

Interior Drainage Analysis

Tributary of Smith Canal

Stockton, CA

April 2010

Prepared By:

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Prepared For:

San Joaquin Area Flood Control Agency

ENGINEER'S SIGNATURE PAGE

This interior drainage analysis prepared for San Joaquin Area Flood Control Agency:

INTERIOR DRIANAGE ANALYSIS TRIBUTARY OF SMITH CANAL

has been prepared by, or under the direct supervision of, the following Registered Engineers:



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4/28/2010

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TABLE OF CONTENTS

SECTION 1 INTRODUCTION	1
PURPOSE	1
SECTION 2 STUDY AREA	3
GENERAL	3
TOPOGRAPHY	3
SOILS	3
LAND USE.....	3
DRAINAGE AREA.....	3
SECTION 3 PLANNING AND DESIGN.....	8
GENERAL	8
STUDY PROCESS.....	8
LAND USE CONSIDERATIONS	8
DESIGN CONSIDERATIONS	8
SECTION 4 HYDROLOGY	9
METHODOLOGY	9
RAINFALL VOLUME.....	9
TIME OF CONCENTRATION.....	9
PUMPING FACILITIES	9
ANALYSIS.....	9
SECTION 5 CONCLUSIONS/RECOMMENDATIONS.....	13
GENERAL.....	13
IMPROVEMENTS	13

APPENDICES

Appendix A, FEMA Flood Insurance Rate Maps

Appendix B, Drainage subarea Characteristics

Appendix C, Pump Data

Appendix D, Hydrologic Analysis

SECTION 1 INTRODUCTION

PURPOSE

The purpose of this report is to investigate the extent of interior flood hazards within a portion of the City of Stockton that may be affected by Smith Canal. The area under investigation is the drainage tributary area of Smith Canal, as shown in Figure 1, “Location Map”. The westerly portion of the study area lies within a Zone A designation per the FEMA Flood Insurance Rate Map, October 16, 2009 Map Number 06077C0455F. This map list the 100-year flood elevation for Smith Canal at elevation 10 feet (NAVD 88 datum). The easterly portion of the study area lies mostly within a Zone X designation with small portions in a Zone A designation per the FEMA Flood Insurance Rate Map, October 16, 2009 Map Number 06077C0460F. Both of these Flood Insurance Rate Maps are available in Appendix A, “FEMA Flood Insurance Rate Maps.” This report analyzes the interior drainage flood hazards that may result from a 24-hour 100-year rainfall event.

A closure structure or gate is currently in design for the west end of Smith Canal this gate is intended to be closed during high tide events. An analysis of the closure structure and the operation of Smith Canal as a detention basin is beyond the scope of this analysis. A copy of the technical memorandum on the proposed closure structure is available in Appendix E, “Smith Canal Closure Structure Conceptualization.”

High and low points within the streets of the study area can possibly create isolated flooding at the low points. However, a detailed analysis of the possible isolated flooding locations was beyond the scope of this report and is not a part of this analysis. Instead, this report focuses only on the ability to detain and evacuate the total runoff volume from within the drainage shed.

FILE SPEC: P:\2091_SJA\CA_IDI\0060-Smith_Canal_Closure_Structure\05_Interior_Drainage\Location Map.dwg
 PLOT DATE: Nov 16, 2009 - 4:13pm

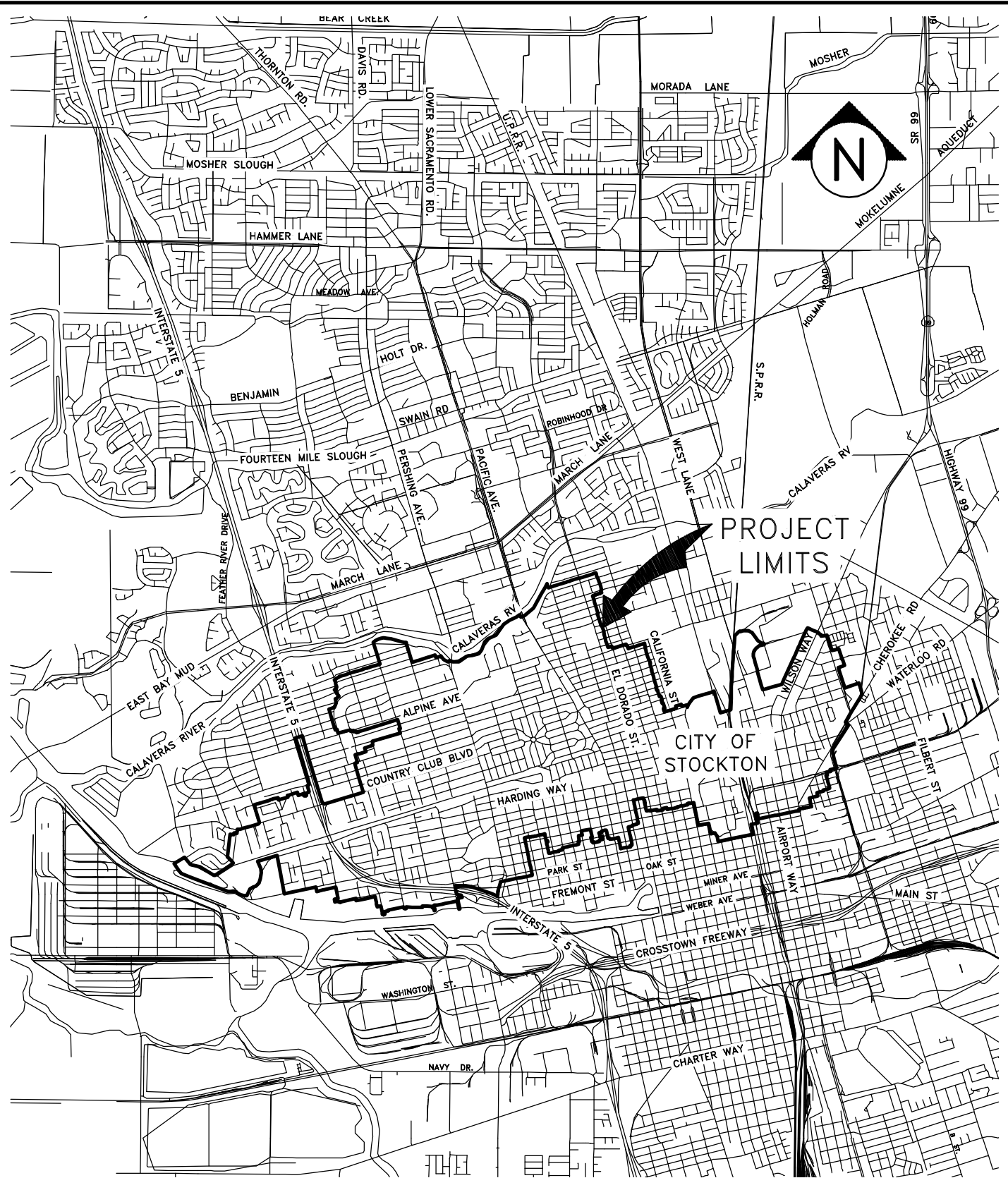


FIGURE 1

**KJELDEN
 SINNOCK
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 INC.
 Civil Engineers
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SMITH CANAL

INTERIOR DRAINAGE ANALYSIS LOCATION MAP

Design
 TCR
 Drawn
 TCR
 Check
 MRC

Scale
 1" = 5000'
 Original Drawing Scale
 0 1/4" 1/2"

Date
 JUNE 2009
 Sheet Number
 1 Of 1
 Project File No.
 2091-0060

SECTION 2 STUDY AREA

GENERAL

The study area lies in the City of Stockton, San Joaquin County. The study area is the drainage shed tributary to Smith Canal. Figure 2 shows the approximate limits of the Smith Canal drainage shed.

For the purpose of this report, the total drainage shed studied is approximately 3,430 acres.

TOPOGRAPHY

In general, the existing ground surface topography within the drainage shed slopes from east to west 18.5 feet (NAVD 88 datum) at the intersection of California Street and Pine Street to an approximate elevation of -1.0 feet (NAVD 88 datum) at the intersection of Alpine Avenue and Wisconsin Avenue.

SOILS

A detailed soils investigation was beyond the scope of this report; however, the determination of the general soil characteristics was necessary to complete the hydrologic analysis. General soils information was obtained from the "Soil Survey of San Joaquin County, California" prepared by the United States Department of Agriculture (USDA) Soil Conservation Service.

The dominant soil classifications or map units within the District boundaries are Scribner-Urban land complex, Jacktone-Urban land complex, and Columbia fine sandy loam (drained). These soils have a general hydrologic group classification of Class "C," "D," and "B," respectively, according to the USDA NRCS Web Soil Survey.

SCS Curve Numbers (CN)

Land Use Description	Hydrologic Soil Group			
	A	B	C	D
Residential ¼ acre lot size	61	75	83	87
Commercial and Business Areas	98	98	98	98

LAND USE

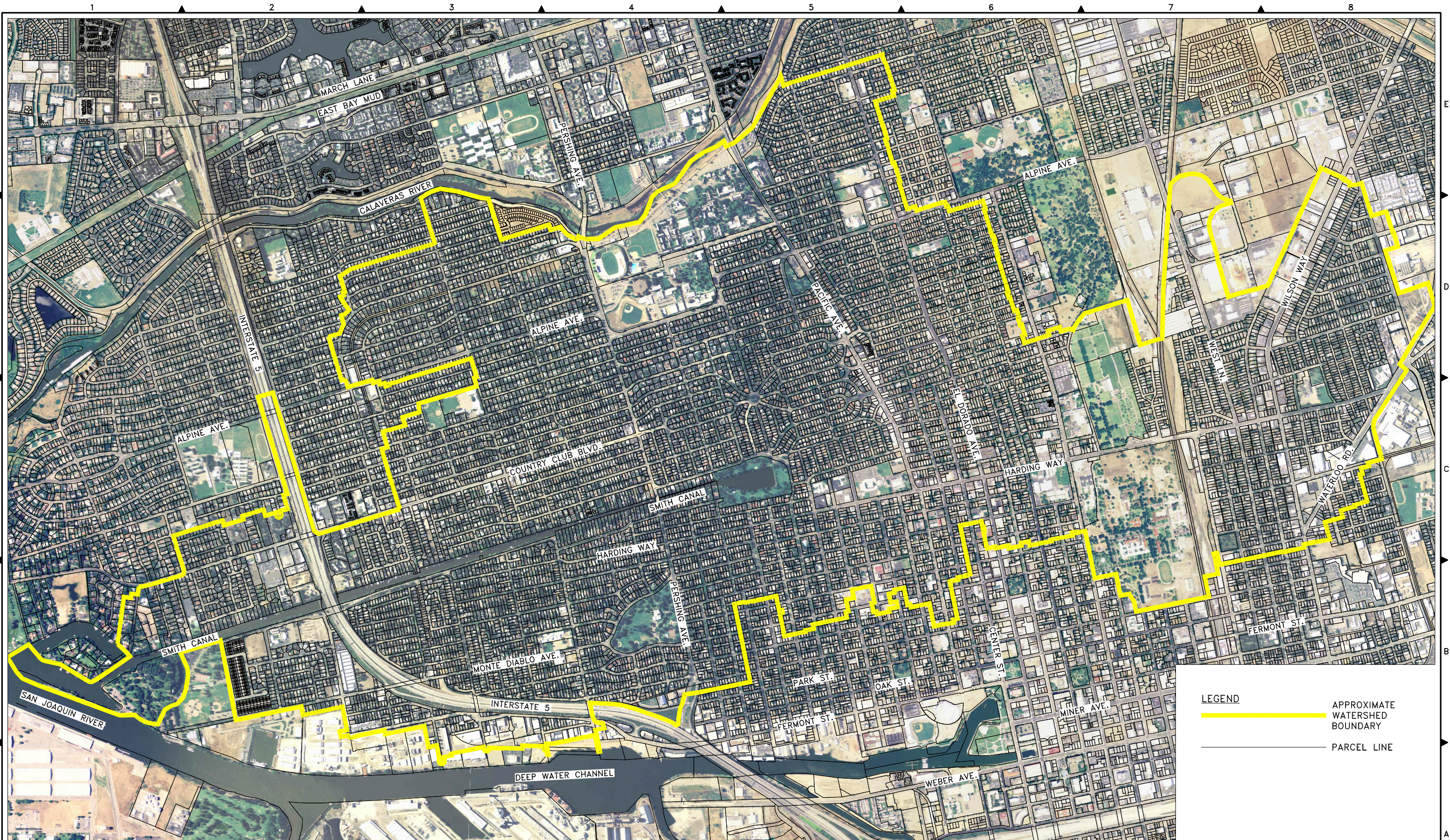
The general land use within the drainage shed is primarily residential development ($\frac{1}{8}$ acre lots to $\frac{1}{4}$ acre lots) with some commercial development.

DRAINAGE AREA

The study area is divided into thirteen subareas, as shown in Figure 3, "Drainage Subareas," nine of the thirteen areas discharge from individual pump stations into Smith Canal. The remaining four subareas located in the southwest corner of the study area discharge by gravity into Smith

Canal. General subarea information is listed on Table 1 with specific data associated to each subarea drainage shed found in Appendix B, “Drainage Subarea Characteristics.” None of the pump stations is currently equipped with a generator. Section 5 discusses the alternative means of providing power to the pump stations in the event of a power outage during a flood event. Detailed information about the pumps and pump stations is located in Appendix C, “Pump Data.”

FILE SPEC: P:\2091_SIAFCA_IDIQ\0060-Smith_Canal_Closure_Structure\05_Interior_Drainage_Areas-Smith_Canal.dwg
PLOT DATE: Jun 10, 2009 - 12:47pm



LEGEND

- APPROXIMATE WATERSHED BOUNDARY
- PARCEL LINE

K S N INC. **KJELDSSEN SINNOCK NEUDECK**
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Scale
1" = 800'
Original Drawing Scale
0 1/2" 1"



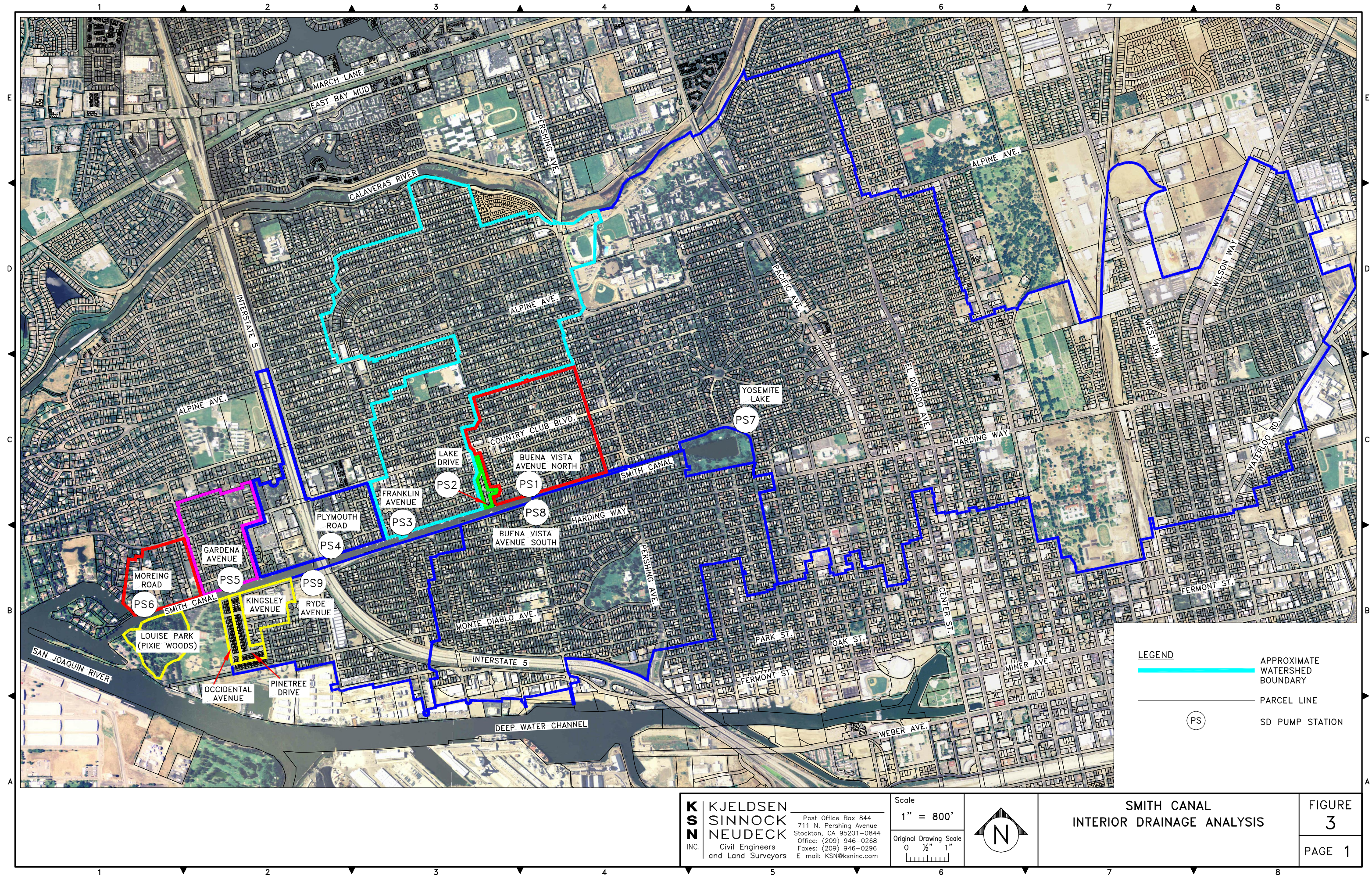
SMITH CANAL
INTERIOR DRAINAGE ANALYSIS
TRIBUTARY AREA OF SMITH CANAL

FIGURE 2
PAGE 1

Table 1: Pump Station Data

Drainage Subarea Designation	Drainage Subarea Name	Drainage Subarea Area (Ac)	Drainage Subarea Pump Station	Total Maximum Pump Station Capacity (gpm)
1	Buena Vista North	121.63	No. 1	5,500
2	Lake Drive	4.22	No. 2	2,700
3	Franklin Avenue	425.22	No. 3	15,260
4	Plymouth Road	90.44	No. 4	14,320
5	Gardena PS	54.65	No. 5	5,600
6	Moreing	35.92	No. 6	5,500
7	Yosemite Lake	1935.91	No. 7	129,500
8	Buena Vista South	477.47	No. 8	31,100
9	Ryde Ave.	167.1	No. 9	16,800
10	Kingsley Ave.	18.03	Gravity Discharge	
11	Pinetree Dr.	7.78	Gravity Discharge	
12	Occidental Ave	5.6	Gravity Discharge	
13	Louis Park	21.33	Gravity Discharge	

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PLOT DATE: Nov 17, 2009 3:00pm



SECTION 3 PLANNING AND DESIGN

GENERAL

Presented in this section is an overview of the planning and design considerations for the interior drainage of the study area. The following sections of this report utilize this information to describe the hydrologic strategies and analytical process.

STUDY PROCESS

An analysis of the interior drainage areas that discharge into Smith Canal is necessary to determine whether street detention storage and existing facilities are sufficient to manage the runoff from a 24-hour, 100-year rainfall event.

LAND USE CONSIDERATIONS

As noted in Section 2 of this report, the land use of the subject area is primarily residential development with some commercial development. For the purposes of this report no other type of land use was considered in the analysis.

DESIGN CONSIDERATIONS

Rainfall runoff is considered as the only source of water entering the study area. This study will analyze the likely locations of street detention storage during a major rainfall event, the depth of detention storage within the streets is due to this event, and existing pumping facility capabilities.

SECTION 4 HYDROLOGY

A hydrologic analysis was performed to determine the runoff volume from a 24-hour, 100-year storm event. The thirteen subareas within the study area are in primarily residential areas. An analysis of City of Stockton GIS and aerial photographs shows that approximately twenty percent of these areas are composed of a network of residential streets. The street elevations are lower than those of the adjacent houses, so flooding would first occur in the street network before ponding to an elevation that would begin to flood houses or other buildings.

Approximately one-half of the street networks could fill up with water to a depth of one foot before the water would inundate any buildings. The results of the hydrologic analysis were used to determine if the combination of street storage and the existing pump rates are adequate discharge rainfall runoff from a 24-hour, 100-year storm event into Smith Canal.

METHODOLOGY

The rainfall characteristic of the area is found in the Hydrology Manual for the San Joaquin County Department of Public Works. Using Hydraflow® Hydrographs 2008 and the NRCS Type 1 rainfall distribution unit hydrographs were established for each of the thirteen subareas. These unit hydrographs were then applied to a 24-hour storm duration obtained from the San Joaquin County Hydrology Manual (September 1997), producing a hydrograph appropriate for each subarea during a 24-hour, 100-year storm event. Data unique to each subarea such as acreage, soil group areas, paved area, SCS curve number, hydraulic length, and approximate time of concentration, are shown in Appendix B, "Drainage Subarea Characteristics."

Each pump station was modeled using a constant maximum pumping rate as shown in Table 1, "Pump Station Data," derived from the anticipated design pump capacity per the pump curves provided in Appendix C, "Pump Data."

RAINFALL VOLUME

Calculations for the runoff volume of each subarea were based on flow rates determined from hydrographs of a 24-hour, 100-year storm event, which were established as described above. Hydraflow Hydrographs determines the maximum runoff flow rate for a given watershed using a unit hydrograph for the rainfall depth of a 24-hour, 100-year storm event, watershed area, land use type and hydrologic soil groups, approximate watershed slope, and watershed hydraulic length.

TIME OF CONCENTRATION

The time of concentration was estimated to be the maximum time for rainfall to surface flow from the most hydrologically remote location to the street gutter, into the first storm drain inlet, and travel through the storm drain system to the point of concentration (pump station) for each subarea. The time of concentration for each subarea is shown in Appendix D, "Hydrologic Analysis."

PUMPING FACILITIES

As previously described, there are nine pump stations that discharge into Smith Canal, See Table 1 for specific pump data.

ANALYSIS

Results of the analysis are contained in Appendix D, "Hydrologic Analysis." A summary of the

results are shown in Table 2, “Storage and Runoff Volumes,” which compares the total available street storage to the required 100-year runoff volume. As stated above, analysis of the available street network shows that approximately 20% of each of the subareas is composed of streets, as can be seen in Appendix B, “Watershed Characteristics.” For the purposes of this report, it is assumed that one-half of the streets are capable of holding a depth of up to one foot of water before inundation will threaten buildings.

Table 2: Storage and Runoff Volumes

Drainage Subarea Designation	Drainage Subarea Name	Drainage Subarea Area (Ac)	Available Street Network Storage (Ac-ft)	Required 100-Year Runoff Storage Volume (Ac-ft), with Pumping Rate	% Storage Used, 100-year Storm, Existing Pump Rate	Available Storage Remaining (ac-ft)
1	Buena Vista North	121.63	12.0	10.6	88.3%	1.40
2	Lake Drive	4.22	0.4	0.06	15.0%	0.34
3	Franklin	425.22	42.0	41.0	97.6%	1.00
4	Plymouth	90.44	9.0	2.6	28.9%	6.40
5	Gardena	54.65	5.4	2.5	46.3%	2.90
6	Moreing	35.92	3.5	1.2	34.3%	2.30
7	Yosemite Lake	1935.91	193.0	158.7	82.2%	34.30
8	Buena Vista South	477.47	47.0	42.8	91.1%	4.20
9	Ryde Avenue	167.1	16.7	13.2	79.0%	3.50
10	Kingsley Avenue	18.03	1.8			
11	Pinetree Drive	7.78	0.8			
12	Occidental Avenue	5.6	0.6			
13	Pixie Woods	21.33	2.1			

1. Required 100-year Runoff Storage Volume is the maximum storage volume required, which was determined using Hydraflow Hydrographs’ reservoir modeling, which accounts for the time of concentration, the rainfall distribution, and the pumping rate at the point of outflow. The reservoir hydrographs are available in Appendix D, “Hydrologic Analysis.”

2. Existing pump rates provided are derived from the anticipated design pump rate at the time the pump was installed. Actual pump rates will vary.

As shown in the table above, all drainage subarea pump stations provide sufficient protection to the subareas they serve, minimizing flooding on the interior of the study area during a 100-year

storm event.

The discharge hydrographs from each drainage subarea (1 through 13) are combined to generate the Smith Canal inflow hydrograph. The volume of this inflow hydrograph is approximately 765 acre-feet. A plot of the Smith Canal inflow hydrograph is shown in Figure 4.

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Apr 26, 2010

Hyd. No. 28

Smith Canal Combined

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 5 min

Peak discharge = 465.01 cfs
Time to peak = 645 min
Hyd. volume = 765.475 acft



SECTION 5 CONCLUSIONS/RECOMMENDATIONS

GENERAL

This analysis demonstrates that the street network and existing drainage facilities as discussed above can adequately accommodate a 24-hour, 100-year storm event.

IMPROVEMENTS

Each pump station's electrical system should be improved to include a generator power receptacle with the appropriate switching gear. This will allow the connection of a portable generator during a power failure.

Appendix A,
FEMA Flood Insurance Rate
Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only to landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 10N. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NNGS12
National Geodetic Survey, SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit their website at <http://www.ngs.noaa.gov/>.

Base map information shown on this FIRM was derived from multiple sources. This information was compiled from the U.S. Geological Survey, 2002, National Geodetic Survey, 2002, City of Lathrop, 1997, City of Manteca, Department of Public Works, 2001, and San Joaquin County Community Development Department, 2008. Additional information was photogrammetrically compiled at a scale of 1:12,000 from U.S. Geological Survey aerial photography dated 1989, 1993 and 2002.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

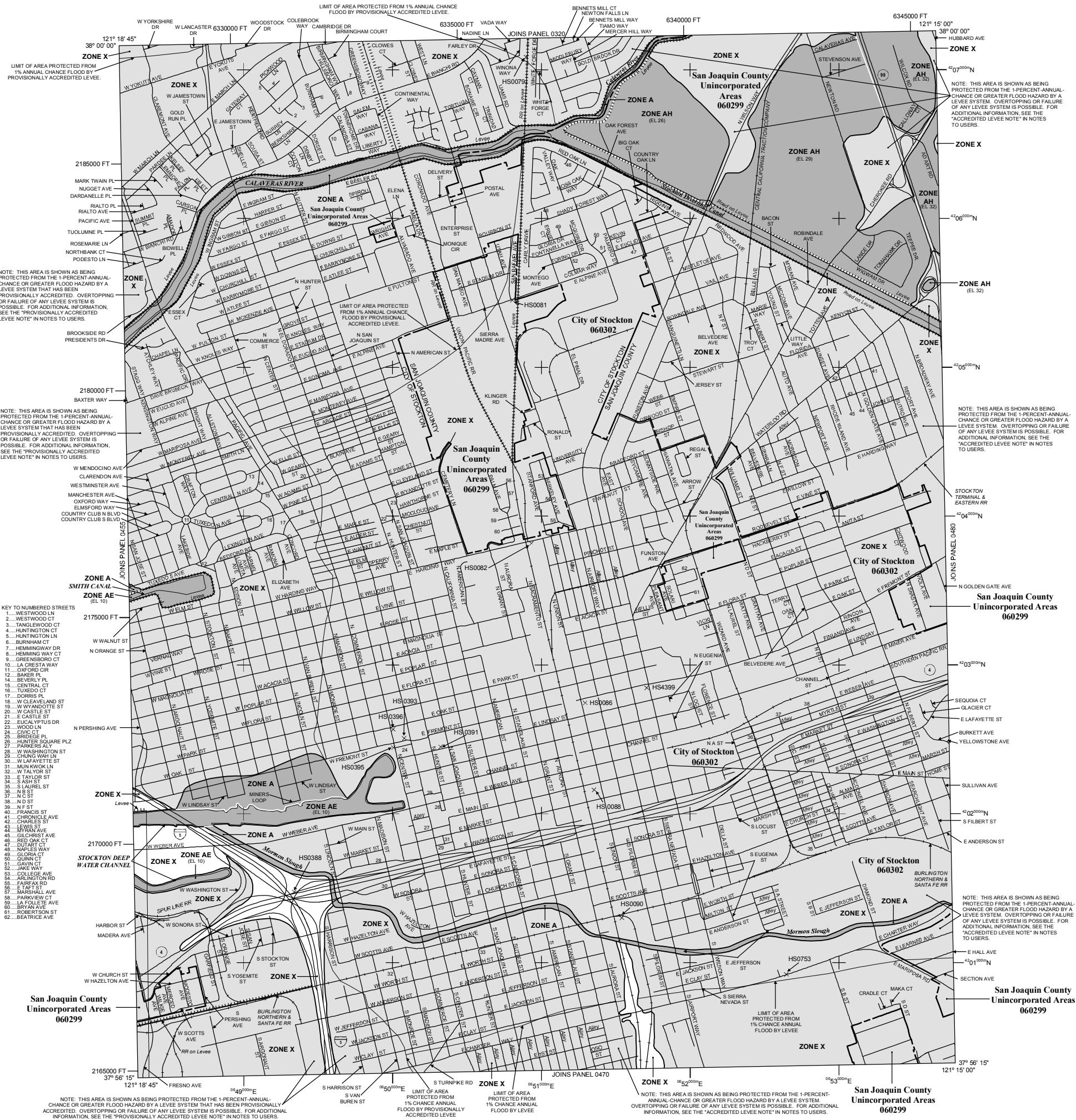
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and their website at <http://www.msc.fema.gov/>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/>.

Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/businessinfo/index.shtm>.

Provisionally Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by August 23, 2010, for Levee P452 (along the northwest boundary of Reclamation District 404 on panel 06077C0455F) and March 30, 2010, for all other levees. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/businessinfo/index.shtm>.

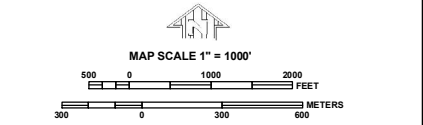


LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
- The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, vehicles also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS**
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain. Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAs)**
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- Floodplain boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*
- *Referenced to the North American Vertical Datum of 1988
- Cross section line
Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
1000-meter Universal Transverse Mercator grid values, zone 10
5000-foot grid ticks: California State Plane coordinate system, zone III (FIPSZONE 0403), Lambert Conformal Conic Projection
Bench mark (see explanation in Notes to Users section of this FIRM panel)
River Mile
- MAP REPOSITORIES**
Refer to Map Repositories list on Map Index.
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP PANEL**
October 16, 2009
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0460F

FIRM

FLOOD INSURANCE RATE MAP
SAN JOAQUIN COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 460 OF 950

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	SAN JOAQUIN COUNTY	060299	0460	F
	STOCKTON, CITY OF	060302	0460	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER
06077C0460F

EFFECTIVE DATE
OCTOBER 16, 2009

Federal Emergency Management Agency

Appendix B, Drainage subarea Characteristics

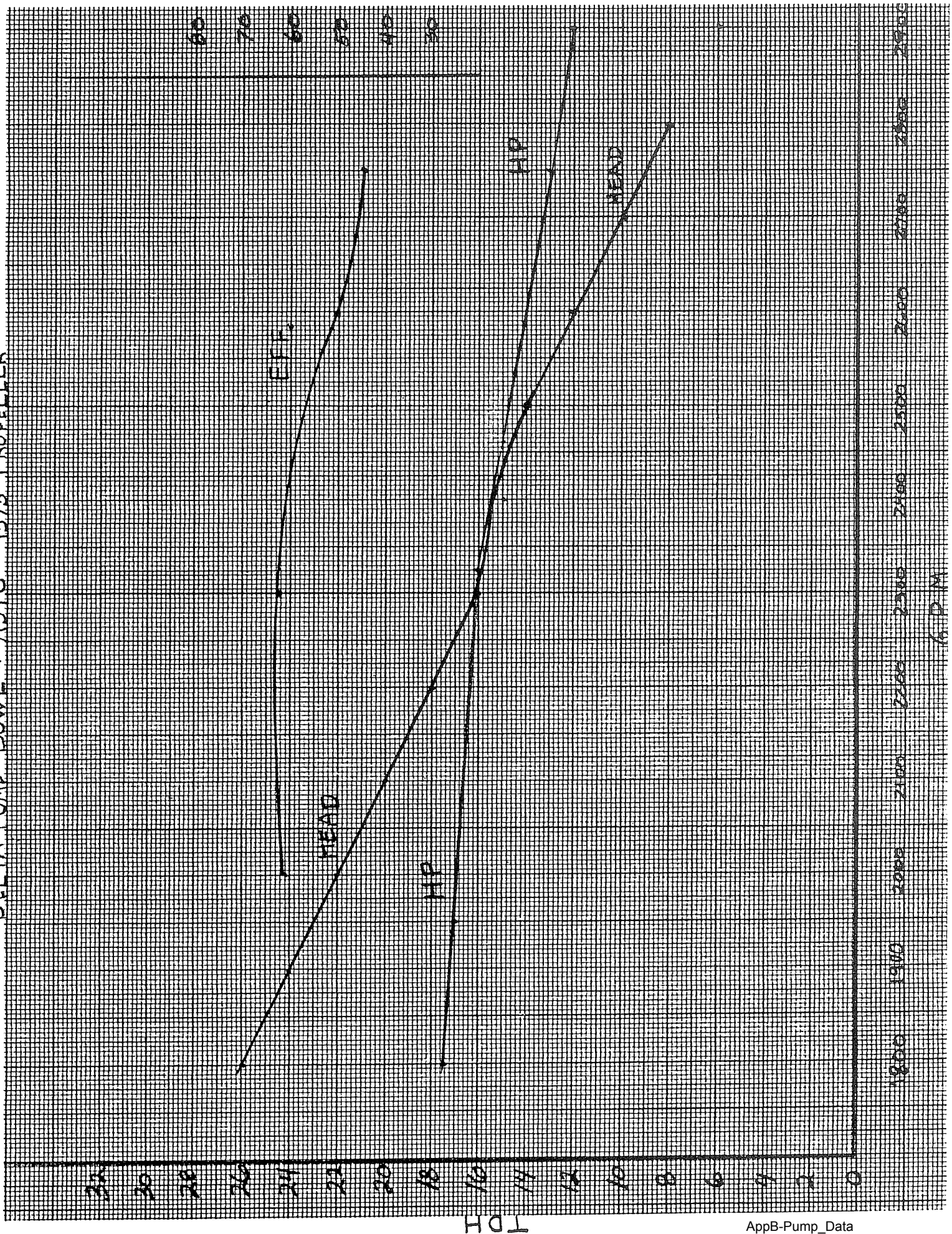
Drainage subarea Characteristics

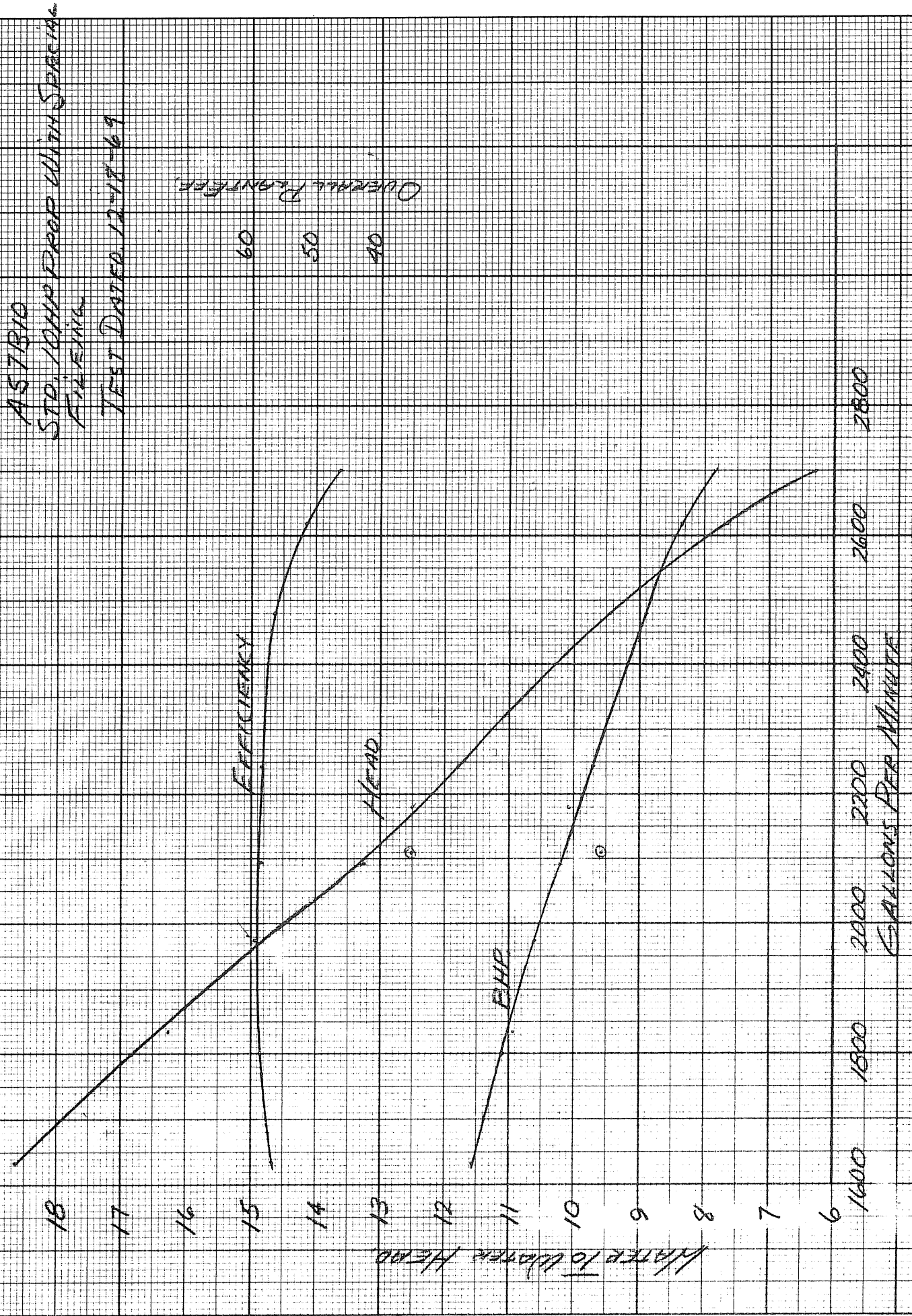
Drainage Subarea Name	Area (Ac)	Composite CN	Length (ft)	Time of Conc. (min)	Frequency Storm	SCS Rainfall Distribution	Rainfall Depth (in)
Buena Vista-1	121.63	89.6	3950	65.8	1%	Type 1	3.51
Lake Drive-2	4.22	90.1	925	15.4	1%	Type 1	3.51
Franklin-3	425.22	88.8	9300	155.0	1%	Type 1	3.51
Plymouth-4	90.44	84.6	4225	70.4	1%	Type 1	3.51
Gardena-5	54.65	86.2	3000	50.0	1%	Type 1	3.51
Moreing-6	35.92	85.2	3200	53.3	1%	Type 1	3.51
Yosemite Lake-7	1935.91	94	15800	263.3	1%	Type 1	3.51
Buena Vista-8	498.15	95	7000	116.7	1%	Type 1	3.51
Ryde Avenue-9	167.1	95	4600	76.7	1%	Type 1	3.51
Kingsley Avenue-10	18.03	94	1400	23.3	1%	Type 1	3.51
Pinetree Drive-11	7.78	94	1500	25.0	1%	Type 1	3.51
Occidental Avenue-12	5.6	95	1400	23.3	1%	Type 1	3.51
Pixie Woods-13	21.33	93	600	10.0	1%	Type 1	3.51

Appendix C, Pump Data

Pump Station 1
Subarea: Buena Vista North

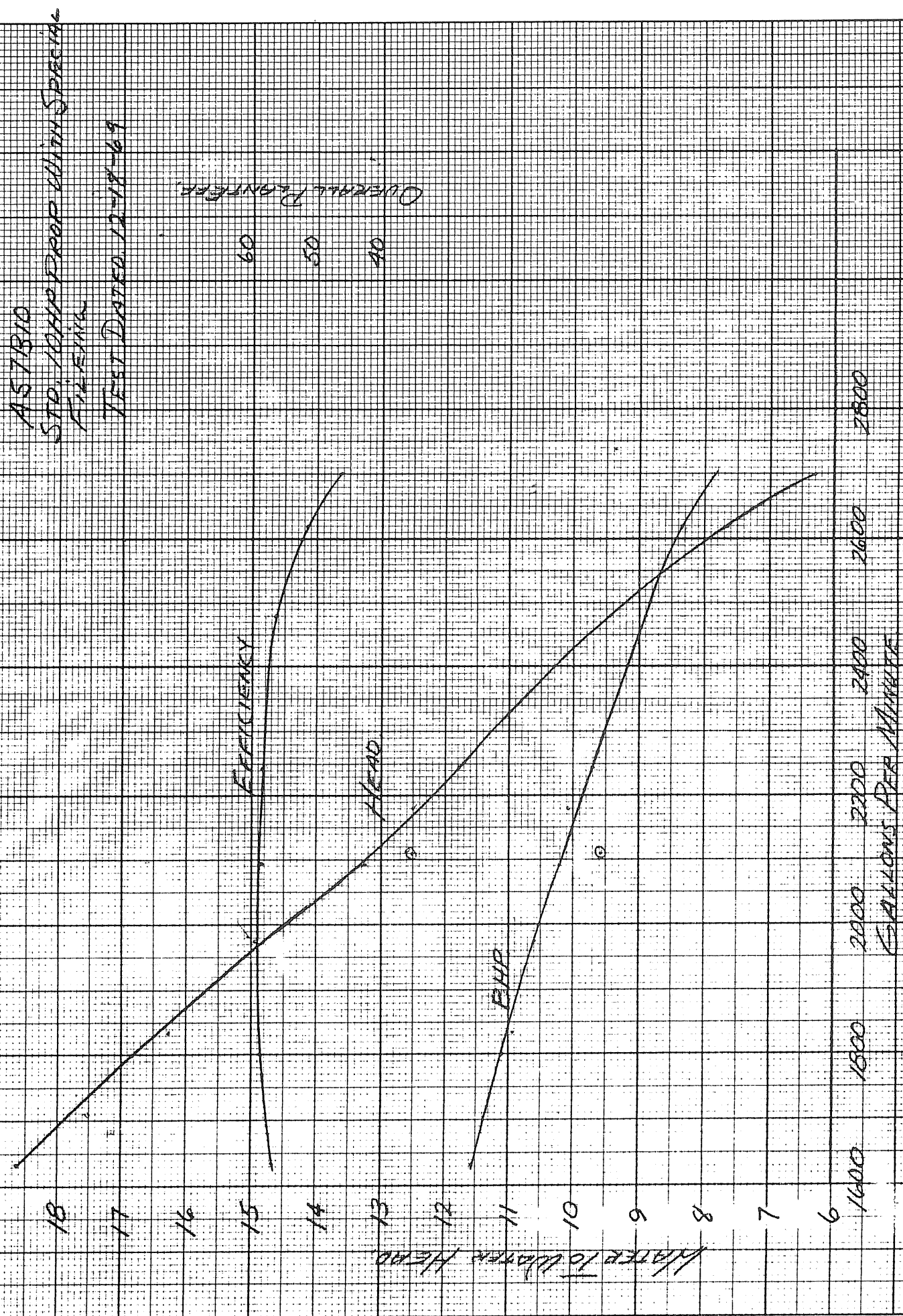
DELTA PUMP BOWL # A59C 1375 PROPELLER





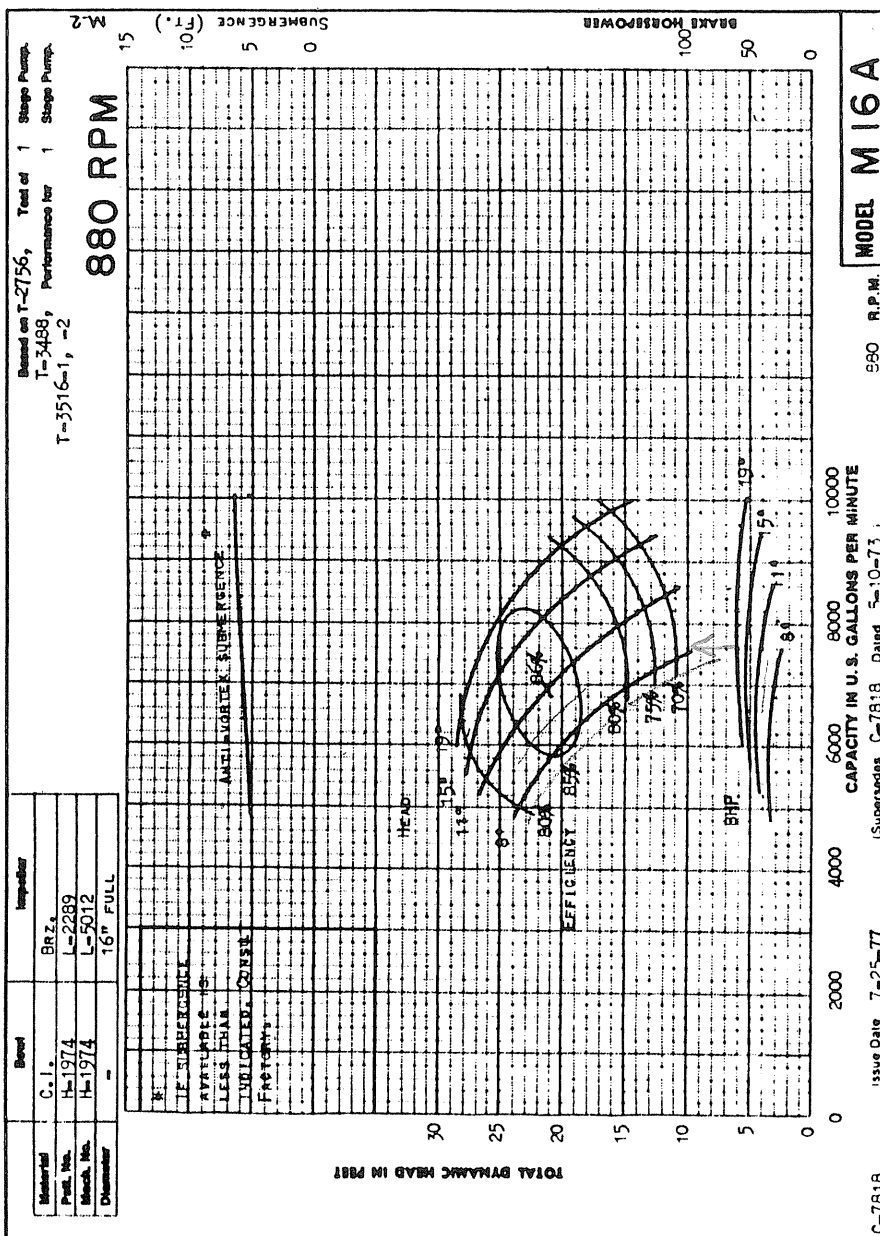
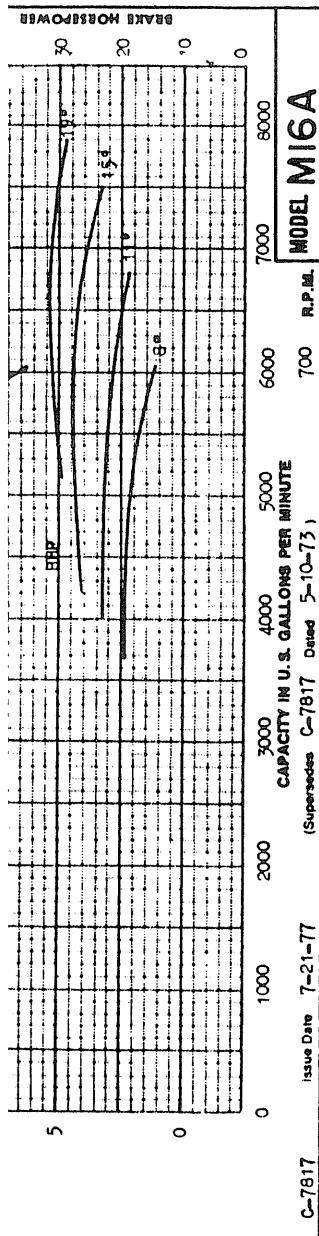
Pump Station 2
Subarea: Lake Dr.

3

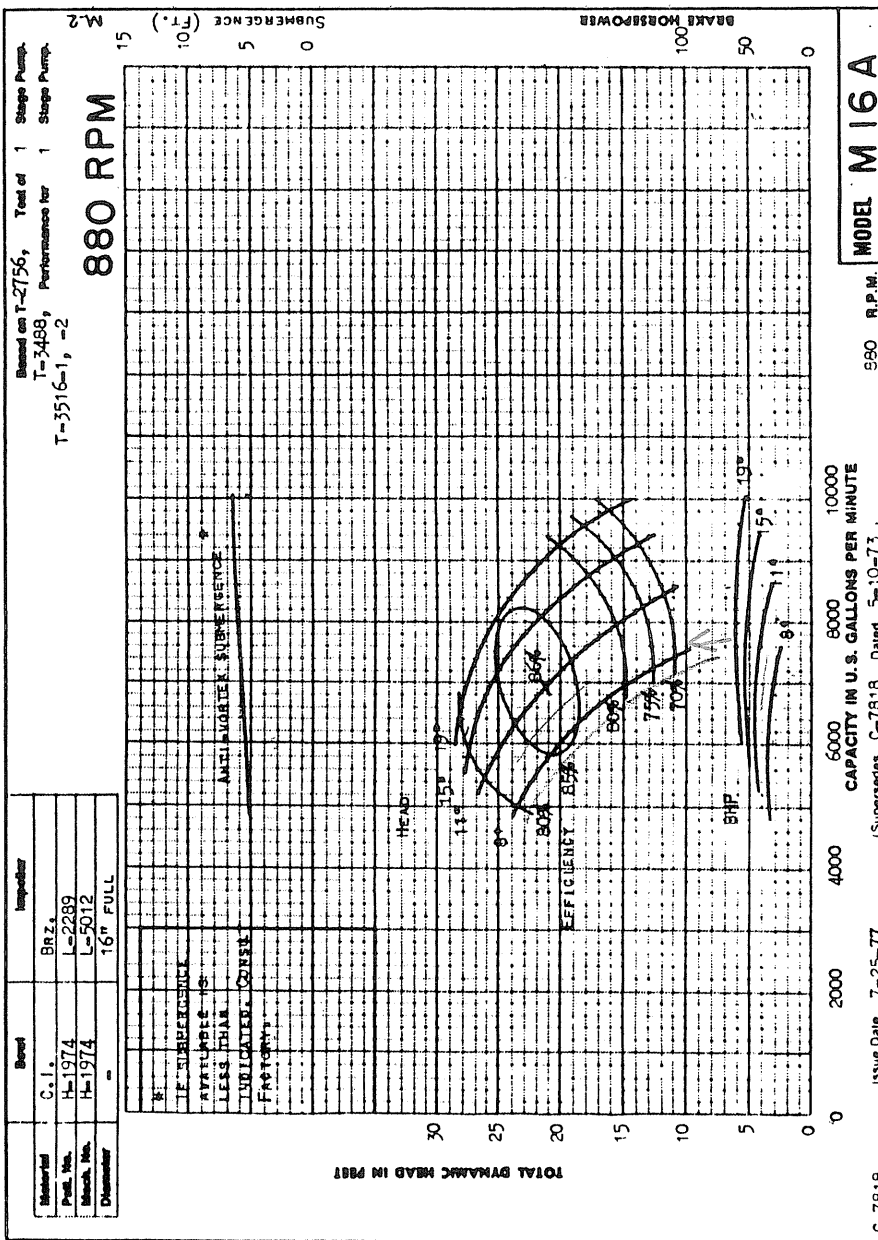
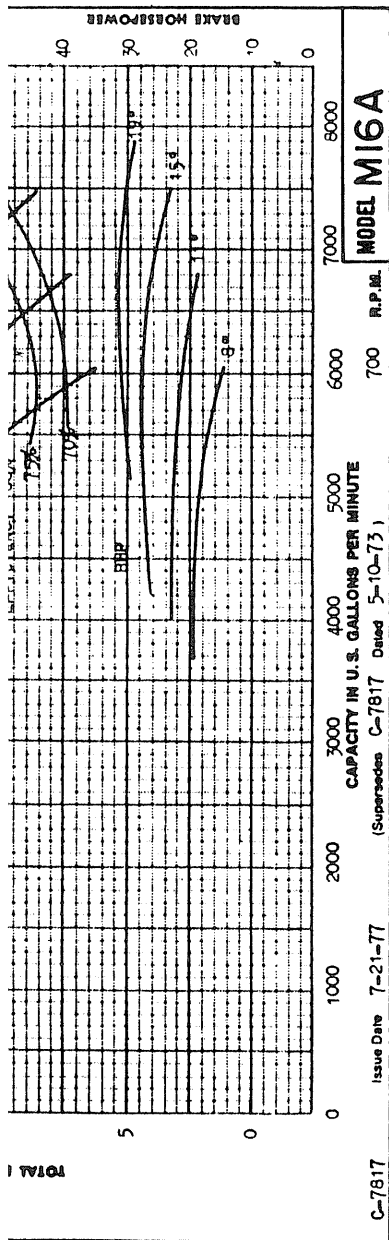


Pump Station 3
Subarea: Franklin Dr.

4



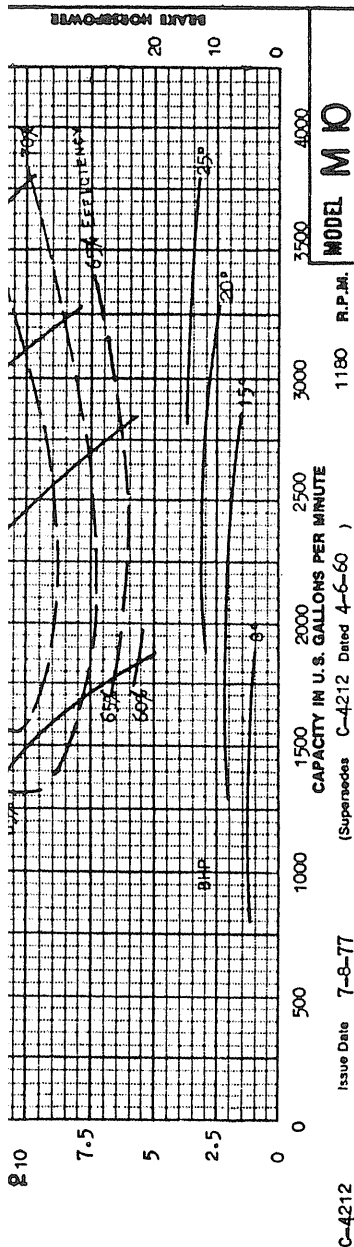
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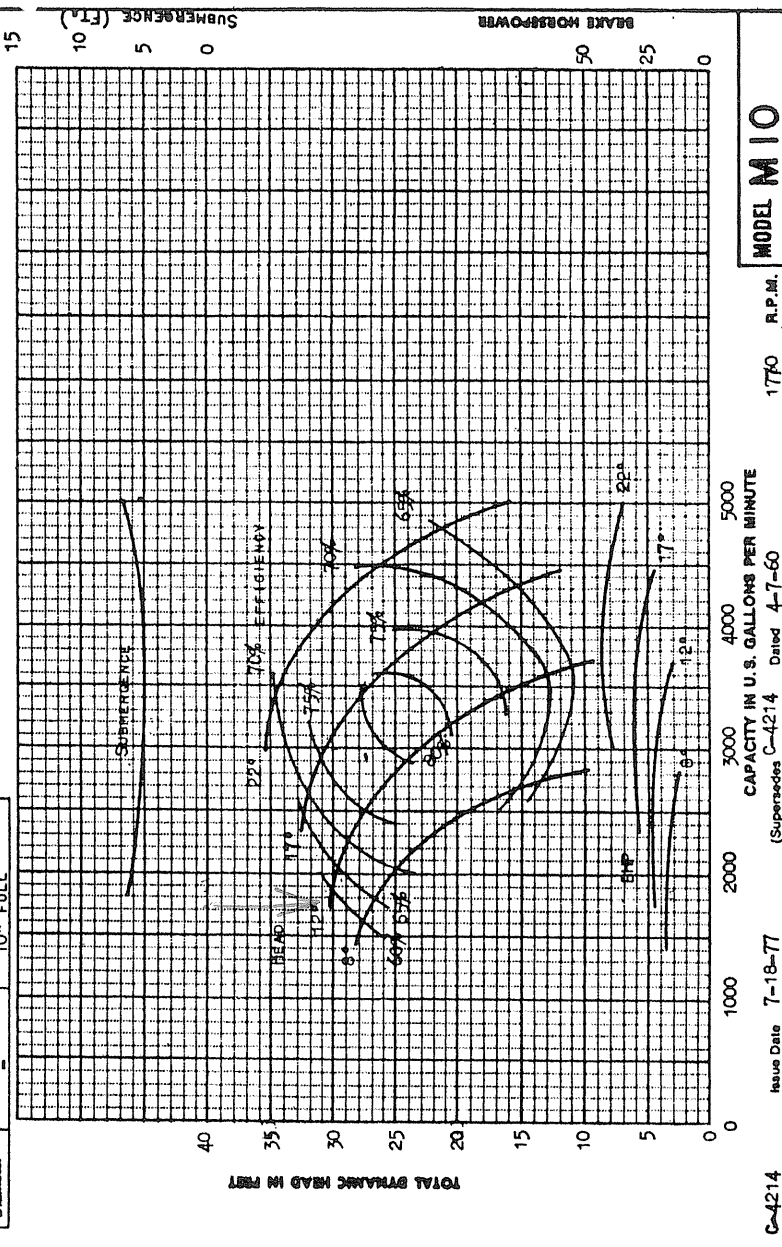
Pump Station 4
Subarea: Plymouth Dr.

