Appendix D

Water Supply Facilities Report

PUTNAM ENGINEERING, PLLC.
Engineers and Architects

ENGINEERING REPORT
AND
SPECIFICATIONS
FOR
WATER SUPPLY FACILITIES

THE FAIRWAYS
FAIR STREET
TOWN OF CARMEL
PUTNAM COUNTY, NEW YORK

AUGUST 2003

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ENGINEERING REPORT
FOR
WATER SUPPLY FACILITIES

THE FAIRWAYS
FAIR STREET
TOWN OF CARMEL
PUTNAM COUNTY, NEW YORK

INTRODUCTION

This report describes and gives the basis of design of the proposed water supply facilities to serve the proposed senior housing development the Fairways in the Town of Carmel, Putnam County, New York. The project consists of 150 multi family residential units in the Residential Zoning District situated on an approximated 94.9 acre parcel within the Centennial Golf Club boundary.

ESTIMATED WATER SUPPLY DEMAND

The water supply system that will serve potable water to all dwelling units will be an extension of service lines within the existing Carmel Water District #2. The water demands for the units are based upon Putnam County Department of Health Residential Water Design Flows, which is calculated below:

Unit Type	Units	Estimated Water* Usage (GPD)
2 Bedroom	150	300 x 120* = 36,000
Club House / Pool	100	25 x 100 = 2,500

Total: 38,500 GPD

Total Estimated Metered Water Consumption per day = 38,500 GPD.
* Reflects using 20% credit for water saving fixtures.

WATER SUPPLY FACILITIES

It is proposed to extend the existing facilities of the Carmel Water District #2 by means of an 8" PVC water transmission line. The proposed waterline will generally traverse the property following the proposed road system with connection to the existing water district watermain in Kelly Road.

EXISTING WATER PRESSURE (OFF SITE)

Water pressure tests were performed by the Carmel Water District #2 in the area of the proposed connections along Fair Street. The results of the tests are as follows:

Hydrant Location	Elevation	Static Pressure
Kelly Ridge Road (existing fire hydrant)	701.0	35 psi

PROJECTED WATER PRESSURE

Test Hydrant (Kelly Ridge Road) - elevation 701.0'

Highest Proposed Dwelling (2nd Floor) 684.50'

Static Head 16.5

PROPOSED MINIMUM WATER PRESSURES

State required minimum static head @ proposed high point = 20 psi.

Static Pressure:	El. 701.00'	=	35.00 psi
	El. 684.50'		
Pressure Gain:	(16.5) x 0.4335	=	7.15 psi
	Static Pressure @ Highpoint		42.65 psi

SPECIFICATIONS

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SPECIFICATIONS

Piping

Buried water piping with nominal internal diameter of eight inches shall be made from clean, virgin polyvinyl chloride conforming to ASTM Resin Specification D1784. The pipe shall be rated for 200 PSI working pressure with a 2 to 1 safety factor and shall have a standard dimension ration of 21 in accordance with ASTM 2241. The pipe shall be furnished with a rubber gasketed push-on joint. The rubber gasket shall conform to ASTM D 1869. Fittings, including elbows, tees, etc., shall be of the same material or of cast iron and shall be of the same or greater strength as the pipe. Cast iron accessories including valves, hydrants, etc., shall have standard bell ends conforming to AWWA C110/A21.10-87. An iron pipe size transition gasket shall be used when joining the PVC pipe with a cast iron fitting or accessory to maintain a watertight seal. PVC piping shall be approved by National Sanitation Foundation.

Valves

Furnish and install valves and valve accessories such as valve box, cover, operating wrench and connection fitting where shown on the Drawings, specified herein, or necessary for the control of maintenance of piping and equipment. All valves shall be the product of one manufacturer except for special applications. They shall be of first quality, watertight at the specified working pressure and installed with sufficient clearance for operation. Each valve shall have the manufacturer's name, branch or figure number with other means of easy identification. The valve shall be of the same material and working pressure as the pipe except as may be herein modified.

Valves shall be joined to the pipe in such a manner as to be compatible with the type of pipe joint specified.

Where access pits to underground valves are not provided, a valve box with a cover shall be installed. The valve box shall be cast iron, firmly supported, centered and plumb over the operating nut of the valve and shall not transmit shock or stress to the valve or pipeline. The cast iron cover shall be marked to denote the service being controlled.

The distribution system valves shall be tight closing butterfly valve with rubber seats and no metal-to-metal sealing. The valve shall be bubble tight at 200 pounds per square inch pressure with flow in either direction. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. The valve shall meet the full requirements of AWWA Specification C 504-87 Class 200.

Fire Hydrant

The Contractor shall furnish and install, where shown on the Drawings, fire hydrant with auxiliary gate valve and valve box and accessories as specified herein.

The hydrant shall conform to AWWA Standard C-502-85 and shall be suitable for 150 pounds per square inch working pressure. It shall have a 5 1/4 inch valve opening with a three way nozzle arrangement and a compression type valve for shutoff. The inlet connection and gate valve shall be 6 inches in diameter with bell ends. The hydrant shall be provided with a barrel drain and set on a concrete foundation block. Hydrant operating nut and nozzle threads shall conform to the requirements of the proper regulatory authority.

