (amended sections listed below)		X																		
Adopt only those sections that are listed below																				
[California Code of Regulations, Title 19, Division 1]																				
Chapter / Section																				
B105.2		X																		

* The *California Code of Regulations* (CCR), Title 19, Division 1 provisions that are found in the *California Fire Code* are a reprint from the current CCR, Title 19, Division 1 text for the code user's convenience only. The scope, applicability and appeals procedures of CCR, Title 19, Division 1 remain the same.

APPENDIX B

FIRE-FLOW REQUIREMENTS FOR BUILDINGS

SECTION B101 GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102 DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103 MODIFICATIONS

B103.1 Decreases. The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the *California Wildland-Urban Interface Code.*

SECTION B104 FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation. Portions of buildings which are separated by fire walls without openings, constructed in accordance with the *California Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105 FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings. The minimum fire-flow and flow duration requirements for one- and two-family dwellings having a fire-flow calculation area that does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min) for 1 hour. Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of 3,600 square feet (344.5m^2) shall not be less than that specified in Table B105.1.

Exception: A reduction in required fire-flow of 50 percent, as approved, is allowed when the building is equipped with an approved automatic sprinkler system.

B105.2 Buildings other than one- and two-family dwellings. The minimum fire-flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Table B105.1.

Exceptions:

1. A reduction in required fire-flow of up to 75 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2. The resulting fire-flow shall not be less than 1,500 gallons per minute (5678 L/min) for the prescribed duration as specified in Table B105.1.

2. *[SFM] Group B, S-2 and U occupancies having a floor area not exceeding 1,000 square feet, primarily constructed of noncombustible exterior walls with wood or steel roof framing, having a Class A roof assembly, with uses limited to the following or similar uses:*

2.1. California State Parks buildings of an accessory nature (restrooms).

2.2. Safety roadside rest areas, (SRRA), public restrooms.

2.3. Truck inspection facilities, (TIF), CHP office space and vehicle inspection bays.

2.4. Sand/salt storage buildings, storage of sand and salt.

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *California Building Code*.

b. Measured at 20 psi residual pressure.

APPENDIX C

OAK KNOLL WATER MASTER PLAN

Table C1
Anticipated Water Demand at Proposed Buildings

No.	Modeled Junction Label	SFU (units)	TH (units)	MFU (units)	Commercial Area (sq ft)	Restaurant Area (sq ft)	Average Day Demand (gpd)	Maximum Day Demand (gpd)	Peak Hour Demand (gpd)	Fire Demand (gal/min)
1	N-A2-1			134	72,000		34,000	68,000	136,000	1,500
2	N-A4-1		40				10,000	20,000	40,000	1,500
3	N-A4-2		40				10,000	20,000	40,000	1,500
4	N-A5-1		40				10,000	20,000	40,000	1,500
5	N-A5-2		40				10,000	20,000	40,000	1,500
6	N-A5-3		40				10,000	20,000	40,000	1,500
7	N-B1		76				19,000	38,000	76,000	1,500
8	N-B2	53					13,250	26,500	53,000	1,500
9	N-B3		70				17,500	35,000	70,000	1,500
10	N-B4		87				21,750	43,500	87,000	1,500
11	N-C1	49					12,250	24,500	49,000	2,000
12	N-D1	47					11,625	23,250	46,500	2,000
13	N-D4	47					11,625	23,250	46,500	2,000
14	N-D6		26				6,500	13,000	26,000	2,000
15	N-E1	21					5,250	10,500	21,000	2,000
16	N-E4	30					7,500	15,000	30,000	2,000
17	N-E5	35					8,750	17,500	35,000	2,000
18	N-E7	30					7,500	15,000	30,000	2,000
19	N-E8	31					7,750	15,500	31,000	2,000
	Subtotal	**342**	**459**	**134**	**72,000**		**234,250**	**468,500**	**937,000**	

Notes:
SFU - Single Family Unit
TH - Town Home
MFU - Multi Family Unit
gpd - gallons per day
BR - bedroom(s)
Park demand calculated for

Total Residential Units = **935**
Total Commercial Area (sq.ft.) = **72,000**

Average Day Flow and Peaking Factors

SFU	250	gpd per unit
TH	250	gpd per unit
MFU	200	gpd per unit
Commercial	0.1	gpd per square foot

Maximum Day PF	2.0
Peak Hour PF	4.0

OAK KNOLL WATER MASTER PLAN

Table C2
EBMUD Water Flow Data

Hydrant/ Location	Location Description	Data Type	Static Pressure (psi)	Flow (gpm)	Residual Pressure (psi)	Flow with 20 PSI Residual Pressure (gpm)
Hydrant No. 4232	Entrance to Naval Hospital on Mountain Blvd	Measured	150	1,840	127	4,682
Hydrant No. 3096	8750 Mountain Blvd, At corner of Sequoyah Rd & Barcelona St	Measured	134	1,445	122	2,000
Hydrant No. 10853	Naval Hosp. Entrance, Keller Ave	Measured	112	1,637	100	4,911
A	Off 12-inch main in Keller, 5 ft west of Canyon Oaks Drive Entrance	Calculated	104	1,500	100	7,881
B	Off 8-inch man in Mountain Blvd, approx. 1570 feet north of Sequoyah Road	Calculated	142	1,500	132	5,773
C	Off 6-inch main in Keller Avenue, approx. 460 feet north of Sequoyah Road	Calculated	50	1,450	20	1,452

Notes:

1. See Figure 3 for locations
2. Information provided by EBMUD. See Appendix B for details

OAK KNOLL WATER MASTER PLAN

Table C3
Maximum Day Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	612.8	157.0
N-A2	277	B3A	0.0	612.7	145.0
N-A2-1	277	B3A	47.0	612.7	145.0
N-A3	295	B3A	0.0	612.7	137.0
N-A4	307	B3A	0.0	612.7	132.0
N-A4-1	330	B3A	14.0	612.7	122.0
N-A4-2	339	B3A	14.0	612.7	118.0
N-A5	335	B3A	0.0	612.7	120.0
N-A5-1	355	B3A	14.0	612.7	111.0
N-A5-2	400	B3A	14.0	612.6	92.0
N-A5-3	419	B3A	14.0	612.6	84.0
N-A6	354	B3A	0.0	612.9	112.0
N-B1	233	B3A	27.0	612.8	164.0
N-B2	285	B3A	19.0	612.8	142.0
N-B3	345	B3A	25.0	612.6	116.0
N-B4	340	B3A	30.0	612.6	118.0
N-B5	335	B3A	0.0	612.6	120.0
N-C1	304	B3A	17.0	613.0	134.0
N-C2	310	B3A	0.0	612.9	131.0
N-C2-1	330	B3A	0.0	612.9	122.0
N-C3	310	B3A	0.0	612.9	131.0
N-D1	344	B3A	16.0	612.6	116.0
N-D2	350	B3A	0.0	612.6	114.0
N-D3	342	B3A	0.0	612.6	117.0
N-D4	334	B3A	16.0	612.6	121.0
N-D4-1	332	B3A	0.0	612.6	121.0
N-D5	334	B3A	0.0	612.6	121.0
N-D6	334	B3A	9.0	612.6	121.0
N-E1	602	B5D	7.0	783.0	78.0
N-E1-1	589	B5D	0.0	783.0	84.0
N-E2	496	B5D	0.0	783.0	124.0
N-E3	493	B3A	0.0	612.6	52.0
N-E4	490	B3A	11.0	612.6	53.0
N-E5	390	B3A	12.0	612.6	96.0
N-E6	377	B3A	0.0	612.6	102.0
N-E7	468	B3A	11.0	612.6	63.0
N-E8	375	B3A	11.0	612.6	103.0
N-E8-1	375	B3A	0.0	612.6	103.0

OAK KNOLL WATER MASTER PLAN

Table C3
Maximum Day Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	613.0	55.0
E-B3A-03	480	B3A	0.0	613.0	58.0
E-B3A-04	480	B3A	0.0	613.0	58.0
E-B3A-05	340	B3A	0.0	613.0	118.0
E-B3A-06	315	B3A	0.0	613.0	129.0
E-B3A-07	315	B3A	0.0	613.0	129.0
E-B3A-08	315	B3A	0.0	613.0	129.0
E-B3A-09	290	B3A	0.0	613.0	140.0
E-B3A-10	290	B3A	0.0	613.0	140.0
E-B3A-11	255	B3A	0.0	613.0	155.0
E-B3A-12	241	B3A	0.0	613.0	161.0
E-B3A-13	227	B3A	0.0	613.0	167.0
E-B3A-14	230	B3A	0.0	613.0	166.0
E-B3A-15	246	B3A	0.0	613.0	159.0
E-B3A-16	252	B3A	0.0	613.0	156.0
E-B3A-17	260	B3A	0.0	613.0	153.0
E-B3A-18	261	B3A	0.0	613.0	152.0
E-B3A-19	278	B3A	0.0	613.0	145.0
E-B3A-20	280	B3A	0.0	613.0	144.0
E-B3A-21	302	B3A	0.0	613.0	135.0
E-B3A-22	340	B3A	0.0	613.0	118.0
E-B3A-23	340	B3A	0.0	613.0	118.0
E-B3A-24	350	B3A	0.0	613.0	114.0
E-B3A-25	350	B3A	0.0	613.0	114.0
E-B3A-26	500	B3A	0.0	613.0	49.0
E-B3A-27	530	B3A	0.0	613.0	36.0
E-B3A-28	520	B3A	0.0	613.0	40.0
E-B3A-29	560	B3A	0.0	613.0	23.0
E-B3A-30	480	B3A	0.0	612.9	58.0
E-B3A-31	480	B3A	0.0	612.9	58.0
E-B3A-32	408	B3A	0.0	612.9	89.0
E-B3A-33	409	B3A	0.0	612.9	88.0
E-B3A-35	358	B3A	0.0	612.9	110.0
E-B3A-36	371	B3A	0.0	612.9	105.0
E-B3A-37	417	B3A	0.0	612.9	85.0
E-B3A-38	420	B3A	0.0	612.9	83.0
E-B3A-39	480	B3A	0.0	612.9	58.0
E-B3A-40	380	B3A	0.0	612.9	101.0
E-B3A-41	330	B3A	0.0	613.0	122.0
E-B3A-42	330	B3A	0.0	613.0	122.0
E-B3A-43	330	B3A	0.0	613.0	122.0
E-B3A-44	315	B3A	0.0	613.0	129.0

Table C3
Maximum Day Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	613.0	129.0
E-B3A-46	300	B3A	0.0	613.0	135.0
E-B3A-47	330	B3A	0.0	613.0	122.0
E-B3A-48	315	B3A	0.0	613.0	129.0
E-B3A-49	315	B3A	0.0	613.0	129.0
E-B3A-50	315	B3A	0.0	613.0	129.0
E-B3A-51	300	B3A	0.0	612.9	135.0
E-B3A-52	300	B3A	0.0	612.9	135.0
E-B3A-53	300	B3A	0.0	612.9	135.0
E-B3A-54	300	B3A	0.0	612.9	135.0
E-B3A-55	290	B3A	0.0	612.9	140.0
E-B3A-56	290	B3A	0.0	612.9	140.0
E-B3A-57	308	B3A	0.0	612.9	132.0
E-B3A-58	276	B3A	0.0	612.8	146.0
E-B3A-59	276	B3A	0.0	612.8	146.0
E-B3A-60	259	B3A	0.0	612.8	153.0
E-B3A-60	259	B3A	0.0	612.8	153.0
E-B3A-61	241	B3A	0.0	612.8	161.0
E-B3A-62	227	B3A	0.0	613.0	167.0
E-B3A-63	232	B3A	0.0	613.0	165.0
E-B3A-64	245	B3A	0.0	613.0	159.0
E-B3A-66	310	B3A	0.0	613.0	131.0
E-B3A-67	340	B3A	0.0	613.0	118.0
E-B3A-68	400	B3A	0.0	613.0	92.0
E-B3A-69	420	B3A	0.0	613.0	83.0
E-B3A-70	396	B3A	0.0	613.0	94.0
E-B3A-71	381	B3A	0.0	613.0	100.0
E-B3A-72	391	B3A	0.0	613.0	96.0
E-B3A-73	428	B3A	0.0	613.0	80.0
E-B3A-74	480	B3A	0.0	613.0	58.0
E-B3A-75	350	B3A	0.0	613.0	114.0
E-B5D-01	750	B5D	0.0	783.0	14.0
E-B5D-02	730	B5D	0.0	783.0	23.0
E-B5D-03	660	B5D	0.0	783.0	53.0
E-B5D-03-20	606	B5D	0.0	783.0	77.0
E-B5D-03-23	620	B5D	0.0	783.0	71.0
E-B5D-03-25	669	B5D	0.0	783.0	49.0
E-B5D-04	650	B5D	0.0	783.0	58.0
E-B5D-05	620	B5D	0.0	783.0	71.0
E-B5D-06	610	B5D	0.0	783.0	75.0
E-B5D-07	610	B5D	0.0	783.0	75.0
E-B5D-08	600	B5D	0.0	783.0	79.0

OAK KNOLL WATER MASTER PLAN

Table C3
Maximum Day Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	78	0.5	0.1
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	47	0.3	0.0
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	31	0.2	0.0
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	31	0.2	0.0
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	6	0.0	0.0
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-8	0.1	0.0
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-22	0.1	0.0
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-33	0.2	0.0
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	64	0.4	0.0
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	28	0.2	0.0
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	14	0.1	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	97	0.6	0.2
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	27	0.2	0.0
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-73	0.5	0.1
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	82	0.5	0.2
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	30	0.2	0.0
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	27	0.2	0.0
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	-28	0.2	0.0
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	-29	0.2	0.0
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	-58	0.4	0.1
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	73	0.5	0.0
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	26	0.2	0.0
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	10	0.1	0.0
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	10	0.1	0.0
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	10	0.1	0.0
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	14	0.1	0.0
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	-14	0.1	0.0
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	-20	0.1	0.0
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	-20	0.1	0.0
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	0	0.0	0.0
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	0	0.0	0.0
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	0	0.0	0.0
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	-1	0.0	0.0
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	-13	0.1	0.0
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	1	0.0	0.0
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	10	0.1	0.0
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	-19	0.1	0.0
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	318	0.2	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	318	0.2	0.0
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C3
Maximum Day Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	318	0.2	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	318	0.2	0.0
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	318	0.2	0.0
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	318	0.2	0.0
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	318	0.2	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	318	0.2	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-133	0.1	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	186	0.1	0.0
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	186	0.1	0.0
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	42	0.3	0.0
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	186	0.1	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	79	0.2	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-42	0.3	0.0
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-96	0.6	0.1
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-186	0.1	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-186	0.1	0.0
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	100	0.3	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-85	0.1	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	85	0.1	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	85	0.1	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	85	0.1	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	85	0.1	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	85	0.1	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	85	0.1	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-85	0.1	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-6	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	6	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-6	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-6	0.0	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	0	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	0	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	97	0.3	0.0
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	97	0.3	0.0