3

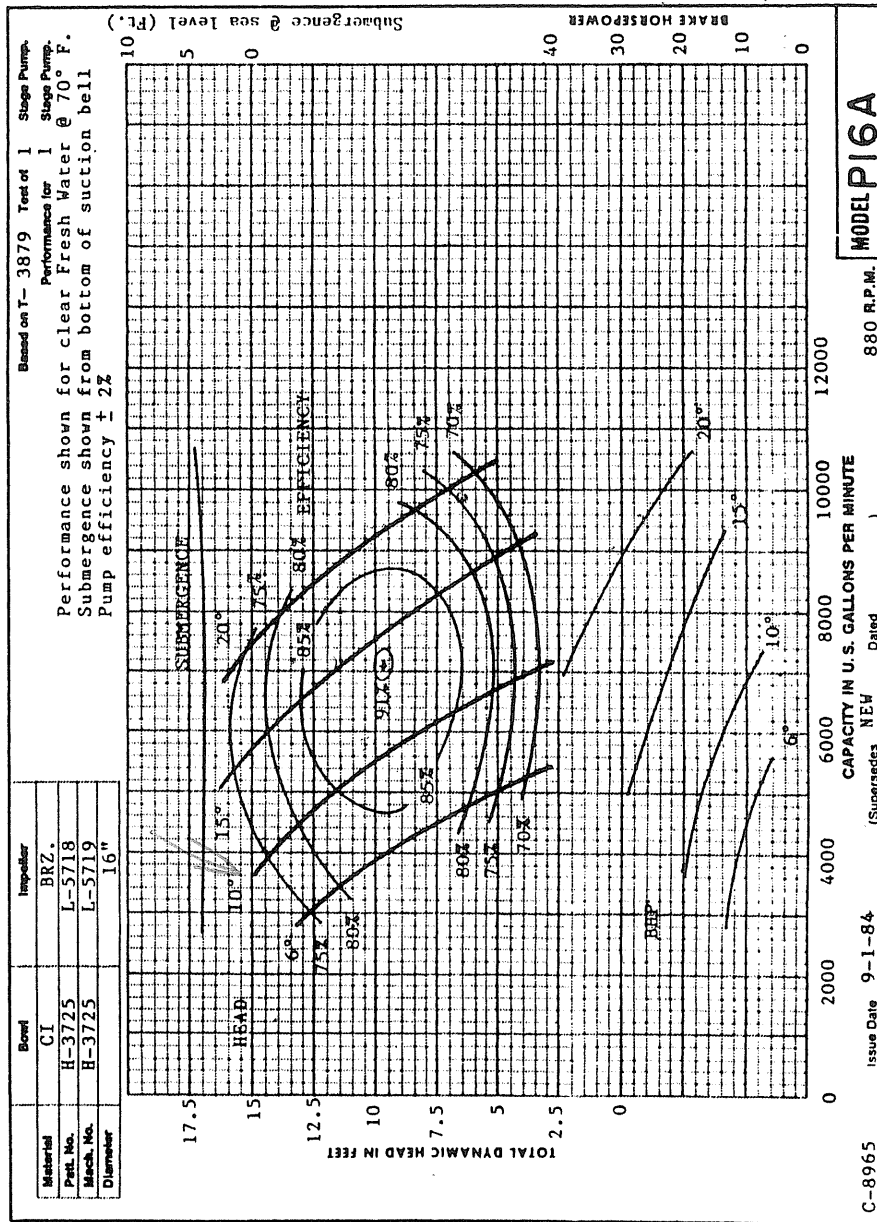
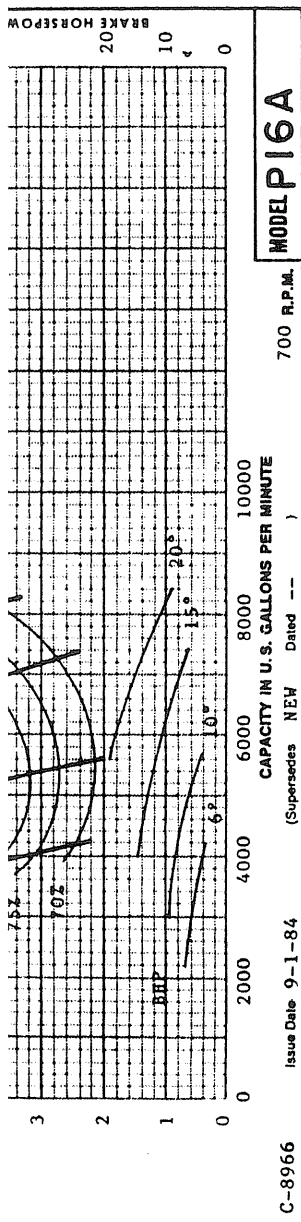
1107



Board	Impeller
C.I.L.	BRZ.
I-2156	M-3347
I-2156	I-4982
Diameter	10" FULL



7





CASCADE PUMP COMPANY

10107 South Norwalk Boulevard • PO Box 2767
Santa Fe Springs, California 90670-0767

8

CURVE NUMBER
MC1206DD4

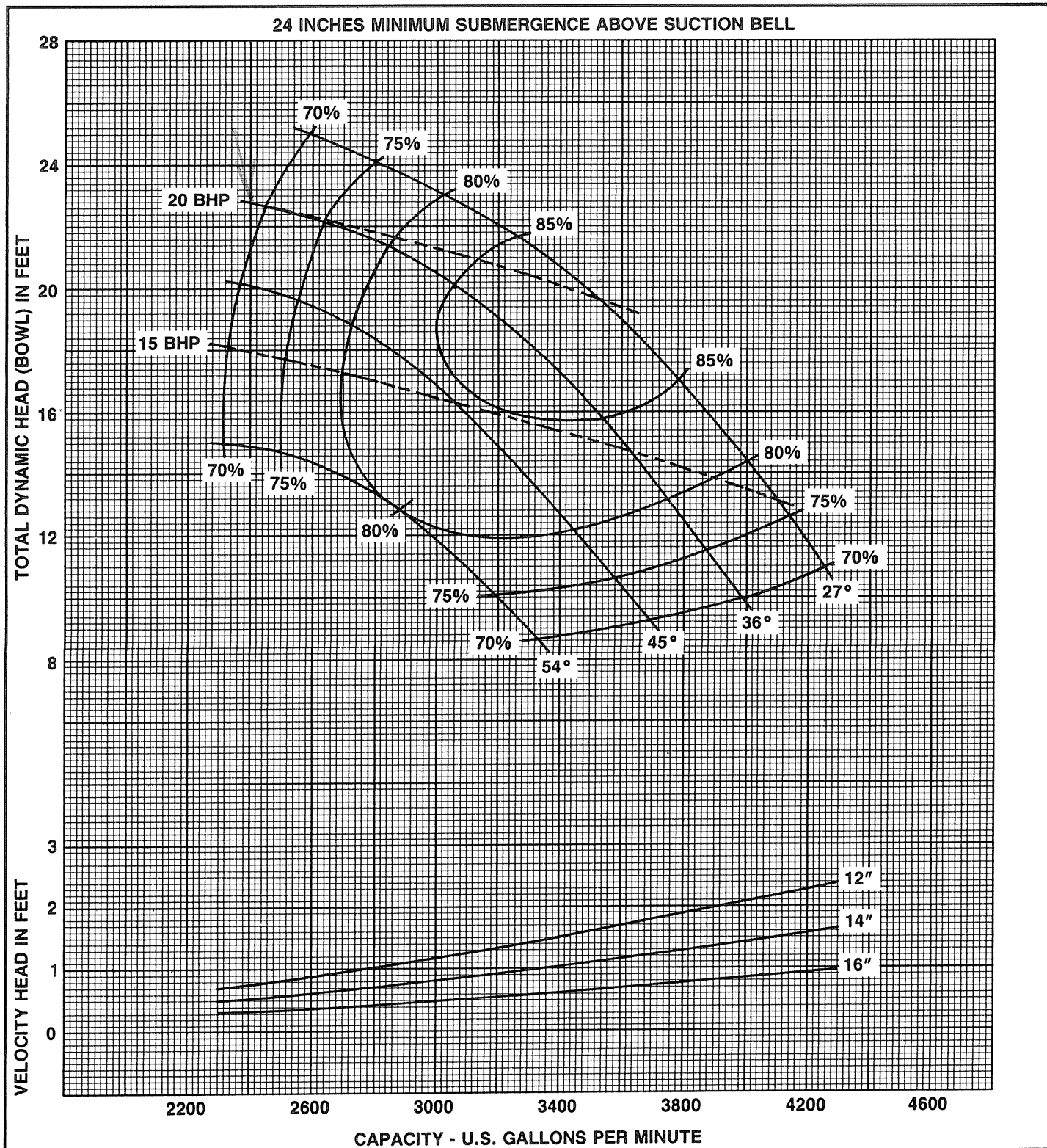
DATE
08-91

SUPERCEDES
NEW ISSUE

12

MFC

**1175
RPM**



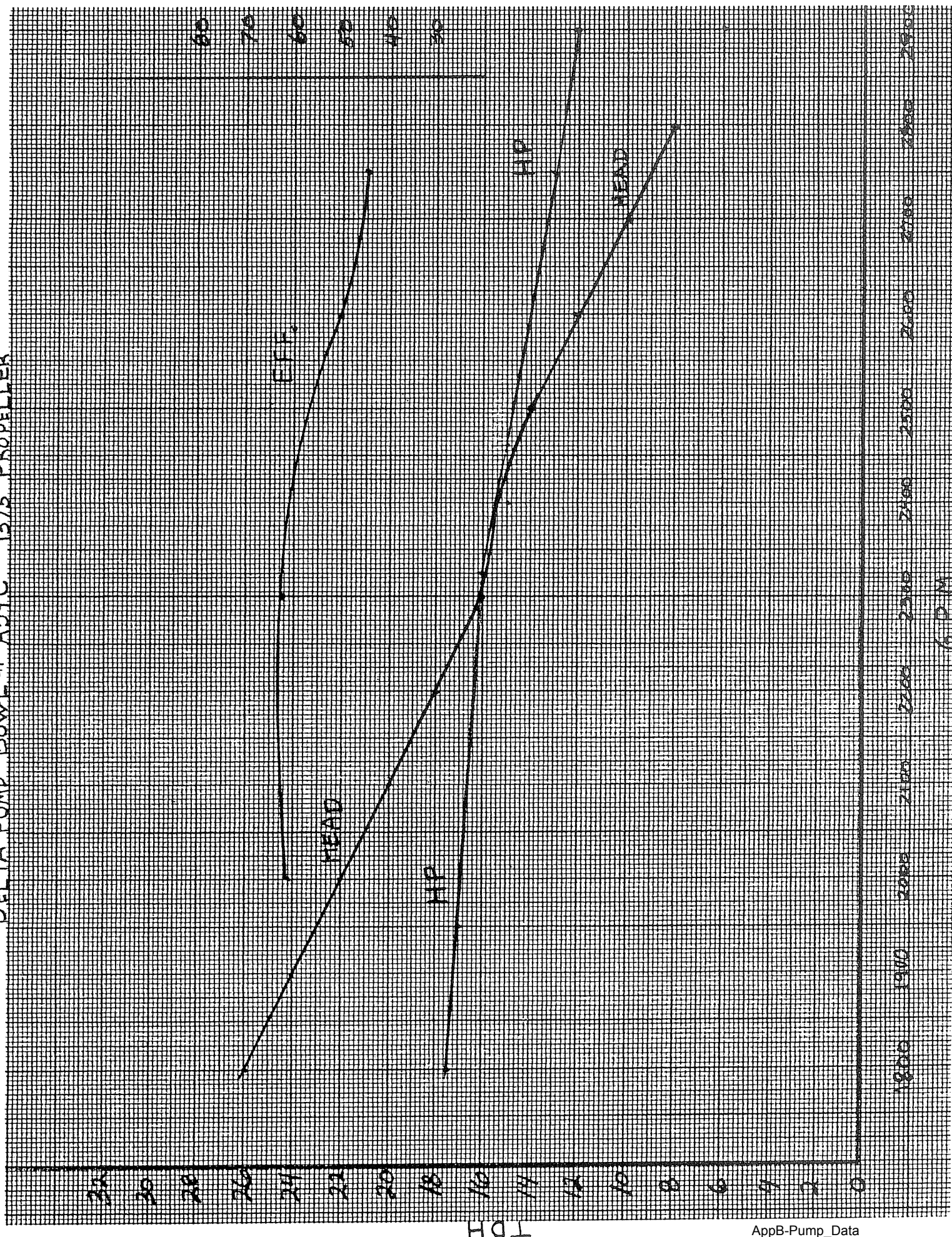
CASCADE MIXED FLOW PUMP

CURVE CHARACTERISTICS BASED ON PUMP PERFORMANCE WITH SPECIFIED AMOUNT OF CLEAR, NON-AERATED, FRESH COLD WATER.

THIS PERFORMANCE CURVE IS FOR ESTIMATING ONLY. CURVE SHOWS SINGLE STAGE PERFORMANCE. FOR MULTIPLE, VARIABLE AND OTHER SPEED APPLICATIONS, CONSULT FACTORY.
AppB-Pump_Data

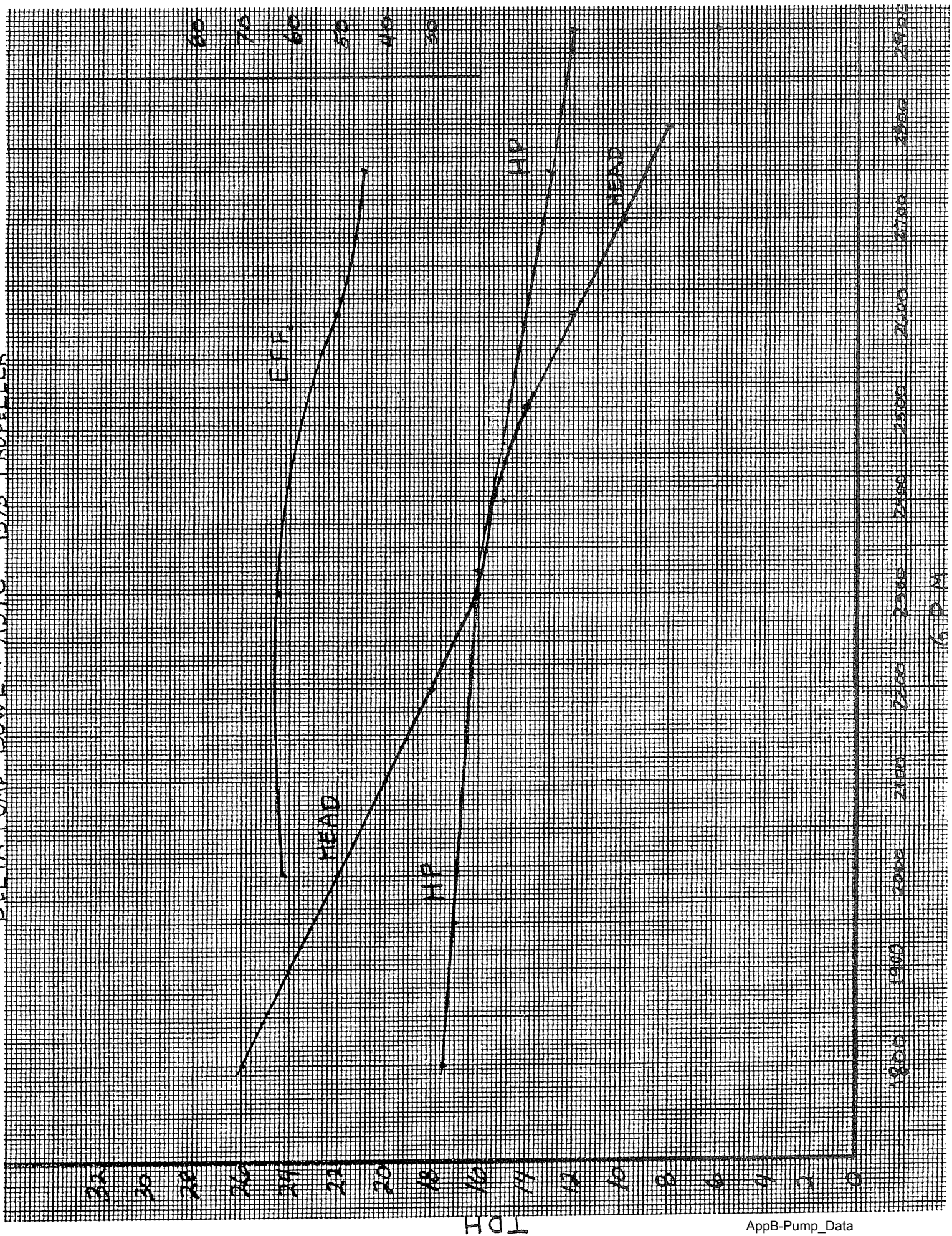
Pump Station 5
Subarea: Gardena St.

DELTA PUMP BOWL # A59C 1375 PROPELLER

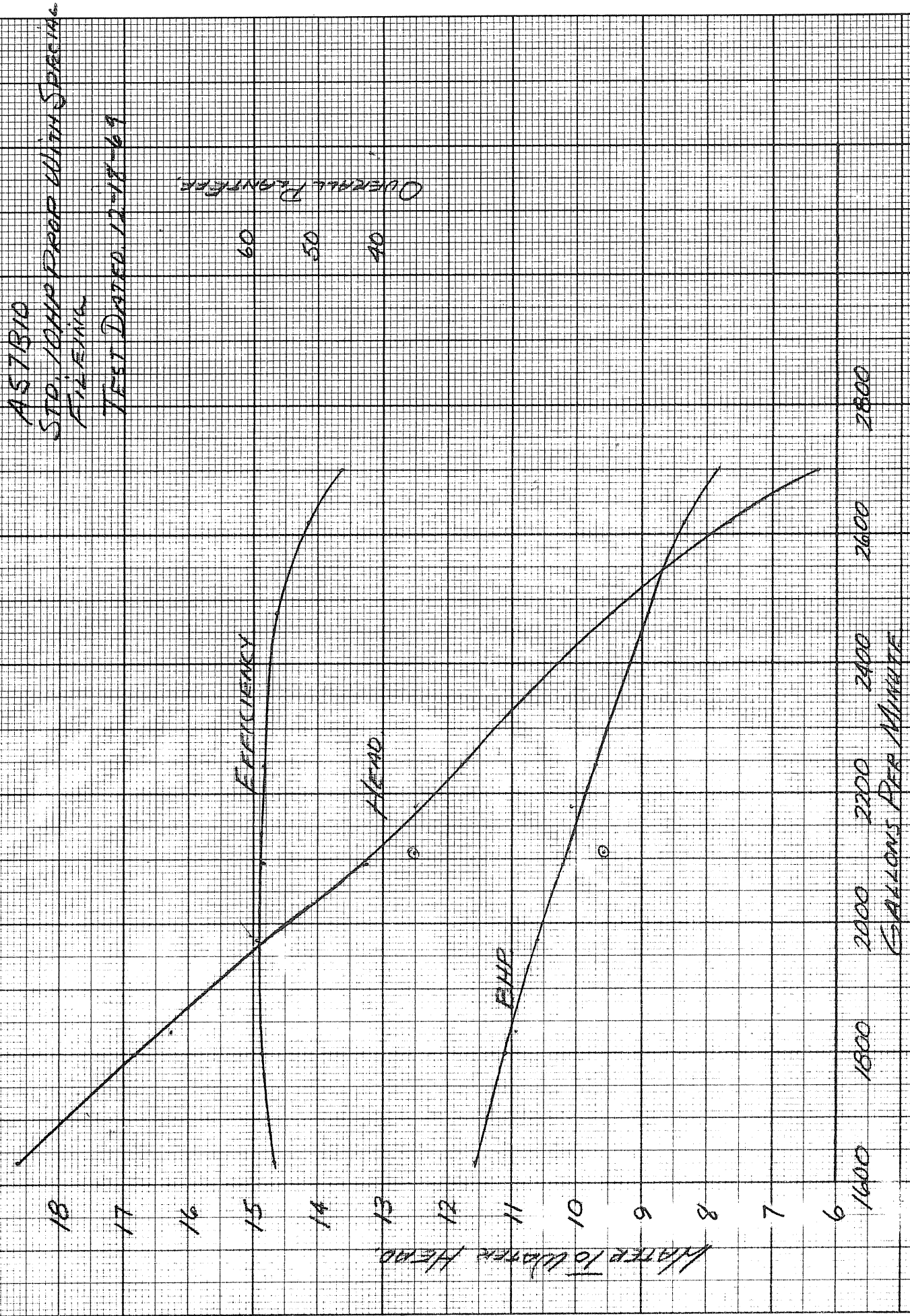


6 D M

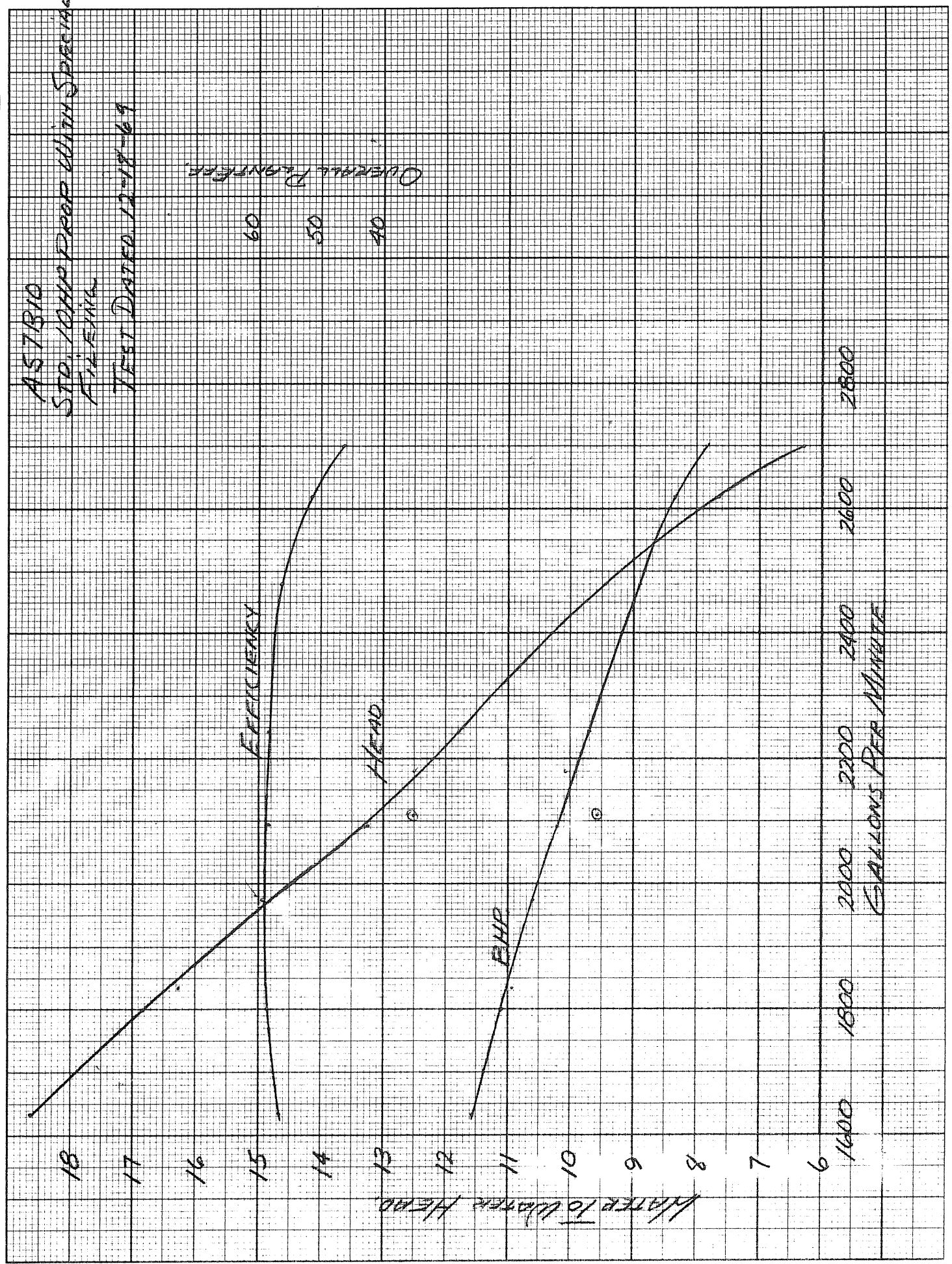
DELTA PUMP BOWL # A59C 1375 PROPELLER



Pump Station 6
Subarea: Moreing St.



ASTBIO
 STD. 10HP PUMP WITH SPECIAL
 FILING
 TEST DATED 12-18-69



Pump Station 7
Subarea: Yosemite Lake

2. Gears shall be of the spiral bevel type, case hardened, and lapped together to insure quiet operation. Gears shall be designed with a service factor to equal or exceed 1.50 on speed decreasing ratio and shall be rated at 150 HP at 580 RPM.
 3. Bearing and gears shall be lubricated by means of a force feed system. The oil pump shall deliver an adequate supply of oil by spray jet to the gear mesh and by oil passage to the upper bearings, from which the oil may be returned by gravity through the pinion bearing back to the pump. An oil sight glass shall be mounted on the gear housing to indicate oil level.
 4. The right angle gear drive shall be an air cooled type not requiring auxiliary heat exchanger equipment.
 5. The right angle gear drive shall be designed to withstand the thrust of the propeller pump and also momentary up thrust.
 - c. The right angle gear drive shall be furnished with three (3) copies of complete testing, operating and maintenance instructions and replacement parts lists for the unit furnished.
- .03 Low Lift Propeller Pump (Four (4) Required)

The storm water pumps shall be as outlined below and shall be Johnston Pump Company Model 30 PO, Byron Jackson 30 HS, or approved equal.

a. Pump Performance Data

Design Capacity, GPM	27,000.	
Design Head, TDH	15'	
Min. Bowl Eff. at Des. Hd., %	85.5%	94
Max. HP at Des. Head	125	

Secondary Capacity, GPM	31,000
Secondary Head, TDH	13'
Min. Bowl Eff. at Sec. Hd., %	85%
Max. HP at Des. Head	120
Max. Submergence	70"
Max. Syn. Speed, RPM	585
Size Column & Disch.	36"
Min. Lineshaft Size	2-3/16"

The total pumping head includes losses in the pump, discharge column, suction pipe and bell.

It is noted that the pumps will be rated at the principal design condition only and that the other points indicated are for guide purposes indicating ranges of operation in which the units must operate satisfactorily.

The term "submergence" shall be understood to be the vertical distance from the bottom of the suction bell to water surface in the sump. The term "total dynamic head" shall be understood to mean the sum of the static head, the friction head in the discharge elbow and discharge pipe, and discharge velocity head.

- b. Pump Column and Discharge Elbow: The vertical pump supporting column and discharge elbow shall be made of welded plate steel with 5/16" wall thickness. The discharge opening shall be plain end, fitted with a Dresser type coupling suitable for connection to the discharge pipe. The discharge elbow shall be of the long-sweep type consisting of at least 3 sections, and shall be above base discharge.
- c. Base Plate: The pumping unit shall be suspended from a steel base plate 1-1/2" thick to support the weight and thrust of the complete unit. The oil tube nut shall be located on or above

the base plate to provide for easy maintenance. The dimensions of the base plates shall be 66" square.

