

REPORT ON
FIRE FLOW TESTING

Target
La Madrona Drive
Scotts Valley, California

JULY, 2008

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CITY OF SCOTTS VALLEY



FIRE FLOW TESTING
Target
Scotts Valley, California

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**TARGET STORE
LA MADRONA DRIVE
Scotts Valley, California**

1.0 – Introduction

These testing and calculations described in this report have been undertaken in preparation for the proposed Target store along La Madrona Drive within the City of Scotts Valley's Gateway South Development.

The proposed parcel for the Target store is located on an commercially zoning property. The site is located between the Existing Hilton Hotel and Silverwood Drive. To coordinate Scotts Valley Water District's staff review of the proposed store, the District staff requested fire flow data along La Madrona Drive. The existing fire flow data along La Madrona Drive was in their opinion, antiquated, and required verification to determine if their distribution system could convey the required fire flow.

C2G has been requested by the Target to obtain fire flow data for the distribution system along La Madrona Drive. This data is used to determine if the size, material and sprinkler requirements for the proposed store meet the California Fire Code (Title 24, Chapter 9) as well as the National Fire Protection Association (NFPA) requirements.

In addition to facilitating the agency approval process, fire flow testing also provides valuable input to the SVWD's computer-base simulation modeling. The computer modeling helps to identify the distribution of the water within the system and identify age deterioration associated with the system.

2.0 – Water Distribution System Description

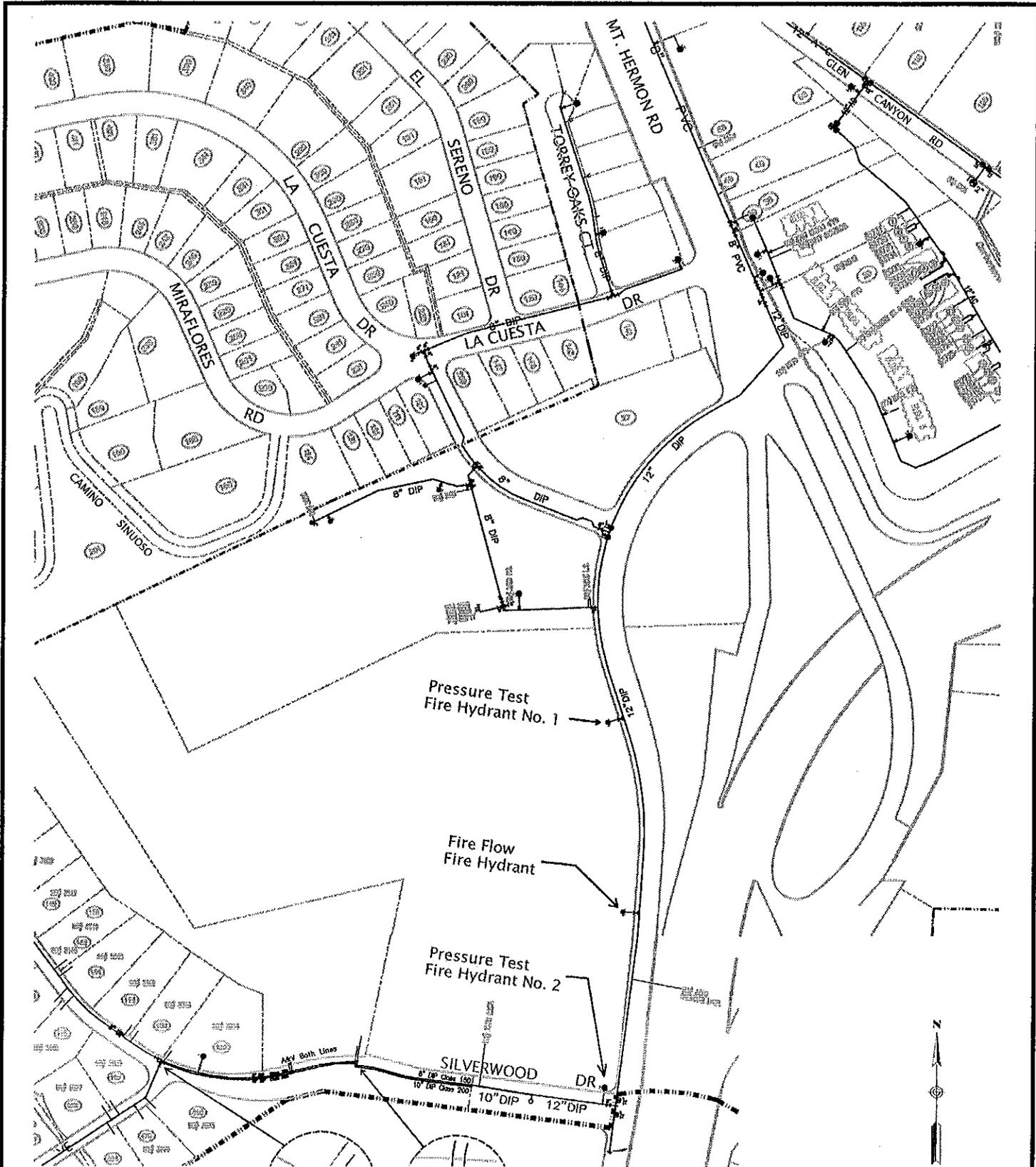
La Madrona Drive is served by a 12-inch diameter ductile iron pipe (DIP) and provides water distribution for fire suppression needs as well as potable and irrigation uses along La Madrona Drive.