OAK KNOLL WATER MASTER PLAN

Table C3
Maximum Day Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	97	0.3	0.0
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	97	0.3	0.0
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	36	0.2	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	36	0.2	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	4	0.0	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	4	0.0	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	4	0.0	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	6	0.1	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	0	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	0	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	0	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	0	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	0	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	0	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	0	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	0	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	0	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-133	0.4	0.0
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	8	0.1	0.0
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	8	0.1	0.0
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	8	0.0	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	8	0.1	0.0
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	8	0.0	0.0
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	8	0.0	0.0
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	8	0.0	0.0
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	8	0.0	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C4
Peak Hour Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	612.3	157.0
N-A2	277	B3A	0.0	611.8	145.0
N-A2-1	277	B3A	94.0	611.8	145.0
N-A3	295	B3A	0.0	611.8	137.0
N-A4	307	B3A	0.0	611.7	132.0
N-A4-1	330	B3A	28.0	611.7	122.0
N-A4-2	339	B3A	28.0	611.7	118.0
N-A5	335	B3A	0.0	611.9	120.0
N-A5-1	355	B3A	28.0	611.8	111.0
N-A5-2	400	B3A	28.0	611.7	92.0
N-A5-3	419	B3A	28.0	611.7	83.0
N-A6	354	B3A	0.0	612.4	112.0
N-B1	233	B3A	53.0	612.4	164.0
N-B2	285	B3A	37.0	612.3	142.0
N-B3	345	B3A	49.0	611.6	115.0
N-B4	340	B3A	60.0	611.5	117.0
N-B5	335	B3A	0.0	611.5	120.0
N-C1	304	B3A	34.0	612.8	134.0
N-C2	310	B3A	0.0	612.7	131.0
N-C2-1	330	B3A	0.0	612.7	122.0
N-C3	310	B3A	0.0	612.7	131.0
N-D1	344	B3A	32.0	611.5	116.0
N-D2	350	B3A	0.0	611.5	113.0
N-D3	342	B3A	0.0	611.5	117.0
N-D4	334	B3A	32.0	611.5	120.0
N-D4-1	332	B3A	0.0	611.5	121.0
N-D5	334	B3A	0.0	611.5	120.0
N-D6	334	B3A	18.0	611.5	120.0
N-E1	602	B5D	15.0	783.0	78.0
N-E1-1	589	B5D	0.0	783.0	84.0
N-E2	496	B5D	0.0	783.0	124.0
N-E3	493	B3A	0.0	611.5	51.0
N-E4	490	B3A	21.0	611.5	53.0
N-E5	390	B3A	24.0	611.5	96.0
N-E6	377	B3A	0.0	611.5	101.0
N-E7	468	B3A	21.0	611.5	62.0
N-E8	375	B3A	22.0	611.5	102.0
N-E8-1	375	B3A	0.0	611.5	102.0

OAK KNOLL WATER MASTER PLAN

Table C4
Peak Hour Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	613.0	55.0
E-B3A-03	480	B3A	0.0	613.0	58.0
E-B3A-04	480	B3A	0.0	613.0	58.0
E-B3A-05	340	B3A	0.0	612.9	118.0
E-B3A-06	315	B3A	0.0	612.9	129.0
E-B3A-07	315	B3A	0.0	612.9	129.0
E-B3A-08	315	B3A	0.0	612.9	129.0
E-B3A-09	290	B3A	0.0	612.9	140.0
E-B3A-10	290	B3A	0.0	612.9	140.0
E-B3A-11	255	B3A	0.0	612.8	155.0
E-B3A-12	241	B3A	0.0	612.8	161.0
E-B3A-13	227	B3A	0.0	612.8	167.0
E-B3A-14	230	B3A	0.0	612.8	166.0
E-B3A-15	246	B3A	0.0	612.8	159.0
E-B3A-16	252	B3A	0.0	612.8	156.0
E-B3A-17	260	B3A	0.0	612.8	153.0
E-B3A-18	261	B3A	0.0	612.8	152.0
E-B3A-19	278	B3A	0.0	612.8	145.0
E-B3A-20	280	B3A	0.0	612.8	144.0
E-B3A-21	302	B3A	0.0	612.8	134.0
E-B3A-22	340	B3A	0.0	612.8	118.0
E-B3A-23	340	B3A	0.0	612.8	118.0
E-B3A-24	350	B3A	0.0	612.8	114.0
E-B3A-25	350	B3A	0.0	612.8	114.0
E-B3A-26	500	B3A	0.0	612.8	49.0
E-B3A-27	530	B3A	0.0	612.8	36.0
E-B3A-28	520	B3A	0.0	612.8	40.0
E-B3A-29	560	B3A	0.0	612.8	23.0
E-B3A-30	480	B3A	0.0	612.7	57.0
E-B3A-31	480	B3A	0.0	612.7	57.0
E-B3A-32	408	B3A	0.0	612.6	89.0
E-B3A-33	409	B3A	0.0	612.6	88.0
E-B3A-35	358	B3A	0.0	612.4	110.0
E-B3A-36	371	B3A	0.0	612.4	104.0
E-B3A-37	417	B3A	0.0	612.4	85.0
E-B3A-38	420	B3A	0.0	612.4	83.0
E-B3A-39	480	B3A	0.0	612.7	57.0
E-B3A-40	380	B3A	0.0	612.8	101.0
E-B3A-41	330	B3A	0.0	612.8	122.0
E-B3A-42	330	B3A	0.0	612.8	122.0
E-B3A-43	330	B3A	0.0	612.8	122.0
E-B3A-44	315	B3A	0.0	612.8	129.0

OAK KNOLL WATER MASTER PLAN

Table C4
Peak Hour Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	612.8	129.0
E-B3A-46	300	B3A	0.0	612.8	135.0
E-B3A-47	330	B3A	0.0	612.9	122.0
E-B3A-48	315	B3A	0.0	612.9	129.0
E-B3A-49	315	B3A	0.0	612.9	129.0
E-B3A-50	315	B3A	0.0	612.9	129.0
E-B3A-51	300	B3A	0.0	612.8	135.0
E-B3A-52	300	B3A	0.0	612.8	135.0
E-B3A-53	300	B3A	0.0	612.7	135.0
E-B3A-54	300	B3A	0.0	612.7	135.0
E-B3A-55	290	B3A	0.0	612.7	140.0
E-B3A-56	290	B3A	0.0	612.6	140.0
E-B3A-57	308	B3A	0.0	612.5	132.0
E-B3A-58	276	B3A	0.0	612.4	146.0
E-B3A-59	276	B3A	0.0	612.3	146.0
E-B3A-60	259	B3A	0.0	612.3	153.0
E-B3A-60	259	B3A	0.0	612.3	153.0
E-B3A-61	241	B3A	0.0	612.3	161.0
E-B3A-62	227	B3A	0.0	612.8	167.0
E-B3A-63	232	B3A	0.0	612.8	165.0
E-B3A-64	245	B3A	0.0	612.8	159.0
E-B3A-66	310	B3A	0.0	612.8	131.0
E-B3A-67	340	B3A	0.0	612.8	118.0
E-B3A-68	400	B3A	0.0	612.8	92.0
E-B3A-69	420	B3A	0.0	612.8	83.0
E-B3A-70	396	B3A	0.0	612.8	94.0
E-B3A-71	381	B3A	0.0	612.8	100.0
E-B3A-72	391	B3A	0.0	612.8	96.0
E-B3A-73	428	B3A	0.0	612.8	80.0
E-B3A-74	480	B3A	0.0	612.8	57.0
E-B3A-75	350	B3A	0.0	612.8	114.0
E-B5D-01	750	B5D	0.0	783.0	14.0
E-B5D-02	730	B5D	0.0	783.0	23.0
E-B5D-03	660	B5D	0.0	783.0	53.0
E-B5D-03-20	606	B5D	0.0	783.0	77.0
E-B5D-03-23	620	B5D	0.0	783.0	71.0
E-B5D-03-25	669	B5D	0.0	783.0	49.0
E-B5D-04	650	B5D	0.0	783.0	58.0
E-B5D-05	620	B5D	0.0	783.0	71.0
E-B5D-06	610	B5D	0.0	783.0	75.0
E-B5D-07	610	B5D	0.0	783.0	75.0
E-B5D-08	600	B5D	0.0	783.0	79.0

OAK KNOLL WATER MASTER PLAN

Table C4
Peak Hour Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	155	1.0	0.4
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	94	0.6	0.1
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	61	0.4	0.1
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	61	0.4	0.0
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	12	0.1	0.0
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-16	0.1	0.0
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-44	0.3	0.0
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-67	0.4	0.1
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	128	0.8	0.1
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	56	0.4	0.1
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	28	0.2	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	195	1.2	0.6
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	55	0.4	0.1
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-145	0.9	0.4
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	163	1.0	0.8
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	60	0.4	0.0
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	54	0.4	0.0
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	-57	0.4	0.0
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	-59	0.4	0.0
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	-116	0.7	0.2
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	145	0.9	0.1
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	51	0.3	0.0
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	19	0.1	0.0
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	19	0.1	0.0
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	19	0.1	0.0
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	28	0.2	0.0
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	-28	0.2	0.0
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	-41	0.3	0.0
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	-41	0.3	0.0
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	0	0.0	0.0
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	0	0.0	0.0
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	0	0.0	0.0
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	-1	0.0	0.0
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	-25	0.2	0.0
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	3	0.0	0.0
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	20	0.1	0.0
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	-38	0.2	0.0
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	637	0.5	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	637	0.5	0.0
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C4
Peak Hour Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	637	0.5	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	637	0.5	0.0
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	637	0.5	0.0
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	637	0.5	0.0
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	637	0.5	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	637	0.5	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-266	0.2	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	371	0.3	0.0
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	371	0.3	0.0
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-71	0.5	0.0
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	84	0.5	0.1
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	371	0.3	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	158	0.5	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-84	0.5	0.1
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-192	1.2	0.4
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-371	0.3	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-371	0.3	0.0
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	201	0.6	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-170	0.1	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	170	0.1	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	170	0.1	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	170	0.1	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-71	0.5	0.0
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	170	0.1	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	170	0.1	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	170	0.1	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-170	0.1	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-12	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	12	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-12	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-12	0.0	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	0	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	0	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-195	0.6	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-195	0.6	0.1
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-195	0.6	0.0
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-195	0.6	0.1
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-195	0.6	0.0
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	195	0.6	0.1
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	195	0.6	0.1

OAK KNOLL WATER MASTER PLAN

Table C4
Peak Hour Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	195	0.6	0.0
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	195	0.6	0.0
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	71	0.5	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-71	0.5	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-71	0.5	0.1
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-71	0.5	0.0
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-71	0.5	0.0
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-71	0.5	0.0
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-71	0.5	0.0
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-71	0.5	0.2
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-71	0.5	0.1
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-71	0.5	0.1
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	71	0.5	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	9	0.1	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	9	0.1	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	9	0.1	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	12	0.1	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	0	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	0	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	0	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	0	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	0	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	0	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	0	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	0	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	0	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-266	0.8	0.0
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	15	0.1	0.0
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	15	0.1	0.0
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	15	0.0	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	15	0.2	0.0
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	15	0.2	0.0
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	15	0.2	0.0
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	15	0.2	0.0
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	15	0.0	0.0
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	15	0.0	0.0
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	15	0.0	0.0
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	15	0.0	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C5
Fire Flow at N-A2-1 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	604.2	153.0
N-A2	277	B3A	0.0	594.8	138.0
N-A2-1	277	B3A	1547.0	582.5	132.0
N-A3	295	B3A	0.0	599.6	132.0
N-A4	307	B3A	0.0	603.2	128.0
N-A4-1	330	B3A	14.0	603.7	118.0
N-A4-2	339	B3A	14.0	604.0	115.0
N-A5	335	B3A	0.0	605.0	117.0
N-A5-1	355	B3A	14.0	604.7	108.0
N-A5-2	400	B3A	14.0	604.7	89.0
N-A5-3	419	B3A	14.0	604.7	80.0
N-A6	354	B3A	0.0	609.1	110.0
N-B1	233	B3A	27.0	608.8	162.0
N-B2	285	B3A	19.0	608.8	140.0
N-B3	345	B3A	25.0	604.8	112.0
N-B4	340	B3A	30.0	604.2	114.0
N-B5	335	B3A	0.0	604.1	116.0
N-C1	304	B3A	17.0	611.8	133.0
N-C2	310	B3A	0.0	611.0	130.0
N-C2-1	330	B3A	0.0	611.0	122.0
N-C3	310	B3A	0.0	611.0	130.0
N-D1	344	B3A	16.0	604.2	113.0
N-D2	350	B3A	0.0	604.2	110.0
N-D3	342	B3A	0.0	604.2	113.0
N-D4	334	B3A	16.0	604.2	117.0
N-D4-1	332	B3A	0.0	604.2	118.0
N-D5	334	B3A	0.0	604.1	117.0
N-D6	334	B3A	9.0	604.1	117.0
N-E1	602	B5D	7.0	783.0	78.0
N-E1-1	589	B5D	0.0	783.0	84.0
N-E2	496	B5D	0.0	783.0	124.0
N-E3	493	B3A	0.0	604.4	48.0
N-E4	490	B3A	11.0	604.4	49.0
N-E5	390	B3A	12.0	604.3	93.0
N-E6	377	B3A	0.0	604.3	98.0
N-E7	468	B3A	11.0	604.4	59.0
N-E8	375	B3A	11.0	604.7	99.0
N-E8-1	375	B3A	0.0	604.7	99.0