The hydrant shall be installed in accordance with AWWA C-600-87 and shall be plumb and set with the nozzles at least 18 inches above the hydrant by placing acceptable coarse gravel at least 6 inches above the drain opening.

Joint Restraint

The Contractor shall provide joint restraints consisting of a combination of concrete thrust blocks and rods and clamps at all tee, plugs, caps and bends exceeding eleven and one-quarter (11 1/4) degrees. Concrete thrust blocks shall be poured between solid ground and the fitting to be anchored. The thrust blocks shall conform to the dimensions shown on the drawings and shall be placed so that pipe and fitting joints will be accessible for repair. Restraint by means of tie rods shall be shown on the drawings.

Marking Tape

The alignment of all PVC pipe shall be marked by installing continuous plastic covered metal tapes at a depth of 1-1/2 to 2 feet directly over the pipe during the backfill operation. The tape shall be specially designed for this purpose. The tape should be wrapped around all valve bodies and hydrants to aid location of the main with a metal detector. Tapes of one uniform color shall be utilized.

Installation of Piping

All material furnished by the Contractor is subject to inspection and approval and all material found defective in manufacture or damaged in handling or in installation shall be replaced and removed from the job site. The installation of water pipe and fittings shall conform to AWWA Designation C900-89. All work shall be of the best quality. All bolts, nuts, glands, gaskets, couplings, etc., necessary for doing the work shall be provided.

The width of the trench shall be the minimum necessary to permit the pipe to be laid and properly joined. It shall be dug so that the pipe can be placed at the depth and alignment required. The trench shall be so braced and drained that workmen may work therein safely and efficiently.

Water shall not be allowed to contact any joint until the joint has been completed. The discharge from the dewatering pumps shall be conducted to natural drainage channels or storm drains.

The subgrade shall be made by installing an approval coarse granular material to provide a uniform and continuous support for the pipe to be installed. Bell holes shall be provided at each joint to permit the joint to be made properly.

All pipe fittings, especially spigot ends, shall be carefully examined while suspended above the excavation immediately prior to installation in final position. Fittings shall be carefully lowered into place by suitable equipment to prevent damage to the material, protective coating or lining. Under no circumstances shall the material be dropped.

At times when pipe laying is not in progress the open ends of pipe shall be sealed with a watertight plug. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry. Any pipe which has floated shall be removed from the trench and relaid.

Every precaution shall be taken to prevent material from entering the pipe while it is being placed in the line. No tools, clothing, debris or other material shall be placed in the pipe during installation.

The pipe shall be laid and maintained to the required line and grade with fittings, valves and connections at the required locations. All lumps, blisters and excess coating shall be removed from the outside of the spigot end and the inside of the bell. Each end shall be wiped clean and dry and be free from oil or grease.

The circular rubber gasket of the water piping shall be inserted in the gasket recess of the joint coupling sleeve. A thin film of gasket lubricant shall be applied to the inside surface of the coupling or the spigot end of the pipe or both. The spigot end of the pipe shall be entered into the socket with care to prevent the joint from contacting the ground. The joint shall then be completed by forcing the spigot to the bottom of the socket with a jack-type tool or other approved device. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot is inserted to the full depth of the joint.

Whenever it is necessary to deflect water pipe from a straight line, either horizontally or vertically, to avoid obstructions or plumb stems, the amount of deflection shall be in accordance with the manufacturer's recommendation for the type of joint used.

The cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe or linings. It shall leave a smooth end at right angles to the axis of the pipe. Cut pipe lengths shall be made to resemble the spigot end of the pipe manufactured.

Whenever water lines must cross house sewers, storm drains or sanitary sewers, the water lines shall be laid at such an elevation that the bottom of the water main is eighteen (18) inches above the top of the drain or sewer. This vertical separation shall be maintained for that portion of the water line location within ten (10) feet to be measured as the normal drain it crosses, said ten (10) feet to be measured as the normal distance from this water line to the drain or sewer. Where a water line must cross under a sewer, a vertical separation of eighteen (18) inches between the bottom of the sewer line and the top of the water line shall be maintained, with concrete supports as shown on the Contract Drawings for the larger-sized sewer lines to prevent them from settling on and breaking the water line and the water line shall be encased in concrete.

All trenches shall be backfilled by hand, from the bottom of the trench to the center line of the pipe with granular material placed in layers and compacted by tamping. Backfilling material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously. From the center line of the pipe, fittings and appurtenances to a depth of 1 ft. above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods.

The contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe. From 1 ft. above the pipe to the grade shown on the drawings or specified herein, the trench shall be backfilled by approved mechanical methods.

Hydrostatic Testing of Water Main

Furnish all labor, materials and equipment required for performing all hydrostatic tests (pressure and leakage) including pump, pipe connections, vents, water, and all necessary apparatus and gauges for the tests. Pressure and leakage tests shall meet minimum standards of AWWA Standard C600-87.

After the pipe has been laid, the joints completed and the trench either partially backfilled with all the joints exposed or completely backfilled, at the Contractor's option, all newly laid water pipe shall be subjected for at least two (2) hours to a hydrostatic pressure of one hundred fifty (150) lbs. per square inch, based on the elevation of the lowest point in the line or section under test. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete thrust block was installed. If high early strength cement is used in the concrete thrust block, the hydrostatic pressure test shall not be made until at least two (2) days have elapsed.