Based on data form Scotts Valley Water District mapping, the 12-inch main in La Madrona Drive is southern end of their water distribution system and is served by the MacDorsa Zone (gravity system). A looped system at the intersection of La Madrona Drive and Mount Hermon Road help supply the water main in La Madrona Drive by serving 12-inch main from multiple directions. Figure 1, shown on page 2, shows Scotts Valley's water distribution system at the southeast side of Scotts Valley.

3.0 – Topography

La Madrona Drive is located within the lower foothills that surround the valley of Scotts Valley. Due to the significant change in elevation along the foothills of Scotts Valley multiple pressure zones are available with in the Scotts Valley Water District boundaries. The valley floor is where some of the highest operating pressures are located within the District.

Measurements conducted in field tests logged the static pressure at the SVWD service connection ranged between 90 psi and 96 psi.



Scotts Valley Water District
 Water Distribution System
 Figure - 1

Drawn By: TRC
 Scale: NTS
 Date: 7/28/08



4.0 – Testing Methodology

In the conduct of fire flow testing along La Madrona Drive, C2G's staff employed equipment that uses the pitot tube method to measure water flow within a fire hydrant water stream. This method measures the velocity head of the stream to determine the flow of water from a nozzle of known diameter. Pitometer-based measurement is the predominant technique used by fire protection agencies in determining hydrant flow rates.

While measurement of the flow rate requires only a single hydrant to be tested, the methodology utilized in this investigation also employed pressure recording devices on adjacent hydrants to determine the relative flow contribution from each pipeline segment and to provide data on the pipe's condition. In most instances this involved a total of three hydrants: the flow test hydrant; and the nearest hydrants on either side. This three hydrant configuration (illustrated in Figure 2) is used for a continuous source (e.g. "looped" systems) which results in two "pressure" hydrants and one "flow" hydrant.

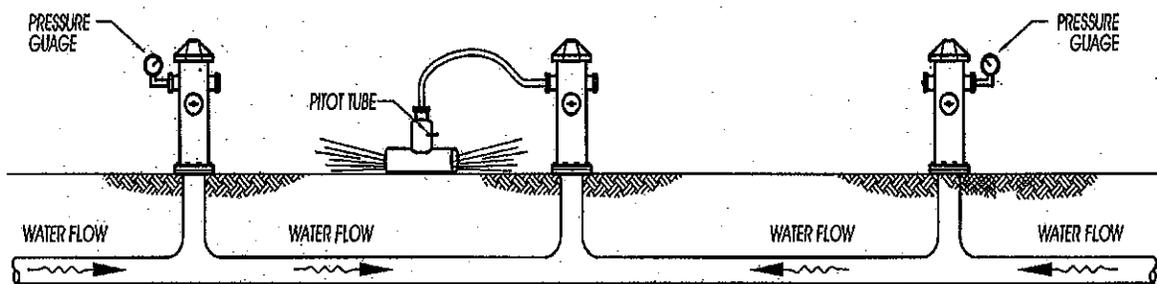


Figure 2 – Three Hydrant Testing Configuration

The two hydrant configuration (illustrated in Figure 3) is used for single source mains (i.e. "dead end" lines) where the terminal hydrant is the "flow" hydrant and the next upstream hydrant is the "pressure" hydrant.