OAK KNOLL WATER MASTER PLAN

Table C5
Fire Flow at N-A2-1 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	612.8	55.0
E-B3A-03	480	B3A	0.0	612.8	57.0
E-B3A-04	480	B3A	0.0	612.7	57.0
E-B3A-05	340	B3A	0.0	612.5	118.0
E-B3A-06	315	B3A	0.0	612.3	129.0
E-B3A-07	315	B3A	0.0	612.3	129.0
E-B3A-08	315	B3A	0.0	612.3	129.0
E-B3A-09	290	B3A	0.0	612.1	139.0
E-B3A-10	290	B3A	0.0	612.0	139.0
E-B3A-11	255	B3A	0.0	612.0	154.0
E-B3A-12	241	B3A	0.0	611.9	161.0
E-B3A-13	227	B3A	0.0	611.8	167.0
E-B3A-14	230	B3A	0.0	611.8	165.0
E-B3A-15	246	B3A	0.0	611.8	158.0
E-B3A-16	252	B3A	0.0	611.8	156.0
E-B3A-17	260	B3A	0.0	611.8	152.0
E-B3A-18	261	B3A	0.0	611.8	152.0
E-B3A-19	278	B3A	0.0	611.8	144.0
E-B3A-20	280	B3A	0.0	611.8	144.0
E-B3A-21	302	B3A	0.0	611.8	134.0
E-B3A-22	340	B3A	0.0	611.8	118.0
E-B3A-23	340	B3A	0.0	611.8	118.0
E-B3A-24	350	B3A	0.0	611.8	113.0
E-B3A-25	350	B3A	0.0	611.8	113.0
E-B3A-26	500	B3A	0.0	611.8	48.0
E-B3A-27	530	B3A	0.0	611.8	35.0
E-B3A-28	520	B3A	0.0	611.8	40.0
E-B3A-29	560	B3A	0.0	611.8	22.0
E-B3A-30	480	B3A	0.0	610.7	57.0
E-B3A-31	480	B3A	0.0	610.6	57.0
E-B3A-32	408	B3A	0.0	610.0	87.0
E-B3A-33	409	B3A	0.0	609.8	87.0
E-B3A-35	358	B3A	0.0	609.1	109.0
E-B3A-36	371	B3A	0.0	609.1	103.0
E-B3A-37	417	B3A	0.0	609.1	83.0
E-B3A-38	420	B3A	0.0	609.1	82.0
E-B3A-39	480	B3A	0.0	610.9	57.0
E-B3A-40	380	B3A	0.0	611.3	100.0
E-B3A-41	330	B3A	0.0	611.9	122.0
E-B3A-42	330	B3A	0.0	611.9	122.0
E-B3A-43	330	B3A	0.0	611.9	122.0
E-B3A-44	315	B3A	0.0	611.9	128.0

OAK KNOLL WATER MASTER PLAN

Table C5
Fire Flow at N-A2-1 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	611.9	128.0
E-B3A-46	300	B3A	0.0	611.9	135.0
E-B3A-47	330	B3A	0.0	611.9	122.0
E-B3A-48	315	B3A	0.0	612.1	129.0
E-B3A-49	315	B3A	0.0	612.0	129.0
E-B3A-50	315	B3A	0.0	612.0	128.0
E-B3A-51	300	B3A	0.0	610.8	134.0
E-B3A-52	300	B3A	0.0	610.8	134.0
E-B3A-53	300	B3A	0.0	610.3	134.0
E-B3A-54	300	B3A	0.0	609.9	134.0
E-B3A-55	290	B3A	0.0	609.4	138.0
E-B3A-56	290	B3A	0.0	608.9	138.0
E-B3A-57	308	B3A	0.0	606.9	129.0
E-B3A-58	276	B3A	0.0	605.6	143.0
E-B3A-59	276	B3A	0.0	605.2	142.0
E-B3A-60	259	B3A	0.0	604.5	149.0
E-B3A-60	259	B3A	0.0	604.5	149.0
E-B3A-61	241	B3A	0.0	605.9	158.0
E-B3A-62	227	B3A	0.0	611.8	166.0
E-B3A-63	232	B3A	0.0	611.8	165.0
E-B3A-64	245	B3A	0.0	611.8	159.0
E-B3A-66	310	B3A	0.0	611.8	131.0
E-B3A-67	340	B3A	0.0	611.8	118.0
E-B3A-68	400	B3A	0.0	611.8	92.0
E-B3A-69	420	B3A	0.0	611.8	83.0
E-B3A-70	396	B3A	0.0	611.8	93.0
E-B3A-71	381	B3A	0.0	611.8	100.0
E-B3A-72	391	B3A	0.0	611.8	96.0
E-B3A-73	428	B3A	0.0	611.8	80.0
E-B3A-74	480	B3A	0.0	611.8	57.0
E-B3A-75	350	B3A	0.0	611.8	113.0
E-B5D-01	750	B5D	0.0	783.0	14.0
E-B5D-02	730	B5D	0.0	783.0	23.0
E-B5D-03	660	B5D	0.0	783.0	53.0
E-B5D-03-20	606	B5D	0.0	783.0	77.0
E-B5D-03-23	620	B5D	0.0	783.0	71.0
E-B5D-03-25	669	B5D	0.0	783.0	49.0
E-B5D-04	650	B5D	0.0	783.0	58.0
E-B5D-05	620	B5D	0.0	783.0	71.0
E-B5D-06	610	B5D	0.0	783.0	75.0
E-B5D-07	610	B5D	0.0	783.0	75.0
E-B5D-08	600	B5D	0.0	783.0	79.0

OAK KNOLL WATER MASTER PLAN

Table C5
Fire Flow at N-A2-1 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	810	5.2	9.4
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	1547	9.9	12.3
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	-737	4.7	4.8
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	-737	4.7	3.6
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	-187	1.2	0.5
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-201	1.3	0.3
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-215	1.4	0.7
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-297	1.9	1.8
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	257	1.6	0.3
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	28	0.2	0.0
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	14	0.1	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	554	3.5	4.1
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	18	0.1	0.0
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-393	2.5	2.2
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	392	2.5	4.0
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	114	0.7	0.1
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	254	1.6	0.6
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	185	1.2	0.2
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	68	0.4	0.0
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	253	1.6	0.9
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	393	2.5	0.8
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	39	0.3	0.0
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	23	0.2	0.0
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	23	0.2	0.0
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	23	0.2	0.0
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	-70	0.5	0.0
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	70	0.5	0.1
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	77	0.5	0.1
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	77	0.5	0.0
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	0	0.0	0.0
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	0	0.0	0.0
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	0	0.0	0.0
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	37	0.2	0.1
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	25	0.2	0.0
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	-45	0.3	0.1
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	47	0.3	0.0
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	-103	0.7	0.3
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	1819	1.3	0.2
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C5
Fire Flow at N-A2-1 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	1819	1.3	0.1
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	1819	1.3	0.2
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	1819	1.3	0.1
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-838	0.6	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	981	0.7	0.2
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	981	0.7	0.1
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-284	1.8	0.3
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	526	3.4	1.8
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	981	0.7	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	374	1.1	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-526	3.4	2.8
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-570	3.6	3.0
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-981	0.7	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-981	0.7	0.1
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	578	1.6	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-403	0.3	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	403	0.3	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	403	0.3	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	403	0.3	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-284	1.8	0.4
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	403	0.3	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	403	0.3	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	403	0.3	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-403	0.3	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-29	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	29	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-29	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-30	0.1	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	1	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	-1	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-554	1.6	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-554	1.6	0.7
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-554	1.6	0.1
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-554	1.6	0.7
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-554	1.6	0.3
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	554	1.6	0.4
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	554	1.6	0.6

OAK KNOLL WATER MASTER PLAN

Table C5
Fire Flow at N-A2-1 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	554	1.6	0.1
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	554	1.6	0.2
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	284	1.8	0.1
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-284	1.8	0.1
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-284	1.8	1.2
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-284	1.8	0.5
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-284	1.8	0.4
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-284	1.8	0.5
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-284	1.8	0.6
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-284	1.8	2.0
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-284	1.8	1.2
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-284	1.8	0.7
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	284	1.8	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	7	0.1	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	7	0.1	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	7	0.1	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	29	0.3	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	-1	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	1	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	2	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	2	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	2	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	2	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	2	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	1	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	1	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-838	2.4	0.2
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	8	0.1	0.0
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	8	0.1	0.0
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	8	0.0	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	8	0.1	0.0
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	8	0.0	0.0
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	8	0.0	0.0
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	8	0.0	0.0
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	8	0.0	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C6
Fire Flow at N-A5-3 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	608.1	155.0
N-A2	277	B3A	0.0	604.3	142.0
N-A2-1	277	B3A	47.0	604.3	142.0
N-A3	295	B3A	0.0	602.4	133.0
N-A4	307	B3A	0.0	600.9	127.0
N-A4-1	330	B3A	14.0	598.3	116.0
N-A4-2	339	B3A	14.0	596.9	112.0
N-A5	335	B3A	0.0	598.7	114.0
N-A5-1	355	B3A	14.0	594.5	104.0
N-A5-2	400	B3A	14.0	567.6	73.0
N-A5-3	419	B3A	1514.0	548.2	56.0
N-A6	354	B3A	0.0	606.4	109.0
N-B1	233	B3A	27.0	609.8	163.0
N-B2	285	B3A	19.0	609.4	140.0
N-B3	345	B3A	25.0	603.5	112.0
N-B4	340	B3A	30.0	602.7	114.0
N-B5	335	B3A	0.0	602.5	116.0
N-C1	304	B3A	17.0	611.9	133.0
N-C2	310	B3A	0.0	611.2	130.0
N-C2-1	330	B3A	0.0	611.2	122.0
N-C3	310	B3A	0.0	611.2	130.0
N-D1	344	B3A	16.0	602.7	112.0
N-D2	350	B3A	0.0	602.7	109.0
N-D3	342	B3A	0.0	602.7	113.0
N-D4	334	B3A	16.0	602.7	116.0
N-D4-1	332	B3A	0.0	602.7	117.0
N-D5	334	B3A	0.0	602.6	116.0
N-D6	334	B3A	9.0	602.5	116.0
N-E1	602	B5D	7.0	783.0	78.0
N-E1-1	589	B5D	0.0	783.0	84.0
N-E2	496	B5D	0.0	783.0	124.0
N-E3	493	B3A	0.0	602.9	47.0
N-E4	490	B3A	11.0	602.9	49.0
N-E5	390	B3A	12.0	602.8	92.0
N-E6	377	B3A	0.0	602.8	98.0
N-E7	468	B3A	11.0	602.9	58.0
N-E8	375	B3A	11.0	603.4	99.0
N-E8-1	375	B3A	0.0	603.4	99.0

OAK KNOLL WATER MASTER PLAN

Table C6
Fire Flow at N-A5-3 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	612.8	55.0
E-B3A-03	480	B3A	0.0	612.8	57.0
E-B3A-04	480	B3A	0.0	612.7	57.0
E-B3A-05	340	B3A	0.0	612.5	118.0
E-B3A-06	315	B3A	0.0	612.3	129.0
E-B3A-07	315	B3A	0.0	612.3	129.0
E-B3A-08	315	B3A	0.0	612.3	129.0
E-B3A-09	290	B3A	0.0	612.2	139.0
E-B3A-10	290	B3A	0.0	612.1	139.0
E-B3A-11	255	B3A	0.0	612.1	154.0
E-B3A-12	241	B3A	0.0	612.0	161.0
E-B3A-13	227	B3A	0.0	612.0	167.0
E-B3A-14	230	B3A	0.0	612.0	165.0
E-B3A-15	246	B3A	0.0	612.0	158.0
E-B3A-16	252	B3A	0.0	612.0	156.0
E-B3A-17	260	B3A	0.0	612.0	152.0
E-B3A-18	261	B3A	0.0	612.0	152.0
E-B3A-19	278	B3A	0.0	611.9	144.0
E-B3A-20	280	B3A	0.0	611.9	144.0
E-B3A-21	302	B3A	0.0	611.9	134.0
E-B3A-22	340	B3A	0.0	611.9	118.0
E-B3A-23	340	B3A	0.0	611.9	118.0
E-B3A-24	350	B3A	0.0	611.9	113.0
E-B3A-25	350	B3A	0.0	611.9	113.0
E-B3A-26	500	B3A	0.0	611.9	48.0
E-B3A-27	530	B3A	0.0	611.9	35.0
E-B3A-28	520	B3A	0.0	611.9	40.0
E-B3A-29	560	B3A	0.0	611.9	22.0
E-B3A-30	480	B3A	0.0	609.3	56.0
E-B3A-31	480	B3A	0.0	609.3	56.0
E-B3A-32	408	B3A	0.0	608.0	87.0
E-B3A-33	409	B3A	0.0	607.8	86.0
E-B3A-35	358	B3A	0.0	606.4	107.0
E-B3A-36	371	B3A	0.0	606.4	102.0
E-B3A-37	417	B3A	0.0	606.4	82.0
E-B3A-38	420	B3A	0.0	606.4	81.0
E-B3A-39	480	B3A	0.0	609.8	56.0
E-B3A-40	380	B3A	0.0	610.5	100.0
E-B3A-41	330	B3A	0.0	611.6	122.0
E-B3A-42	330	B3A	0.0	611.6	122.0
E-B3A-43	330	B3A	0.0	611.6	122.0
E-B3A-44	315	B3A	0.0	611.6	128.0

OAK KNOLL WATER MASTER PLAN

Table C6
Fire Flow at N-A5-3 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	611.6	128.0
E-B3A-46	300	B3A	0.0	611.6	135.0
E-B3A-47	330	B3A	0.0	611.7	122.0
E-B3A-48	315	B3A	0.0	612.1	129.0
E-B3A-49	315	B3A	0.0	612.0	129.0
E-B3A-50	315	B3A	0.0	612.0	128.0
E-B3A-51	300	B3A	0.0	611.4	135.0
E-B3A-52	300	B3A	0.0	611.4	135.0
E-B3A-53	300	B3A	0.0	611.2	135.0
E-B3A-54	300	B3A	0.0	610.9	135.0
E-B3A-55	290	B3A	0.0	610.7	139.0
E-B3A-56	290	B3A	0.0	610.4	139.0
E-B3A-57	308	B3A	0.0	609.5	130.0
E-B3A-58	276	B3A	0.0	608.9	144.0
E-B3A-59	276	B3A	0.0	608.6	144.0
E-B3A-60	259	B3A	0.0	608.3	151.0
E-B3A-60	259	B3A	0.0	608.3	151.0
E-B3A-61	241	B3A	0.0	608.8	159.0
E-B3A-62	227	B3A	0.0	611.9	167.0
E-B3A-63	232	B3A	0.0	611.9	165.0
E-B3A-64	245	B3A	0.0	611.9	159.0
E-B3A-66	310	B3A	0.0	611.9	131.0
E-B3A-67	340	B3A	0.0	611.9	118.0
E-B3A-68	400	B3A	0.0	611.9	92.0
E-B3A-69	420	B3A	0.0	611.9	83.0
E-B3A-70	396	B3A	0.0	611.9	93.0
E-B3A-71	381	B3A	0.0	611.9	100.0
E-B3A-72	391	B3A	0.0	611.9	96.0
E-B3A-73	428	B3A	0.0	611.9	80.0
E-B3A-74	480	B3A	0.0	611.9	57.0
E-B3A-75	350	B3A	0.0	611.9	113.0
E-B5D-01	750	B5D	0.0	783.0	14.0
E-B5D-02	730	B5D	0.0	783.0	23.0
E-B5D-03	660	B5D	0.0	783.0	53.0
E-B5D-03-20	606	B5D	0.0	783.0	77.0
E-B5D-03-23	620	B5D	0.0	783.0	71.0
E-B5D-03-25	669	B5D	0.0	783.0	49.0
E-B5D-04	650	B5D	0.0	783.0	58.0
E-B5D-05	620	B5D	0.0	783.0	71.0
E-B5D-06	610	B5D	0.0	783.0	75.0
E-B5D-07	610	B5D	0.0	783.0	75.0
E-B5D-08	600	B5D	0.0	783.0	79.0