- d. Bowls: The suction bell and pump bowl shall be made of close-grained Class 40 cast iron and shall be designed for easy removal of the impellers and bearings. The suction bell shall have a flared inlet designed to reduce entrance losses and a sufficient number of vanes to support the lower guide bearing as well as to sustain the weight of the impeller and pump shaft when dismantling the pump. The bowl shall have a replaceable bronze liner.
- e. Impellers: The pump impeller shall be made of bronze (ASTM B62-52) and shall be fastened to the shaft in such a manner as to be removed readily. They shall be balanced statically and dynamically to reduce vibration and wear.
- f. Shaft: The shaft of the pumping unit shall be of ample size to operate without objectionable distortion or vibration at maximum speed in both the forward and reverse direction of rotation. The pump-bowl shall be made of 416 stainless steel and the line shaft shall be made of carbon or alloy steel.. The shaft couplings shall be of the threaded type. Provision shall be made at the top of the motor shaft for adjusting the elevation of the impeller with reference to the bowl.
- g. Bowl Bearings: The pump shall have a main bronze bearing immediately above the impeller, and a lower bronze bearing below the impeller. The bearing below the impeller shall be grease lubricated from above the base plate.

- h. Lineshaft Bearings: The oil-lubricated lineshaft bearings shall be protected from water and foreign matter by the Schedule No. 80 steel enclosing tube. A shaft seal shall be provided immediately above the top propeller. By-pass ports to drain excess oil from the shaft enclosing tube shall be provided above the seal. All bearings shall be easily replaceable, and spaced not more than five feet apart.
- i. Lubrication: The pump shall be oil-lubricated and equipped with a solenoid operated lubricating system which shall supply lubricant to each lineshaft bearing. The solenoid-operated oiler shall be designed for outdoor operation and shall have a metal oil reservoir with a capacity of not less than 1 gallon.
- j. Coating: Below the baseplates, the pumps shall be coated inside and outside with a 2-coat application of bitumastic.
- k. Operational Data: The successful bidder shall submit two copies each of dimension prints; performance curves showing head-capacity, pump efficiency, and brake horsepower; and the pump manufacturer's published single stage book performance curves which show compliance with these specifications.

.04 Electric Powered Summer Pump

The summer pump shall be as outlined below:

a. Pump Performance Data

Maximum Horsepower	40	
Pump Head	18.5'	
Minimum GPM	5,500	
RPM Max.	1,200	97
RPM Min.	.875	
Pump Eff.	80%	

The total pumping head includes losses in the pump, discharge column, suction pipe and bell.

- b. The applicable provision set forth in Section C, 5.03, b, c, d, e, f, g, h, i, j, and k shall apply to the construction of the pump.

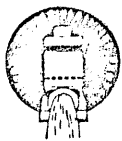
The pump column and discharge elbow shall be twenty (20) inches in diameter and shall be constructed of 1/4" thick welded steel plate.

The column length, location of the discharge and the base plate size shall be as shown on the plans.

- c. The motor to operate the summer pump shall be a 40 horsepower electric vertical ball-bearing; hollow-shaft; normal thrust; squirrel cage induction type for continuous operation; with a temperature rise not to exceed 40 degrees C. on 208 volt, 3 phase, 60 hertz current. RPM rating shall be adjusted to match the demands of the particular pump supplied.

The motor shall be designed for across the line starting. The motor shall be shielded, drip-proof with back spin protection, and fully guaranteed in writing for these conditions.

Momentary up-thrust protection shall be provided by proper bolting to the base.



LAY & BOWLER
PL. COMPANY

P. O. BOX 1300
LA PUENTE, CALIF. 91747
200 NORTH PUENTE AVE.
CITY OF INDUSTRY, CALIF.

Veri-Line

PROPELLER/MIXED FLOW
ORDER ACKNOWLEDGEMENT

Legion Park & Smith Canal

ORDER NO. D-36940	Sheet No. 1 of 1 Sheets	No. Units 4
Extra Copies - PURCH. 4	JCP 1	FACTORY ☒

S O L D T O	R. GOOLDE'S SON
	P.O. Box 910
	STOCKTON, CALIF.
S H I P T O	CITY OF STOCKTON
	AMERICAN LEGION PARK
	STOCKTON, CA.

GPM	27000		
	HD	EFF	HP
STATIC			
FIELD TDH			
LOSS			
LAB TDH	15	86.5	118
RPM	600		
MODEL	L20SBP36P		

P.O. No. 5820
REFERENCE No.
QUOTE No.
REQUESTED SHIPPING DATE 7-14-72
SCHEDULED SHIPPING DATE 9-8-72
DATE SHIPPED _____ BY _____
SHIP AS COMPONENTS ☐
SHIP ASSEMBLED LESS MOTOR ☒
CREDIT APPROVAL 10/10/72
COD \$ _____ HO By _____
TERMS

SHIP VIA B/W	MARKS STEAM WATER PUMPS	Prepaid ☒ Collect ☐	BRANCH 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
JOB NAME AMERICAN LEGION PARK	Dealer or Rep.	USE Agr. Gov. Exp. Ind.	Driver Other
L & B P.O. No.	VENDOR	SHIP BY L & B Vendor ☐	CODE

QUANTITY		DESCRIPTION	CODE 41-260
Per Pump	Total		
1	4	GEAR DRIVE - Mr. RANDOLPH Model #20 Ratio 3:1 Increase ☐ Decrease ☒ Standard ☒ Yes ☐ No ☒ BX 2 3/16 BD 20 CD 24 1/2 Combination ☐ NRR ☐ Input Shaft CW ☒ CCW ☐ Cooling Coil ☐ Rotation	
3	3	COMPLETE TESTING, OPERATING & MAINTENANCE INSTRUCTIONS & PARTS LIST	
		PANEL - STARTER - Mr. _____ HP _____ V _____ PH _____ Type _____ PB ☐ 3rd Leg ☐ TDR ☐ Fuses ☐ V _____ HDA ☐ SB ☐ Thermotectors ☐ Fuselrons ☐ Amps _____ BHP Heaters _____ Model L20SBP36P	
1	4	Pedestal ☐ Height _____ Part Number _____ Open Shaft ☐ Manual Oil ☐ Ped. & Elbow _____ Lgth. _____ Part Number _____ Encl. Shaft ☒ Electromatic ☒ 12V Surf. Elbow ☒ 7-7 5/8" Lgth. D26940-101 Part Number _____ Elbow _____ Plain End ☒ Packing Box ☐ 6 Fit _____ Tube 3 1/2" Shaft 2 3/16 Tension Nut ☒ Head Shaft 2 3/16 X 32 3/4 Lgth. _____ With Adjusting Nut, Lock Screw & Key _____	B & Disch. Out 36" G & Disch. Up 32" F & Disch. Down 17-7 5/8" H Col. Incl. Elbow 15-10" Bell Lip 15-10" OA Base to _____
7 1/2	28 1/2	FT. COLUMN 36" Pipe 3 1/2" Tube 2 3/4" Shaft _____ Max. Col. _____ Lgth. _____ L.S. Bearing 3'-4" ☐ Centers 5'-0" ☒ Elbow Lgth. _____ Part No. _____ *Top Inner Col. Assem. 5'-2" Total Lgth. _____ Inter Col. Lgth. _____ Part No. _____ 3 1/2 x 2 1/8 Lgth. _____ Other Col. Lgth. _____ Part No. _____ With Top Lineshaft 2 3/16 x 5'-4 5/8" Lgth. _____ Bot. Col. Lgth. 10'-0" Part No. D36940-204 Shaft Proj. Below Dr. Base 7" Lgth. _____ Other Inner Col. Assem. _____ Lgth. _____ Col. Flg. Bolts/Nuts 3/4 x 3 *Bot. Inner Col. Assem. 5x3 1/2 Size 10'-1" Lgth. _____	
1	4	*BOWL ASSEMBLY - Type 30 P Stages 1 Basket Strainer ☐ Propeller ☒ 13 1/2" x 1 1/2" BACK Tube 3 1/2" Proj. 7" Shaft 2 3/4" Proj. 20" Impeller ☐ DYNAMIC BALANCE PCRP BRONZE LINER LS9523 & DISCH BOWL LS9824 SUCTION BELL LS9394 (MARKED PRINT) OVERSIE FIVE FT 6650X1 1/2 - ADD	
1	1	*COAT LIDE 3.0 COAT ELIMINATED COVER TUBE O.D. BOWL WITH 2 COATS BITUMASTIC BY L&B MINI WALL THICKNESS 3/16 **DISCH. CASE SUCT. CASE T-25 CLASS 40 C.I.	

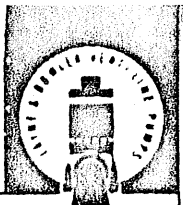
SALES DIST.	COST DIST.	Commission
Performance Certified ☐ Lab. Driver ☒ Notify Sales Dept. _____ Days Before Test _____	Approval ☐ Curve 4 ✓ Dim. Print 4 ✓ Typical Pump Assembly 4 ✓	
Hydrostatic Certified ☐ Elbow ☐ Column ☐ Bowls ☐ PSI _____ PSI _____ PSI _____	Parts List ☒ Recommended Spare Parts _____ Literature 4 ✓ Manuals 4 ✓	
	Documents: Invoices _____ Packing List _____ Bill of Lading _____ Other _____	

WRITTEN **PHL** DATE **5-15-72** PROCESSED **PHL** DATE **6/15/72** Form No. L & B 260-10/67

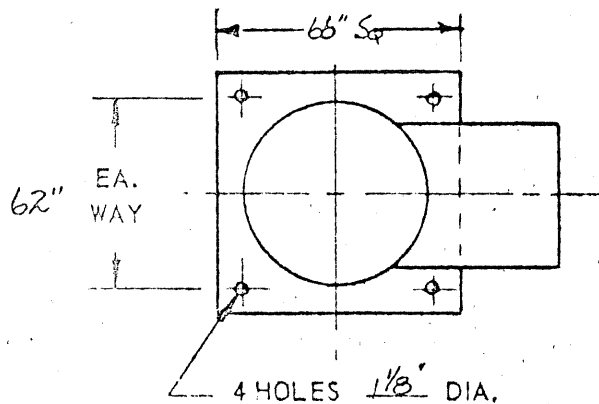
SERIAL NO. **D-36940**

Verli-Line

PROPELLER PUMP



Engine 1800 RPM



RANDOLPH MODEL 20 RIGHT ANGLE
GEAR DRIVE, ~~3:1~~ RATIO, '3:1'
STANDARD ROTATION, 580 R.P.M.
PUMP SPEED.

drive is 180° from discharge

SINGLE STAGE 30P BOWLS

27,000 G.P.M. 15.0 FT. PER. CURVE S-24-9 (A)

36" O.D. PLAIN END DISCHARGE ELBOW

BELOW BASEPLATE O.D. & I.D. OF COLUMN, O.D.

OF OIL TUBE AND BOWL COATED WITH

36" 2 COATS BITUMASTIC.

36" O.D. x 5/16" WALL COLUMN PIPE

ENCLOSING TUBE

SHAFTING

SECTION BELL 5 1/2" DIAMETER.

BOWL TO HAVE REPLACEABLE

BRONZE LINER, GREASE LINE TO

BOWL SUCTION CASE BEARING.

* BACK WALL CLEARANCE SHOWN
MIN. SIDE WALL CLEARANCE $\frac{D}{2}$ see comment sheet

P.O. 5820 R. GOULD & SON.

LAYNE & BOWLER PUMP CO.

LOS ANGELES, CALIFORNIA

PROPOSAL FOR CITY of STOCKTON

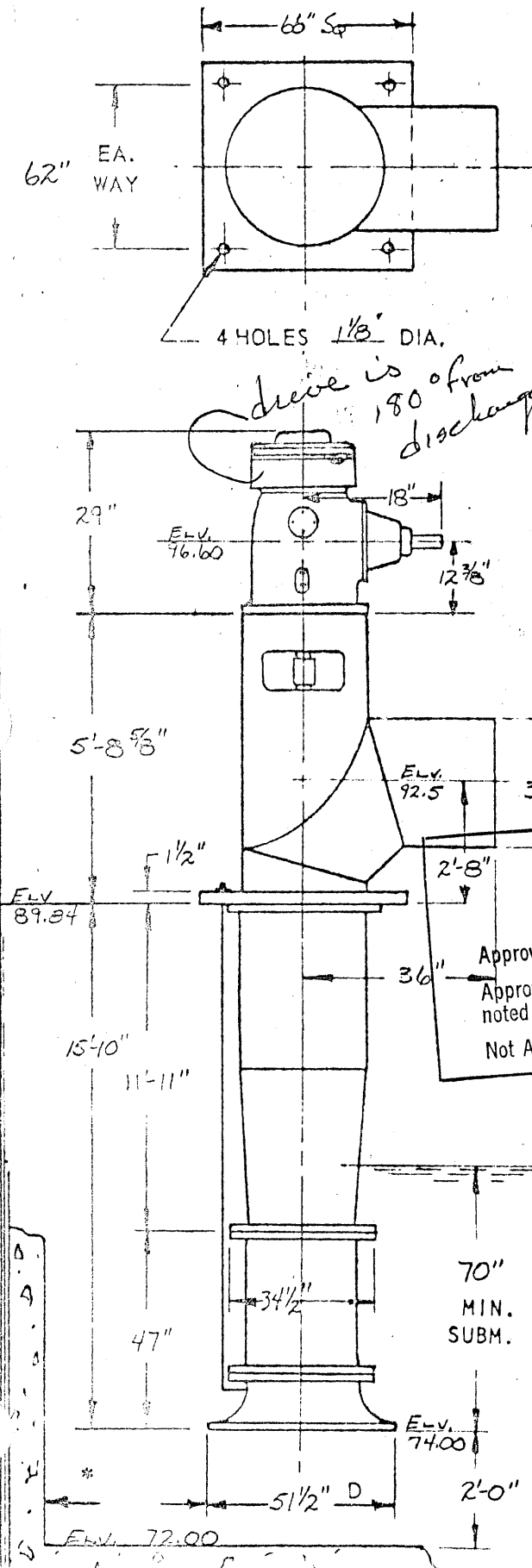
AMERICAN LEGION PARK

SPEC. ITEM

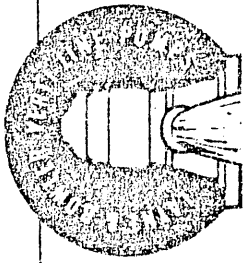
CERTIFIED

BY DAD

1 B B NO. S-24-9 (A)



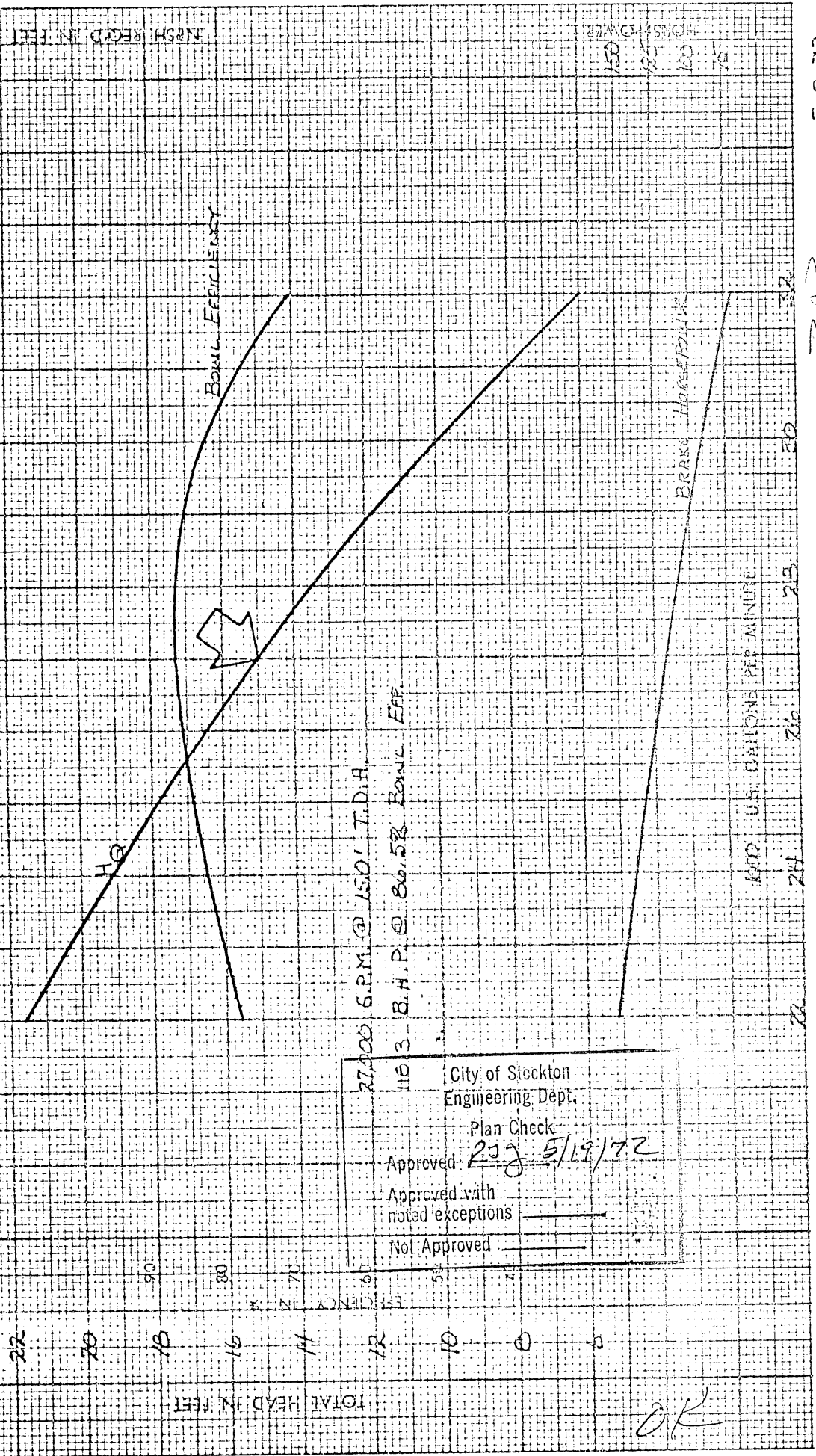
CURVE NO. 5-24-9 (A)



BOWL PERFORMANCE
 SINGLE STAGE 30P PUMP
 580 R.P.M.

FOR
 CITY OF STOCKTON
 AMERICAN LEGION PARK
 STORMWATER PUMPING PLANT

LAYNE & BOWLER ENGINEERING COMPANY
 LOS ANGELES 12, CALIF.



City of Stockton
 Engineering Dept.
 Plan Check
 Approved: 252 5/19/72
 Approved with noted exceptions _____
 Not Approved _____

OK

PLOTTED BY: R.A.R. DATE 5-8-72
 CERTIFIED BY: _____ DATE _____

OPERATING AND MAINTAINANCE INSTRUCTIONS FOR RANDOLPH PROPELLER PUMP DRIVES
MODELS 12, 16, 20, 24 AND 30

LUBRICATION:

Use a high grade turbine oil, preferably with rust and oxidation inhibitor.

AMBIENT TEMPERATURE (°F)	10°--40°	30°--60°	50°--125°
AGMA NUMBER	3	4	5
VISCOSITY RANGE SUV	490-700	700-1000	80-105
	SUV @ 100°F	SUV @ 100°F	SUV @ 210°F
GULF	HARMONY C	HARMONY 69	HARMONY 97
HUMBLE	TERESSTIC 52	TERESSTIC 65	TERESSTIC 85
TEXACO	REGAL E	REGAL F	REGAL G

The above list of oils is given only as the type of oil. There are many other suitable turbine oils.

Change oil at least every 1000 to 1500 hours of operation. If drive is operated intermittently less than 1000 hours in a season run of two or three months, change oil at end of that period of operation to eliminate the water formed in the gear case due to condensation. Frequency of change depends upon the rate of water condensation in the drive.

To drain the oil, remove the drain plug which is located near the bottom of the drive. The oil should be maintained at or near the red line marked on the sight gage glass.

COOLING:

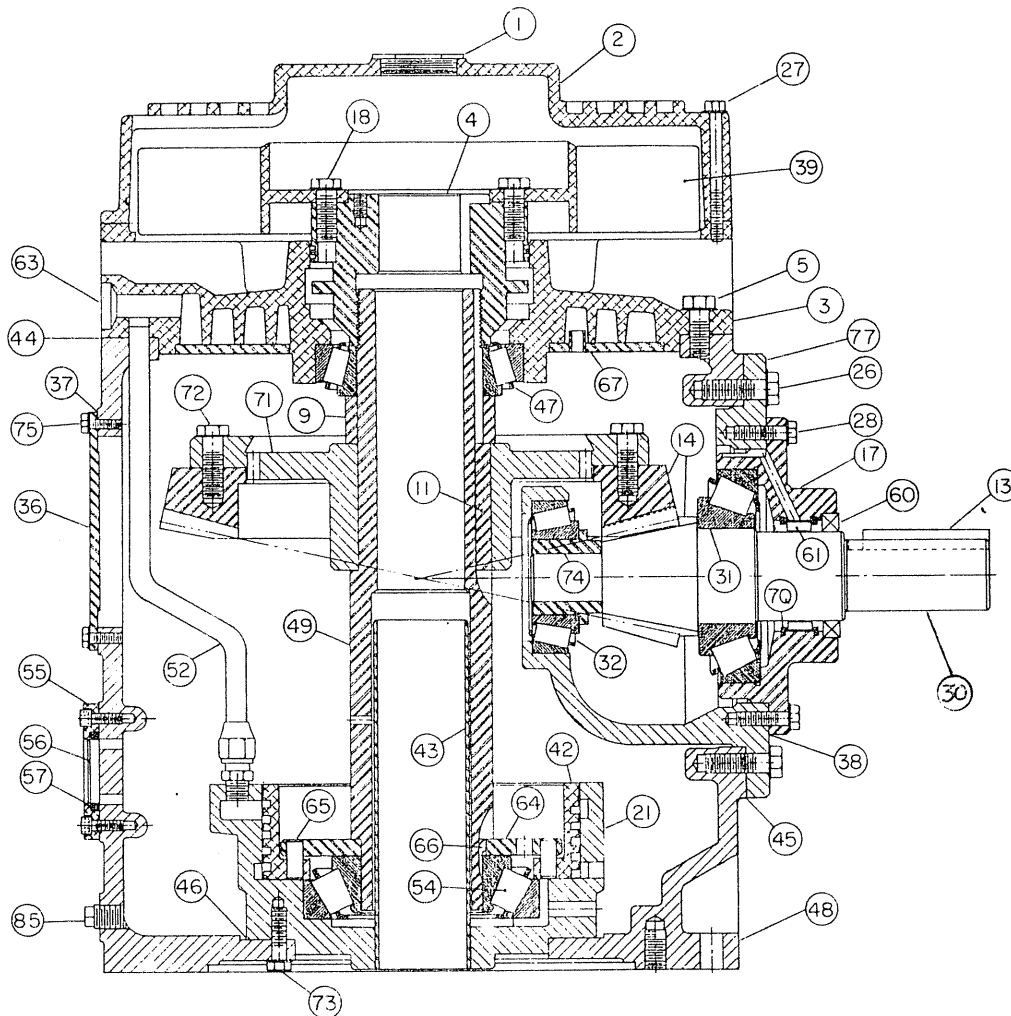
Models 20, 24, and 30 are air cooled. Models 12 and 16 do not require extra cooling. Therefore very little maintainance is required on the heat exchanger. In dusty locations the heat exchanger should be cleaned once each year to ensure peak cooling. To clean remove cover and fan blade. Scrub inside fins and parts with a good cleaning solvent.

REPAIRS:

If possible repairs should be made by the factory. Any ratio changes should be made by a qualified mechanic. Shims will be necessary to obtain proper gear tooth contact and back lash.

Consult factory for recommendations if repairs are necessary. Be sure to give serial number of drive when ordering parts.

RANDOLPH MANUFACTURING COMPANY
1110 N. AVENUE T. BOX 5306
LUBBOCK, TEXAS 79417



PARTS LIST

1 COVER PLUG WITH GASKET S 250 TFC	36. INSPECTION PLATE R 306	60. OIL SEAL 55511 S
2 COVER R 2021 A	37. GASKET G 306	61. NON-REVERSE CLUTCH 8C18677 CM
3 HEAT EXCHANGER R 2021	38. SHIM G 2055	63. ROUND SIGHT GAUGE B 5604
4 CLUTCH R 2009 A	39. FAN R 2024	64. DRIVE PLATE R 2006
5 CAP SCREWS & LOCK WASHERS $\frac{5}{8}$ X $1\frac{3}{4}$ (8 REQ'D)	42. OIL PUMP R 1608	65. DOWELL PINS $\frac{1}{2}$ X $1\frac{1}{4}$ (2 REQ'D)
9 OVER GEAR SPACER	43. STANDPIPE R 495	66. DRIVE PLATE KEY $\frac{3}{8}$ X $\frac{1}{4}$ X $\frac{1}{2}$
10 UNDER GEAR SPACER	44. SHIMS G 2000	67. DRAIN PLATE WITH 2 $\frac{3}{8}$ " PLUGS R 2022
11 GEAR KEY $\frac{3}{4}$ X $\frac{1}{2}$ X $3\frac{1}{2}$	45. SHIMS G 102	70. SNAP RING 5000-350 (2 REQ'D)
12 PINION KEY $\frac{1}{2}$ X $\frac{3}{8}$ X $2\frac{3}{4}$ (WHEN REQ'D)	46. SHIMS G 52	71. GEAR HUB R 2017
13. HORIZONTAL SHAFT KEY $\frac{5}{8}$ X $\frac{3}{8}$ X 4	47. RADIAL BEARING 672/687	72. DRILLED HEAD CAP SCREWS $\frac{5}{8}$ -18NF X $1\frac{1}{4}$ (12 REQ'D)
14 GEAR AND PINION SET (SPECIFY RATIO)	48. MAIN CASE R 2000	73. CAP SCREWS & LOCK WASHERS $\frac{7}{16}$ X $1\frac{1}{2}$ (6 REQ'D)
17 NON-REVERSE CLUTCH HOUSING R 2055	49. VERTICAL SHAFT V 2001	74. INBOARD BEARING BUSHING R 2011 (WHEN REQ'D)
18 CAP SCREWS & LOCK WASHERS $\frac{5}{8}$ X $1\frac{1}{4}$ (4 REQ'D)	52. OIL LINES & FITTINGS	75. CAP SCREWS & LOCK WASHERS $\frac{5}{8}$ X 1 (6 REQ'D)
21 THRUST BEARING CARRIER R 2003	MALE HALF UNION $\frac{1}{2}$ X $\frac{5}{8}$	77. INBOARD BEARING CARRIER R 2054
26 CAP SCREWS & LOCK WASHERS $\frac{5}{8}$ X $1\frac{3}{4}$ (8 REQ'D)	FLARE NUT $\frac{5}{8}$	85. PIPE PLUG $\frac{1}{2}$ " N.P.T.
27. CAP SCREWS & LOCK WASHERS $\frac{5}{8}$ X 4 (8 REQ'D)	OIL LINE $\frac{1}{2}$ " K X 15	
28 CAP SCREWS & LOCK WASHERS $\frac{7}{16}$ X $1\frac{1}{2}$ (6 REQ'D)	54. THRUST BEARING 90744 / 90381	
30. HORIZONTAL SHAFT H 2021 (WHEN REQ'D)	55. SIGHT GAUGE CASTING R 61	
31. OUTBOARD BEARING 9321 / 9380	ALLEN HEAD CAP SCREW $\frac{3}{8}$ X 1 (2 REQ'D)	
32. INBOARD BEARING HM 212011 / HM 212044	56. SIGHT GAUGE GLASS R 64	
	57. SIGHT GAUGE GASKET G 53	

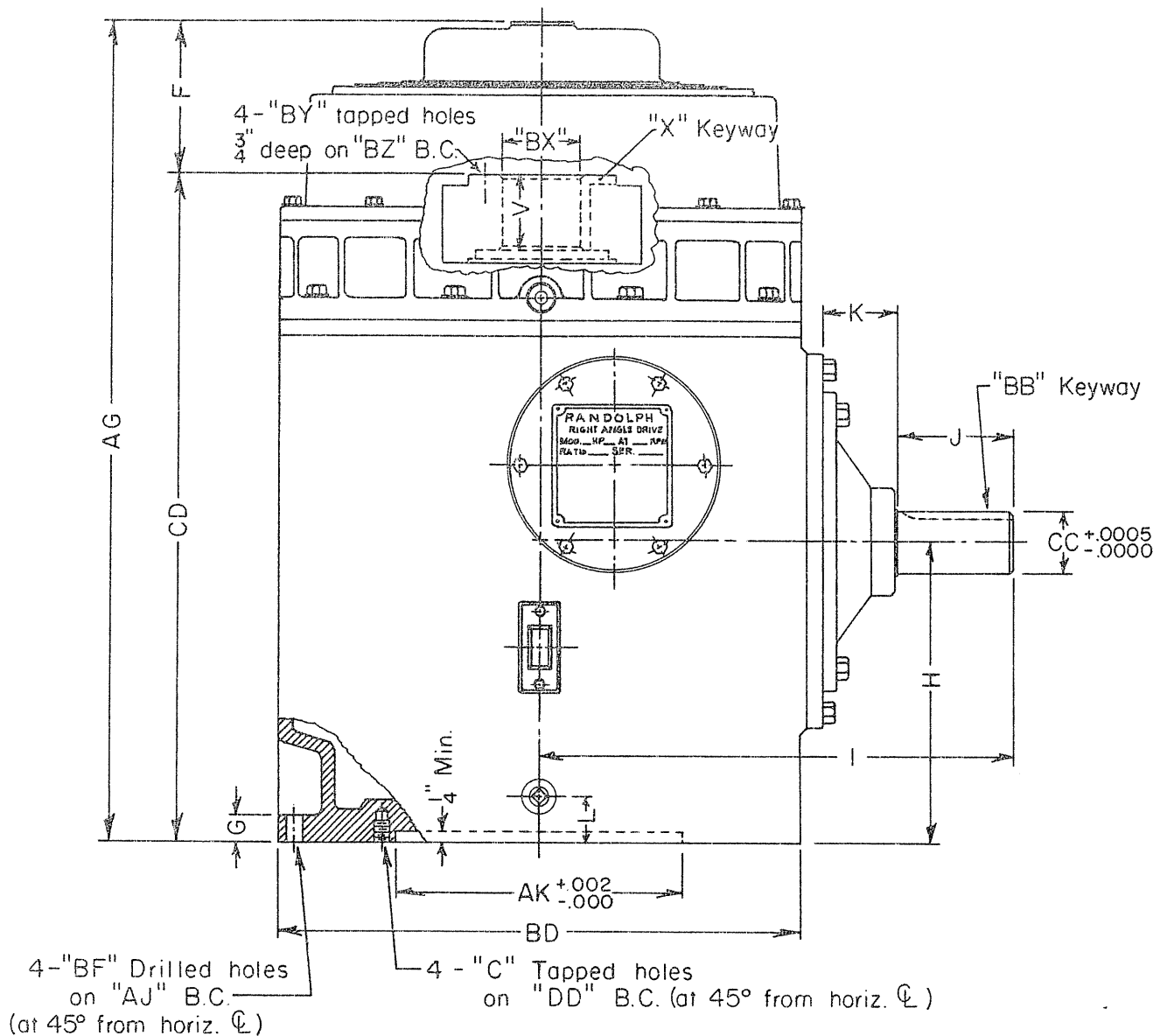
REV. 11-21-69

RANDOLPH MANUFACTURING CO.