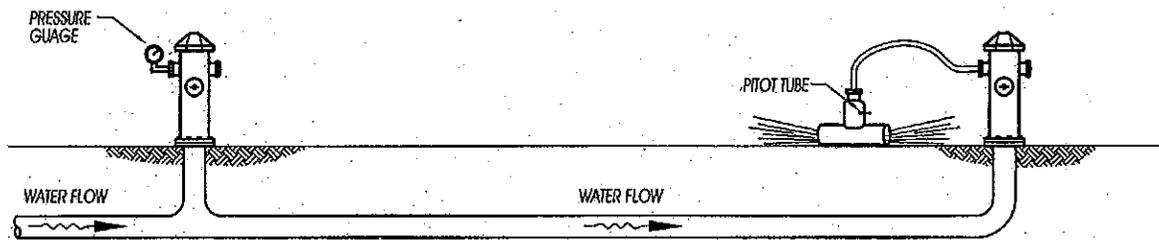


Figure 3 – Two Hydrant Testing Configuration

The most accurate way to measure the nozzle flow is to position the pitot tube tip precisely in the center of the water stream. When done properly, the pitot measures the stream's velocity head and provides a corresponding pressure reading (in psi) on a remote gauge. To ensure accuracy, field testing utilized the Model II 2-1/2" Hose Monster[®] test equipment which automatically positions the pitot tube directly in the center of the water flow. In addition to positioning the pitot tube in the correct location, the Hose Monster[®] acts as an energy diffuser which minimizes water damage while performing the tests. The assembled Hose Monster[®] testing apparatus is shown in Figure 4 below.

Prior to initiating the test, recording pressure gages are installed on the adjacent hydrants. When the test is ready to be performed, a valve mounted on the flow hydrant hose nozzle is slowly opened. Once the valve is fully opened, the pitot tube pressure reading from the Hose Monster® apparatus is recorded. The pressure reading from the “flow” hydrant is then converted to a flow rate using calibrated tables corresponding to the diameter of the hydrant’s hose connection.

The “pressure” hydrant data (static and residual pressure) is downloaded into a computer program called Fire Flow Tester™ created by Track One Distribution System Software. The software calculates a simulated fire flow using the “pressure” and “flow” hydrant data. This software minimizes the number of required on-site fire flow tests, which in turn reduces the amount of water discharged during the testing program. The flow hydrant was located at La Madrona Drive. The “pressure” hydrants were located at north of the flow hydrant and at the intersection of La Madrona Drive and Silverwood (See Figure 1 for location of hydrants). Appendix “A” contains recorded data for each “pressure” hydrant measured during the conduct of the field tests.