Each valved section of pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants are not available at high points, the Contractor shall make the necessary taps at points of highest elevation before the test is made and shall furnish and install the plugs after the test has been completed.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipes, and any valved section thereof, to maintain the specified one hundred fifty (150) lbs. per square inch test pressure after the air has been expelled and the pipe has been filled with water. The test pressure shall last a minimum of two (2) hours. No pipe installation will be accepted if the leakage is greater than thirty (30) gallon per day per mile of pipe per inch of nominal diameter.

Any cracked or defective pipe, fitting or valves, discovered in consequence of this pressure and leakage test shall be removed and replaced by the Contractor with sound material.

If any test of pipes laid discloses leakage greater than that specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

Warranty

The equipment provided under these specifications shall be warranted for a period of one year from the date of the final acceptance, against defective material and workmanship.

VALVES

Gate Valves

Valves 4 in. and larger shall be iron body, bronze-mounted, double disc, parallel seat, with non-rising stem conforming to the requirements of AWWA Specification C500-86. Valves shall be furnished with mechanical joint, flanged or screwed ends.

Valves 2-1/2 in. and smaller shall be all bronze, double-disc, parallel seat with non-rising stem designed for a working pressure of 300 psi and shall be equal to Darling Valve & Manufacturing Co. 150 lb steam bronze gate valve. Valves shall be furnished with iron handwheels and screwed or solder joint ends and shall be installed in accordance with the recommendations of the manufacturer.

Valves shall be furnished with the handwheels and operating nuts turning counterclockwise to open the valve, and they shall be so marked with an arrow and the word "OPEN". Valves in air and gas lines shall be specially machined and shall be tight under pressure.

Valve Stems and Extensions Stems

Valve stems and extension stems for valves 2 in. and larger, shall be of bronze conforming to the requirements of ASTM Designation B147, Alloy 8A or B 132, Alloy A. Stems shall be of a suitable size to provide for the satisfactory operation of the valve under conditions. Threads shall be of the square or Acme type unless otherwise required or permitted, and shall be cut smooth and true. Approved stem guides shall be provided where required.

Valve Boxes

Cast iron valve boxes shall be three piece screw type with oval base and drop cover and shall be equal to M & H Valve and Fittings Co. three piece valve box. They shall be set flush with existing or finished grade and to the lines shown or ordered.

Check Valves

Check valves 2-1/2 in. and larger for water cast iron 125 lbs., bolted bonnet, flanged ends, swing check, with bronze seat rings and metal disc, Crane No. 373 or equal.

Check valves 2 in. and smaller for water - 125 lbs. bronze body, bronze trimmed swing check, with metal disc, Crane No. 373 or equal.

DISINFECTION

General

The intent of this item is to describe the necessary procedures for disinfecting new and repaired water mains. The basic procedure includes:

1. Preventing contaminating materials from entering the water mains during construction or repair. No contaminated material or any material capable of supporting prolific growth of micro-organisms shall be used for sealing joints. Packing material shall be handled in such a manner as to avoid contamination.

2. Flushing contaminating materials that may have entered the water main. If dirt, that in the opinion of the Owner's Representative, will not be removed by flushing operation enters the pipe, the interior of the pipe shall be cleaned and swabbed as necessary with a 5 percent hypochlorite disinfecting solution.

3. Disinfecting any residual contamination that may remain.

4. Final flushing.

5. Determining the bacteriologic quality by laboratory tests after disinfection.

Disinfection of new, repaired or relocated potable water distribution lines shall be performed in accordance with the latest AWWA Standard, C651-86, except for Section 5.1 regarding the tablet method. The basic procedure is as outlined below.

Flushing

The main shall be flushed prior to disinfecting. The sites and velocities of flushing shall be as stated in the Contract Specifications, as shown on the Contract Drawings or as directed by the Owner's Representative.

Forms of Chlorine

Acceptable forms of chlorine are calcium hypochlorite and sodium hypochlorite. The tablet form of chlorine will not be accepted for disinfecting. The chlorine concentration in the solution prepared with these compounds before entering the piping shall be at least, but not limited to, 50 ppm.

Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a person familiar with the physiological, chemical and physical properties of this element who is properly trained and equipped to handle any emergency that may arise. Introduction of chlorine gas directly from the supply cylinder shall not be permitted. The acceptable equipment consists of a solution feed chlorinator in combination with a booster pump for injecting the chlorine gas water mixture into the main to be disinfected. Direct feed chlorinators shall not be used.

Chlorine Application

All new mains and repaired portions of, or extensions to, existing mains shall be chlorinated before being placed to service so that a chlorine residual of not less than 25 ppm remains in the water after 24 hours standing in the pipe.

The point of application of the chlorinating agent shall be the beginning of the pipeline extension or at the pumping station.

The tablet method of disinfecting will not be accepted.

1. Continuous Feed Method - Water from the existing distribution system or other approved sources of supply shall be made to flow slowly at a constant measured rate into the newly laid pipeline. The water shall receive a dose of chlorine, also fed at a constant measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/1 available chlorine.