LUBBOCK — TEXAS

MODEL 20 ASSEMBLY

Dr By P A J Date 10-18-67



DIMENSIONS OF STANDARD GEAR DRIVES

	BD	AK	C	CD	AG	F	G	H	I	J	K	L	V	AJ	BF	DD	BB	CC
MODEL 20	20	13.501	5-11	24 1/2	29	4 1/2	1 1/8	12 3/8	18	4 5/8	3 1/8	1 3/4	2 1/2	18 1/4	1 1/16	14 3/4	5/8 X 5/16	2.249
MODEL 24	24 1/2	13.501	5-11	31 1/4	38 3/8	7 1/8	1 1/4	14 1/8	22 1/4	6	3 3/4	1 3/4	3 1/2	23	1 3/16	14 3/4	3/4 X 3/8	2.937

CUSTOMER R. Goold & Son
City of Stockton

ADDRESS American Legion Park
Pumping Plant

CUSTOMER ORDER NO. 5820

MODEL 20 HP 200 RATIO 3:1

INPUT RPM 1800 OUTPUT RPM 600

CLUTCH BORE "BX" 2-3/16" KEYWAY "X"

TAP SIZE "BY" "BZ" B.C.

Pump Station 8
Subarea: Buena Vista South

BUENA VISTA & SMITH CANAL
(STORM - PUMP STATION)

(1a) WAUKESHA GASOLINE ENGINE

MODEL 195GK SIZE 4 1/8 x 4

SER. # 1019018 LOT 564 SPEC. 195GK53-J

(1b) U.S. MOTORS (ELECTRIC MOTOR)

H.P. 50 PH. 3 SER. # ~~11345~~ 1131476

VOLTS 440 TYPE CFN 60 CYCLES

720 R.P.M. 69.5 HI VOLTS (AMPS)

FRAME 587-P

BEARINGS: UPPER - 2-7226GM

LOWER - 1-6220 F CODE B DESIGN

(1c) JOHNSON GEAR & MFG CO

RIGHT ANGLE DRIVE

SER. # 28360 HELLO RATIO 5-2

B.H.P. 36 @ 720 R.P.M. (VERT SHAFT)

(1d) FAIRBANKS - MORSE PUMP

FIG. 6310 PROPELLER PUMP 12,000 GPM, 24" DISCHARGE

FACTORY SER. # PW 6069 PUMP SIZE 2A

STAGES 1 PROP. ~~A5~~ A357-3 R.P.M. 720

(2a) GEN. ELECTRIC MOTOR (STERLING PUMP CO.)

MODEL 12FA11 FRAME 6306

VOLTS 220/440 FL AMP. 101/50.5 3 PH.

CYCLES 60 SPEED FULL LOAD 1175

40 H.P. SER. # 5421894 8,000 GPM

(2b) STERLING PUMP

16" DISCHARGE

DRIVE # 8823?

PUMP # 8823

(3a) GENERAL ELECTRIC PUMP

HP 5

(3b) STERLING PUMP

(4a) 75 HP MOTOR? CHECK

(4b) CASCADE PUMP

SER. # 3076

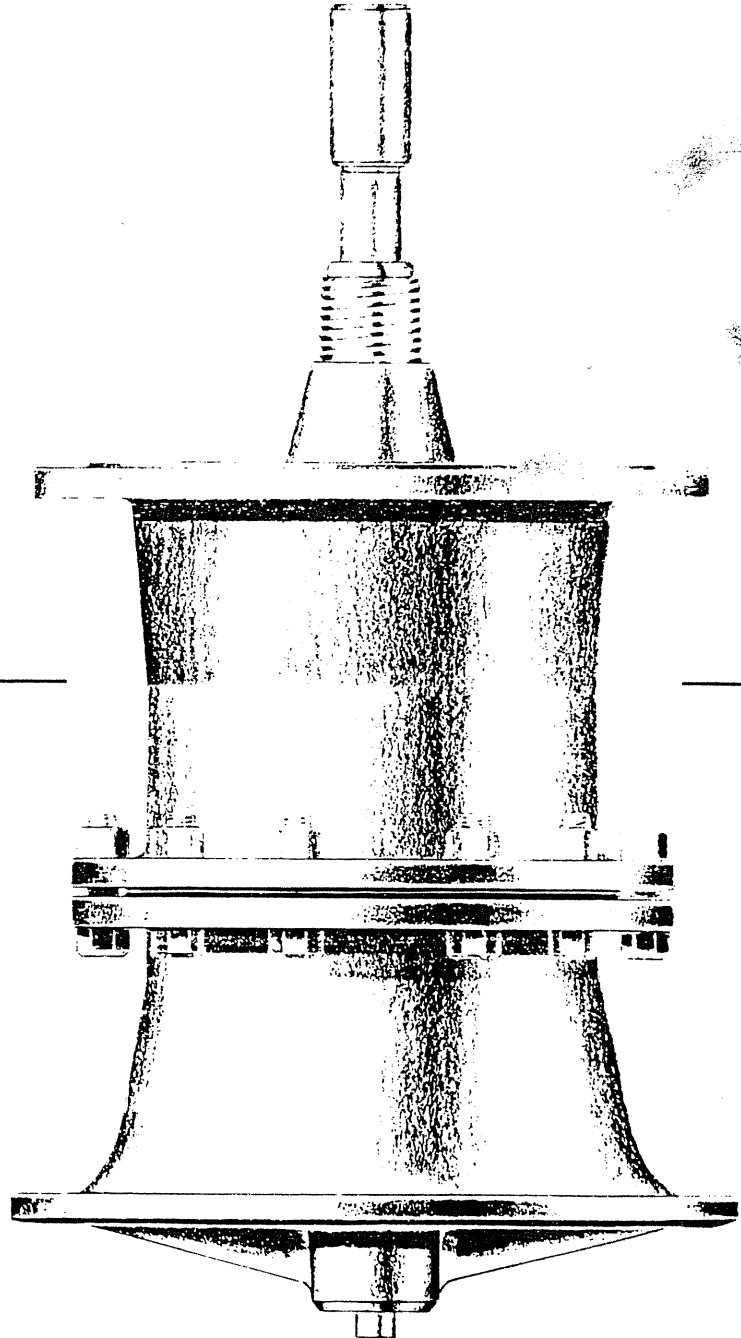
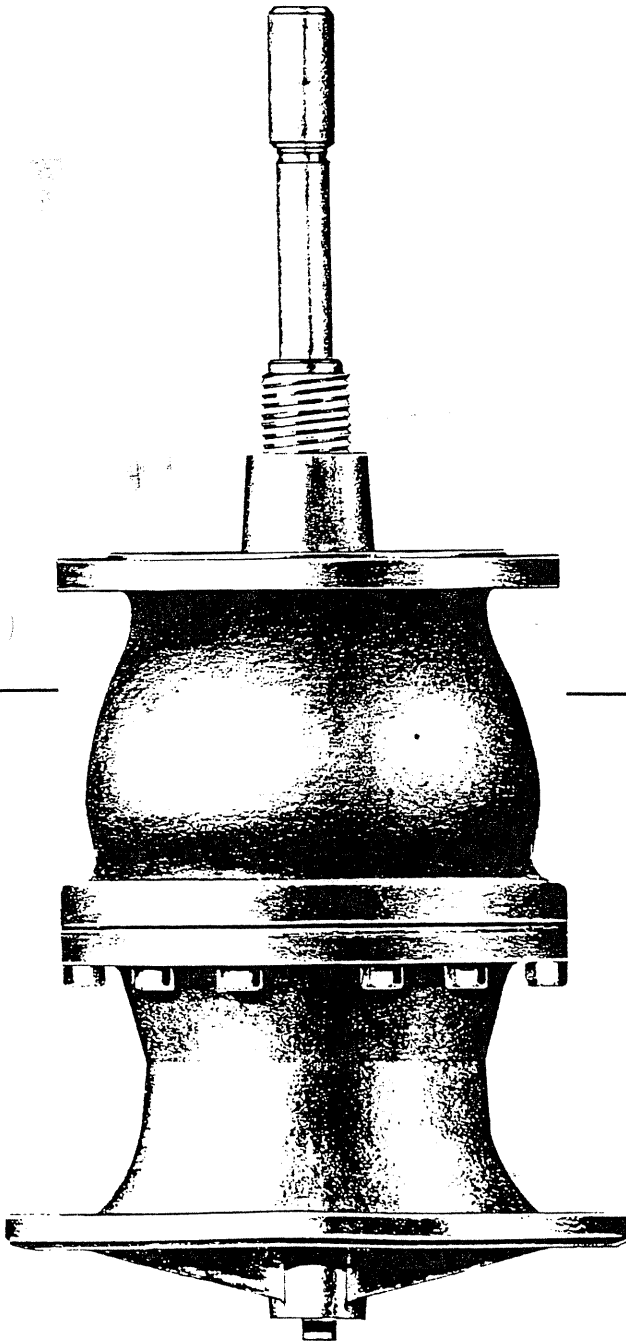
NO
MANUALS
11-15-82

INSTALLATION,
OPERATION AND
MAINTENANCE
INSTRUCTIONS

Buena Vista
10-9-96

8000

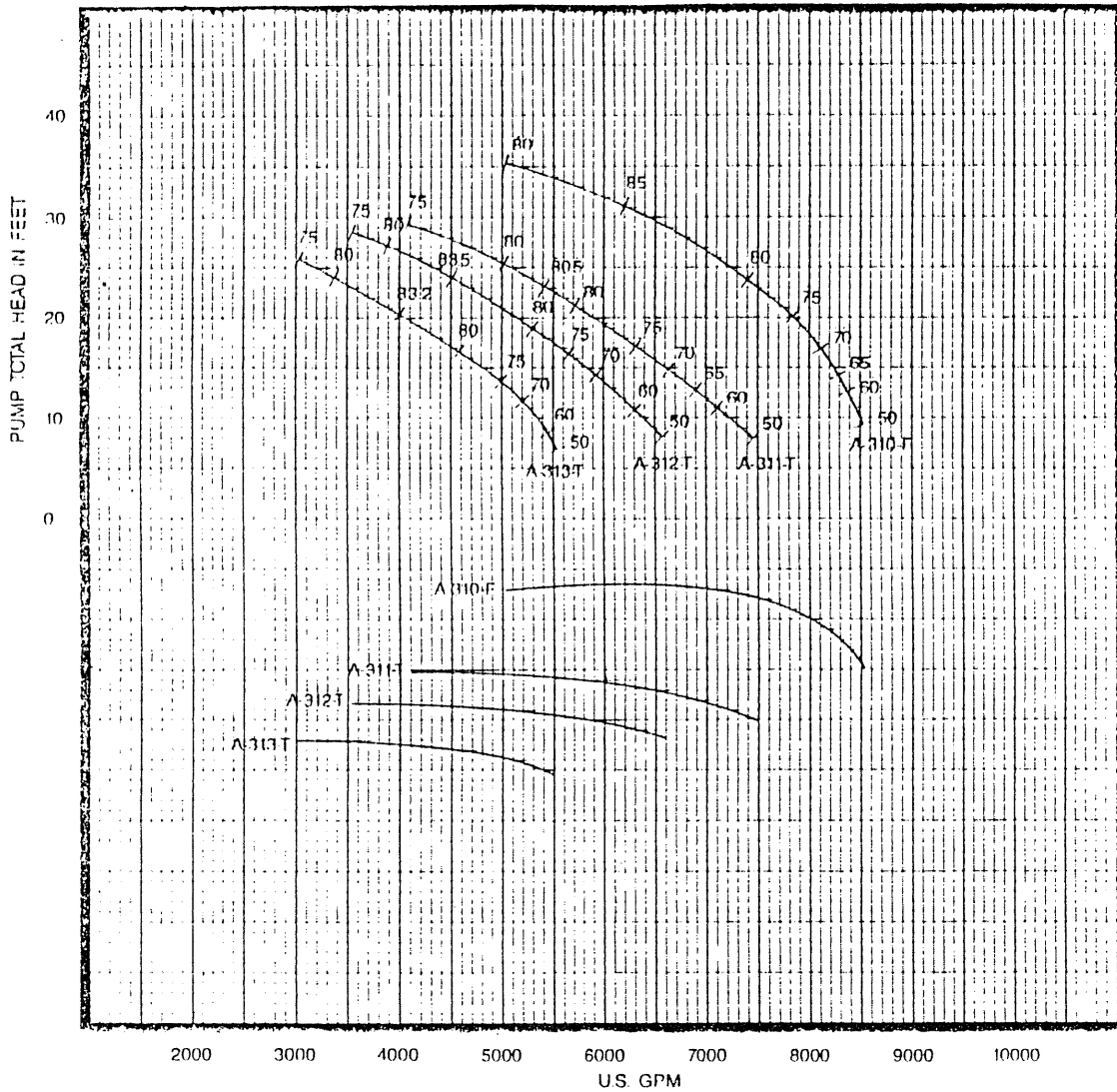
PROPELLER PUMPS



Fairbanks Morse

8000 PROPELLER PUMPS PUMP PERFORMANCE

367



14"
8312
1170
RPM
1
STAGE

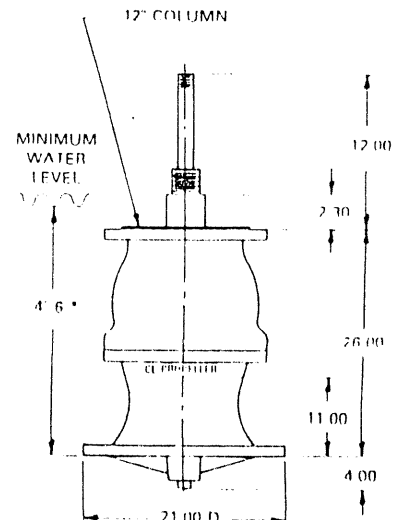
16"
COLUMN
16"
FABRICATED
STEEL ELBOW
1-1/2"
LINESHAFT
2-1/2"
ENCLOSING
TUBE

60
50
40
30
20
SHF

DATA	VALUE
PUMP SHAFT DIAMETER	1.6875 IN.
MAXIMUM SPHERE SIZE	2.25 IN.
K _t (THRUST FACTOR)	46 LBS./FT.
K _a (TOTAL ROTOR WEIGHT)	45 LBS.
K _s (SETTING CONSTANT)	5.5 LBS./FT.
WK ²	7.1 LBS.-FT. ²
BOWL ASSEMBLY WEIGHT	425 LBS.
EYE AREA: PROPELLER NO. A-310-F	92.0 SQ. IN. 4 VANE
PROPELLER NO. A-311-T	92.0 SQ. IN. 3 VANE
PROPELLER NO. A-312-T	92.0 SQ. IN. 3 VANE
PROPELLER NO. A-313-T	92.0 SQ. IN. 3 VANE
PROPELLER NO.	
PROPELLER NO.	

HYDRAULIC PERFORMANCE IS CONTINGENT ON FURNISHING THE PUMP WITH SPECIFIED AMOUNT OF CLEAR, FRESH, NON-AERATED WATER NOT TO EXCEED 85° F.

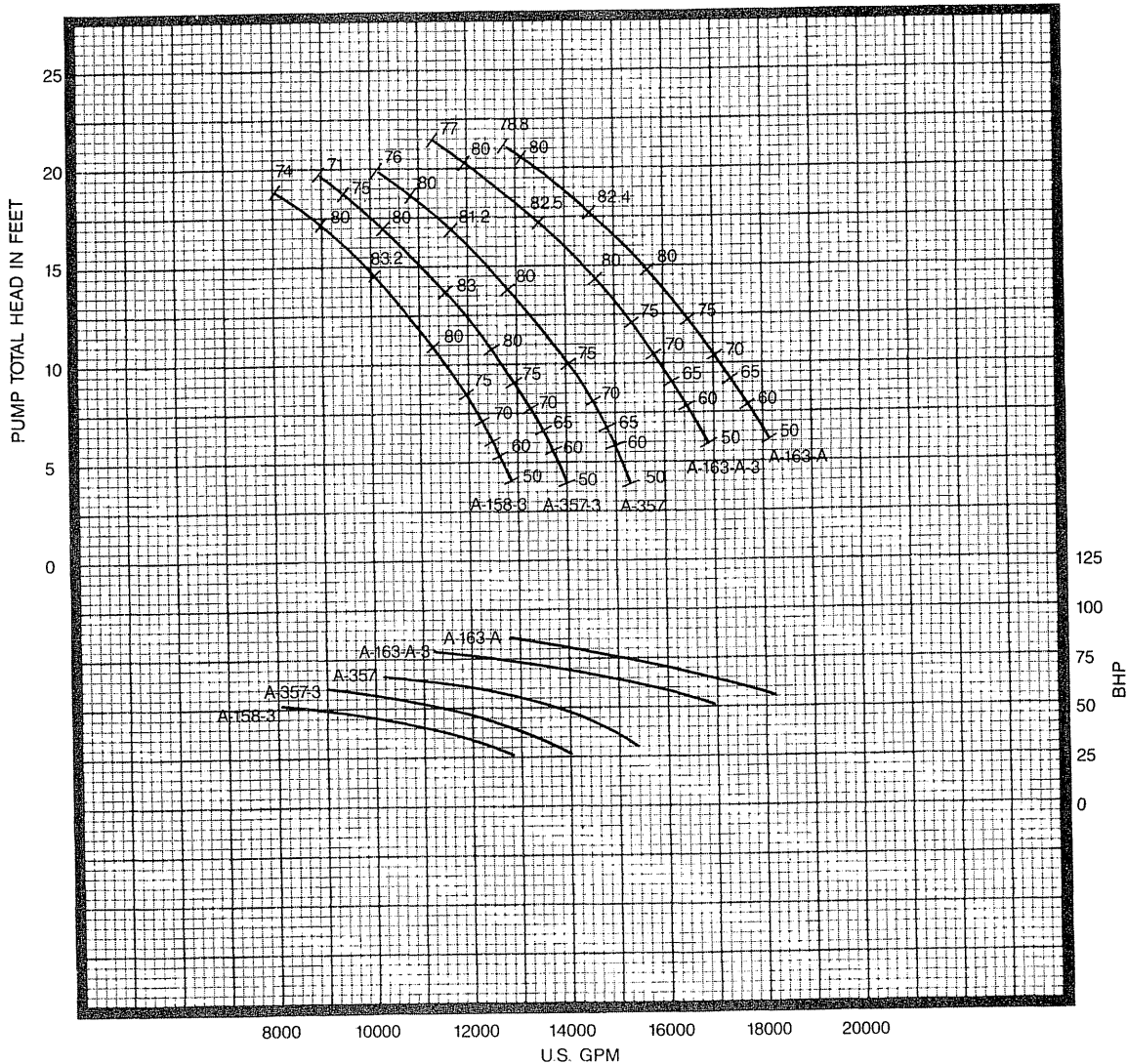
PUMP PERFORMANCE SHOWN IS BOWL ASSEMBLY WITH 10 FEET OF COLUMN INCLUDING A STANDARD ABOVE GROUND DISCHARGE ELBOW. ADDITIONAL COLUMN LOSSES SHOULD BE ADDED WHEN SETTINGS ARE DEEPER THAN 10 FEET AND/OR FOR OTHER DISCHARGE ARRANGEMENTS.



*This value is the minimum submergence required to prevent vortexing only. This value may need to be increased to provide adequate NPSHA.

8000 PROPELLER PUMPS PUMP PERFORMANCE

327



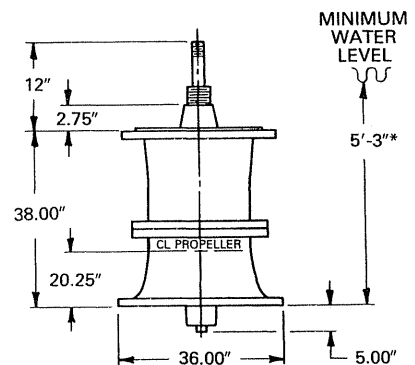
24"
8211
705
RPM
1
STAGE

24"
COLUMN
24"
FABRICATED
STEEL ELBOW
1-15/16"
LINESHAFT
3"
ENCLOSING
TUBE

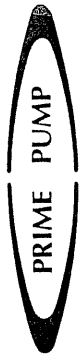
DATA	VALUE
PUMP SHAFT DIAMETER	2.1875 IN.
MAXIMUM SPHERE SIZE	3.75 IN.
K _t (THRUST FACTOR)	150 LBS./FT.
K _a (TOTAL ROTOR WEIGHT)	165 LBS.
K _s (SETTING CONSTANT)	10.0 LBS./FT.
WK ²	67 LBS.-FT. ²
BOWL ASSEMBLY WEIGHT	1300 LBS.
EYE AREA: PROPELLER NO. A-158-3	247.4 SQ. IN. 3 VANE
PROPELLER NO. A-357-3	247.4 SQ. IN. 3 VANE
PROPELLER NO. A-357	271.7 SQ. IN. 3 VANE
PROPELLER NO. A-163-A-3	247.4 SQ. IN. 4 VANE
PROPELLER NO. A-163-A	271.7 SQ. IN. 4 VANE
PROPELLER NO.	

HYDRAULIC PERFORMANCE IS CONTINGENT ON FURNISHING THE PUMP WITH SPECIFIED AMOUNT OF CLEAR, FRESH, NON-AERATED WATER NOT TO EXCEED 85° F.

PUMP PERFORMANCE SHOWN IS BOWL ASSEMBLY WITH 10 FEET OF COLUMN INCLUDING A STANDARD ABOVE GROUND DISCHARGE ELBOW. ADDITIONAL COLUMN LOSSES SHOULD BE ADDED WHEN SETTINGS ARE DEEPER THAN 10 FEET AND/OR FOR OTHER DISCHARGE ARRANGEMENTS.



*This value is the minimum submergence required to prevent vortexing only. This value may need to be increased to provide adequate NPSHA.

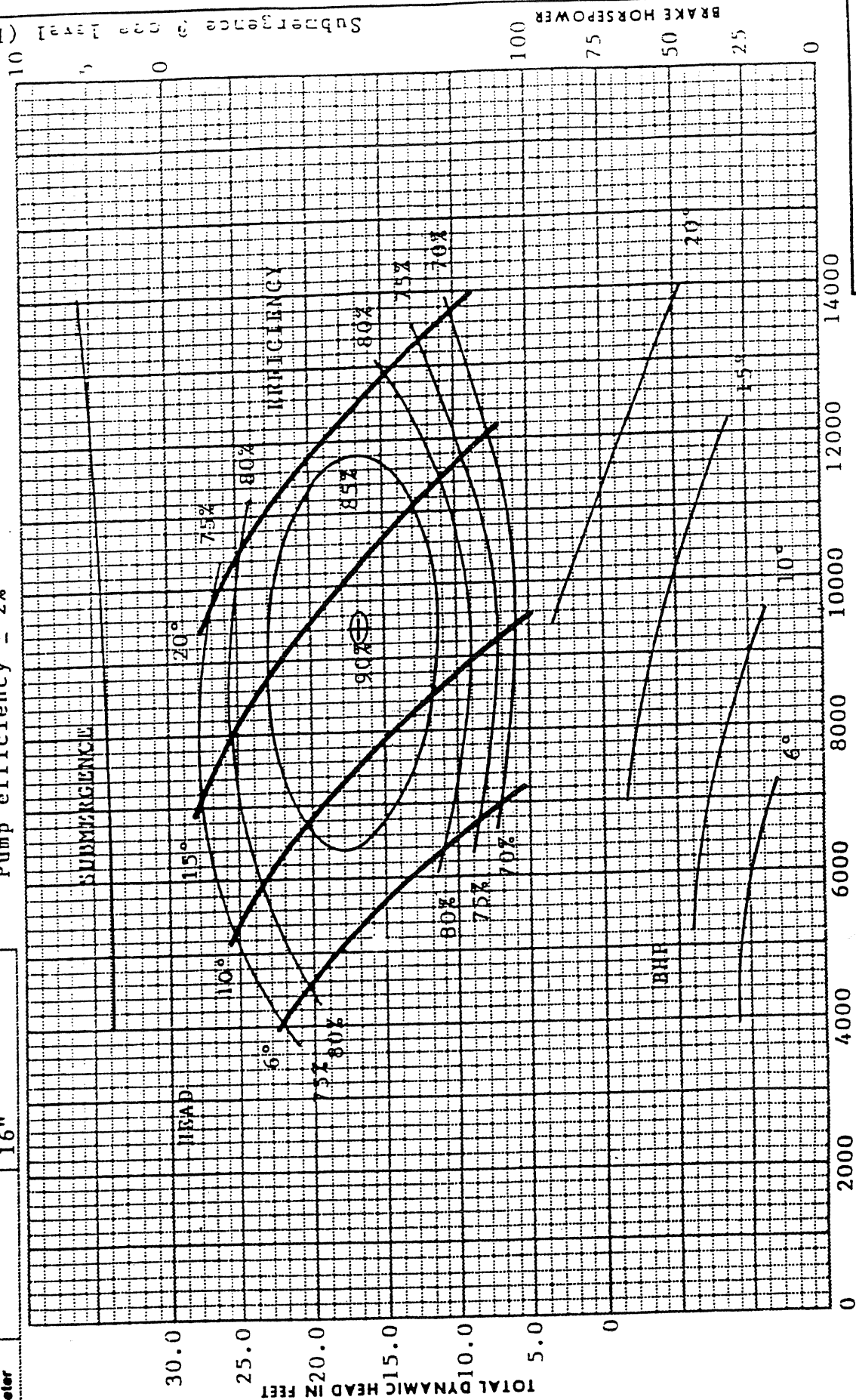


sterling 40hp 800 gpm 16" discharge
Model P16A

Bowl		Impeller
Material	C.I.	BRZ
Part. No.	H-3725	L-5718
Mach. No.	H-3725	L-5719
Diameter	16"	

Based on T-3879 Test of 1 Stage Pump.
Performance for 1 Stage Pump.