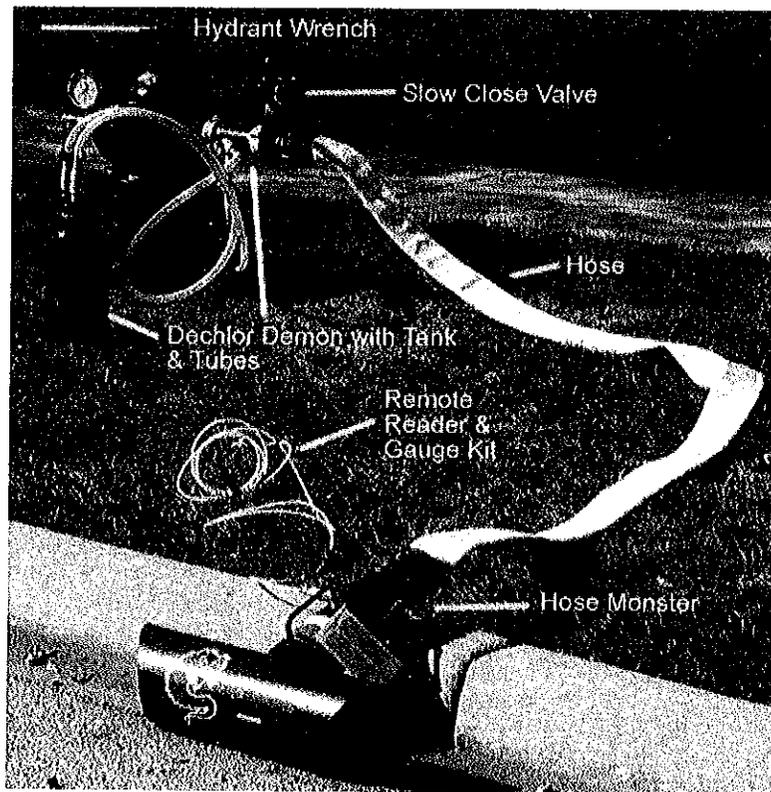


Figure 4 - Test Apparatus

5.0 – Anticipated Fire Flow Requirements

At the time of this fire flow test, the preliminary site plan has not been approved by the City of Scotts Valley’s Planning Commission or by the City of Scotts Valley’s City Council. During this approval process the proposed Scotts Valley Target’s footprint and parking garage may change during the entitlement process. Since the Fire Flow requirements are based upon building square footage, the fire flow requirements may change. At this moment in time, the fire flow requirements are shown below:

Building	Area (Sq. Ft.)	Type of Const.	2007 CA Fire Code Flow Req.	Flow Req. With 75% sprinkler reduction	Sprinkler System demand
Target Store	153,266	II B	8,000 gpm	2000 gpm	1,490 ¹
Parking Garage	61,250	II B	5250 gpm	Min. 1500 gpm	500 ²

¹ Based upon Target Development Guide, Edition 2.7

² Assumed sprinkler flow requirement by C2G. A correct value needs to be calculated by a fire sprinkler consultant.

The largest water flow demand for the site is the Target Store building, which would require a total fire flow demand of 3,490 gpm (2000 gpm via fire hydrants and 1,490 gpm for the sprinkler system).

6.0 – Field Test Results

The fire flow test results show the test hydrant produced 1,546 gallons per minute with a residual pressure of 86 psi. Appendix “B” contains the fire flow test results and graph showing the predicted fire flow at 20 psi (5,138 gpm). The predicted flow rate at 20-psi is feasible on paper, but not practical with a 12-inch water main.

The “pressure” hydrants on south sides of the “flow” hydrant showing a bigger static and residual pressure drop (10 psi) than the hydrant to the north (5 psi), an assumption can be made that the delivery of the water to the project site is primarily served from Mount Hermon Road. This is also confirmed by reviewing Scotts Valley’s mapping (see Figure 1, Page 2).

Since the site is primarily served by a dead-end 12-inch main, a more practically flow that can be delivered to the project site would be approximately 3,500 gpm. Per the graph in Appendix “B”, 3,500 gpm would result in a residual pressure of 57.5 psi with an approximate water velocity of 10.0 ft/s. Total flow demands greater than 3,500 gpm may require additional analysis of the Scotts Valley Water District distribution system by the project design team for Target as well as Scotts Valley Water District’s engineering staff.

7.0 – Satisfaction of NFPA Requirements

These computations were done in compliance with the National Fire Protection Association “Recommended Practice for Fire Flow Testing and Marking of Hydrants” NFPA Standard 291.

8.0 – Engineer’s Certification

I, Todd Creamer, certify that I am a Civil Engineer duly licensed to practice in the State of California and that the within computations were prepared under my supervision.