   Treated water shall be retained in the pipe at least 24 hours and shall produce no less than 25 ppm at all points in, including the extremities of the line at the end of the retention period. This may be expected with an application of between 50 and 100 parts per million, although some conditions may require greater concentrations.

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used, if desired.

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

2. Slug Method - This method is acceptable for use with mains of very large diameter for which, because of the volumes of water involved, the continuous feed method is not practical. Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at no less than 100 mg/1. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" or chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/1 for at least 3 hours. The application shall be checked at a tap near the upstream end of the chlorine residual measurements.

   As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect appurtenances.

Sampling

The taking of bacterial test samples from various points in the lines shall be done from hydrants. Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate. These samples shall be taken and analyzed in accordance with all applicable codes and the latest standard methods as approved by the New York State Department of Health.

In the case of repair work, bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures used can be determined. If the direction of flow is unknown, samples shall be taken on each side of the break.

Final Flushing

The line shall be flushed completely so as to remove any strong chlorine solution. The chlorine residual in the line shall not exceed that of the existing line in the system or less than 1 mg/1 when it is put into proper operation. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline.

After final flushing, and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency of samples is not prescribed by the public health authority having jurisdiction, at least one sample shall be collected from chlorinated supplies where a chlorine residual is maintained throughout the main. From unchlorinated supplies, at least two samples shall be collected at least 24 hours apart.

Note: In the case of extremely long mains, it is desirable that samples be collected along the length of the line as well as its end.

Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate.

Repetition of Procedure

If the initial disinfecting fails to produce satisfactory results, the disinfecting procedure shall be repeated until satisfactory samples have been obtained.

WATER SERVICE PIPE

Water service pipe shall be soft, annealed, seamless copper tubing conforming to Fed. Spec. WW-T-799E or to ASTM B 88, Type "K".

1. Service fittings shall include a corporation stop with a curb stop service box, with frame and cover extending to the surface.

2. The Contractor shall furnish the Engineer satisfactory evidence that the copper tubing and fittings meet the requirements of these Specifications.

3. Joints in the copper service shall be kept to a minimum by use of coiled copper.

4. Where necessary, joints shall be made with cast brass three-part compression couplings or flared tube fittings conforming to ANSI B16.26.

5. Bends in copper service pipe, particularly gooseneck bends, shall be made with a bending tool especially designed for that purpose.

COUPLINGS

Sleeve-type couplings shall be cast iron and shall be Dresser Style 53, manufactured by Dresser Mfg. Div., Bradford, PA; Smith-Blair Style 441, manufactured by Smith-Blair, Inc., San Francisco, CA; Clow Type F-1208, manufactured by Clow Corporation, Rochester, NY; or approved equal.

1. To ensure correct fitting of pipe and couplings, sleeve-type couplings and accessories shall be furnished by the supplier of the pipe and shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.

2. Couplings shall be provided with galvanized steel bolts and nuts.

3. Couplings shall be furnished with the pipe stop removed.

CORPORATION STOP

A. Corporation stop shall be bronze, made from castings conforming to ASTM B 61.

B. Corporation stop for 2 in. services shall be 1-1/2 in. stop with a 1-1/2 in. by 2 in. adapter.

1. Corporation stop shall be similar to Mueller H-15000-99016, Hayes No. 5200-26, Ford F-1000 (c.c.thread by compression), or approved equal.

2. Corporation stop shall be equipped with a "Boston Key."

C. Couplings shall be bronze made from castings, conforming to ASTM B 61 or B 62.

D. Corporation stop shall have a solid plug which operates freely as adjusted for testing. All plugs shall have a full, round, smooth reamed waterway. Each stop shall be individually tested under a hydrostatic head of 250 lb. per sq. in. and found to be tight before leaving the factory.

1. A certified statement of the manufacturer to this effect shall be furnished, if requested.

2. Inlet end of each corporation stop shall be long enough to pass entirely through the wall of the pipe and project at least 1/8 in. beyond the inside face of the pipe.

3. Threaded parts of fittings, except the inlet ends of the corporation stop which shall have Standard Mueller Threads, or shall have American Standard Wrought Iron Pipe Threads, unless otherwise approved by the Engineer.

E. Corporation stop for service pipe shall be of a type adapted for use with a straight service.

F. Corporation stop shall be screwed firmly into the water mains, placed with the key upward and the inlet ends projecting at least 1/8 inch beyond the inside face of the main, unless otherwise permitted by the Engineer. Corporation stop shall be left open (turned on) before the trench is backfilled around them, so as to allow examination of connections for leaks.

G. All joints between corporation stop, fittings, and service pipe shall be made up watertight. Corporations shall be installed using a double wrap of Teflon tape on thread of each corporation.

H. Corporation frames and covers, tubes, and caps shall be cast iron, thoroughly coated with two coats of asphalt varnish. Access tubes shall be set plumb and flush with finished grade.