Performance shown for clear Fresh Water @ 70° F.
Submergence shown from bottom of suction bell
Pump efficiency $\pm 2\%$



CAPACITY IN U.S. GALLONS PER MINUTE

Issue Date 9/13/82

(Supersedes NEW)

Dated - -)

1170

R.P.M.

MODEL P16A

CURVE NO. C-8968

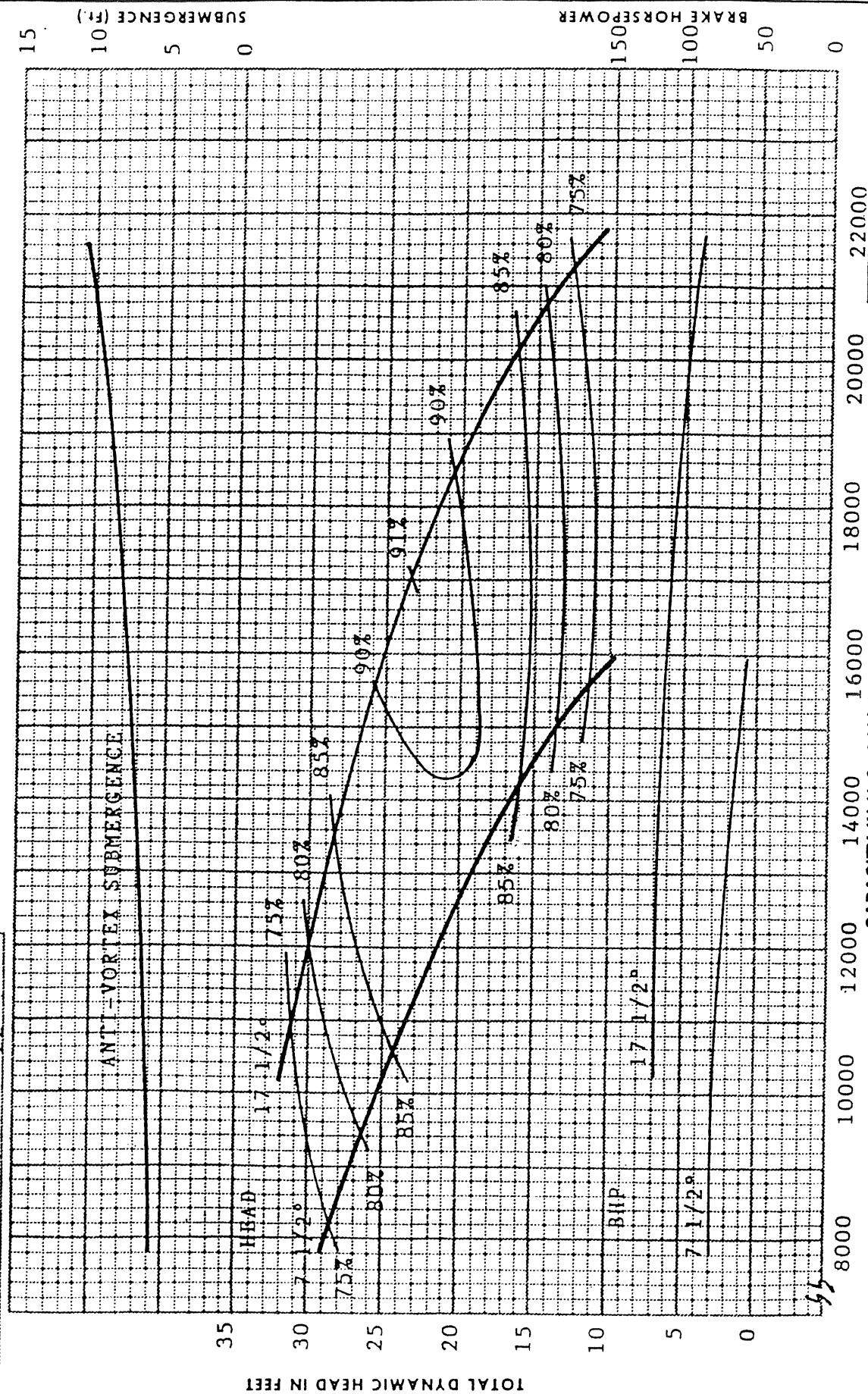
+ *Case 22-15-14P*

Model M22

BASED ON T-3795, T-3795-1 Test of 1 Stage Pump.
Performance for 1 Stage Pump.

PRIME PUMP

Material	Bowl	Impeller
C.I.		BZE.
Pat. No.	H-2695	L-5469
Mach. No.	H-2695	L-5485
Diameter		22"



C-89

Issue Date 9-1-84

CAPACITY IN U.S. GALLONS PER MINUTE

(Supersedes C-5597 L 2-20-63)

700 R.P.M.

MODEL M22

Pump Station 9
Subarea: Ryde St.

SMITH CANAL & RYDE
(STORM - PUMP STATION)

#2 (1a) U.S. MOTORS
WEST MOTOR ↑
ELECTRIC MOTOR PUMP 20 HP 3 PH 60 CYCLES
FRAME A286UPY 30% UP THRUST
TYPE RU DESIGN B CODE G
VOLTS 230 - 50 AMPS 1800 R.P.M.
460 - 25 AMPS
BEARINGS: UPPER - 1-7218BX
LOWER - 1-6210J
S.F. 1.15 SER. # H-1019803

(1b) FAIRBANKS - MORSE PUMP
STAGES 1 SIZE 8 MODEL 6360
IMP B-1431-T
SER. # K2M2037266 RPM 1770 GPM 2900

#1 (2a) U.S. MOTORS (HOLDSNAFT)
ELECTRIC MOTOR 20 HP 3 PH 60 CYCLES
FRAME A286UPY 30% UP THRUST
TYPE RU DESIGN B CODE G
VOLTS - AMPS (SEE ABOVE)
BEARINGS (SEE ABOVE)
SER. # H-1019802

(2b) FAIRBANKS - MORSE PUMP
(SEE ABOVE)
SER. # K2M2037265

FEET N.P.S.H. REQUIRED

BRAKE HORSEPOWER

② AUCTION IMPELLER

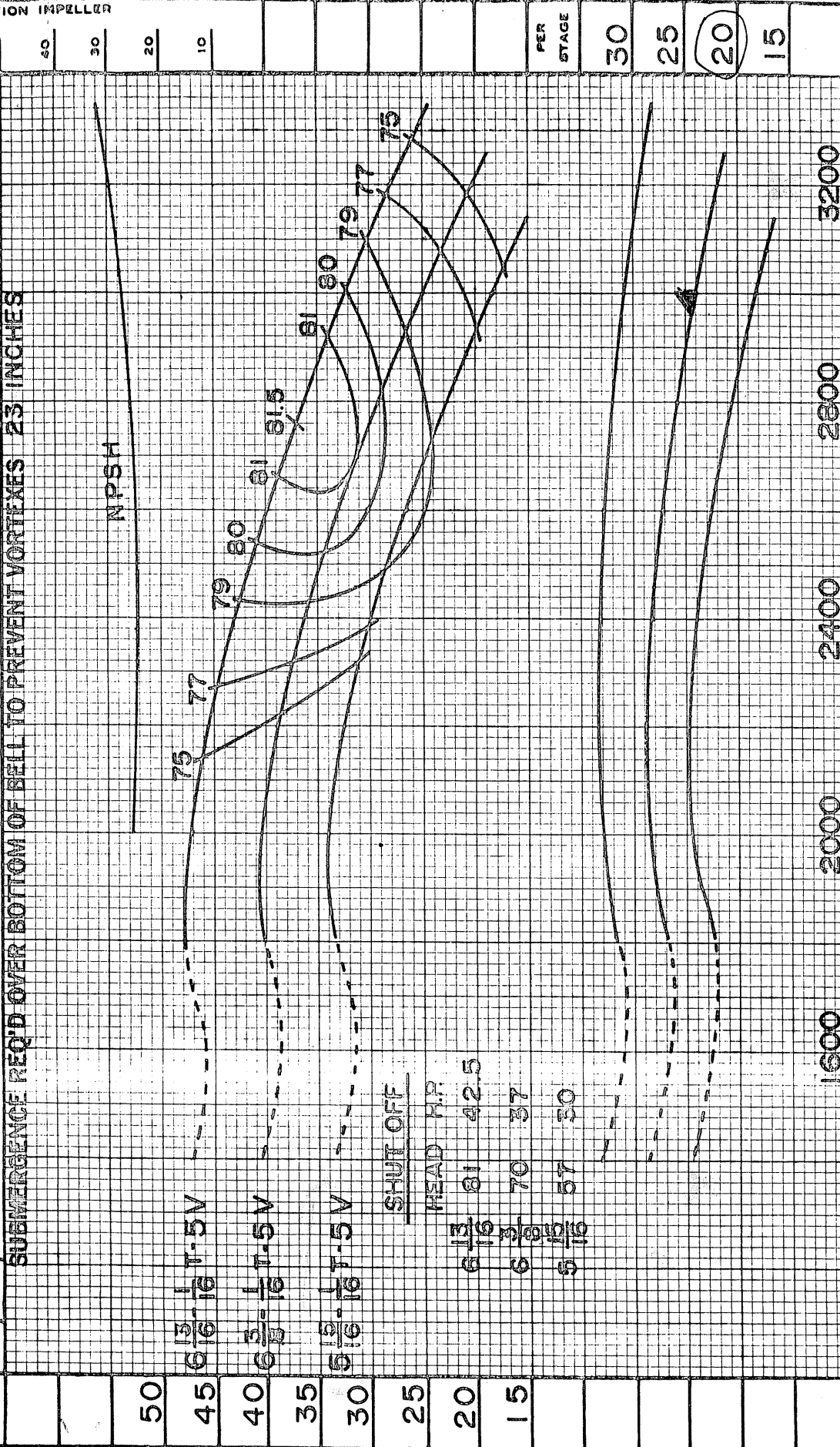
6 le St Pumps Installed New Bowls 7-82

PUMP SHAFT DIAM. **1 1/2"**

THRUST CONSTANT **21**
WR² **0.96** LB. FT²/STAGE

IMPELLER PART NO. **6774**
IMPELLER PATTERN NO. **6358**

SUBMERGENCE REQ'D OVER BOTTOM OF BELL TO PREVENT VORTEXES **23 INCHES**



PERFORMANCE BASED ON MULTISTAGE TESTS
PUMPING CLEAR COLD WATER SP. GR. 1.0
FOR 1 STAGE MULTIPLY HEAD & EFF. BY

FOR **2** STAGES MULTIPLY HD. & EFF. BY **1.0**

DATE **8-9-73**

U.S. GALLONS PER MINUTE

Johnston Pump Company
Glendora, California 91740

ESTABLISHED 1909

10MS MIXED-FLOW PUMP
IMPELLER — BRONZE
CLASS 'C' FIN.

1760 R.P.M.

BOWL — CAST IRON

CURVE SHEET NO.

EC-0831

18' head

At least 30 days prior to the designated completion date of the contract, the contractor shall submit to the Engineer for approval the proof of a complete maintenance and operations manual for the pumping plant.

At least 5 days prior to the designated completion date, the contractor shall furnish to the Engineer four (4) copies of the completed approved maintenance operations manual.

The manuals shall be hard cover loose-leaf notebook type with all inserts covered by clear plastic covering.

The manuals will include a written operation description outlining overall plant operation sequences, including initial control settings along with standard publications on all major items including wiring diagrams, dimensional drawings and performance curves. Bulletins and catalogs shall be furnished on all accessory equipment.

3.11 STORM WATER PUMPS AND MOTORS

3.11a Scope of Work

The work includes all labor, material and equipment required for the installation of a storm water pumping station for this project in strict accordance with these specifications and as shown on the applicable drawings, and shall be subject to the terms and conditions of the contract. Any incidental work not shown or specified which can be reasonable inferred or taken as belonging to the work necessary to provide the system described or shown shall be the responsibility of the contractor.

3.11b The Work Includes

- (1) Furnish and install one (1) Layne and Bowler 20P24 propellor pump, 880RPM with 60 H.P. motor.
- (2) Furnish and install one (1) Paco Lift Type QDN612-11, submersible non-clog pump system, 870RPM with 5 H.P. motor.

damage to other materials, furnishings, equipment or premises caused by such defects during this period, if, in the opinion of the Engineer, said defect is due to imperfection of material or workmanship.

3.11f Care and Cleaning

All broken, damaged or otherwise defective parts of his work shall be repaired or replaced by the contractor, at his expense, and the entire work left in a condition satisfactory to the Engineer. At completion, the contractor shall carefully clean and adjust all equipment, and trim which are installed as part of his work and the systems and equipment left in satisfactory operating condition. Piping shall be drained and flushed to remove grease and foreign matter.

All surplus materials and debris resulting from his work shall be cleaned out and removed by the contractor, as directed. This includes surplus excavated material.

3.11g Testing

The complete pumping unit shall be tested under full load conditions and all adjustments shall be made to insure proper operation. The test shall be made to insure proper operation and shall be conducted at a date after the installation has been complete and as requested by the Engineer. Said test will be requested when there is sufficient water in the system to conduct the test.

3.11h Propellor Pump

The main pump shall be a Layne and Bowler propellor pump, Model 20P24, 880 RPM, or an approved equal meeting the following performance requirements:

<u>Total Head</u>	<u>Capacity</u>	<u>Bowl Efficiency</u>	<u>Horsepower</u>
18.5 ft.	10,000gpm	80%	59
16.0 ft.	11,000gpm	84%	55
13.4 ft.	11,700gpm	84%	51

performs in accordance with the design requirements. Such tests shall be certified in writing by a Registered Civil Engineer. Passing certified test results shall be supplied the Engineer prior to installation of pumps.

The pump impeller shall be made of bronze (ASTM B62-52) and shall be fastened to the shaft in such a manner as to be removed readily. They shall be balanced statically and dynamically to reduce vibration and wear.

The shaft of the pumping unit shall be of ample size to operate without objectionable distortion or vibration at maximum speed in both the forward and reverse direction of rotation. The pump-bowl shall be made of 416 stainless steel and the line shaft shall be made of carbon or alloy steel. The shaft couplings shall be of the threaded type. Provision shall be made at the top of the motor shaft for adjusting the elevation of the impeller with reference to the bowl.

The pump shall have a main bronze bearing immediately above the impeller, and a lower bronze bearing below the impeller. The bearing below the impeller shall be grease lubricated from above the base plate.

The oil-lubricated lineshaft bearings shall be protected from water and foreign matter by the Schedule No. 80 steel enclosing tube. A shaft seal shall be provided immediately above the top propeller. By-pass ports to drain excess oil from the shaft enclosing tube shall be provided above the seal. All bearings shall be easily replaceable, and spaced not more than five (5) feet apart.

The pump shall be oil-lubricated and equipped with a solenoid operated lubricating system which shall supply lubricant to each lineshaft bearing. The solenoid operated oiler shall be designed for outdoor operation and shall have a metal oil reservoir with a capacity of not

3.11k Control Panel

See Electrical, plans and specifications, for full operational and equipment requirements.

3.12 PUMP DISCHARGE PIPES

3.12a Sump Pump Pipe

Sump pump discharge pipe shall be cement lined ductile iron pipe with threaded companion flanges in accordance with AWWA C115. Fittings shall be flanged, AWWA C110. Swing check shall be designed for sewage flows.

3.12b Storm Pump Discharge Pipe

Pump discharge piping shall be welded steel pipe, coated in conformance with AWWA C203, coal tar enamel coated with 15 pound felt and Kraft paper outside. The twenty-four (24) inch diameter pipe shall be one-quarter (1/4) inch, minimum, thick steel pipe.

All bends shall be shop fabricated to AWWA standards prior to coating and wrapping. Pipe sections shall be made up in longest units possible to hold field welding to a minimum.

Fieldwelds on discharge pipe shall not exceed five (5). Field repair of coating and wrapping shall meet or exceed original.

3.12c Siphon Breaker

Siphon breaker shall be Harris size C-7 as manufactured by Sacramento Pipe Works or an approved equal.

3.12d Cut Off Wall

Cut off wall shall be standard size, clamp type, steel, 12 gauge minimum, and soil proofed.

3.12e Riprap

Levee protection material shall be Light Class conforming to Section 72 of the Standard Specifications and placed on prepared slope area by Method B.

**AURORA PUMP**

A UNIT OF GENERAL SIGNAL

800 AIRPORT ROAD • NORTH AURORA, ILLINOIS • 60542

NO. OF PRINTS

FOR APPROVAL

FINAL

FILES OFFICE: SAN FRANCISCO PO # _____
FACTORY ORDER NUMBER: 825-71794
JOB: CITY OF STOCKTON RYDE AVE PUMP STATION
SERVICE: STORM WATER
ENGINEER: DPW STOCKTON
CONTRACTOR: WAYNE FRECIEN
SOLD TO: — " — PO # 7/18/85 LTR
REFERENCE: _____

PUMP

1 NUMBER OF UNITS 20P2A SIZE SEE CURVE GPM 11,000 GPM TDH 880 RPM
17442A DISCHARGE HEAD COMPANION FLANGE SEPARATE 1" BASEPLATE 120 SOL. OILER VOLTAGE
24" COLUMN ☐ THREAD ☐ FLANGE 2 1/2" TUBE 1 1/2" SHAFT
20P BOWL ASSEMBLY SINGLE NUMBER OF STAGES — ☐ CONE ☐ BASKET STRAINER

MOTOR

60 HP. 3 PHASE 60 HERTZ 460 VOLTS 900 RPM AAATP FRAME
☒ AURORA ☒ WP1 ☒ VHS ☐ VSS
☐ OTHERS ☐ TEFC U.S. MOTORS MANUFACTURER
☐ EXPLOSION PROOF

NOTE: MOTOR NOT MOUNTED
AT FACTORY ON
VERTICAL UNITS.

GEAR DRIVE

N.A. MFR. _____ SIZE _____ RATIO _____ ROTATION _____
FURNISHED BY: ☐ AURORA ☐ OTHERS

SPECIAL REQUIREMENTS

PUMP: BRONZE BOWL LINER GRAVURIZED GREASE LINE TO LOWER BEARING OVERSIZE BASEPLATE 63" X 38" X 1 1/4" CERTIFIED FACTORY PERFORMANCE TEST TWO (2) COATS BITUMASTIC COATING
ELECTRICAL: _____

CERTIFIED PRINT:

SECTION: 1160 PAGE: 308-9 CURVE NUMBER: 35PC-120092

CURVE SHOWS THE GENERAL SHAPE OF PUMP CHARACTERISTIC, BUT GUARANTEE COVERS ONLY GPM AND HEAD INDICATED. (1) REVISED 7/1/85

THIS ORDER WILL NOT BE PROCESSED FOR MANUFACTURING UNTIL APPROVAL IS RECEIVED.
PRINTS ARE NOT TO SCALE AND ARE CERTIFIED CORRECT ONLY FOR THIS ORDER. ALL
ORDERS SUBJECT TO ACCEPTANCE AT AURORA PUMP, CITY OF INDUSTRY, CALIF.

THIS ORDER CAN BE RELEASED FOR MANUFACTURING AS SHOWN: ☐

RELEASE FOR MANUFACTURING PER ATTACHED CHANGE ORDER: ☐

AUTHORITY: _____

OFFICE: _____

DATE: _____

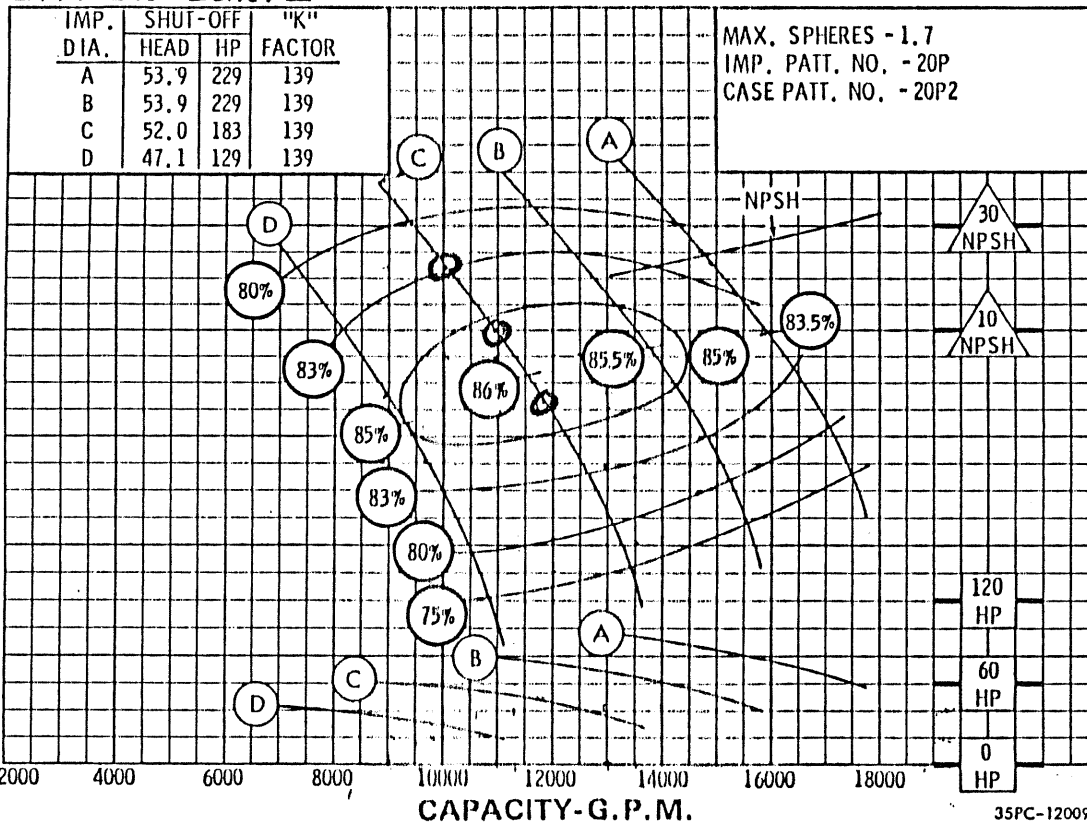
20P SERIES 1160

PROPELLER

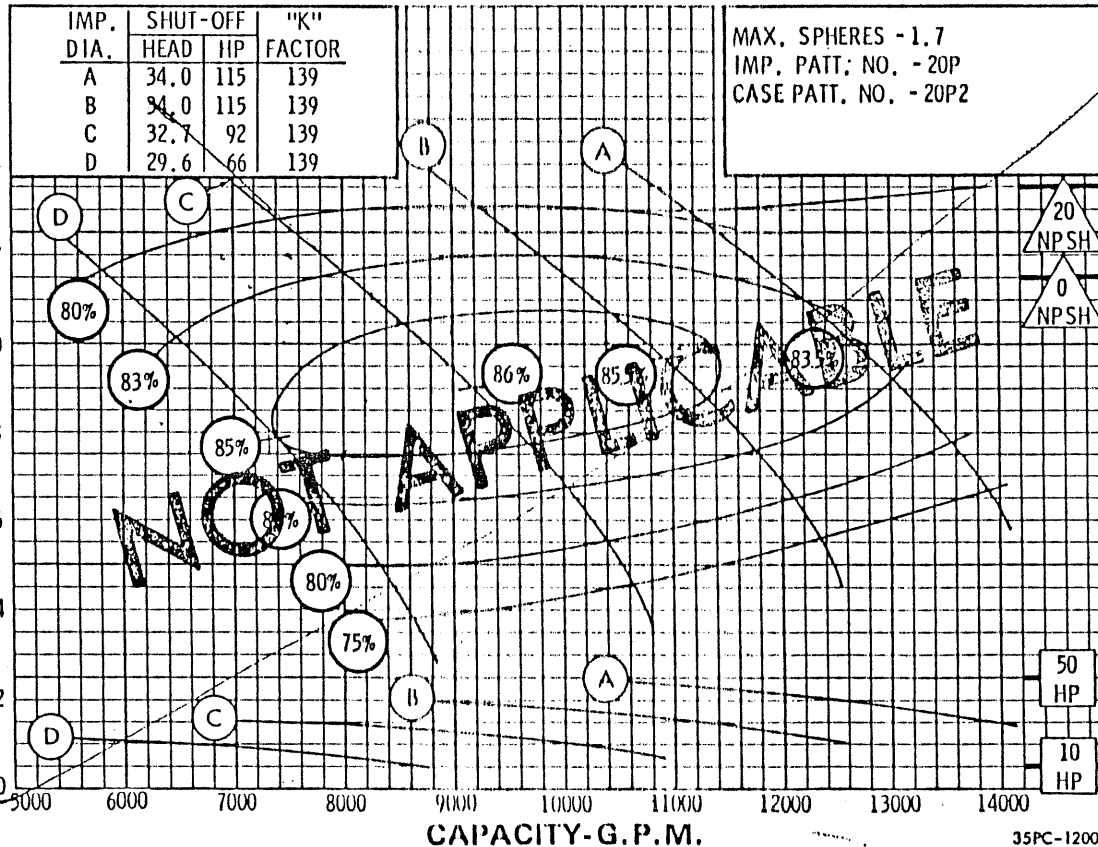
SECTION 1160 PAGE 507
DATED DECEMBER 1981
SUPERSEDES PAGE 507
DATED NOVEMBER 1972

SPEED CURVE

TOTAL DYNAMIC HEAD-FEET



TOTAL DYNAMIC HEAD-FEET



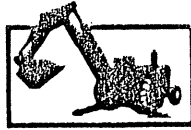
PROPELLER PUMP DIMENSIONS 20P THRU 42P

DATED FEBRUARY 1985
SUPERSEDES PAGE 309
DATED FEBRUARY 1974

- ① FLANGES, WHEN FURNISHED, WILL BE DRILLED TO 150 LB. ASA STANDARDS, FLAT FACE, HOLES STRADDLE Q₂ THICKNESS AS SHOWN IN CHART, UNLESS OTHERWISE SPECIFIED.
- ② INCREASE "D" BY 2" FOR FLOOR OPENING CLEARANCE WHEN USING STRAINER.
- ③ MINIMUM SUBMERGENCE TO AVOID EXCESSIVE VORTEX FORMATION WHEN PUMPING CONTINUOUSLY. SUBMERGENCE MAY BE REDUCED FOR INTERMITTENT OPERATION. NPSH REQUIREMENTS, AS SHOWN ON PUMP PERFORMANCE CURVE, MUST ALSO BE SATISFIED.
- ④ INCREASE 50% IF STRAINER IS USED.
- ⑤ DIMENSION "E" SHOWN IS FOR GIVEN SIZE TOP BOWL FLANGE. WHEN INTERMEDIATE LENGTH OF COLUMN PIPE IS FURNISHED, FLANGE O.D. IS SAME AS CORRESPONDING BOWL SIZE. EXAMPLE - 10P BOWL WITH 12" INTERMEDIATE COLUMN, FLANGE DIAMETER IS 16" O.D. CHECK FLOOR OPENING FOR LARGEST DIAMETER FLANGE CLEARANCE.