Date: July 6th, 2008

By _____



Todd R. Creamer, PE
RCE 64561



FIRE FLOW TESTING

Target

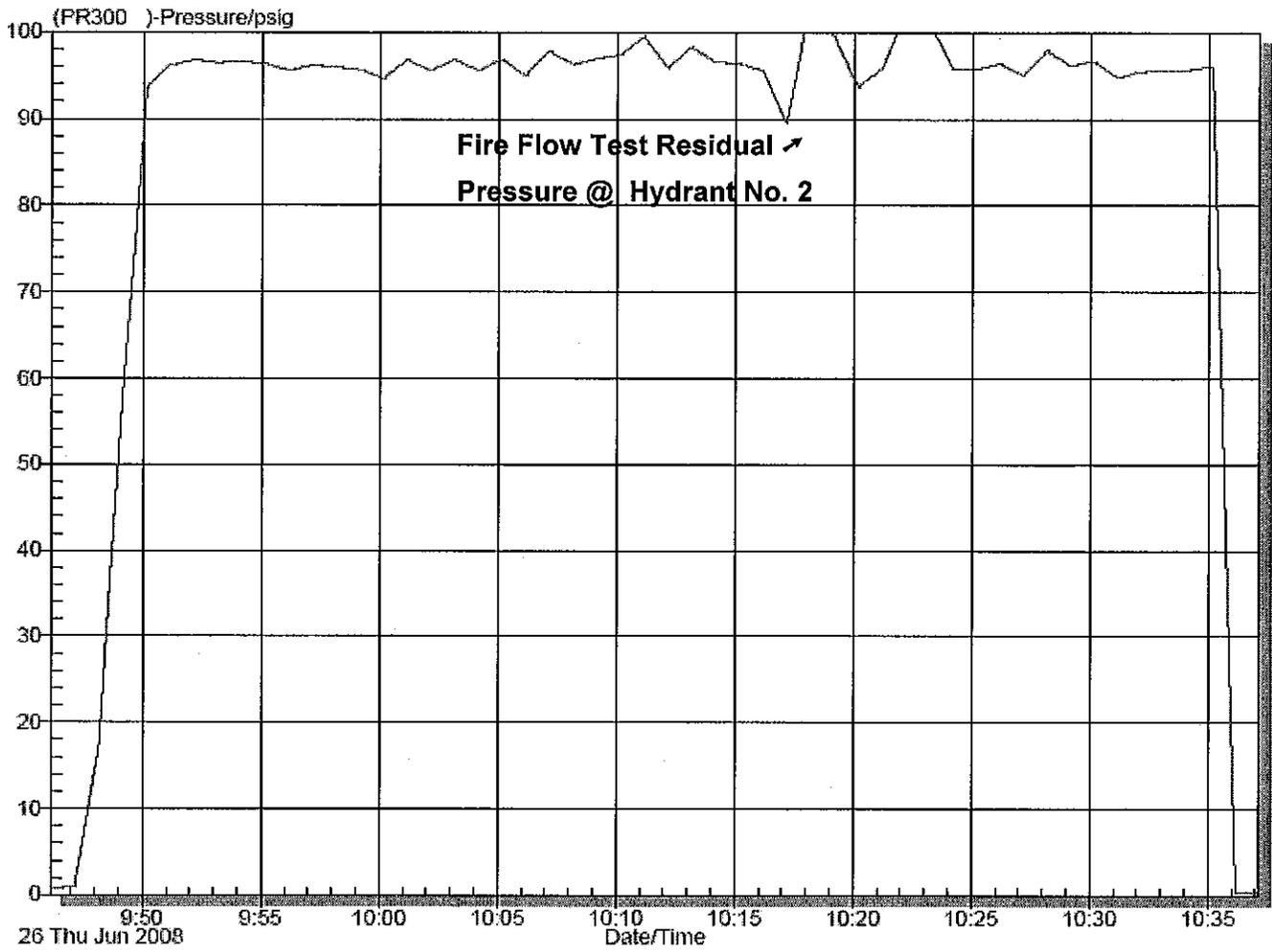
La Madrona Drive

Scotts Valley, California

APPENDIX "A"