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ROUTE 6
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ENGINEERING REPORT
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WATER SUPPLY FACILITIES

GATEWAY SUMMIT
ROUTE 6
TOWN OF CARMEL
PUTNAM COUNTY, NEW YORK

INTRODUCTION

This report describes and gives the basis of design of the proposed water supply facilities to serve the proposed commercial development known as Gateway Summit in the Town of Carmel, Putnam County, New York. The project consists of a nine (9) lot subdivision, which will provide sites for a hotel with a banquet and conference center, assisted living/senior housing projects, professional offices/retail use, a YMCA, a restaurant and a retail building. Each of the above will be situated on its own lot subdivided out of the approximated 88.29 acre parcel along Route 6, immediately west of the Town of Carmel/Town of Southeast Town line.

ESTIMATED WATER SUPPLY DEMAND

The water supply system that will serve potable water to all uses will be an extension of service lines within the existing Carmel Water District #2. The water demands for the units are based upon Putnam County Department of Health water design flows and the NYSDEC Guidelines, which are estimated as follows:

GATEWAY SUMMIT SUBDIVISION			
PRIMARY SUBMISSION PLAN			
LOT #	**PROPOSED USE**	**DESIGN FLOW RATE**	**DESIGN FLOW WITH 20% CREDIT**
1	Hotel (150 Rooms x 120 GPD) Banquet and Conference Center (400 people x 20 GPD)	18,000 GPD 8,000 GPD	14,400 GPD 6,400 GPD
2	Restaurant 7,000 SF (230 Seats x 35 GPD)	8,050 GPD	6,440 GPD
3	Retail 45,000 SF (45,000 SF x 0.1 GPD)	4,500 GPD	3,600 GPD
4	Office 10,000 SF (10,000 SF x 0.1 GPD)	1,000 GPD	800 GPD
5	Senior Housing 143 Units (143, 2BR x 300* GPD)	42,900 GPD	34,320 GPD
6	Assisted Living or Senior Housing 48 Units (48, 2BR x 300* GPD)	14,400 GPD	11,520 GPD
7	Corporate/Professional Offices and Convenience Retail 8,000 SF (8,000 SF x 0.1 GPD)	800 GPD	640 GPD
8	YMCA 68,000 SF (500 people x 25 GPD)	12,500 GPD	10,000 GPD
9	Conservation Area	0 GPD	0 GPD
	TOTAL:	**110,150 GPD**	**88,520 GPD**

*Reflects using 20% credit for water saving fixtures.

The above chart reflects a design flow rate with and without water saving devices in accordance with the NYSDEC guidelines. The flow rate based on the guidelines is 110,150 GPD. However, current standards dictate that water saving fixtures be used in all new construction. Therefore, we believe the design flow rate should be 88,520 GPD as tabulated in the fourth column.

WATER SUPPLY FACILITIES

It is proposed to extend the existing facilities of the Carmel Water District #2 by means of an 8" PVC water transmission line. The proposed waterline will generally traverse the property following the proposed road system with connection to the existing water district watermain in Route 6, and the proposed new waterline in the adjacent Fairways Project.

EXISTING WATER PRESSURE (OFF SITE)

Water pressure tests were performed by the Carmel Water District #2 in the area of the proposed connections along Fair Street. The results of the tests are as follows:

Hydrant Location	Elevation	Static Pressure
Kelly Ridge Road (existing fire hydrant)	701.0	35 psi

PROJECTED WATER PRESSURE

Test Hydrant (Kelly Ridge Road) - elevation	701.0'
Highest Proposed Occupied Spaces (Lot 5):	740.0'
Static Head (Lot 5):	- 39.0

PROPOSED MINIMUM WATER PRESSURES

State required minimum static head @ proposed high point = 20 psi.

Static Pressure:	El. 701.00'	=	35.00 psi
Pressure Loss:	El. 740.00' (-39.00) x 0.4335	=	-16.91 psi
Static Pressure @ Highest point (Lot 5)		=	18.09 psi*

*Booster pumps will be required for dwellings with occupied spaces above elevation 735.6.

SPECIFICATIONS

FOR

WATER SUPPLY FACILITIES

GATEWAY SUMMIT
ROUTE 6
TOWN OF CARMEL

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Furnish and install valves and valve accessories such as valve box, cover, operating wrench and connection fitting where shown on the Drawings, specified herein, or necessary for the control of maintenance of piping and equipment. All valves shall be the product of one manufacturer except for special applications. They shall be of first quality, watertight at the specified working pressure and installed with sufficient clearance for operation. Each valve shall have the manufacturer's name, branch or figure number with other means of easy identification. The valve shall be of the same material and working pressure as the pipe except as may be herein modified.

Valves shall be joined to the pipe in such a manner as to be compatible with the type of pipe joint specified.

Where access pits to underground valves are not provided, a valve box with a cover shall be installed. The valve box shall be cast iron, firmly supported, centered and plumb over the operating nut of the valve and shall not transmit shock or stress to the valve or pipeline. The cast iron cover shall be marked to denote the service being controlled.

The distribution system valves shall be tight closing butterfly valve with rubber seats and no metal-to-metal sealing. The valve shall be bubble tight at 200 pounds per square inch pressure with flow in either direction. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. The valve shall meet the full requirements of AWWA Specification C 504-87 Class 200.

Fire Hydrant

The Contractor shall furnish and install, where shown on the Drawings, fire hydrant with auxiliary gate valve and valve box and accessories as specified herein.