OAK KNOLL WATER MASTER PLAN

Table C6
Fireflow at N-A5-3 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	499	3.2	3.8
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	47	0.3	0.0
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	452	2.9	1.9
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	452	2.9	1.5
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	457	2.9	2.6
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	443	2.8	1.4
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	429	2.7	2.4
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	336	2.2	2.2
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	1113	7.1	4.2
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	1528	9.8	26.9
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	1514	9.7	19.4
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	777	5.0	7.7
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	139	0.9	0.5
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-360	2.3	1.9
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	481	3.1	5.8
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	138	0.9	0.2
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	318	2.0	0.8
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	245	1.6	0.3
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	96	0.6	0.1
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	341	2.2	1.5
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	360	2.3	0.7
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	43	0.3	0.0
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	27	0.2	0.0
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	27	0.2	0.0
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	27	0.2	0.0
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	-94	0.6	0.0
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	94	0.6	0.1
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	105	0.7	0.1
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	105	0.7	0.1
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	0	0.0	0.0
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	0	0.0	0.0
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	0	0.0	0.0
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	47	0.3	0.1
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	35	0.2	0.0
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	-58	0.4	0.2
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	58	0.4	0.0
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	-127	0.8	0.4
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	1819	1.3	0.2
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C6
Fireflow at N-A5-3 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	1819	1.3	0.1
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	1819	1.3	0.2
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	1819	1.3	0.1
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	1819	1.3	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-971	0.7	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	847	0.6	0.2
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	847	0.6	0.1
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-194	1.2	0.1
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	305	2.0	0.6
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	847	0.6	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	337	1.0	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-305	2.0	1.0
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-471	3.0	2.1
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-847	0.6	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-847	0.6	0.1
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	484	1.4	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-363	0.3	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	363	0.3	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	363	0.3	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	363	0.3	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	363	0.3	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	363	0.3	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	363	0.3	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-363	0.3	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-26	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	26	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-26	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-27	0.0	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	1	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	-1	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-777	2.2	0.1
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-777	2.2	1.2
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-777	2.2	0.3
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-777	2.2	1.4
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-777	2.2	0.5
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	777	2.2	0.7
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	777	2.2	1.1

OAK KNOLL WATER MASTER PLAN

Table C6
Fireflow at N-A5-3 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	777	2.2	0.1
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	777	2.2	0.4
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	194	1.2	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-194	1.2	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-194	1.2	0.6
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-194	1.2	0.3
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-194	1.2	1.0
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-194	1.2	0.6
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-194	1.2	0.3
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	194	1.2	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	13	0.1	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	13	0.1	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	13	0.1	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	26	0.3	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	-1	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	1	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	2	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	2	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	2	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	2	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	2	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	1	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	1	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-971	2.8	0.2
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	8	0.1	0.0
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	8	0.1	0.0
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	8	0.0	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	8	0.1	0.0
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	8	0.0	0.0
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	8	0.0	0.0
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	8	0.0	0.0
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	8	0.0	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C7
Fire Flow at N-B5 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	608.3	155.0
N-A2	277	B3A	0.0	605.1	142.0
N-A2-1	277	B3A	47.0	605.1	142.0
N-A3	295	B3A	0.0	603.6	134.0
N-A4	307	B3A	0.0	602.4	128.0
N-A4-1	330	B3A	14.0	603.0	118.0
N-A4-2	339	B3A	14.0	603.3	114.0
N-A5	335	B3A	0.0	604.4	117.0
N-A5-1	355	B3A	14.0	604.1	108.0
N-A5-2	400	B3A	14.0	604.0	88.0
N-A5-3	419	B3A	14.0	604.0	80.0
N-A6	354	B3A	0.0	608.9	110.0
N-B1	233	B3A	27.0	609.5	163.0
N-B2	285	B3A	19.0	608.4	140.0
N-B3	345	B3A	25.0	598.7	110.0
N-B4	340	B3A	30.0	594.9	110.0
N-B5	335	B3A	2000.0	593.0	112.0
N-C1	304	B3A	17.0	611.9	133.0
N-C2	310	B3A	0.0	611.0	130.0
N-C2-1	330	B3A	0.0	611.0	122.0
N-C3	310	B3A	0.0	611.0	130.0
N-D1	344	B3A	16.0	594.9	109.0
N-D2	350	B3A	0.0	595.0	106.0
N-D3	342	B3A	0.0	595.0	109.0
N-D4	334	B3A	16.0	595.1	113.0
N-D4-1	332	B3A	0.0	595.8	114.0
N-D5	334	B3A	0.0	594.2	113.0
N-D6	334	B3A	9.0	593.7	112.0
N-E1	602	B5D	7.0	738.4	59.0
N-E1-1	589	B5D	0.0	738.4	65.0
N-E2	496	B5D	0.0	732.1	102.0
N-E3	493	B3A	0.0	600.0	46.0
N-E4	490	B3A	11.0	599.8	47.0
N-E5	390	B3A	12.0	597.6	90.0
N-E6	377	B3A	0.0	597.4	95.0
N-E7	468	B3A	11.0	599.2	57.0
N-E8	375	B3A	11.0	598.8	97.0
N-E8-1	375	B3A	0.0	598.8	97.0

OAK KNOLL WATER MASTER PLAN

Table C7
Fire Flow at N-B5 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	612.8	55.0
E-B3A-03	480	B3A	0.0	612.8	57.0
E-B3A-04	480	B3A	0.0	612.7	57.0
E-B3A-05	340	B3A	0.0	612.5	118.0
E-B3A-06	315	B3A	0.0	612.4	129.0
E-B3A-07	315	B3A	0.0	612.4	129.0
E-B3A-08	315	B3A	0.0	612.4	129.0
E-B3A-09	290	B3A	0.0	612.2	139.0
E-B3A-10	290	B3A	0.0	612.1	139.0
E-B3A-11	255	B3A	0.0	612.1	154.0
E-B3A-12	241	B3A	0.0	612.0	161.0
E-B3A-13	227	B3A	0.0	611.9	167.0
E-B3A-14	230	B3A	0.0	611.9	165.0
E-B3A-15	246	B3A	0.0	611.9	158.0
E-B3A-16	252	B3A	0.0	611.9	156.0
E-B3A-17	260	B3A	0.0	611.9	152.0
E-B3A-18	261	B3A	0.0	611.9	152.0
E-B3A-19	278	B3A	0.0	611.9	144.0
E-B3A-20	280	B3A	0.0	611.9	144.0
E-B3A-21	302	B3A	0.0	611.9	134.0
E-B3A-22	340	B3A	0.0	611.9	118.0
E-B3A-23	340	B3A	0.0	611.9	118.0
E-B3A-24	350	B3A	0.0	611.9	113.0
E-B3A-25	350	B3A	0.0	611.9	113.0
E-B3A-26	500	B3A	0.0	611.9	48.0
E-B3A-27	530	B3A	0.0	611.9	35.0
E-B3A-28	520	B3A	0.0	611.9	40.0
E-B3A-29	560	B3A	0.0	611.9	22.0
E-B3A-30	480	B3A	0.0	610.6	57.0
E-B3A-31	480	B3A	0.0	610.6	56.0
E-B3A-32	408	B3A	0.0	609.8	87.0
E-B3A-33	409	B3A	0.0	609.7	87.0
E-B3A-35	358	B3A	0.0	608.9	109.0
E-B3A-36	371	B3A	0.0	608.9	103.0
E-B3A-37	417	B3A	0.0	608.9	83.0
E-B3A-38	420	B3A	0.0	608.9	82.0
E-B3A-39	480	B3A	0.0	610.9	57.0
E-B3A-40	380	B3A	0.0	611.3	100.0
E-B3A-41	330	B3A	0.0	611.9	122.0
E-B3A-42	330	B3A	0.0	611.9	122.0
E-B3A-43	330	B3A	0.0	611.9	122.0
E-B3A-44	315	B3A	0.0	611.9	128.0

OAK KNOLL WATER MASTER PLAN

Table C7
Fire Flow at N-B5 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	611.9	128.0
E-B3A-46	300	B3A	0.0	611.9	135.0
E-B3A-47	330	B3A	0.0	612.0	122.0
E-B3A-48	315	B3A	0.0	612.2	129.0
E-B3A-49	315	B3A	0.0	612.2	129.0
E-B3A-50	315	B3A	0.0	612.1	129.0
E-B3A-51	300	B3A	0.0	611.5	135.0
E-B3A-52	300	B3A	0.0	611.5	135.0
E-B3A-53	300	B3A	0.0	611.3	135.0
E-B3A-54	300	B3A	0.0	611.1	135.0
E-B3A-55	290	B3A	0.0	610.9	139.0
E-B3A-56	290	B3A	0.0	610.6	139.0
E-B3A-57	308	B3A	0.0	609.6	130.0
E-B3A-58	276	B3A	0.0	609.0	144.0
E-B3A-59	276	B3A	0.0	608.8	144.0
E-B3A-60	259	B3A	0.0	608.4	151.0
E-B3A-60	259	B3A	0.0	608.4	151.0
E-B3A-61	241	B3A	0.0	608.7	159.0
E-B3A-62	227	B3A	0.0	611.9	167.0
E-B3A-63	232	B3A	0.0	611.9	165.0
E-B3A-64	245	B3A	0.0	611.9	159.0
E-B3A-66	310	B3A	0.0	611.9	131.0
E-B3A-67	340	B3A	0.0	611.9	118.0
E-B3A-68	400	B3A	0.0	611.9	92.0
E-B3A-69	420	B3A	0.0	611.9	83.0
E-B3A-70	396	B3A	0.0	611.9	93.0
E-B3A-71	381	B3A	0.0	611.9	100.0
E-B3A-72	391	B3A	0.0	611.9	96.0
E-B3A-73	428	B3A	0.0	611.9	80.0
E-B3A-74	480	B3A	0.0	611.9	57.0
E-B3A-75	350	B3A	0.0	611.9	113.0
E-B5D-01	750	B5D	0.0	782.3	14.0
E-B5D-02	730	B5D	0.0	781.1	22.0
E-B5D-03	660	B5D	0.0	780.9	52.0
E-B5D-03-20	606	B5D	0.0	742.0	59.0
E-B5D-03-23	620	B5D	0.0	758.3	60.0
E-B5D-03-25	669	B5D	0.0	770.0	44.0
E-B5D-04	650	B5D	0.0	780.8	57.0
E-B5D-05	620	B5D	0.0	780.6	69.0
E-B5D-06	610	B5D	0.0	780.6	74.0
E-B5D-07	610	B5D	0.0	780.6	74.0
E-B5D-08	600	B5D	0.0	780.6	78.0

OAK KNOLL WATER MASTER PLAN

Table C7
Fireflow at N-B5 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	450	2.9	3.1
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	47	0.3	0.0
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	403	2.6	1.6
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	403	2.6	1.2
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	-199	1.3	0.6
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-213	1.4	0.4
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-227	1.5	0.7
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-314	2.0	2.0
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	269	1.7	0.3
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	28	0.2	0.0
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	14	0.1	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	583	3.7	4.5
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	225	1.4	1.1
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-426	2.7	2.6
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	633	4.0	9.7
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	-112	0.7	0.1
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	720	4.6	3.8
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	737	4.7	1.9
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	348	2.2	0.7
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	-916	5.8	9.4
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	426	2.7	0.9
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	-47	0.3	0.0
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	-63	0.4	0.0
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	-63	0.4	0.1
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	-63	0.4	0.1
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	-436	2.8	0.7
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	436	2.8	1.6
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	357	2.3	0.9
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	357	2.3	0.5
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	591	3.8	6.3
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	591	3.8	0.1
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	591	3.8	0.2
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	224	1.4	2.2
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	212	1.4	0.2
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	-224	1.4	1.8
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	-357	2.3	0.6
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	123	0.8	0.4
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	1727	1.2	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	1727	1.2	0.2
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C7
Fireflow at N-B5 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	1727	1.2	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	1727	1.2	0.1
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	1727	1.2	0.2
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	1727	1.2	0.1
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	1727	1.2	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	1727	1.2	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-777	0.6	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	950	0.7	0.2
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	950	0.7	0.1
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	255	1.6	0.5
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	950	0.7	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	393	1.1	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-255	1.6	0.7
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-507	3.2	2.4
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-950	0.7	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-950	0.7	0.1
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	526	1.5	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-424	0.3	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	424	0.3	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	424	0.3	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	424	0.3	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	424	0.3	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	424	0.3	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	424	0.3	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-424	0.3	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-30	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	30	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-30	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-30	0.1	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	0	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	0	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-583	1.7	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-583	1.7	0.7
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-583	1.7	0.2
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-583	1.7	0.8
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-583	1.7	0.3
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	583	1.7	0.4
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	583	1.7	0.6