Pressure Logger Data

Downloaded Data - Friday, June 27, 2008



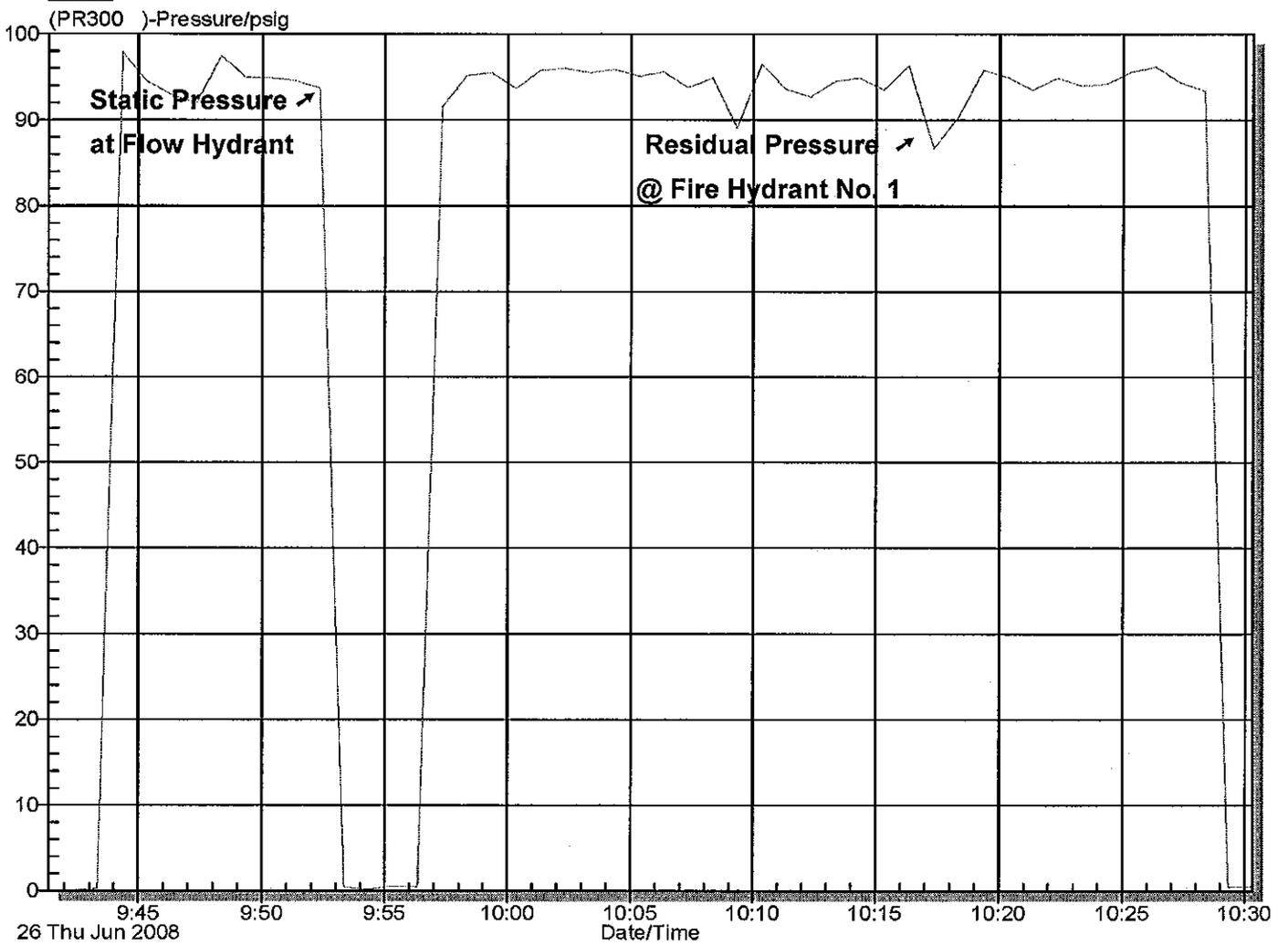
Downloaded Data - Friday, June 27, 2008

Date/Time	(PR300)-Pressure/psig	Index
(52 sel) Minimum Value	0.4	
(52 sel) Average Value	86.9	
(52 sel) Maximum Value	103.9	
6/26/2008 9:46:10 AM	0.7	26
6/26/2008 9:47:10 AM	1.0	27
6/26/2008 9:48:10 AM	17.1	28
6/26/2008 9:49:10 AM	58.3	29
6/26/2008 9:50:10 AM	93.6	30
6/26/2008 9:51:10 AM	96.2	31
6/26/2008 9:52:10 AM	96.8	32
6/26/2008 9:53:10 AM	96.5	33
6/26/2008 9:54:10 AM	96.6	34
6/26/2008 9:55:10 AM	96.4	35
6/26/2008 9:56:10 AM	95.6	36
6/26/2008 9:57:10 AM	96.2	37
6/26/2008 9:58:10 AM	96.0	38
6/26/2008 9:59:10 AM	95.7	39
6/26/2008 10:00:10 AM	94.7	40
6/26/2008 10:01:10 AM	96.8	41
6/26/2008 10:02:10 AM	95.6	42
6/26/2008 10:03:10 AM	96.8	43
6/26/2008 10:04:10 AM	95.6	44
6/26/2008 10:05:10 AM	96.9	45
6/26/2008 10:06:10 AM	95.0	46
6/26/2008 10:07:10 AM	97.8	47
6/26/2008 10:08:10 AM	96.3	48
6/26/2008 10:09:10 AM	97.0	49
6/26/2008 10:10:10 AM	97.4	50
6/26/2008 10:11:10 AM	99.5	51
6/26/2008 10:12:10 AM	95.9	52
6/26/2008 10:13:10 AM	98.3	53
6/26/2008 10:14:10 AM	96.6	54
6/26/2008 10:15:10 AM	96.4	55
6/26/2008 10:16:10 AM	95.6	56
6/26/2008 10:17:10 AM	89.5	57
6/26/2008 10:18:10 AM	103.9	58
6/26/2008 10:19:10 AM	99.6	59