The hydrant shall conform to AWWA Standard C-502-85 and shall be suitable for 150 pounds per square inch working pressure. It shall have a 5 1/4 inch valve opening with a three way nozzle arrangement and a compression type valve for shutoff. The inlet connection and gate valve shall be 6 inches in diameter with bell ends. The hydrant shall be provided with a barrel drain and set on a concrete foundation block. Hydrant operating nut and nozzle threads shall conform to the requirements of the proper regulatory authority.

The hydrant shall be installed in accordance with AWWA C-600-87 and shall be plumb and set with the nozzles at least 18 inches above the hydrant by placing acceptable coarse gravel at least 6 inches above the drain opening.

Joint Restraint

The Contractor shall provide joint restraints consisting of a combination of concrete thrust blocks and rods and clamps at all tee, plugs, caps and bends exceeding eleven and one-quarter (11 1/4) degrees. Concrete thrust blocks shall be poured between solid ground and the fitting to be anchored. The thrust blocks shall conform to the dimensions shown on the drawings and shall be placed so that pipe and fitting joints will be accessible for repair. Restraint by means of tie rods shall be shown on the drawings.

Marking Tape

The alignment of all PVC pipe shall be marked by installing continuous plastic covered metal tapes at a depth of 1-1/2 to 2 feet directly over the pipe during the backfill operation. The tape shall be specially designed for this purpose. The tape should be wrapped around all valve bodies and hydrants to aid location of the main with a metal detector. Tapes of one uniform color shall be utilized.

Installation of Piping

All material furnished by the Contractor is subject to inspection and approval and all material found defective in manufacture or damaged in handling or in installation shall be replaced and removed from the job site. The installation of water pipe and fittings shall conform to AWWA Designation C900-89. All work shall be of the best quality. All bolts, nuts, glands, gaskets, couplings, etc., necessary for doing the work shall be provided.

The width of the trench shall be the minimum necessary to permit the pipe to be laid and properly joined. It shall be dug so that the pipe can be placed at the depth and alignment required. The trench shall be so braced and drained that workmen may work therein safely and efficiently. Water shall not be allowed to contact any joint until the joint has been completed.

The discharge from the dewatering pumps shall be conducted to natural drainage channels or storm drains.

The subgrade shall be made by installing an approval coarse granular material to provide a uniform and continuous support for the pipe to be installed. Bell holes shall be provided at each joint to permit the joint to be made properly.

All pipe fittings, especially spigot ends, shall be carefully examined while suspended above the excavation immediately prior to installation in final position. Fittings shall be carefully lowered into place by suitable equipment to prevent damage to the material, protective coating or lining. Under no circumstances shall the material be dropped.

At times when pipe laying is not in progress the open ends of pipe shall be sealed with a watertight plug. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry. Any pipe which has floated shall be removed from the trench and relaid.

Every precaution shall be taken to prevent material from entering the pipe while it is being placed in the line. No tools, clothing, debris or other material shall be placed in the pipe during installation.

The pipe shall be laid and maintained to the required line and grade with fittings, valves and connections at the required locations. All lumps, blisters and excess coating shall be removed from the outside of the spigot end and the inside of the bell. Each end shall be wiped clean and dry and be free from oil or grease.

The circular rubber gasket of the water piping shall be inserted in the gasket recess of the joint coupling sleeve. A thin film of gasket lubricant shall be applied to the inside surface of the coupling or the spigot end of the pipe or both. The spigot end of the pipe shall be entered into the socket with care to prevent the joint from contacting the ground. The joint shall then be completed by forcing the spigot to the bottom of the socket with a jack-type tool or other approved device. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot is inserted to the full depth of the joint.

Whenever it is necessary to deflect water pipe from a straight line, either horizontally or vertically, to avoid obstructions or plumb stems, the amount of deflection shall be in accordance with the manufacturer's recommendation for the type of joint used.

The cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe or linings. It shall leave a smooth end at right angles to the axis of the pipe. Cut pipe lengths shall be made to resemble the spigot end of the pipe manufactured.

Whenever water lines must cross house sewers, storm drains or sanitary sewers, the water lines shall be laid at such an elevation that the bottom of the water main is eighteen (18) inches above the top of the drain or sewer. This vertical separation shall be maintained for that portion of the water line location within ten (10) feet to be measured as the normal drain it crosses, said ten (10) feet to be measured as the normal distance from this water line to the drain or sewer. Where a water line must cross under a sewer, a vertical separation of eighteen (18) inches between the bottom of the sewer line and the top of the water line shall be maintained, with concrete supports as shown on the Contract Drawings for the larger-sized sewer lines to prevent them from settling on and breaking the water line and the water line shall be encased in concrete.

All trenches shall be backfilled by hand, from the bottom of the trench to the center line of the pipe with granular material placed in layers and compacted by tamping. Backfilling material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously. From the center line of the pipe, fittings and appurtenances to a depth of 1 ft. above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods.

The contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe. From 1 ft. above the pipe to the grade shown on the drawings or specified herein, the trench shall be backfilled by approved mechanical methods.

Hydrostatic Testing of Water Main

Furnish all labor, materials and equipment required for performing all hydrostatic tests (pressure and leakage) including pump, pipe connections, vents, water, and all necessary apparatus and gauges for the tests. Pressure and leakage tests shall meet minimum standards of AWWA Standard C600-87.