Table C7
Fireflow at N-B5 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	583	1.7	0.1
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	583	1.7	0.2
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	194	1.2	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-194	1.2	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-194	1.2	0.6
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-194	1.2	0.2
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-194	1.2	0.3
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-194	1.2	1.0
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-194	1.2	0.6
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-194	1.2	0.3
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	194	1.2	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	20	0.1	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	20	0.1	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	20	0.1	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	30	0.4	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	0	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	0	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	0	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	0	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	0	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	0	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	0	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	0	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	0	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-777	2.2	0.2
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	599	3.8	0.8
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	599	3.8	1.2
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	599	1.0	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	599	6.8	3.6
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	599	6.8	16.4
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	599	6.8	11.6
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	599	6.8	10.6
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	599	1.0	0.2
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	599	1.0	0.2
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	599	1.0	0.2
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	599	1.0	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C8
Fire Flow at N-C2 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	609.0	155.0
N-A2	277	B3A	0.0	608.7	144.0
N-A2-1	277	B3A	47.0	608.7	144.0
N-A3	295	B3A	0.0	608.7	136.0
N-A4	307	B3A	0.0	608.6	130.0
N-A4-1	330	B3A	14.0	608.8	121.0
N-A4-2	339	B3A	14.0	608.9	117.0
N-A5	335	B3A	0.0	609.2	119.0
N-A5-1	355	B3A	14.0	609.1	110.0
N-A5-2	400	B3A	14.0	609.1	90.0
N-A5-3	419	B3A	14.0	609.1	82.0
N-A6	354	B3A	0.0	610.7	111.0
N-B1	233	B3A	27.0	609.0	162.0
N-B2	285	B3A	19.0	605.7	139.0
N-B3	345	B3A	25.0	606.8	113.0
N-B4	340	B3A	30.0	607.0	116.0
N-B5	335	B3A	0.0	607.2	118.0
N-C1	304	B3A	17.0	610.0	132.0
N-C2	310	B3A	2000.0	601.3	126.0
N-C2-1	330	B3A	0.0	601.3	117.0
N-C3	310	B3A	0.0	601.3	126.0
N-D1	344	B3A	16.0	607.0	114.0
N-D2	350	B3A	0.0	607.0	111.0
N-D3	342	B3A	0.0	607.0	115.0
N-D4	334	B3A	16.0	607.0	118.0
N-D4-1	332	B3A	0.0	607.0	119.0
N-D5	334	B3A	0.0	607.1	118.0
N-D6	334	B3A	9.0	607.2	118.0
N-E1	602	B5D	7.0	783.0	78.0
N-E1-1	589	B5D	0.0	783.0	84.0
N-E2	496	B5D	0.0	783.0	124.0
N-E3	493	B3A	0.0	606.9	49.0
N-E4	490	B3A	11.0	606.9	51.0
N-E5	390	B3A	12.0	606.9	94.0
N-E6	377	B3A	0.0	606.9	99.0
N-E7	468	B3A	11.0	606.9	60.0
N-E8	375	B3A	11.0	606.8	100.0
N-E8-1	375	B3A	0.0	606.8	100.0

OAK KNOLL WATER MASTER PLAN

Table C8
Fire Flow at N-C2 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	612.7	55.0
E-B3A-03	480	B3A	0.0	612.7	57.0
E-B3A-04	480	B3A	0.0	612.5	57.0
E-B3A-05	340	B3A	0.0	612.2	118.0
E-B3A-06	315	B3A	0.0	612.0	128.0
E-B3A-07	315	B3A	0.0	611.9	128.0
E-B3A-08	315	B3A	0.0	611.9	128.0
E-B3A-09	290	B3A	0.0	611.3	139.0
E-B3A-10	290	B3A	0.0	610.9	139.0
E-B3A-11	255	B3A	0.0	610.8	154.0
E-B3A-12	241	B3A	0.0	610.7	160.0
E-B3A-13	227	B3A	0.0	610.4	166.0
E-B3A-14	230	B3A	0.0	610.4	165.0
E-B3A-15	246	B3A	0.0	610.4	158.0
E-B3A-16	252	B3A	0.0	610.4	155.0
E-B3A-17	260	B3A	0.0	610.4	152.0
E-B3A-18	261	B3A	0.0	610.4	151.0
E-B3A-19	278	B3A	0.0	610.3	144.0
E-B3A-20	280	B3A	0.0	610.3	143.0
E-B3A-21	302	B3A	0.0	610.3	133.0
E-B3A-22	340	B3A	0.0	610.3	117.0
E-B3A-23	340	B3A	0.0	610.3	117.0
E-B3A-24	350	B3A	0.0	610.3	113.0
E-B3A-25	350	B3A	0.0	610.3	113.0
E-B3A-26	500	B3A	0.0	610.3	48.0
E-B3A-27	530	B3A	0.0	610.3	35.0
E-B3A-28	520	B3A	0.0	610.3	39.0
E-B3A-29	560	B3A	0.0	610.3	22.0
E-B3A-30	480	B3A	0.0	611.3	57.0
E-B3A-31	480	B3A	0.0	611.3	57.0
E-B3A-32	408	B3A	0.0	611.1	88.0
E-B3A-33	409	B3A	0.0	611.0	87.0
E-B3A-35	358	B3A	0.0	610.7	109.0
E-B3A-36	371	B3A	0.0	610.7	104.0
E-B3A-37	417	B3A	0.0	610.7	84.0
E-B3A-38	420	B3A	0.0	610.7	83.0
E-B3A-39	480	B3A	0.0	611.4	57.0
E-B3A-40	380	B3A	0.0	611.5	100.0
E-B3A-41	330	B3A	0.0	611.8	122.0
E-B3A-42	330	B3A	0.0	611.8	122.0
E-B3A-43	330	B3A	0.0	611.8	122.0
E-B3A-44	315	B3A	0.0	611.8	128.0

OAK KNOLL WATER MASTER PLAN

Table C8
Fire Flow at N-C2 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	611.8	128.0
E-B3A-46	300	B3A	0.0	611.8	135.0
E-B3A-47	330	B3A	0.0	611.8	122.0
E-B3A-48	315	B3A	0.0	611.9	128.0
E-B3A-49	315	B3A	0.0	611.8	128.0
E-B3A-50	315	B3A	0.0	611.8	128.0
E-B3A-51	300	B3A	0.0	611.4	135.0
E-B3A-52	300	B3A	0.0	611.4	135.0
E-B3A-53	300	B3A	0.0	611.2	135.0
E-B3A-54	300	B3A	0.0	611.0	135.0
E-B3A-55	290	B3A	0.0	610.9	139.0
E-B3A-56	290	B3A	0.0	610.7	139.0
E-B3A-57	308	B3A	0.0	610.0	131.0
E-B3A-58	276	B3A	0.0	609.5	144.0
E-B3A-59	276	B3A	0.0	609.4	144.0
E-B3A-60	259	B3A	0.0	609.1	151.0
E-B3A-60	259	B3A	0.0	609.1	151.0
E-B3A-61	241	B3A	0.0	609.0	159.0
E-B3A-62	227	B3A	0.0	610.4	166.0
E-B3A-63	232	B3A	0.0	610.4	164.0
E-B3A-64	245	B3A	0.0	610.3	158.0
E-B3A-66	310	B3A	0.0	610.0	130.0
E-B3A-67	340	B3A	0.0	610.3	117.0
E-B3A-68	400	B3A	0.0	610.3	91.0
E-B3A-69	420	B3A	0.0	610.3	82.0
E-B3A-70	396	B3A	0.0	610.3	93.0
E-B3A-71	381	B3A	0.0	610.3	99.0
E-B3A-72	391	B3A	0.0	610.3	95.0
E-B3A-73	428	B3A	0.0	610.3	79.0
E-B3A-74	480	B3A	0.0	610.3	56.0
E-B3A-75	350	B3A	0.0	610.3	113.0
E-B5D-01	750	B5D	0.0	783.0	14.0
E-B5D-02	730	B5D	0.0	783.0	23.0
E-B5D-03	660	B5D	0.0	783.0	53.0
E-B5D-03-20	606	B5D	0.0	783.0	77.0
E-B5D-03-23	620	B5D	0.0	783.0	71.0
E-B5D-03-25	669	B5D	0.0	783.0	49.0
E-B5D-04	650	B5D	0.0	783.0	58.0
E-B5D-05	620	B5D	0.0	783.0	71.0
E-B5D-06	610	B5D	0.0	783.0	75.0
E-B5D-07	610	B5D	0.0	783.0	75.0
E-B5D-08	600	B5D	0.0	783.0	79.0

OAK KNOLL WATER MASTER PLAN

Table C8
Fireflow at N-C2 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	119	0.8	0.3
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	47	0.3	0.0
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	72	0.5	0.1
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	72	0.5	0.1
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	-92	0.6	0.1
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-106	0.7	0.1
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-120	0.8	0.2
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-162	1.0	0.6
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	162	1.0	0.1
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	28	0.2	0.0
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	14	0.1	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	324	2.1	1.5
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	401	2.6	3.2
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	570	3.6	4.4
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	-187	1.2	1.0
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	-38	0.2	0.0
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	-173	1.1	0.3
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	-219	1.4	0.2
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	-107	0.7	0.1
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	-327	2.1	1.4
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	1430	9.1	8.7
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	16	0.1	0.0
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	0	0.0	0.0
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	0	0.0	0.0
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	0	0.0	0.0
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	82	0.5	0.0
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	-82	0.5	0.1
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	-98	0.6	0.1
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	-98	0.6	0.1
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	0	0.0	0.0
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	0	0.0	0.0
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	0	0.0	0.0
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	-31	0.2	0.1
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	-43	0.3	0.0
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	39	0.3	0.1
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	-21	0.1	0.0
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	49	0.3	0.1
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	2319	1.6	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	2319	1.6	0.3
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C8
Fireflow at N-C2 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	2319	1.6	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	2319	1.6	0.1
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	2319	1.6	0.4
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	2319	1.6	0.2
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	2319	1.6	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	2319	1.6	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-488	0.4	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	1831	1.3	0.7
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	1831	1.3	0.4
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-163	1.0	0.1
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	-44	0.3	0.0
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	1831	1.3	0.1
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	1233	3.5	0.3
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	44	0.3	0.0
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-383	2.5	1.5
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-1831	1.3	0.1
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-1831	1.3	0.3
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	503	1.4	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-1328	0.9	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	1328	0.9	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	1328	0.9	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	1328	0.9	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-163	1.0	0.2
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	1328	0.9	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	1328	0.9	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	1328	0.9	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-1328	0.9	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-96	0.1	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	96	0.1	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-96	0.1	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-91	0.2	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	-5	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	5	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-324	0.9	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-324	0.9	0.2
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-324	0.9	0.1
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-324	0.9	0.3
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-324	0.9	0.1
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	324	0.9	0.1
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	324	0.9	0.2

OAK KNOLL WATER MASTER PLAN

Table C8
Fireflow at N-C2 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	324	0.9	0.0
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	324	0.9	0.1
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	163	1.0	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-163	1.0	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-163	1.0	0.4
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-163	1.0	0.2
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-163	1.0	0.2
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-163	1.0	0.2
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-163	1.0	0.2
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-163	1.0	0.7
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-163	1.0	0.4
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-163	1.0	0.3
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	163	1.0	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	119	0.8	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	119	0.8	0.1
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	119	0.8	0.3
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	96	1.1	0.3
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	5	0.1	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	-5	0.1	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	1	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	1	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	1	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	1	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	1	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	-5	0.1	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	-5	0.1	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-488	1.4	0.1
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	8	0.1	0.0
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	8	0.1	0.0
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	8	0.0	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	8	0.1	0.0
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	8	0.1	0.0
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	8	0.0	0.0
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	8	0.0	0.0
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	8	0.0	0.0
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	8	0.0	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C9
Fire Flow at N-E1-1 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	612.8	157.0
N-A2	277	B3A	0.0	612.7	145.0
N-A2-1	277	B3A	47.0	612.7	145.0
N-A3	295	B3A	0.0	612.7	137.0
N-A4	307	B3A	0.0	612.7	132.0
N-A4-1	330	B3A	14.0	612.7	122.0
N-A4-2	339	B3A	14.0	612.7	118.0
N-A5	335	B3A	0.0	612.7	120.0
N-A5-1	355	B3A	14.0	612.7	111.0
N-A5-2	400	B3A	14.0	612.6	92.0
N-A5-3	419	B3A	14.0	612.6	84.0
N-A6	354	B3A	0.0	612.9	112.0
N-B1	233	B3A	27.0	612.8	164.0
N-B2	285	B3A	19.0	612.8	142.0
N-B3	345	B3A	25.0	612.6	116.0
N-B4	340	B3A	30.0	612.6	118.0
N-B5	335	B3A	0.0	612.6	120.0
N-C1	304	B3A	17.0	613.0	134.0
N-C2	310	B3A	0.0	612.9	131.0
N-C2-1	330	B3A	0.0	612.9	122.0
N-C3	310	B3A	0.0	612.9	131.0
N-D1	344	B3A	16.0	612.6	116.0
N-D2	350	B3A	0.0	612.6	114.0
N-D3	342	B3A	0.0	612.6	117.0
N-D4	334	B3A	16.0	612.6	121.0
N-D4-1	332	B3A	0.0	612.6	121.0
N-D5	334	B3A	0.0	612.6	121.0
N-D6	334	B3A	9.0	612.6	121.0
N-E1	602	B5D	7.0	666.2	28.0
N-E1-1	589	B5D	1000.0	659.5	31.0
N-E2	496	B5D	0.0	666.2	74.0
N-E3	493	B3A	0.0	612.6	52.0
N-E4	490	B3A	11.0	612.6	53.0
N-E5	390	B3A	12.0	612.6	96.0
N-E6	377	B3A	0.0	612.6	102.0
N-E7	468	B3A	11.0	612.6	63.0
N-E8	375	B3A	11.0	612.6	103.0
N-E8-1	375	B3A	0.0	612.6	103.0