DISCHARGE FLANGE DATA				
SIZE	O.D.	B.C.	NO. AND SIZE BOLTS	FLANGE THICKNESS
20	27-1/4	25	20-1-1/8	7/8
24	32	29-1/2	20-1-1/4	1-1/8
30	38-3/4	30	28-1-1/4	1-1/8
36	40	42-3/4	32-1-1/2	1-1/8
42	53	49-1/2	36-1-1/2	1-1/8
48	59-1/2	56	44-1-1/2	1-3/8
54	66-1/4	62-3/4	44-1-3/4	1-3/8

MODEL NO.		OF ABOVE BASE	K	L	M	N	P & Q	S	T	X	Y	STRAINER LENGTH
AURORA PUMP	VERTI-LINE	MIN.	STD.					③			④	
	20P20	40	0	19	20	1	00	50		12	17	20
	20P24	54	20	21	18	1-1/4	38	50		12	17	20
	24P24	64	0	41	10	1-1/4	00	62		14	21	21
	24P30	64	30	23	20	1-1/4	44	62		14	21	21
	24P36	73	40	25	24	1-1/4	50	62		14	21	21
	30P30	64	0	23	20	1-1/4	44	76		18	26	26
	30P36	73	30	25	24	1-1/4	50	76		18	26	26
	30P42	81	48	27	30	1-1/4	54	76		18	26	26
	36P36	73	0	25	24	1-1/4	50	92		22	31	30
	36P42	81	30	27	30	1-1/4	54	92		22	31	30
	36P48	90	48	30	36	1-1/2	64	92		22	31	30
	42P42	81	0	27	30	1-1/4	54	106		25	36	35
	42P48	90	30	30	36	1-1/2	64	106		25	36	35
	42P54	99	48	32	42	1-1/2	74	106		25	36	35



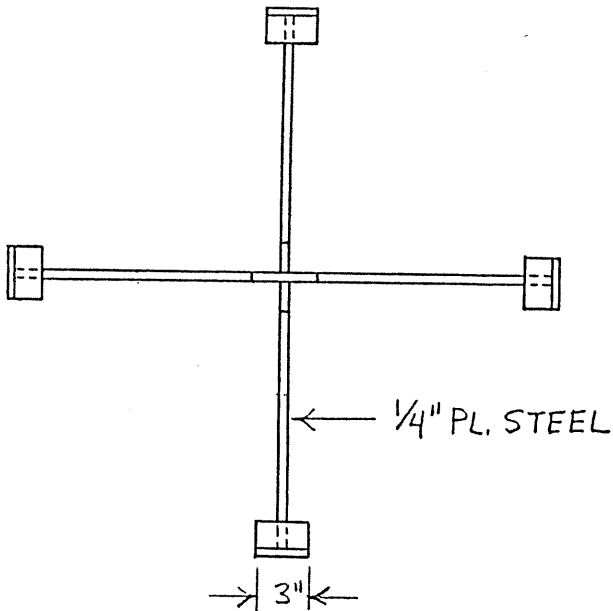
Wayne Fregien

GENERAL ENGINEERING CONTRACTOR

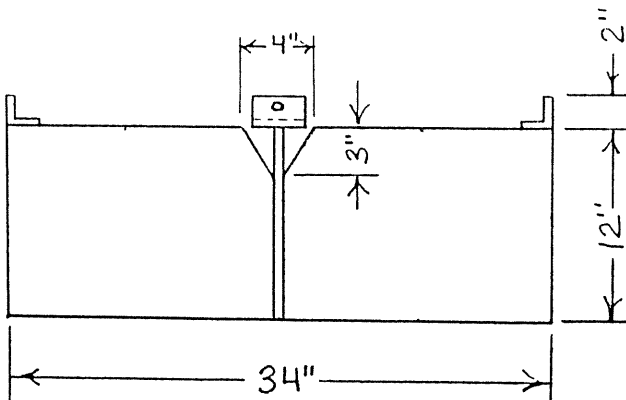
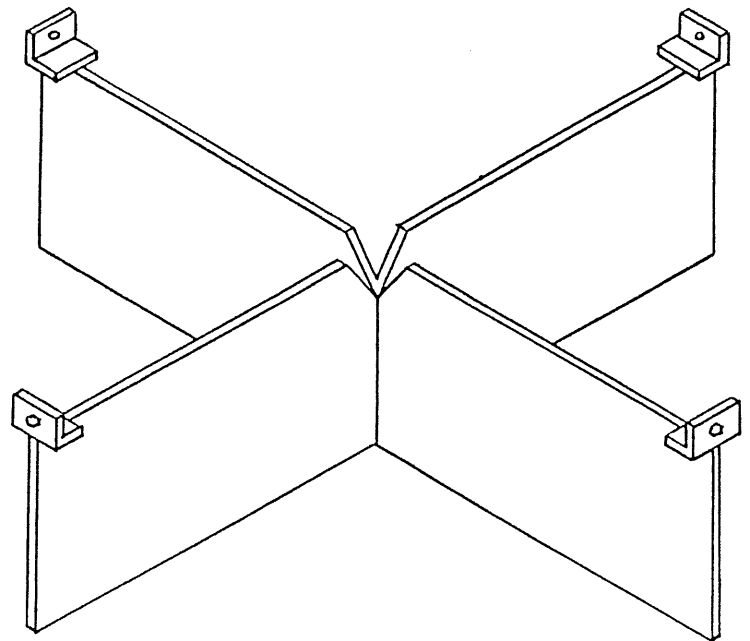
STATE LICENSE NO. 283812

3940 WILCOX ROAD - STOCKTON, CALIFORNIA 95205 - (209) 931-2154

PUMP. BAFFLE PLATE
Ryder-Sutton Canal Pump Sta

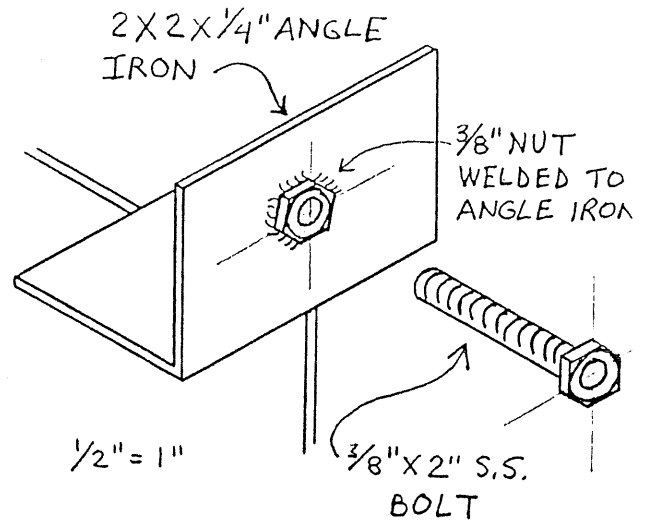


TOP VIEW

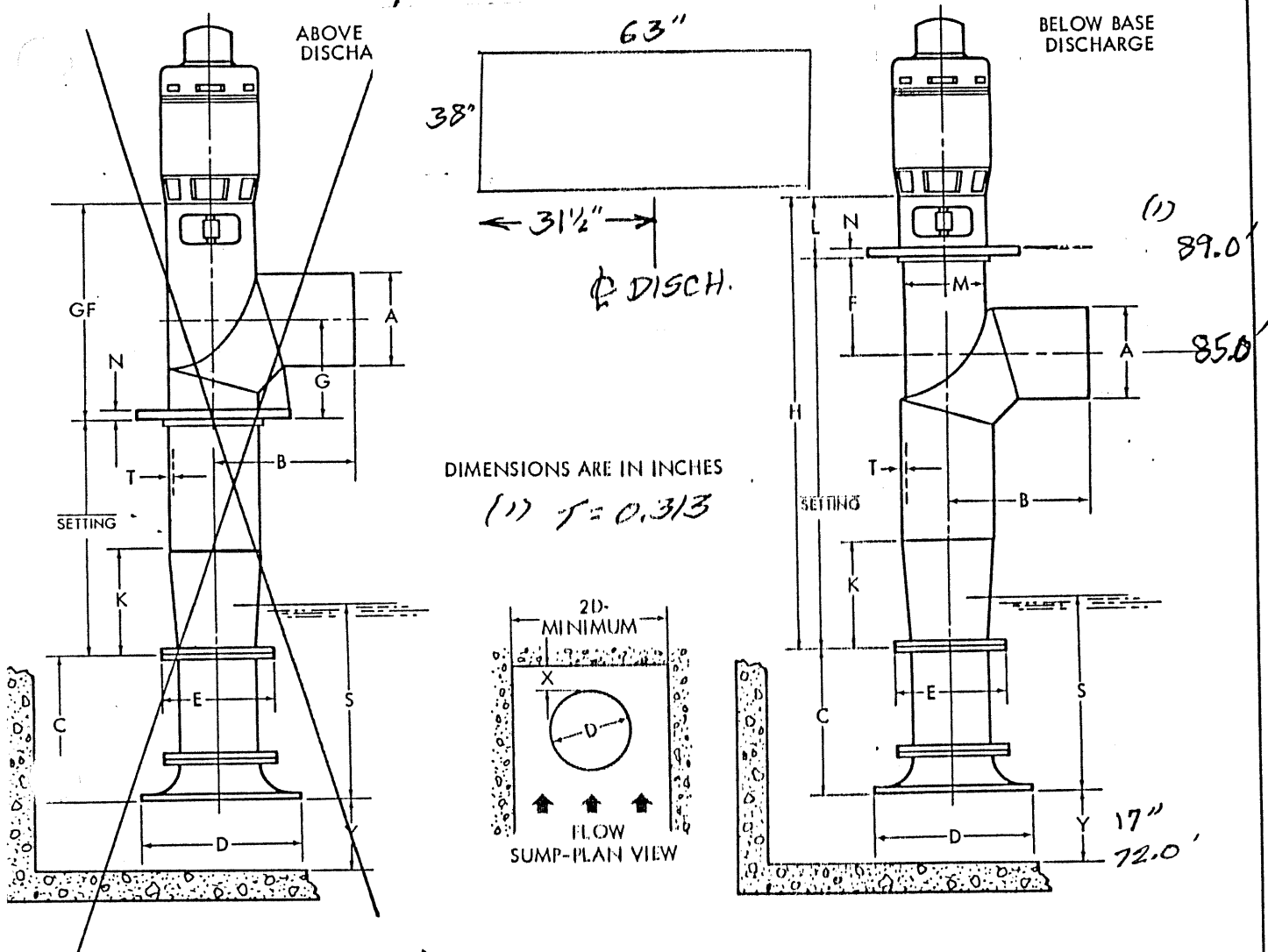


SIDE VIEW

1" = 1"



Veri-Line ENGINEERING DATA **PROPELLER PUMP DIMENSIONS** **20P THRU 42P**



MODEL NO.		A	B		C		D	E	F	G	H	
AURORA PUMP	VERTI-LINE	ELL O.D.	①		ONE STAGE	TWO STAGE	②	⑤	BELOW BASE MIN.	STD. MIN.	BELOW BASE	
			PLAIN	FLGD.							MIN.	
	20P20	20	26	28	31	60-1/8	34	23-5/8	10	20	60	
	20P24	24	28	31	31	60-1/2	34	23-5/8	10	21	83	
	24P24	24	28	31	37	60-1/8	41	28-1/2	20	21	65	
	24P30	30	34	30	37	60-1/8	41	28-1/2	24	26	104	
	24P36	36	38	34	37	60-1/8	41	28-1/2	28	31	133	
	30P30	30	34	30	47	70-1/2	51-1/2	34-1/2	24	26	76	
	30P36	36	38	34	47	70-1/2	51-1/2	34-1/2	28	31	115	
	30P42	42	44	40	47	70-1/2	51-1/2	34-1/2	32	35	144	
	36P36	36	38	34	56	81-3/8	61	40-1/2	28	31	87	
	36P42	42	44	40	56	81-3/8	61	40-1/2	32	35	126	
	36P48	48	48	44	56	81-3/8	61	40-1/2	36	40	156	
	42P42	42	44	40	64	104	71	47-1/4	32	35	99	
	42P48	48	48	44	64	104	71	47-1/4	36	40	138	
	42P54	54	56	50	64	104	71	47-1/4	42	45	168	

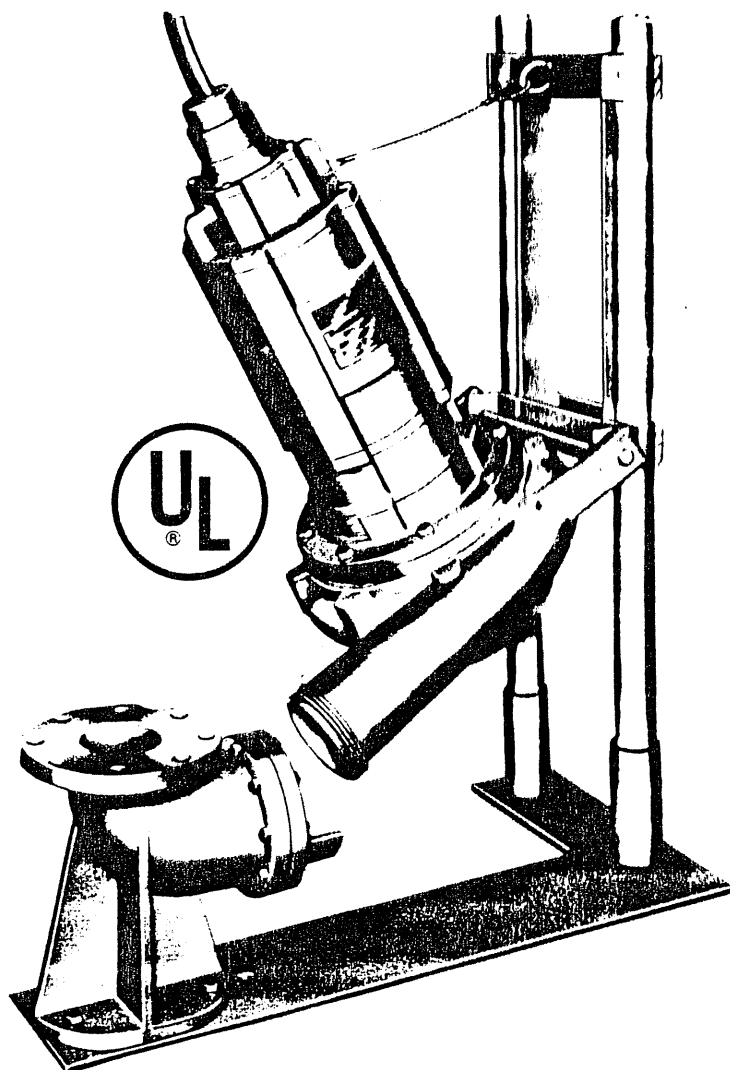
PACO LIFT[®]
TYPE QDN—FOR HAZARDOUS LOCATIONS

**PACO
PUMPS**

SUBMERSIBLE NON-CLOG PUMP SYSTEMS

Meets OSHA and EPA requirements for sewage and wet well
Class 1, Group D, Division 1 service.

Capacities to 2200 GPM. heads to 150 feet. 4- & 6-inch discharge sizes.



Job: RYDE AVE. P.S.
ADD'N., STOCKTON

Engineer: _____

Contractor: WAYNE FREGIE

OPERATING DATA

Pump Symbol: _____

Service: SUMP PUMP

Paco Model No. 58-61215

Pump Size 6"

Duty: 1200 GPM 8' TDE

Motor: 5 HP 870 RPM

3 Phase 60 Hertz

460 Volt EXPL-PRF Enclosure

Construction

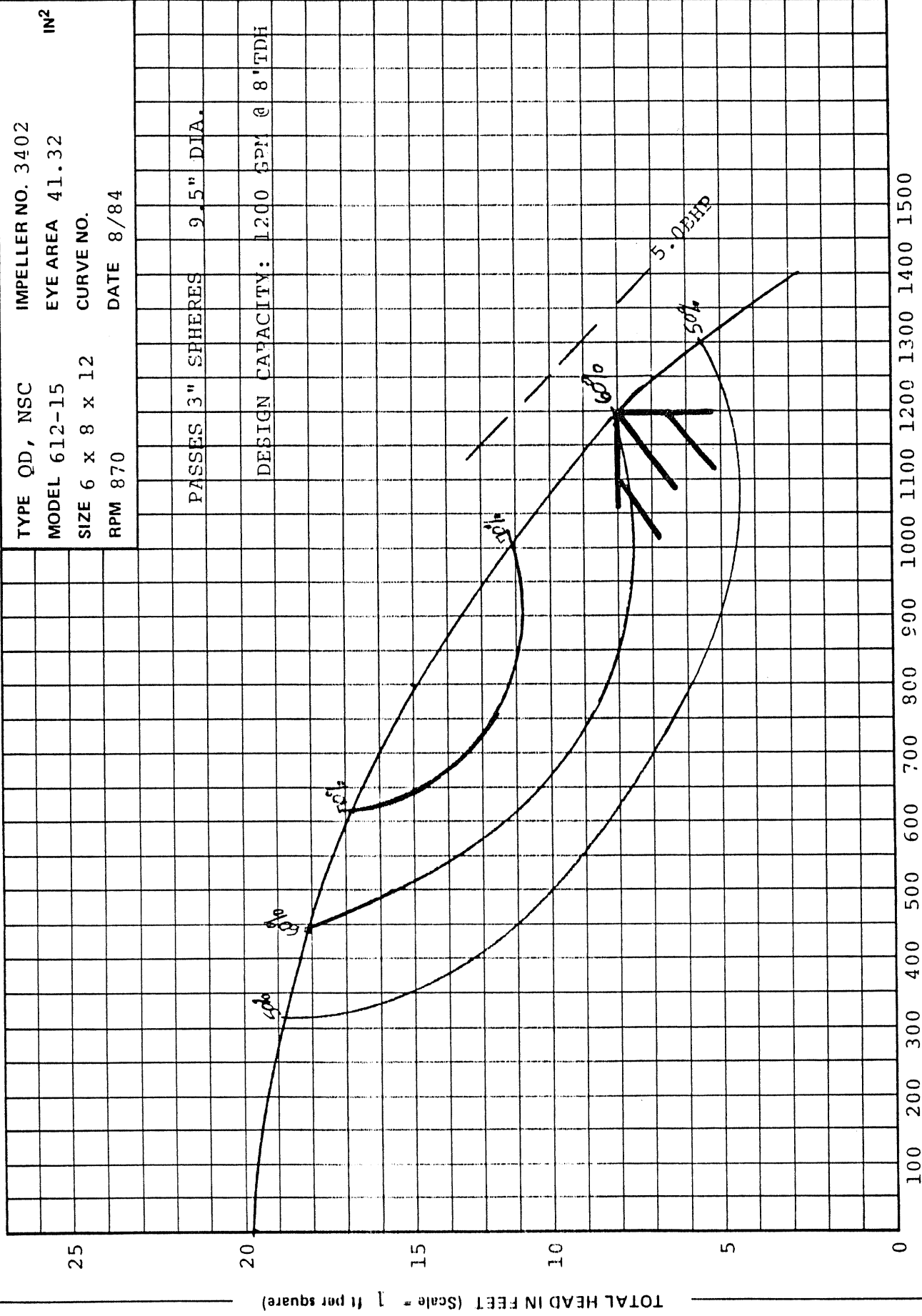
Specifications

Motor Housing	Cast Iron	Base Plate	Steel
Volute Casing	Cast Iron	Discharge Elbow	Cast Iron
Impeller	Cast Iron	Discharge Guide Bracket	Nonsparking Bronze
Shaft	Stainless Steel	Rail Guides	Nonsparking Bronze
Impeller Screw & Washer	Stainless Steel	Lift & Support Cables	Stainless Steel
Mechanical Seals	Carbon/Ceramic Faces S/S Spring & Fittings	O-Ring Seal	Neoprene

M³/HR

TYPE QD, NSC	IMPELLER NO. 3402	IN ²
MODEL 612-15	EYE AREA 41.32	
SIZE 6 x 8 x 12	CURVE NO.	
RPM 870	DATE 8/84	

PASSES 3" SPHERES	9.5" DIA.
DESIGN CAPACITY: 1200 GPM @ 8"TDH	



U.S. GALLONS PER MINUTE (Scale = 50 GPM per square)

A Division of Baltimore Aircoil Company, Inc.
a Merck and Co., Inc., Subsidiary
PO Box 12924 • 845 92nd Avenue
Oakland, California 94604

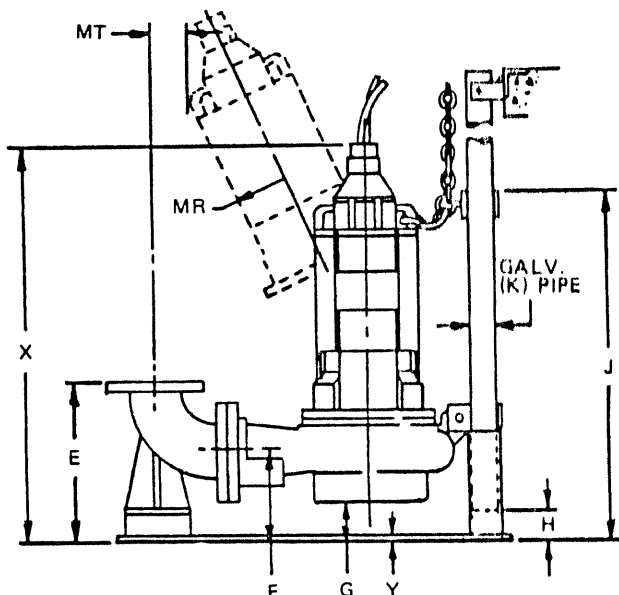
PACO
PUMPS



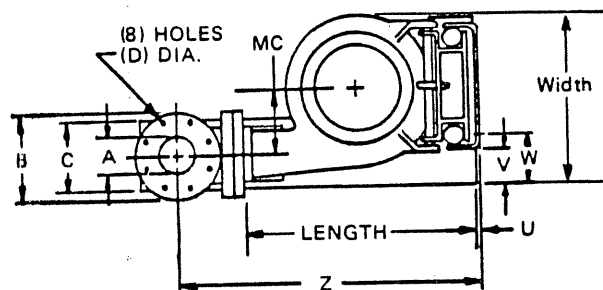
PACO LIFT® SUBMERSIBLE NON-CLOG PUMPS TYPE QDN—FOR HAZARDOUS LOCATIONS

D5c.1N

PUMP DIMENSIONS



REF: ID-19228-1



ALL DIMENSIONS IN INCHES

- Galvanized pipe to be supplied by customer
- *495 Vortex has rectangular base plate, all other QD base plates are "L" shaped.

Pump Model No.	DIMENSIONS															
	A	B	C	D	E	F	G	H	J	U	V	W	Y	Z	MC	K
470	4	9	7-1/2	3/4	14-1/2	8	3-7/8	2-1/4	31-1/2	3/4	2-9/16	5-5/16	1/2	29-3/4	6	2
480	4	9	7-1/2	3/4	14-1/2	8	4-1/4	2-1/4	31-3/4	1/4	3-3/4	6-1/2	1/2	33-5/16	7	2
495	4	9	7-1/2	3/4	14-1/2	8	3-1/2	2-1/4	31-3/4	1/4	3-3/4	6-1/2	1/2	33-5/16	7	2
495 Vortex	4	9	18**	3/4	18-1/4	11-3/4	5	2-3/4	43	3/4	1/16	3	3/4	41-3/16	0	2-1/2
412	4	9	7	3/4	17	10-1/2	4-1/4	5	40-3/4	1/4	3-7/16	6-1/2	3	40-7/16	9	2-1/2
415	4	9	7	3/4	17	10-1/2	3-5/8	5	41-5/8	1/4	4-11/16	7-3/4	3	40-7/16	10-1/4	2-1/2
612	6	11	8	7/8	20	12	5	4-1/2	43-3/8	1/4	4-7/16	7-1/2	2-1/2	44-3/8	9-1/2	2-1/2

Pump Model	OVERALL CLEARANCE DIMENSIONS					DIMENSIONS											
	LENGTH		WIDTH		MOTOR FRAME SIZE												
	Motor Vertical	Motor Tilted		Simplex	Duplex	140 TY			180 TY			210 TY			250 TY		
		@ Motor C	@ Nozzle C			X	MT	MR	X	MT	MR	X	MT	MR	X	MT	MR
470	22-3/4	Z Minus MT	21	15-1/4	31-3/4	35	9-1/4	4	36	8-1/2	4-7/8	42	7	5-3/4	—	—	—
480	26-3/8		24-5/8	16-1/2	34-1/2	35	12-1/2	4	36	11-3/4	4-7/8	42	10-1/2	5-3/4	—	—	—
495	26-3/8		24-5/8	17-3/8	35-3/8	—	—	—	35	11-1/4	4-7/8	42	9-3/4	5-3/4	—	—	—
495 Vortex	35		33-1/4	19-1/4	39-3/8	—	—	—	41	16-3/4	4-7/8	47	18-1/2	5-3/4	53	17-3/4	6-3/8
412	33-1/2		31-3/4	23-3/8	46-3/8	—	—	—	—	—	—	43	15-1/4	5-3/4	50	14	6-3/8
415	33-1/2		31-3/4	25-5/8	49-5/8	—	—	—	—	—	—	—	—	—	51	14-1/4	6-3/8
612	35-1/2		33-3/4	26-1/8	50	—	—	—	—	—	—	47	20-3/4	5-3/4	53	19-3/4	6-3/8

NOTE:

- Check clearance dimensions to insure that pump
- 1) Clears discharge piping while in tilted position
 - 2) Clears door opening while in vertical position

NOTE:

In the interest of product improvement, dimensions are subject to change without notice.



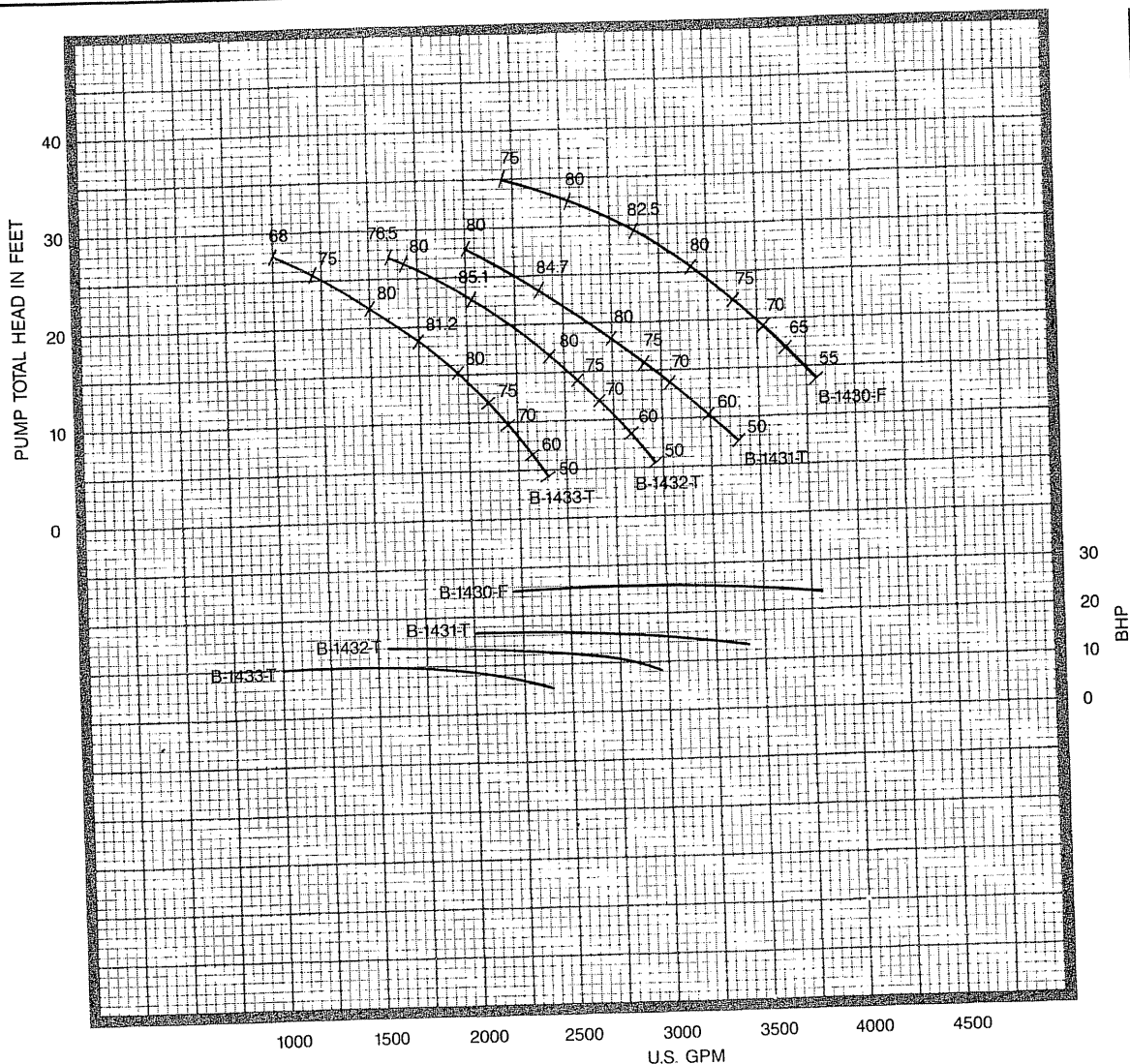
Paco Pumps, a division of Baltimore Aircoil Co., Inc.
PO Box 12924, 845 92nd Avenue
Oakland, California 94604

Paco Pumps of Canada
a division of Baltimore Aircoil InterAmerican Corp.
35 Sinclair Ave., Georgetown, Ontario, Canada

Plant Locations: Oakland, CA • Dallas, TX • Los Angeles, CA • Portland, OH • Milford, DE • Georgetown, Canada

8000 PROPELLER PUMPS PUMP PERFORMANCE

349



10"
8312
1770
RPM
1
STAGE

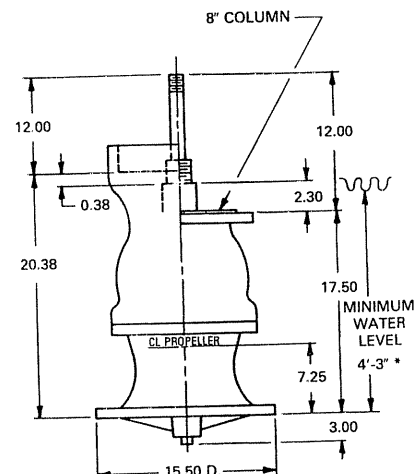
10"
COLUMN
10"
CAST IRON
ELBOW

1"
LINESHAFT
1-1/2"
ENCLOSING
TUBE

DATA	VALUE
PUMP SHAFT DIAMETER	1.1875 IN.
MAXIMUM SPHERE SIZE	1.5 IN.
K _t (THRUST FACTOR)	20 LBS./FT.
K _a (TOTAL ROTOR WEIGHT)	17 LBS.
K _s (SETTING CONSTANT)	2.8 LBS./FT.
WK ²	1.1 LBS.-FT. ²
BOWL ASSEMBLY WEIGHT	265 LBS.
EYE AREA: PROPELLER NO. B-1430-F	41.0 SQ. IN. 4 VANE
PROPELLER NO. B-1431-T	41.0 SQ. IN. 3 VANE
PROPELLER NO. B-1432-T	41.0 SQ. IN. 3 VANE
PROPELLER NO. B-1433-T	41.0 SQ. IN. 3 VANE
PROPELLER NO.	
PROPELLER NO.	