After the pipe has been laid, the joints completed and the trench either partially backfilled with all the joints exposed or completely backfilled, at the Contractor's option, all newly laid water pipe shall be subjected for at least two (2) hours to a hydrostatic pressure of one hundred fifty (150) lbs. per square inch, based on the elevation of the lowest point in the line or section under test. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete thrust block was installed. If high early strength cement is used in the concrete thrust block, the hydrostatic pressure test shall not be made until at least two (2) days have elapsed.

Each valved section of pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants are not available at high points, the Contractor shall make the necessary taps at points of highest elevation before the test is made and shall furnish and install the plugs after the test has been completed.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipes, and any valved section thereof, to maintain the specified one hundred fifty (150) lbs. per square inch test pressure after the air has been expelled and the pipe has been filled with water. The test pressure shall last a minimum of two (2) hours. No pipe installation will be accepted if the leakage is greater than thirty (30) gallon per day per mile of pipe per inch of nominal diameter.

Any cracked or defective pipe, fitting or valves, discovered in consequence of this pressure and leakage test shall be removed and replaced by the Contractor with sound material.

If any test of pipes laid discloses leakage greater than that specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

Warranty

The equipment provided under these specifications shall be warranted for a period of one year from the date of the final acceptance, against defective material and workmanship.

VALVES

Gate Valves

Valves 4 in. and larger shall be iron body, bronze-mounted, double disc, parallel seat, with non-rising stem conforming to the requirements of AWWA Specification C500-86. Valves shall be furnished with mechanical joint, flanged or screwed ends.

Valves 2-1/2 in. and smaller shall be all bronze, double-disc, parallel seat with non-rising stem designed for a working pressure of 300 psi and shall be equal to Darling Valve & Manufacturing Co. 150 lb steam bronze gate valve. Valves shall be furnished with iron handwheels and screwed or solder joint ends and shall be installed in accordance with the recommendations of the manufacturer.

Valves shall be furnished with the handwheels and operating nuts turning counterclockwise to open the valve, and they shall be so marked with an arrow and the word "OPEN". Valves in air and gas lines shall be specially machined and shall be tight under pressure.

Valve Stems and Extensions Stems

Valve stems and extension stems for valves 2 in. and larger, shall be of bronze conforming to the requirements of ASTM Designation B147, Alloy 8A or B 132, Alloy A. Stems shall be of a suitable size to provide for the satisfactory operation of the valve under conditions. Threads shall be of the square or Acme type unless otherwise required or permitted, and shall be cut smooth and true. Approved stem guides shall be provided where required.

Valve Boxes

Cast iron valve boxes shall be three piece screw type with oval base and drop cover and shall be equal to M & H Valve and Fittings Co. three piece valve box. They shall be set flush with existing or finished grade and to the lines shown or ordered.

Check Valves

Check valves 2-1/2 in. and larger for water cast iron 125 lbs., bolted bonnet, flanged ends, swing check, with bronze seat rings and metal disc, Crane No. 373 or equal.

Check valves 2 in. and smaller for water - 125 lbs. bronze body, bronze trimmed swing check, with metal disc, Crane No. 373 or equal.

DISINFECTION

General

The intent of this item is to describe the necessary procedures for disinfecting new and repaired water mains. The basic procedure includes:

1. Preventing contaminating materials from entering the water mains during construction or repair. No contaminated material or any material capable of supporting prolific growth of micro-organisms shall be used for sealing joints. Packing material shall be handled in such a manner as to avoid contamination.

2. Flushing contaminating materials that may have entered the water main. If dirt, that in the opinion of the Owner's Representative, will not be removed by flushing operation enters the pipe, the interior of the pipe shall be cleaned and swabbed as necessary with a 5 percent hypochlorite disinfecting solution.

3. Disinfecting any residual contamination that may remain.

4. Final flushing.

5. Determining the bacteriologic quality by laboratory tests after disinfection.

Disinfection of new, repaired or relocated potable water distribution lines shall be performed in accordance with the latest AWWA Standard, C651-86, except for Section 5.1 regarding the tablet method. The basic procedure is as outlined below.

Flushing

The main shall be flushed prior to disinfecting. The sites and velocities of flushing shall be as stated in the Contract Specifications, as shown on the Contract Drawings or as directed by the Owner's Representative.

Forms of Chlorine

Acceptable forms of chlorine are calcium hypochlorite and sodium hypochlorite. The tablet form of chlorine will not be accepted for disinfecting. The chlorine concentration in the solution prepared with these compounds before entering the piping shall be at least, but not limited to, 50 ppm.

Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a person familiar with the physiological, chemical and physical properties of this element who is properly trained and equipped to handle any emergency that may arise. Introduction of chlorine gas directly from the supply cylinder shall not be permitted. The acceptable equipment consists of a solution feed chlorinator in combination with a booster pump for injecting the chlorine gas water mixture into the main to be disinfected. Direct feed chlorinators shall not be used.

Chlorine Application

All new mains and repaired portions of, or extensions to, existing mains shall be chlorinated before being placed to service so that a chlorine residual of not less than 25 ppm remains in the water after 24 hours standing in the pipe.