OAK KNOLL WATER MASTER PLAN

Table C9
Fire Flow at N-E1-1 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	613.0	55.0
E-B3A-03	480	B3A	0.0	613.0	58.0
E-B3A-04	480	B3A	0.0	613.0	58.0
E-B3A-05	340	B3A	0.0	613.0	118.0
E-B3A-06	315	B3A	0.0	613.0	129.0
E-B3A-07	315	B3A	0.0	613.0	129.0
E-B3A-08	315	B3A	0.0	613.0	129.0
E-B3A-09	290	B3A	0.0	613.0	140.0
E-B3A-10	290	B3A	0.0	613.0	140.0
E-B3A-11	255	B3A	0.0	613.0	155.0
E-B3A-12	241	B3A	0.0	613.0	161.0
E-B3A-13	227	B3A	0.0	613.0	167.0
E-B3A-14	230	B3A	0.0	613.0	166.0
E-B3A-15	246	B3A	0.0	613.0	159.0
E-B3A-16	252	B3A	0.0	613.0	156.0
E-B3A-17	260	B3A	0.0	613.0	153.0
E-B3A-18	261	B3A	0.0	613.0	152.0
E-B3A-19	278	B3A	0.0	613.0	145.0
E-B3A-20	280	B3A	0.0	613.0	144.0
E-B3A-21	302	B3A	0.0	613.0	135.0
E-B3A-22	340	B3A	0.0	613.0	118.0
E-B3A-23	340	B3A	0.0	613.0	118.0
E-B3A-24	350	B3A	0.0	613.0	114.0
E-B3A-25	350	B3A	0.0	613.0	114.0
E-B3A-26	500	B3A	0.0	613.0	49.0
E-B3A-27	530	B3A	0.0	613.0	36.0
E-B3A-28	520	B3A	0.0	613.0	40.0
E-B3A-29	560	B3A	0.0	613.0	23.0
E-B3A-30	480	B3A	0.0	612.9	58.0
E-B3A-31	480	B3A	0.0	612.9	58.0
E-B3A-32	408	B3A	0.0	612.9	89.0
E-B3A-33	409	B3A	0.0	612.9	88.0
E-B3A-35	358	B3A	0.0	612.9	110.0
E-B3A-36	371	B3A	0.0	612.9	105.0
E-B3A-37	417	B3A	0.0	612.9	85.0
E-B3A-38	420	B3A	0.0	612.9	83.0
E-B3A-39	480	B3A	0.0	612.9	58.0
E-B3A-40	380	B3A	0.0	612.9	101.0
E-B3A-41	330	B3A	0.0	613.0	122.0
E-B3A-42	330	B3A	0.0	613.0	122.0
E-B3A-43	330	B3A	0.0	613.0	122.0
E-B3A-44	315	B3A	0.0	613.0	129.0

OAK KNOLL WATER MASTER PLAN

Table C9
Fire Flow at N-E1-1 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	613.0	129.0
E-B3A-46	300	B3A	0.0	613.0	135.0
E-B3A-47	330	B3A	0.0	613.0	122.0
E-B3A-48	315	B3A	0.0	613.0	129.0
E-B3A-49	315	B3A	0.0	613.0	129.0
E-B3A-50	315	B3A	0.0	613.0	129.0
E-B3A-51	300	B3A	0.0	612.9	135.0
E-B3A-52	300	B3A	0.0	612.9	135.0
E-B3A-53	300	B3A	0.0	612.9	135.0
E-B3A-54	300	B3A	0.0	612.9	135.0
E-B3A-55	290	B3A	0.0	612.9	140.0
E-B3A-56	290	B3A	0.0	612.9	140.0
E-B3A-57	308	B3A	0.0	612.9	132.0
E-B3A-58	276	B3A	0.0	612.8	146.0
E-B3A-59	276	B3A	0.0	612.8	146.0
E-B3A-60	259	B3A	0.0	612.8	153.0
E-B3A-60	259	B3A	0.0	612.8	153.0
E-B3A-61	241	B3A	0.0	612.8	161.0
E-B3A-62	227	B3A	0.0	613.0	167.0
E-B3A-63	232	B3A	0.0	613.0	165.0
E-B3A-64	245	B3A	0.0	613.0	159.0
E-B3A-66	310	B3A	0.0	613.0	131.0
E-B3A-67	340	B3A	0.0	613.0	118.0
E-B3A-68	400	B3A	0.0	613.0	92.0
E-B3A-69	420	B3A	0.0	613.0	83.0
E-B3A-70	396	B3A	0.0	613.0	94.0
E-B3A-71	381	B3A	0.0	613.0	100.0
E-B3A-72	391	B3A	0.0	613.0	96.0
E-B3A-73	428	B3A	0.0	613.0	80.0
E-B3A-74	480	B3A	0.0	613.0	58.0
E-B3A-75	350	B3A	0.0	613.0	114.0
E-B5D-01	750	B5D	0.0	781.1	13.0
E-B5D-02	730	B5D	0.0	778.0	21.0
E-B5D-03	660	B5D	0.0	777.6	51.0
E-B5D-03-20	606	B5D	0.0	675.5	30.0
E-B5D-03-23	620	B5D	0.0	718.4	43.0
E-B5D-03-25	669	B5D	0.0	748.8	35.0
E-B5D-04	650	B5D	0.0	777.1	55.0
E-B5D-05	620	B5D	0.0	776.7	68.0
E-B5D-06	610	B5D	0.0	776.7	72.0
E-B5D-07	610	B5D	0.0	776.7	72.0
E-B5D-08	600	B5D	0.0	776.7	76.0

OAK KNOLL WATER MASTER PLAN

Table C9
Fireflow at N-E1-1 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	78	0.5	0.1
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	47	0.3	0.0
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	31	0.2	0.0
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	31	0.2	0.0
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	6	0.0	0.0
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-8	0.1	0.0
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-22	0.1	0.0
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-33	0.2	0.0
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	64	0.4	0.0
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	28	0.2	0.0
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	14	0.1	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	97	0.6	0.2
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	27	0.2	0.0
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-73	0.5	0.1
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	82	0.5	0.2
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	30	0.2	0.0
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	27	0.2	0.0
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	-28	0.2	0.0
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	-29	0.2	0.0
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	-58	0.4	0.1
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	73	0.5	0.0
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	26	0.2	0.0
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	10	0.1	0.0
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	10	0.1	0.0
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	10	0.1	0.0
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	14	0.1	0.0
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	-14	0.1	0.0
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	-20	0.1	0.0
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	-20	0.1	0.0
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	1000	6.4	6.6
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	0	0.0	0.0
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	0	0.0	0.0
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	0	0.0	0.0
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	-1	0.0	0.0
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	-13	0.1	0.0
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	1	0.0	0.0
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	10	0.1	0.0
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	-19	0.1	0.0
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	319	0.2	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	319	0.2	0.0
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C9
Fireflow at N-E1-1 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	319	0.2	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	319	0.2	0.0
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	319	0.2	0.0
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	319	0.2	0.0
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	319	0.2	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	319	0.2	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-133	0.1	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	186	0.1	0.0
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	186	0.1	0.0
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	42	0.3	0.0
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	186	0.1	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	79	0.2	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-42	0.3	0.0
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-96	0.6	0.1
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-186	0.1	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-186	0.1	0.0
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	100	0.3	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-85	0.1	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	85	0.1	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	85	0.1	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	85	0.1	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	85	0.1	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	85	0.1	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	85	0.1	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-85	0.1	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-6	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	6	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-6	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-6	0.0	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	0	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	0	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-97	0.3	0.0
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	97	0.3	0.0
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	97	0.3	0.0

OAK KNOLL WATER MASTER PLAN

Table C9
Fireflow at N-E1-1 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	97	0.3	0.0
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	97	0.3	0.0
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	36	0.2	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-36	0.2	0.0
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	36	0.2	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	4	0.0	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	4	0.0	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	4	0.0	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	6	0.1	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	0	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	0	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	0	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	0	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	0	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	0	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	0	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	0	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	0	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-133	0.4	0.0
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	1008	6.4	2.0
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	1008	6.4	3.0
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	1008	1.6	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	1008	11.4	9.3
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	1008	11.4	42.9
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	1008	11.4	30.5
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	1008	11.4	27.9
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	1008	1.6	0.4
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	1008	1.6	0.5
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	1008	1.6	0.4
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	1008	1.6	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C10
Fire Flow at N-E4 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	610.9	156.0
N-A2	277	B3A	0.0	609.7	144.0
N-A2-1	277	B3A	47.0	609.7	144.0
N-A3	295	B3A	0.0	609.2	136.0
N-A4	307	B3A	0.0	608.8	131.0
N-A4-1	330	B3A	14.0	609.0	121.0
N-A4-2	339	B3A	14.0	609.1	117.0
N-A5	335	B3A	0.0	609.5	119.0
N-A5-1	355	B3A	14.0	609.4	110.0
N-A5-2	400	B3A	14.0	609.3	91.0
N-A5-3	419	B3A	14.0	609.3	82.0
N-A6	354	B3A	0.0	611.3	111.0
N-B1	233	B3A	27.0	611.3	163.0
N-B2	285	B3A	19.0	610.6	141.0
N-B3	345	B3A	25.0	605.4	113.0
N-B4	340	B3A	30.0	605.4	115.0
N-B5	335	B3A	0.0	605.6	117.0
N-C1	304	B3A	17.0	612.5	133.0
N-C2	310	B3A	0.0	612.0	131.0
N-C2-1	330	B3A	0.0	612.0	122.0
N-C3	310	B3A	0.0	612.0	131.0
N-D1	344	B3A	16.0	605.2	113.0
N-D2	350	B3A	0.0	605.0	110.0
N-D3	342	B3A	0.0	604.6	114.0
N-D4	334	B3A	16.0	604.3	117.0
N-D4-1	332	B3A	0.0	603.5	117.0
N-D5	334	B3A	0.0	604.8	117.0
N-D6	334	B3A	9.0	605.1	117.0
N-E1	602	B5D	7.0	624.5	10.0
N-E1-1	589	B5D	0.0	624.5	15.0
N-E2	496	B5D	0.0	601.9	46.0
N-E3	493	B3A	0.0	599.8	46.0
N-E4	490	B3A	2011.0	599.0	47.0
N-E5	390	B3A	12.0	601.6	91.0
N-E6	377	B3A	0.0	601.8	97.0
N-E7	468	B3A	11.0	600.5	57.0
N-E8	375	B3A	11.0	604.1	99.0
N-E8-1	375	B3A	0.0	604.1	99.0

OAK KNOLL WATER MASTER PLAN

Table C10
Fire Flow at N-E4 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	612.9	55.0
E-B3A-03	480	B3A	0.0	612.9	58.0
E-B3A-04	480	B3A	0.0	612.9	57.0
E-B3A-05	340	B3A	0.0	612.8	118.0
E-B3A-06	315	B3A	0.0	612.7	129.0
E-B3A-07	315	B3A	0.0	612.7	129.0
E-B3A-08	315	B3A	0.0	612.7	129.0
E-B3A-09	290	B3A	0.0	612.6	140.0
E-B3A-10	290	B3A	0.0	612.6	140.0
E-B3A-11	255	B3A	0.0	612.6	155.0
E-B3A-12	241	B3A	0.0	612.5	161.0
E-B3A-13	227	B3A	0.0	612.5	167.0
E-B3A-14	230	B3A	0.0	612.5	166.0
E-B3A-15	246	B3A	0.0	612.5	159.0
E-B3A-16	252	B3A	0.0	612.5	156.0
E-B3A-17	260	B3A	0.0	612.5	153.0
E-B3A-18	261	B3A	0.0	612.5	152.0
E-B3A-19	278	B3A	0.0	612.5	145.0
E-B3A-20	280	B3A	0.0	612.5	144.0
E-B3A-21	302	B3A	0.0	612.5	134.0
E-B3A-22	340	B3A	0.0	612.5	118.0
E-B3A-23	340	B3A	0.0	612.5	118.0
E-B3A-24	350	B3A	0.0	612.5	114.0
E-B3A-25	350	B3A	0.0	612.5	114.0
E-B3A-26	500	B3A	0.0	612.5	49.0
E-B3A-27	530	B3A	0.0	612.5	36.0
E-B3A-28	520	B3A	0.0	612.5	40.0
E-B3A-29	560	B3A	0.0	612.5	23.0
E-B3A-30	480	B3A	0.0	612.0	57.0
E-B3A-31	480	B3A	0.0	612.0	57.0
E-B3A-32	408	B3A	0.0	611.7	88.0
E-B3A-33	409	B3A	0.0	611.6	88.0
E-B3A-35	358	B3A	0.0	611.3	110.0
E-B3A-36	371	B3A	0.0	611.3	104.0
E-B3A-37	417	B3A	0.0	611.3	84.0
E-B3A-38	420	B3A	0.0	611.3	83.0
E-B3A-39	480	B3A	0.0	612.1	57.0
E-B3A-40	380	B3A	0.0	612.3	100.0
E-B3A-41	330	B3A	0.0	612.5	122.0
E-B3A-42	330	B3A	0.0	612.5	122.0
E-B3A-43	330	B3A	0.0	612.5	122.0
E-B3A-44	315	B3A	0.0	612.5	129.0

OAK KNOLL WATER MASTER PLAN

Table C10
Fire Flow at N-E4 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	612.5	129.0
E-B3A-46	300	B3A	0.0	612.5	135.0
E-B3A-47	330	B3A	0.0	612.6	122.0
E-B3A-48	315	B3A	0.0	612.6	129.0
E-B3A-49	315	B3A	0.0	612.6	129.0
E-B3A-50	315	B3A	0.0	612.6	129.0
E-B3A-51	300	B3A	0.0	612.3	135.0
E-B3A-52	300	B3A	0.0	612.3	135.0
E-B3A-53	300	B3A	0.0	612.2	135.0
E-B3A-54	300	B3A	0.0	612.2	135.0
E-B3A-55	290	B3A	0.0	612.1	139.0
E-B3A-56	290	B3A	0.0	611.9	139.0
E-B3A-57	308	B3A	0.0	611.5	131.0
E-B3A-58	276	B3A	0.0	611.2	145.0
E-B3A-59	276	B3A	0.0	611.1	145.0
E-B3A-60	259	B3A	0.0	611.0	152.0
E-B3A-60	259	B3A	0.0	611.0	152.0
E-B3A-61	241	B3A	0.0	611.1	160.0
E-B3A-62	227	B3A	0.0	612.5	167.0
E-B3A-63	232	B3A	0.0	612.5	165.0
E-B3A-64	245	B3A	0.0	612.5	159.0
E-B3A-66	310	B3A	0.0	612.5	131.0
E-B3A-67	340	B3A	0.0	612.5	118.0
E-B3A-68	400	B3A	0.0	612.5	92.0
E-B3A-69	420	B3A	0.0	612.5	83.0
E-B3A-70	396	B3A	0.0	612.5	94.0
E-B3A-71	381	B3A	0.0	612.5	100.0
E-B3A-72	391	B3A	0.0	612.5	96.0
E-B3A-73	428	B3A	0.0	612.5	80.0
E-B3A-74	480	B3A	0.0	612.5	57.0
E-B3A-75	350	B3A	0.0	612.5	114.0
E-B5D-01	750	B5D	0.0	780.4	13.0
E-B5D-02	730	B5D	0.0	776.2	20.0
E-B5D-03	660	B5D	0.0	775.7	50.0
E-B5D-03-20	606	B5D	0.0	637.2	13.0
E-B5D-03-23	620	B5D	0.0	695.3	33.0
E-B5D-03-25	669	B5D	0.0	736.6	29.0
E-B5D-04	650	B5D	0.0	775.1	54.0
E-B5D-05	620	B5D	0.0	774.5	67.0
E-B5D-06	610	B5D	0.0	774.5	71.0
E-B5D-07	610	B5D	0.0	774.5	71.0
E-B5D-08	600	B5D	0.0	774.5	75.0