← Residual Flow Pressure during
Fire Flow Test



Downloaded Data - Friday, June 27, 2008



FIRE FLOW TESTING

Target

La Madrona Drive

Scotts Valley, California

APPENDIX "B"

TrackOne™ Hydrant List

TrackOne™ Fire Flow Test and Graphs



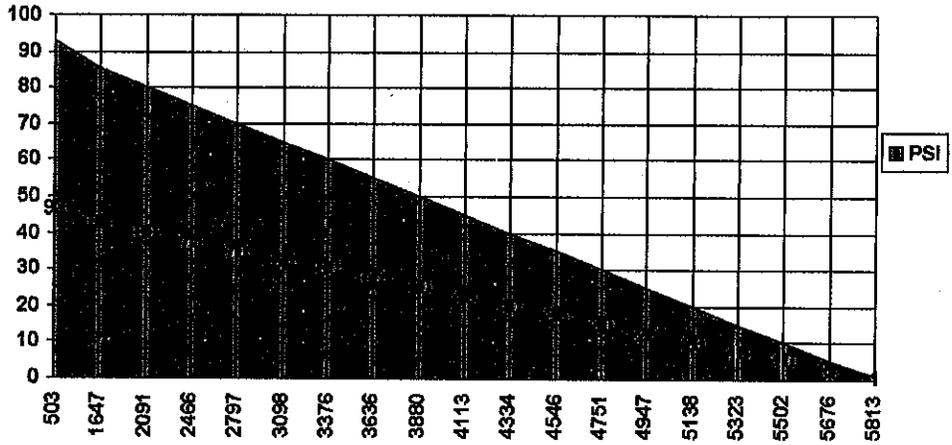
Hydrant ID **FH LA MADRON** Street Address **La Madrona Drive**

Tested Date **6/27/2008** Tested Time **11:15 AM**

Static Pressure PSI 94	Predicted Flow @ 20 5,138	NFPA
Residual Pressure PSI 86	Total GPM during flow test 1,546	AA Blue

Flow Hydrant **FH LA MADRO** Street Address **La Madrona**
 GPM **1,251** Duration **5**

Flow



FIRE FLOW TESTING

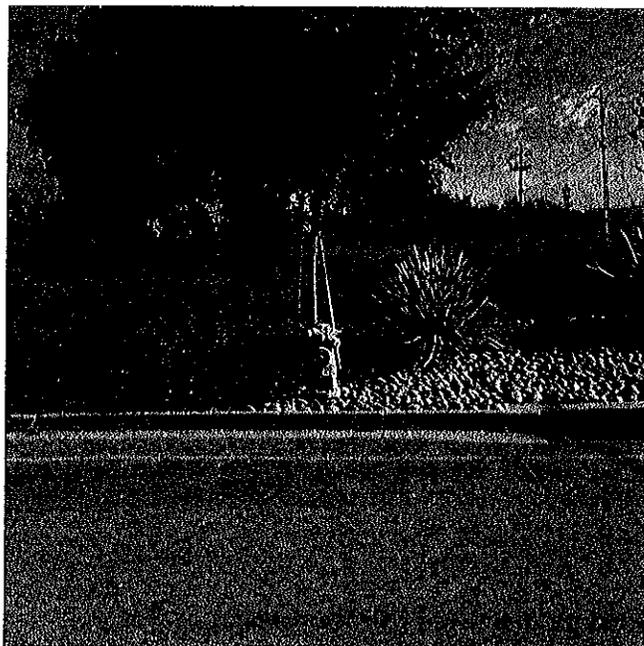
Target
La Madrona Drive
Scotts Valley, California

APPENDIX "C"
Picture of Test Fire Hydrants

Flow Hydrant
(La Madrona Drive)



Pressure Hydrant No. 1
(Corner of Silverwood Drive & La Madrona Dr)



Pressure Hydrant No. 2
(La Madrona Drive)