The point of application of the chlorinating agent shall be the beginning of the pipeline extension or at the pumping station.

The tablet method of disinfecting will not be accepted.

1. Continuous Feed Method - Water from the existing distribution system or other approved sources of supply shall be made to flow slowly at a constant measured rate into the newly laid pipeline. The water shall receive a dose of chlorine, also fed at a constant measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/1 available chlorine.

   Treated water shall be retained in the pipe at least 24 hours and shall produce no less than 25 ppm at all points in, including the extremities of the line at the end of the retention period. This may be expected with an application of between 50 and 100 parts per million, although some conditions may require greater concentrations.

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used, if desired.

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

2. Slug Method - This method is acceptable for use with mains of very large diameter for which, because of the volumes of water involved, the continuous feed method is not practical. Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at no less than 100 mg/1. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" or chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/1 for at least 3 hours. The application shall be checked at a tap near the upstream end of the chlorine residual measurements.

   As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect appurtenances.

Sampling

The taking of bacterial test samples from various points in the lines shall be done from hydrants. Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate. These samples shall be taken and analyzed in accordance with all applicable codes and the latest standard methods as approved by the New York State Department of Health.

In the case of repair work, bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures used can be determined. If the direction of flow is unknown, samples shall be taken on each side of the break.

Final Flushing

The line shall be flushed completely so as to remove any strong chlorine solution. The chlorine residual in the line shall not exceed that of the existing line in the system or less than 1 mg/1 when it is put into proper operation. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline.

After final flushing, and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency of samples is not prescribed by the public health authority having jurisdiction, at least one sample shall be collected from chlorinated supplies where a chlorine residual is maintained throughout the main. From unchlorinated supplies, at least two samples shall be collected at least 24 hours apart.

Note: In the case of extremely long mains, it is desirable that samples be collected along the length of the line as well as its end.

Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate.

Repetition of Procedure

If the initial disinfecting fails to produce satisfactory results, the disinfecting procedure shall be repeated until satisfactory samples have been obtained.

WATER SERVICE PIPE

Water service pipe shall be soft, annealed, seamless copper tubing conforming to Fed. Spec. WW-T-799E or to ASTM B 88, Type "K".

1. Service fittings shall include a corporation stop with a curb stop service box, with frame and cover extending to the surface.

2. The Contractor shall furnish the Engineer satisfactory evidence that the copper tubing and fittings meet the requirements of these Specifications.

3. Joints in the copper service shall be kept to a minimum by use of coiled copper.

4. Where necessary, joints shall be made with cast brass three-part compression couplings or flared tube fittings conforming to ANSI B16.26.

5. Bends in copper service pipe, particularly gooseneck bends, shall be made with a bending tool especially designed for that purpose.

COUPLINGS

Sleeve-type couplings shall be cast iron and shall be Dresser Style 53, manufactured by Dresser Mfg. Div., Bradford, PA; Smith-Blair Style 441, manufactured by Smith-Blair, Inc., San Francisco, CA; Clow Type F-1208, manufactured by Clow Corporation, Rochester, NY; or approved equal.

1. To ensure correct fitting of pipe and couplings, sleeve-type couplings and accessories shall be furnished by the supplier of the pipe and shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.

2. Couplings shall be provided with galvanized steel bolts and nuts.

3. Couplings shall be furnished with the pipe stop removed.

CORPORATION STOP

A. Corporation stop shall be bronze, made from castings conforming to ASTM B 61.

B. Corporation stop for 2 in. services shall be 1-1/2 in. stop with a 1-1/2 in. by 2 in. adapter.

1. Corporation stop shall be similar to Mueller H-15000-99016, Hayes No. 5200-26, Ford F-1000 (c.c.thread by compression), or approved equal.

2. Corporation stop shall be equipped with a "Boston Key."

C. Couplings shall be bronze made from castings, conforming to ASTM B 61 or B 62.

D. Corporation stop shall have a solid plug which operates freely as adjusted for testing. All plugs shall have a full, round, smooth reamed waterway. Each stop shall be individually tested under a hydrostatic head of 250 lb. per sq. in. and found to be tight before leaving the factory.

1. A certified statement of the manufacturer to this effect shall be furnished, if requested.

2. Inlet end of each corporation stop shall be long enough to pass entirely through the wall of the pipe and project at least 1/8 in. beyond the inside face of the pipe.

3. Threaded parts of fittings, except the inlet ends of the corporation stop which shall have Standard Mueller Threads, or shall have American Standard Wrought Iron Pipe Threads, unless otherwise approved by the Engineer.

E. Corporation stop for service pipe shall be of a type adapted for use with a straight service.

F. Corporation stop shall be screwed firmly into the water mains, placed with the key upward and the inlet ends projecting at least 1/8 inch beyond the inside face of the main, unless otherwise permitted by the Engineer. Corporation stop shall be left open (turned on) before the trench is backfilled around them, so as to allow examination of connections for leaks.

G. All joints between corporation stop, fittings, and service pipe shall be made up watertight. Corporations shall be installed using a double wrap of Teflon tape on thread of each corporation.

H. Corporation frames and covers, tubes, and caps shall be cast iron, thoroughly coated with two coats of asphalt varnish. Access tubes shall be set plumb and flush with finished grade.