OAK KNOLL WATER MASTER PLAN

Table C10
Fireflow at N-E4 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	268	1.7	1.2
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	47	0.3	0.0
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	221	1.4	0.5
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	221	1.4	0.4
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	-105	0.7	0.2
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-119	0.8	0.1
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-133	0.9	0.3
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-181	1.2	0.7
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	175	1.1	0.1
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	28	0.2	0.0
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	14	0.1	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	356	2.3	1.8
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	171	1.1	0.7
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-299	1.9	1.3
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	452	2.9	5.2
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	417	2.7	1.3
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	10	0.1	0.0
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	-217	1.4	0.2
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	-291	1.9	0.5
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	-507	3.2	3.2
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	299	1.9	0.5
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	197	1.3	0.2
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	181	1.2	0.3
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	181	1.2	0.3
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	181	1.2	0.4
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	447	2.9	0.8
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	-447	2.9	1.7
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	-282	1.8	0.6
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	-282	1.8	0.3
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	1180	7.5	22.7
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	1180	7.5	0.3
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	1180	7.5	0.8
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	-243	1.6	2.6
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	-255	1.6	0.2
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	192	1.2	1.3
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	587	3.8	1.4
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	-406	2.6	3.7
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	1138	0.8	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	1138	0.8	0.1
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C10
Fireflow at N-E4 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	1138	0.8	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	1138	0.8	0.0
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	1138	0.8	0.1
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	1138	0.8	0.1
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	1138	0.8	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	1138	0.8	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-481	0.3	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	657	0.5	0.1
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	657	0.5	0.1
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-125	0.8	0.1
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	143	0.9	0.2
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	657	0.5	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	279	0.8	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-143	0.9	0.3
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-341	2.2	1.2
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-657	0.5	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-657	0.5	0.0
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	356	1.0	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-300	0.2	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	300	0.2	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	300	0.2	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	300	0.2	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-125	0.8	0.1
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	300	0.2	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	300	0.2	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	300	0.2	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-300	0.2	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-22	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	22	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-22	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-21	0.0	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	-1	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	1	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-356	1.0	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-356	1.0	0.3
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-356	1.0	0.1
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-356	1.0	0.3
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-356	1.0	0.1
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	356	1.0	0.2
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	356	1.0	0.3

OAK KNOLL WATER MASTER PLAN

Table C10
Fireflow at N-E4 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	356	1.0	0.0
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	356	1.0	0.1
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	125	0.8	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-125	0.8	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-125	0.8	0.3
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-125	0.8	0.1
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-125	0.8	0.1
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-125	0.8	0.1
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-125	0.8	0.1
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-125	0.8	0.4
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-125	0.8	0.3
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-125	0.8	0.2
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	125	0.8	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	16	0.1	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	16	0.1	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	16	0.1	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	22	0.3	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	1	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	-1	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	0	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	0	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	0	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	0	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	0	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	-1	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	-1	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-481	1.4	0.1
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	1188	7.6	2.7
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	1188	7.6	4.1
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	1188	1.9	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	1188	13.5	12.7
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	1188	13.5	58.1
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	1188	13.5	41.3
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	1188	13.5	37.8
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	1188	1.9	0.6
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	1188	1.9	0.6
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	1188	1.9	0.5
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	1188	1.9	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C11
Fire Flow at N-E5 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Onsite Junctions - Proposed					
N-A1	250	B3A	0.0	609.9	156.0
N-A2	277	B3A	0.0	608.1	143.0
N-A2-1	277	B3A	47.0	608.0	143.0
N-A3	295	B3A	0.0	607.2	135.0
N-A4	307	B3A	0.0	606.6	130.0
N-A4-1	330	B3A	14.0	606.9	120.0
N-A4-2	339	B3A	14.0	607.1	116.0
N-A5	335	B3A	0.0	607.7	118.0
N-A5-1	355	B3A	14.0	607.5	109.0
N-A5-2	400	B3A	14.0	607.5	90.0
N-A5-3	419	B3A	14.0	607.5	82.0
N-A6	354	B3A	0.0	610.5	111.0
N-B1	233	B3A	27.0	610.5	163.0
N-B2	285	B3A	19.0	609.5	140.0
N-B3	345	B3A	25.0	601.8	111.0
N-B4	340	B3A	30.0	601.3	113.0
N-B5	335	B3A	0.0	601.4	115.0
N-C1	304	B3A	17.0	612.2	133.0
N-C2	310	B3A	0.0	611.5	130.0
N-C2-1	330	B3A	0.0	611.5	122.0
N-C3	310	B3A	0.0	611.5	130.0
N-D1	344	B3A	16.0	600.6	111.0
N-D2	350	B3A	0.0	599.7	108.0
N-D3	342	B3A	0.0	598.6	111.0
N-D4	334	B3A	16.0	597.4	114.0
N-D4-1	332	B3A	0.0	595.1	114.0
N-D5	334	B3A	0.0	599.0	115.0
N-D6	334	B3A	9.0	600.0	115.0
N-E1	602	B5D	7.0	684.1	36.0
N-E1-1	589	B5D	0.0	684.1	41.0
N-E2	496	B5D	0.0	670.0	76.0
N-E3	493	B3A	0.0	599.9	46.0
N-E4	490	B3A	11.0	599.4	47.0
N-E5	390	B3A	2012.0	584.5	84.0
N-E6	377	B3A	0.0	589.7	92.0
N-E7	468	B3A	11.0	599.1	57.0
N-E8	375	B3A	11.0	601.0	98.0
N-E8-1	375	B3A	0.0	601.0	98.0

OAK KNOLL WATER MASTER PLAN

Table C11
Fire Flow at N-E5 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing					
E-B3A-01	610	B3A	0.0	613.0	1.0
E-B3A-02	485	B3A	0.0	612.9	55.0
E-B3A-03	480	B3A	0.0	612.9	57.0
E-B3A-04	480	B3A	0.0	612.8	57.0
E-B3A-05	340	B3A	0.0	612.7	118.0
E-B3A-06	315	B3A	0.0	612.6	129.0
E-B3A-07	315	B3A	0.0	612.6	129.0
E-B3A-08	315	B3A	0.0	612.6	129.0
E-B3A-09	290	B3A	0.0	612.4	139.0
E-B3A-10	290	B3A	0.0	612.4	139.0
E-B3A-11	255	B3A	0.0	612.3	155.0
E-B3A-12	241	B3A	0.0	612.3	161.0
E-B3A-13	227	B3A	0.0	612.3	167.0
E-B3A-14	230	B3A	0.0	612.3	166.0
E-B3A-15	246	B3A	0.0	612.2	158.0
E-B3A-16	252	B3A	0.0	612.2	156.0
E-B3A-17	260	B3A	0.0	612.2	152.0
E-B3A-18	261	B3A	0.0	612.2	152.0
E-B3A-19	278	B3A	0.0	612.2	145.0
E-B3A-20	280	B3A	0.0	612.2	144.0
E-B3A-21	302	B3A	0.0	612.2	134.0
E-B3A-22	340	B3A	0.0	612.2	118.0
E-B3A-23	340	B3A	0.0	612.2	118.0
E-B3A-24	350	B3A	0.0	612.2	113.0
E-B3A-25	350	B3A	0.0	612.2	113.0
E-B3A-26	500	B3A	0.0	612.2	49.0
E-B3A-27	530	B3A	0.0	612.2	36.0
E-B3A-28	520	B3A	0.0	612.2	40.0
E-B3A-29	560	B3A	0.0	612.2	23.0
E-B3A-30	480	B3A	0.0	611.5	57.0
E-B3A-31	480	B3A	0.0	611.5	57.0
E-B3A-32	408	B3A	0.0	611.0	88.0
E-B3A-33	409	B3A	0.0	610.9	87.0
E-B3A-35	358	B3A	0.0	610.5	109.0
E-B3A-36	371	B3A	0.0	610.5	104.0
E-B3A-37	417	B3A	0.0	610.5	84.0
E-B3A-38	420	B3A	0.0	610.5	82.0
E-B3A-39	480	B3A	0.0	611.7	57.0
E-B3A-40	380	B3A	0.0	611.9	100.0
E-B3A-41	330	B3A	0.0	612.3	122.0
E-B3A-42	330	B3A	0.0	612.3	122.0
E-B3A-43	330	B3A	0.0	612.3	122.0
E-B3A-44	315	B3A	0.0	612.3	129.0

OAK KNOLL WATER MASTER PLAN

Table C11
Fire Flow at N-E5 Junction Report

Junction Name	Elevation (ft)	Zone	Demand (calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
Offsite Junctions -Existing (Continued)					
E-B3A-45	315	B3A	0.0	612.3	129.0
E-B3A-46	300	B3A	0.0	612.3	135.0
E-B3A-47	330	B3A	0.0	612.3	122.0
E-B3A-48	315	B3A	0.0	612.5	129.0
E-B3A-49	315	B3A	0.0	612.4	129.0
E-B3A-50	315	B3A	0.0	612.4	129.0
E-B3A-51	300	B3A	0.0	612.0	135.0
E-B3A-52	300	B3A	0.0	612.0	135.0
E-B3A-53	300	B3A	0.0	611.9	135.0
E-B3A-54	300	B3A	0.0	611.7	135.0
E-B3A-55	290	B3A	0.0	611.6	139.0
E-B3A-56	290	B3A	0.0	611.4	139.0
E-B3A-57	308	B3A	0.0	610.8	131.0
E-B3A-58	276	B3A	0.0	610.4	145.0
E-B3A-59	276	B3A	0.0	610.2	145.0
E-B3A-60	259	B3A	0.0	610.0	152.0
E-B3A-60	259	B3A	0.0	610.0	152.0
E-B3A-61	241	B3A	0.0	610.1	160.0
E-B3A-62	227	B3A	0.0	612.2	167.0
E-B3A-63	232	B3A	0.0	612.2	165.0
E-B3A-64	245	B3A	0.0	612.2	159.0
E-B3A-66	310	B3A	0.0	612.2	131.0
E-B3A-67	340	B3A	0.0	612.2	118.0
E-B3A-68	400	B3A	0.0	612.2	92.0
E-B3A-69	420	B3A	0.0	612.2	83.0
E-B3A-70	396	B3A	0.0	612.2	94.0
E-B3A-71	381	B3A	0.0	612.2	100.0
E-B3A-72	391	B3A	0.0	612.2	96.0
E-B3A-73	428	B3A	0.0	612.2	80.0
E-B3A-74	480	B3A	0.0	612.2	57.0
E-B3A-75	350	B3A	0.0	612.2	113.0
E-B5D-01	750	B5D	0.0	781.4	14.0
E-B5D-02	730	B5D	0.0	778.8	21.0
E-B5D-03	660	B5D	0.0	778.4	51.0
E-B5D-03-20	606	B5D	0.0	692.0	37.0
E-B5D-03-23	620	B5D	0.0	728.3	47.0
E-B5D-03-25	669	B5D	0.0	754.1	37.0
E-B5D-04	650	B5D	0.0	778.0	55.0
E-B5D-05	620	B5D	0.0	777.7	68.0
E-B5D-06	610	B5D	0.0	777.7	73.0
E-B5D-07	610	B5D	0.0	777.7	73.0
E-B5D-08	600	B5D	0.0	777.7	77.0

OAK KNOLL WATER MASTER PLAN

Table C11
Fireflow at N-E5 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Onsite Pipes - Proposed									
P-A2	N-A1	N-A2	756	8	Ductile Iron	130	336	2.1	1.8
P-A2-1	N-A2	N-A2-1	301	8	Ductile Iron	130	47	0.3	0.0
P-A3	N-A2	N-A3	460	8	Ductile Iron	130	289	1.8	0.8
P-A4	N-A3	N-A4	347	8	Ductile Iron	130	289	1.8	0.6
P-A4-1	N-A4	N-A4-1	608	8	Ductile Iron	130	-142	0.9	0.3
P-A4-2	N-A4-1	N-A4-2	357	8	Ductile Iron	130	-156	1.0	0.2
P-A4-3	N-A4-2	N-A5-1	623	8	Ductile Iron	130	-170	1.1	0.4
P-A5	N-A4	N-A5	921	8	Ductile Iron	130	-233	1.5	1.1
P-A5-1	N-A5	N-A5-1	188	8	Ductile Iron	130	212	1.4	0.2
P-A5-2	N-A5-1	N-A5-2	672	8	Ductile Iron	130	28	0.2	0.0
P-A5-3	N-A5-2	N-A5-3	493	8	Ductile Iron	130	14	0.1	0.0
P-A6	N-A6	N-A5	673	8	Ductile Iron	130	445	2.8	2.8
P-B2	N-B1	N-B2	955	8	Ductile Iron	130	212	1.4	1.0
P-B2-C2	N-B2	N-C2	687	8	Ductile Iron	130	-368	2.4	2.0
P-B3	N-B2	N-B3	1240	8	Ductile Iron	130	562	3.6	7.8
P-B3-E8	N-B3	N-E8	364	8	Ductile Iron	130	301	1.9	0.7
P-B4	N-B3	N-B4	379	8	Ductile Iron	130	236	1.5	0.5
P-B5	N-B4	N-B5	184	8	Ductile Iron	130	-155	1.0	0.1
P-B5-D6	N-D6	N-B5	273	8	Ductile Iron	130	-509	3.3	1.4
P-B6	N-B5	N-A4	606	8	Ductile Iron	130	-664	4.2	5.2
P-C2	N-C1	N-C2	246	8	Ductile Iron	130	368	2.4	0.7
P-C2-1	N-C2	N-C2-1	109	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-C3	N-C2	N-C3	251	8	Ductile Iron	130	0	0.0	0.0
P-D1	N-B4	N-D1	260	8	Ductile Iron	130	361	2.3	0.7
P-D2	N-D1	N-D2	324	8	Ductile Iron	130	345	2.2	0.8
P-D3	N-D2	N-D3	424	8	Ductile Iron	130	345	2.2	1.1
P-D4	N-D3	N-D4	478	8	Ductile Iron	130	345	2.2	1.2
P-D4-1	N-D4	N-D4-1	183	8	Ductile Iron	130	829	5.3	2.4
P-D4-1-E6	N-E6	N-D4-1	418	8	Ductile Iron	130	-829	5.3	5.4
P-D5	N-D4	N-D5	318	8	Ductile Iron	130	-500	3.2	1.6
P-D6	N-D5	N-D6	181	8	Ductile Iron	130	-500	3.2	0.9
P-E1-1	N-E1	N-E1-1	363	8	Ductile Iron	130	0	0.0	0.0
P-E2	N-E1	N-E2	913	8	Ductile Iron	130	913	5.8	14.1
P-E3	N-E2	PRV-7	10	8	Ductile Iron	130	913	5.8	0.2
P-E4	N-E3	N-E4	33	8	Ductile Iron	130	913	5.8	0.5
P-E5	N-E4	N-E5	1914	8	Ductile Iron	130	631	4.0	14.9
P-E6	N-E5	N-E6	156	8	Ductile Iron	130	-1381	8.8	5.2
P-E7	N-E6	N-E7	1551	8	Ductile Iron	130	-551	3.5	9.4
P-E7-E4	N-E7	N-E4	212	8	Ductile Iron	130	-271	1.7	0.4
P-E8	N-E7	N-E8	1062	8	Ductile Iron	130	-290	1.9	2.0
P-E8-1	N-E8	N-E8-1	125	8	Ductile Iron	130	0	0.0	0.0
P-F2	N-E5	N-E1-1	1513	8	Ductile Iron	130	(N/A)	(N/A)	(N/A)
PRV-BYPASS	N-E3	N-E2	40	8	Ductile Iron	130	0	0.0	0.0
Offsite Pipes -Existing									
O-B3A-01	T-B3A	E-B3A-01	29	24	Ductile Iron	120	1405	1.0	0.0
O-B3A-02	E-B3A-01	E-B3A-02	643	24	Ductile Iron	120	1405	1.0	0.1
O-B3A-02-01	PRV-B3A-02-01	E-B3A-02	13	12	Ductile Iron	120	0	0.0	0.0

OAK KNOLL WATER MASTER PLAN

Table C11
Fireflow at N-E5 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-03	E-B3A-02	E-B3A-03	64	24	Ductile Iron	120	1405	1.0	0.0
O-B3A-04	E-B3A-03	E-B3A-04	232	24	Ductile Iron	120	1405	1.0	0.0
O-B3A-05	E-B3A-04	E-B3A-05	803	24	Ductile Iron	120	1405	1.0	0.2
O-B3A-06	E-B3A-05	E-B3A-06	403	24	Ductile Iron	120	1405	1.0	0.1
O-B3A-07	E-B3A-06	PRV-B3A-07	32	24	Ductile Iron	120	1405	1.0	0.0
O-B3A-08	PRV-B3A-07	E-B3A-07	60	24	Ductile Iron	120	1405	1.0	0.0
O-B3A-08A	E-B3A-08	E-B3A-07	63	24	Ductile Iron	120	-601	0.4	0.0
O-B3A-09	E-B3A-07	E-B3A-09	2158	24	Ductile Iron	120	805	0.6	0.1
O-B3A-10	E-B3A-09	E-B3A-10	1134	24	Ductile Iron	120	805	0.6	0.1
O-B3A-10-A	N-A1	E-B3A-60	142	8	Ductile Iron	120	-155	1.0	0.1
O-B3A-10-B	E-B3A-61	N-A1	272	8	Ductile Iron	120	181	1.2	0.2
O-B3A-11	E-B3A-10	E-B3A-11	284	24	Ductile Iron	130	805	0.6	0.0
O-B3A-11-99	E-B3A-21	N-C1	58	12	Ductile Iron	120	340	1.0	0.0
O-B3A-11-A	E-B3A-61	N-B1	441	8	Ductile Iron	120	-181	1.2	0.4
O-B3A-11-B	N-B1	E-B3A-62	403	8	Ductile Iron	120	-419	2.7	1.7
O-B3A-11A	E-B3A-12	E-B3A-11	409	24	Ductile Iron	120	-805	0.6	0.0
O-B3A-12	E-B3A-13	E-B3A-12	886	24	Ductile Iron	120	-805	0.6	0.1
O-B3A-12A	E-B3A-13	E-B3A-62	39	12	Ductile Iron	120	438	1.2	0.0
O-B3A-13	E-B3A-14	E-B3A-13	46	24	Ductile Iron	120	-367	0.3	0.0
O-B3A-14	E-B3A-14	E-B3A-15	148	24	Ductile Iron	120	367	0.3	0.0
O-B3A-15	E-B3A-15	E-B3A-16	33	24	Ductile Iron	120	367	0.3	0.0
O-B3A-16	E-B3A-16	E-B3A-17	174	24	Ductile Iron	120	367	0.3	0.0
O-B3A-16-13	E-B3A-59	E-B3A-58	204	8	Ductile Iron	120	-155	1.0	0.1
O-B3A-17	E-B3A-17	E-B3A-18	46	24	Ductile Iron	120	367	0.3	0.0
O-B3A-18	E-B3A-18	E-B3A-19	140	24	Ductile Iron	120	367	0.3	0.0
O-B3A-19	E-B3A-19	E-B3A-20	69	24	Ductile Iron	120	367	0.3	0.0
O-B3A-20	E-B3A-21	E-B3A-20	207	24	Ductile Iron	120	-367	0.3	0.0
O-B3A-21	E-B3A-22	E-B3A-21	224	24	Ductile Iron	120	-26	0.0	0.0
O-B3A-22	E-B3A-22	PRV-B3A-22	14	24	Ductile Iron	120	26	0.0	0.0
O-B3A-23	E-B3A-23	PRV-B3A-22	23	24	Ductile Iron	120	-26	0.0	0.0
O-B3A-23A	E-B3A-67	E-B3A-23	38	16	Ductile Iron	120	-26	0.0	0.0
O-B3A-24	E-B3A-24	E-B3A-23	984	16	Ductile Iron	120	0	0.0	0.0
O-B3A-25	E-B3A-24	E-B3A-25	184	16	Ductile Iron	120	0	0.0	0.0
O-B3A-26	E-B3A-26	E-B3A-25	582	16	Ductile Iron	120	0	0.0	0.0
O-B3A-27	E-B3A-27	E-B3A-26	837	16	Ductile Iron	120	0	0.0	0.0
O-B3A-28	E-B3A-28	E-B3A-27	127	16	Ductile Iron	120	0	0.0	0.0
O-B3A-29	E-B3A-29	E-B3A-28	306	16	Ductile Iron	120	0	0.0	0.0
O-B3A-30	T-B3A-30	E-B3A-29	109	16	Ductile Iron	120	(N/A)	(N/A)	(N/A)
O-B3A-31	E-B3A-30	PRV-B3A-02-01	12	12	Ductile Iron	120	0	0.0	0.0
O-B3A-32	E-B3A-31	E-B3A-30	35	12	Ductile Iron	120	-445	1.3	0.0
O-B3A-33	E-B3A-32	E-B3A-31	666	12	Ductile Iron	120	-445	1.3	0.4
O-B3A-34	E-B3A-33	E-B3A-32	134	12	Ductile Iron	120	-445	1.3	0.1
O-B3A-35	N-A6	E-B3A-33	750	12	Ductile Iron	120	-445	1.3	0.5
O-B3A-36	N-A6	E-B3A-35	139	12	Ductile Iron	120	0	0.0	0.0
O-B3A-37	E-B3A-35	E-B3A-36	567	12	Ductile Iron	120	0	0.0	0.0
O-B3A-38	E-B3A-36	E-B3A-37	436	12	Ductile Iron	120	0	0.0	0.0
O-B3A-39	E-B3A-37	E-B3A-38	439	12	Ductile Iron	120	0	0.0	0.0
O-B3A-40	E-B3A-30	E-B3A-39	277	12	Ductile Iron	120	-445	1.3	0.2
O-B3A-41	E-B3A-40	E-B3A-39	359	12	Ductile Iron	120	445	1.3	0.2
O-B3A-42	E-B3A-41	E-B3A-40	577	12	Ductile Iron	120	445	1.3	0.4

OAK KNOLL WATER MASTER PLAN

Table C11
Fireflow at N-E5 Pipe Report

Pipe Name	Start Node	Stop Node	Length (ft)	Diameter (inches)	Material	Hazen- Williams Coefficient	Discharge (gpm)	Velocity (ft/sec)	Friction Headloss (ft)
Offsite Pipes - Existing (Continued)									
O-B3A-43	E-B3A-42	E-B3A-41	62	8	Ductile Iron	120	0	0.0	0.0
O-B3A-44	E-B3A-43	E-B3A-42	97	8	Ductile Iron	120	0	0.0	0.0
O-B3A-45	E-B3A-44	E-B3A-43	428	8	Ductile Iron	120	0	0.0	0.0
O-B3A-46	E-B3A-45	E-B3A-44	35	8	Ductile Iron	120	0	0.0	0.0
O-B3A-47	E-B3A-46	E-B3A-45	189	8	Ductile Iron	120	0	0.0	0.0
O-B3A-48	PRV-5	E-B3A-46	19	8	Ductile Iron	120	0	0.0	0.0
O-B3A-49	E-B3A-52	PRV-5	16	8	Ductile Iron	120	0	0.0	0.0
O-B3A-50	E-B3A-47	E-B3A-41	59	12	Ductile Iron	120	445	1.3	0.0
O-B3A-51	E-B3A-48	E-B3A-47	212	12	Ductile Iron	120	445	1.3	0.1
O-B3A-52	E-B3A-48	E-B3A-49	42	8	Ductile Iron	120	155	1.0	0.0
O-B3A-53	E-B3A-50	E-B3A-49	29	8	Ductile Iron	120	-155	1.0	0.0
O-B3A-54	E-B3A-52	E-B3A-50	592	8	Ductile Iron	120	-155	1.0	0.4
O-B3A-55	E-B3A-52	E-B3A-51	12	8	Ductile Iron	120	0	0.0	0.0
O-B3A-56	E-B3A-53	E-B3A-52	218	8	Ductile Iron	120	-155	1.0	0.2
O-B3A-57	E-B3A-54	E-B3A-53	215	8	Ductile Iron	120	-155	1.0	0.1
O-B3A-58	E-B3A-55	E-B3A-54	221	8	Ductile Iron	120	-155	1.0	0.2
O-B3A-59	E-B3A-56	E-B3A-55	270	8	Ductile Iron	120	-155	1.0	0.2
O-B3A-60	E-B3A-57	E-B3A-56	969	8	Ductile Iron	120	-155	1.0	0.7
O-B3A-61	E-B3A-58	E-B3A-57	600	8	Ductile Iron	120	-155	1.0	0.4
O-B3A-62	E-B3A-60	E-B3A-59	333	8	Ductile Iron	120	-155	1.0	0.2
O-B3A-63	E-B3A-60	E-B3A-60	21	8	Ductile Iron	120	155	1.0	0.0
O-B3A-66	E-B3A-62	E-B3A-63	44	8	Ductile Iron	120	19	0.1	0.0
O-B3A-67	E-B3A-63	E-B3A-64	123	8	Ductile Iron	120	19	0.1	0.0
O-B3A-68	E-B3A-64	N-C1	719	8	Ductile Iron	120	19	0.1	0.0
O-B3A-69	N-C1	E-B3A-66	59	6	Ductile Iron	120	0	0.0	0.0
O-B3A-70	E-B3A-67	N-C1	225	6	Ductile Iron	120	26	0.3	0.0
O-B3A-71	E-B3A-68	E-B3A-67	486	6	Ductile Iron	120	0	0.0	0.0
O-B3A-72	E-B3A-68	E-B3A-69	285	6	Ductile Iron	120	0	0.0	0.0
O-B3A-73	E-B3A-69	E-B3A-70	331	6	Ductile Iron	120	0	0.0	0.0
O-B3A-74	E-B3A-70	E-B3A-71	298	6	Ductile Iron	120	0	0.0	0.0
O-B3A-75	E-B3A-71	E-B3A-72	493	6	Ductile Iron	120	0	0.0	0.0
O-B3A-76	E-B3A-72	E-B3A-73	623	6	Ductile Iron	120	0	0.0	0.0
O-B3A-77	E-B3A-73	E-B3A-74	698	6	Ductile Iron	120	0	0.0	0.0
O-B3A-78	E-B3A-74	E-B3A-70	256	6	Ductile Iron	120	0	0.0	0.0
O-B3A-79	E-B3A-69	E-B3A-75	400	6	Ductile Iron	120	0	0.0	0.0
O-B3A-80	E-B3A-75	E-B3A-25	24	6	Ductile Iron	120	0	0.0	0.0
O-B3A-81	E-B3A-48	E-B3A-08	88	12	Ductile Iron	120	-601	1.7	0.1
O-B5D-01	T-3	E-B5D-01	91	8	Ductile Iron	120	921	5.9	1.7
O-B5D-02	E-B5D-01	E-B5D-02	141	8	Ductile Iron	120	921	5.9	2.6
O-B5D-03	E-B5D-02	PRV-6	12	16	Ductile Iron	120	921	1.5	0.0
O-B5D-03-06	E-B5D-03-20	N-E1	124	6	Ductile Iron	130	921	10.5	7.9
O-B5D-03-21	E-B5D-03-23	E-B5D-03-20	570	6	Ductile Iron	130	921	10.5	36.3
O-B5D-03-23	E-B5D-03-25	E-B5D-03-23	405	6	Ductile Iron	130	921	10.5	25.8
O-B5D-03-25	E-B5D-06	E-B5D-03-25	371	6	Ductile Iron	130	921	10.5	23.6
O-B5D-04	PRV-6	E-B5D-03	563	16	Ductile Iron	120	921	1.5	0.4
O-B5D-05	E-B5D-03	E-B5D-04	619	16	Ductile Iron	120	921	1.5	0.4
O-B5D-06	E-B5D-04	E-B5D-05	546	16	Ductile Iron	120	921	1.5	0.3
O-B5D-07	E-B5D-05	E-B5D-06	43	16	Ductile Iron	120	921	1.5	0.0
O-B5D-08	E-B5D-06	E-B5D-07	89	8	Ductile Iron	120	0	0.0	0.0
O-B5D-09	E-B5D-07	E-B5D-08	124	8	Ductile Iron	120	0	0.0	0.0