HYDRAULIC PERFORMANCE IS CONTINGENT ON FURNISHING THE PUMP WITH SPECIFIED AMOUNT OF CLEAR, FRESH, NON-AERATED WATER NOT TO EXCEED 85° F.

PUMP PERFORMANCE SHOWN IS BOWL ASSEMBLY WITH 10 FEET OF COLUMN INCLUDING A STANDARD ABOVE GROUND DISCHARGE ELBOW. ADDITIONAL COLUMN LOSSES SHOULD BE ADDED WHEN SETTINGS ARE DEEPER THAN 10 FEET AND/OR FOR OTHER DISCHARGE ARRANGEMENTS.



*This value is the minimum submergence required to prevent vortexing only. This value may need to be increased to provide adequate NPSHA.

Appendix D, Hydrologic Analysis

The hydrographs for the 100-year storm event are derived from the Depth-Frequency relationships provided in the San Joaquin County Hydrology Manual.

The hydrological analysis was performed utilizing Hydraflow Hydrographs 2008 software by Autodesk.

Subarea
Buena Vista North

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

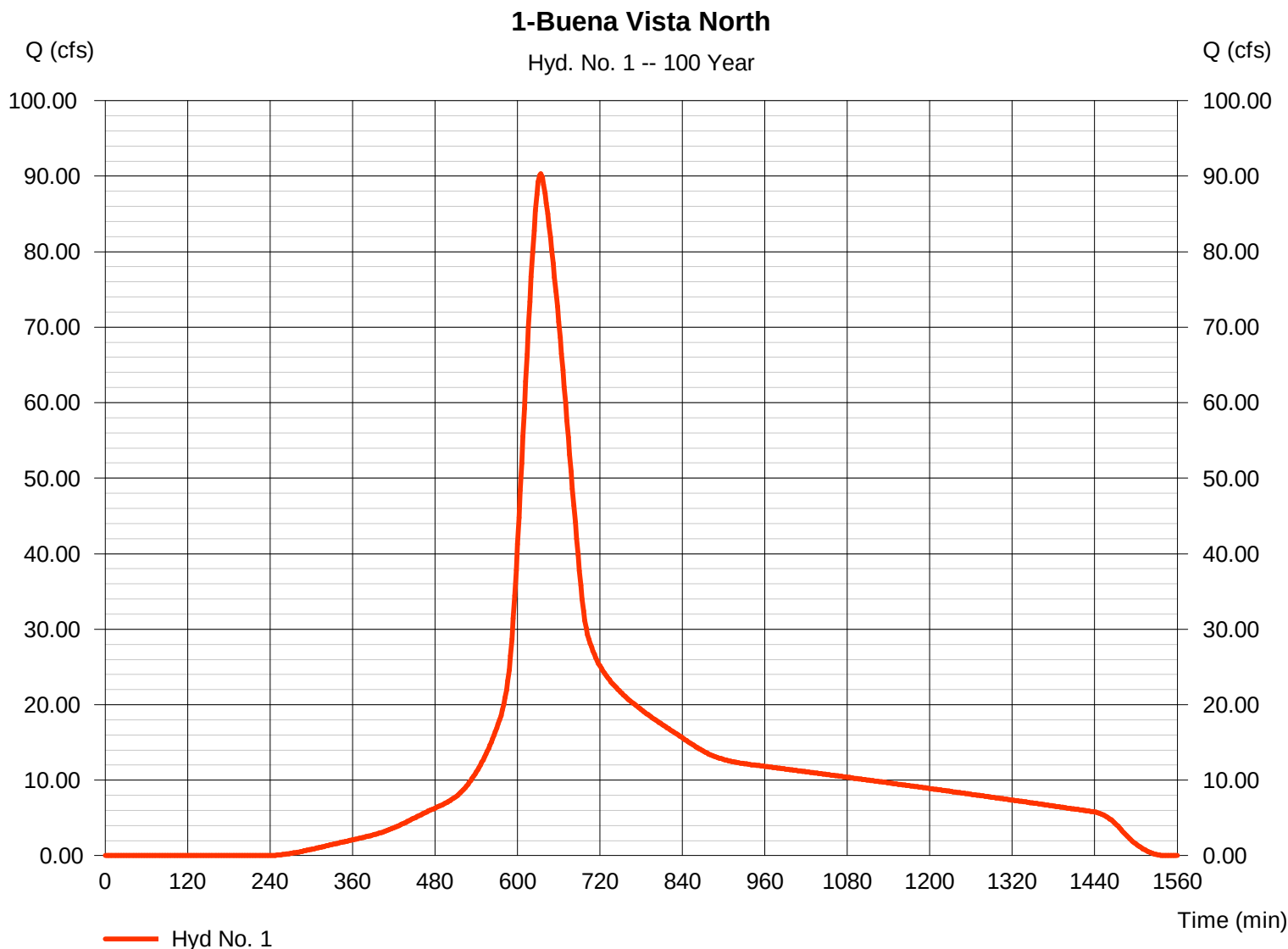
Tuesday, Jun 9, 2009

Hyd. No. 1

1-Buena Vista North

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 121.600 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 90.30 cfs
Time to peak = 634 min
Hyd. volume = 24.376 acft
Curve number = 89.6
Hydraulic length = 3950 ft
Time of conc. (Tc) = 65.80 min
Distribution = Type I
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

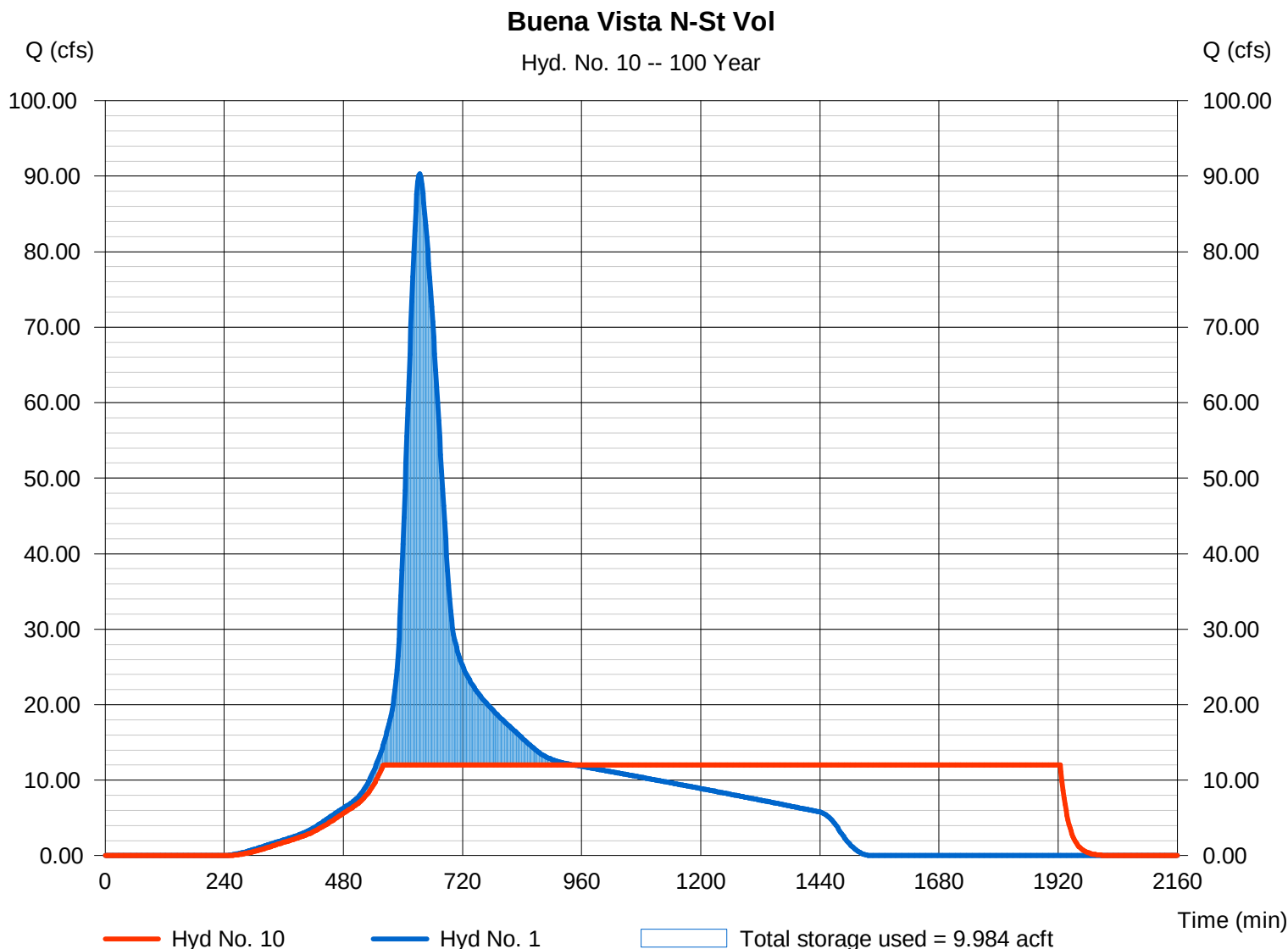
Hyd. No. 10

Buena Vista N-St Vol

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 1 - 1-Buena Vista North
Reservoir name = PS-Buena Vista

Peak discharge = 12.00 cfs
Time to peak = 562 min
Hyd. volume = 24.376 acft
Max. Elevation = 6.11 ft
Max. Storage = 9.984 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Pond No. 1 - PS-Buena Vista

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 4.90 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	4.90	95,832	0.000	0.000
0.10	5.00	139,392	0.270	0.270
0.20	5.10	182,952	0.370	0.640
0.30	5.20	226,512	0.470	1.110
0.40	5.30	270,072	0.570	1.680
0.50	5.40	313,632	0.670	2.350
0.60	5.50	357,192	0.770	3.120
0.70	5.60	400,756	0.870	3.990
0.80	5.70	444,312	0.970	4.960
0.90	5.80	487,872	1.070	6.030
1.00	5.90	531,432	1.170	7.200
1.10	6.00	574,992	1.270	8.470
1.20	6.10	618,552	1.370	9.840
1.30	6.20	662,112	1.470	11.310
1.40	6.30	705,672	1.570	12.880
1.50	6.40	749,232	1.670	14.550
1.60	6.50	792,792	1.770	16.320

Culvert / Orifice Structures

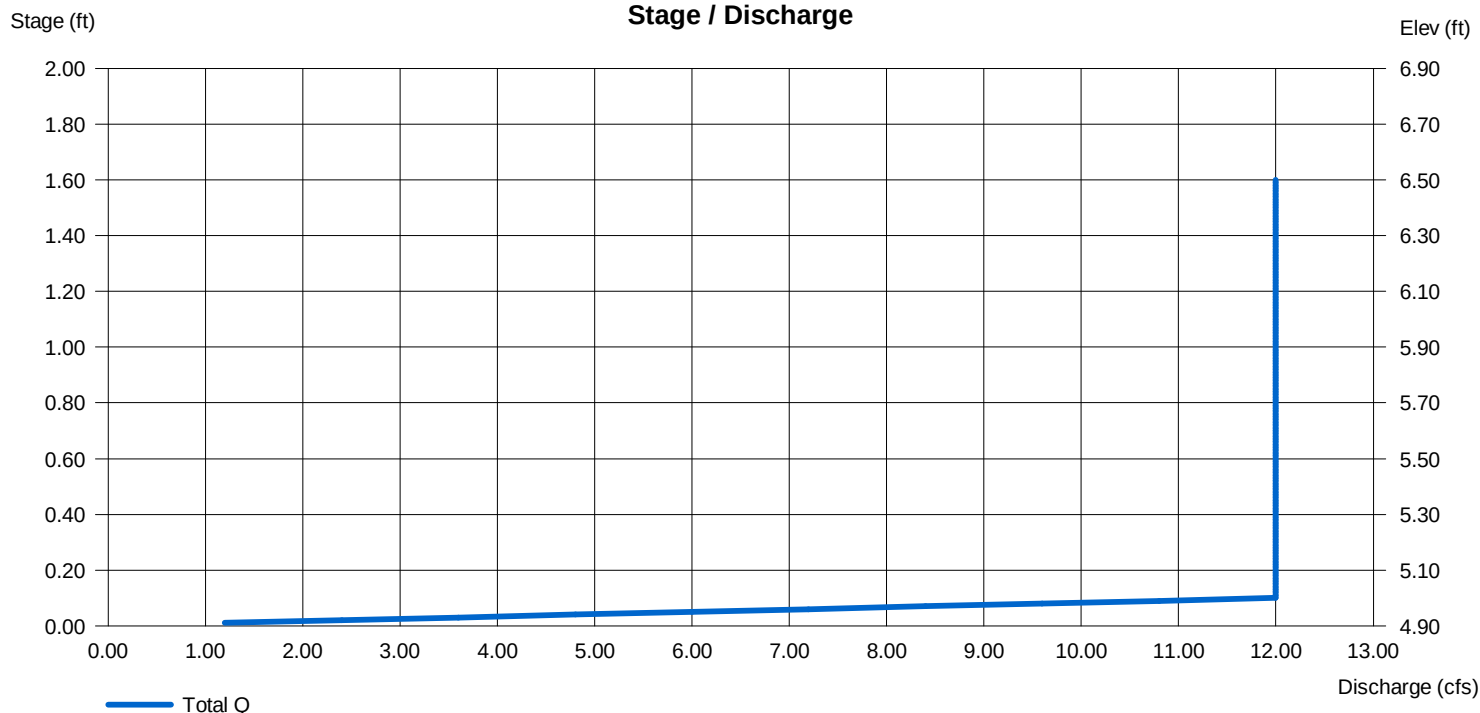
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge



**Subarea
Lake Dr.**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

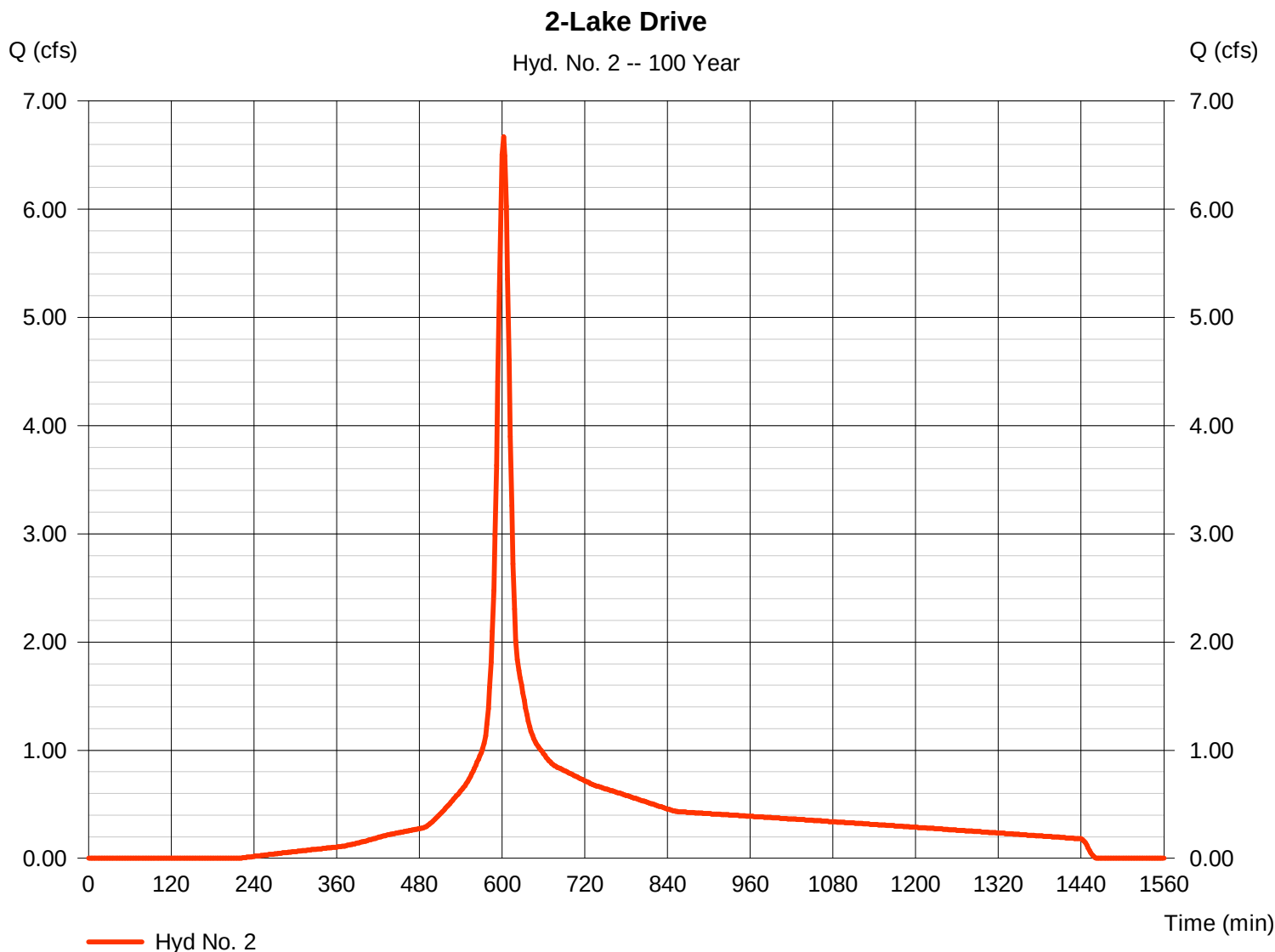
Tuesday, Jun 9, 2009

Hyd. No. 2

2-Lake Drive

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 4.200 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 6.669 cfs
Time to peak = 602 min
Hyd. volume = 0.842 acft
Curve number = 90.1
Hydraulic length = 925 ft
Time of conc. (Tc) = 15.40 min
Distribution = Type I
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

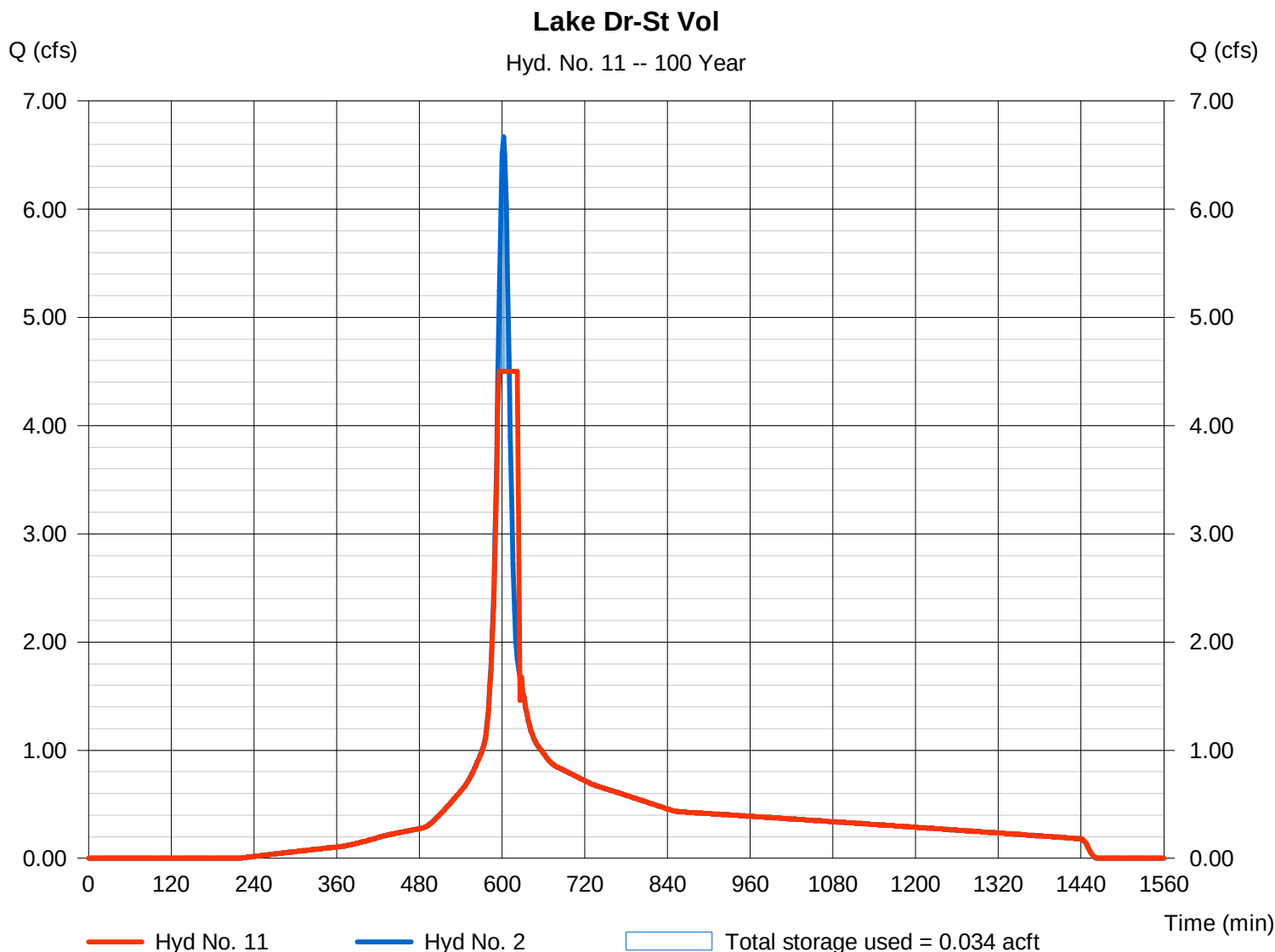
Hyd. No. 11

Lake Dr-St Vol

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 2 - 2-Lake Drive
Reservoir name = Req. Ponding Volume, DS2

Peak discharge = 4.500 cfs
Time to peak = 596 min
Hyd. volume = 0.842 acft
Max. Elevation = 4.16 ft
Max. Storage = 0.034 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Pond No. 2 - Req. Ponding Volume, DS2

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 3.80 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	3.80	871	0.000	0.000
0.10	3.90	2,613	0.004	0.004
0.20	4.00	4,356	0.008	0.012
0.30	4.10	6,098	0.012	0.024
0.40	4.20	7,841	0.016	0.040
0.50	4.30	9,583	0.020	0.060
0.60	4.40	11,325	0.024	0.084
0.70	4.50	13,068	0.028	0.112
0.80	4.60	14,810	0.032	0.144
0.90	4.70	16,553	0.036	0.179
1.00	4.80	18,295	0.040	0.219

Culvert / Orifice Structures

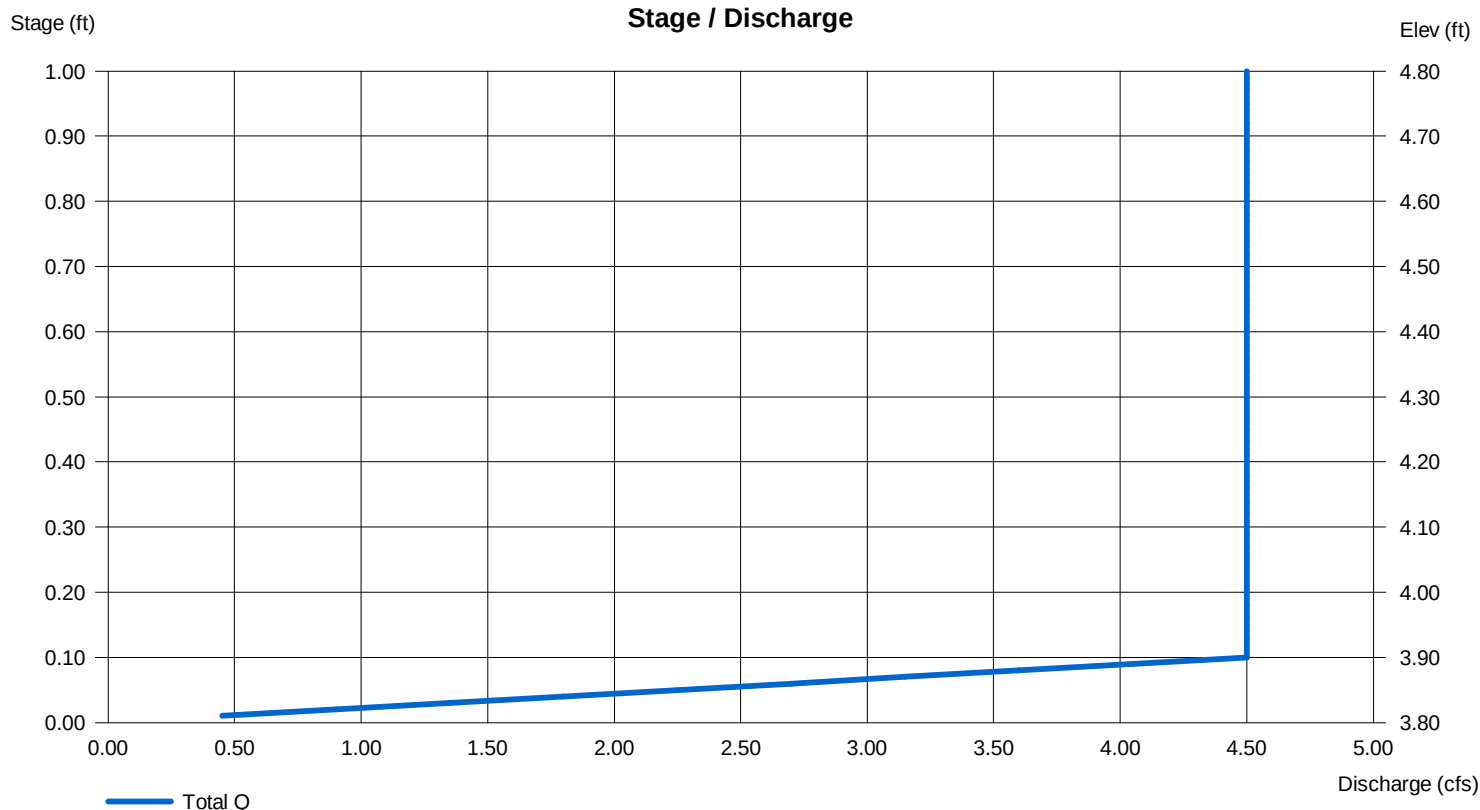
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge



**Subarea
Franklin Dr.**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

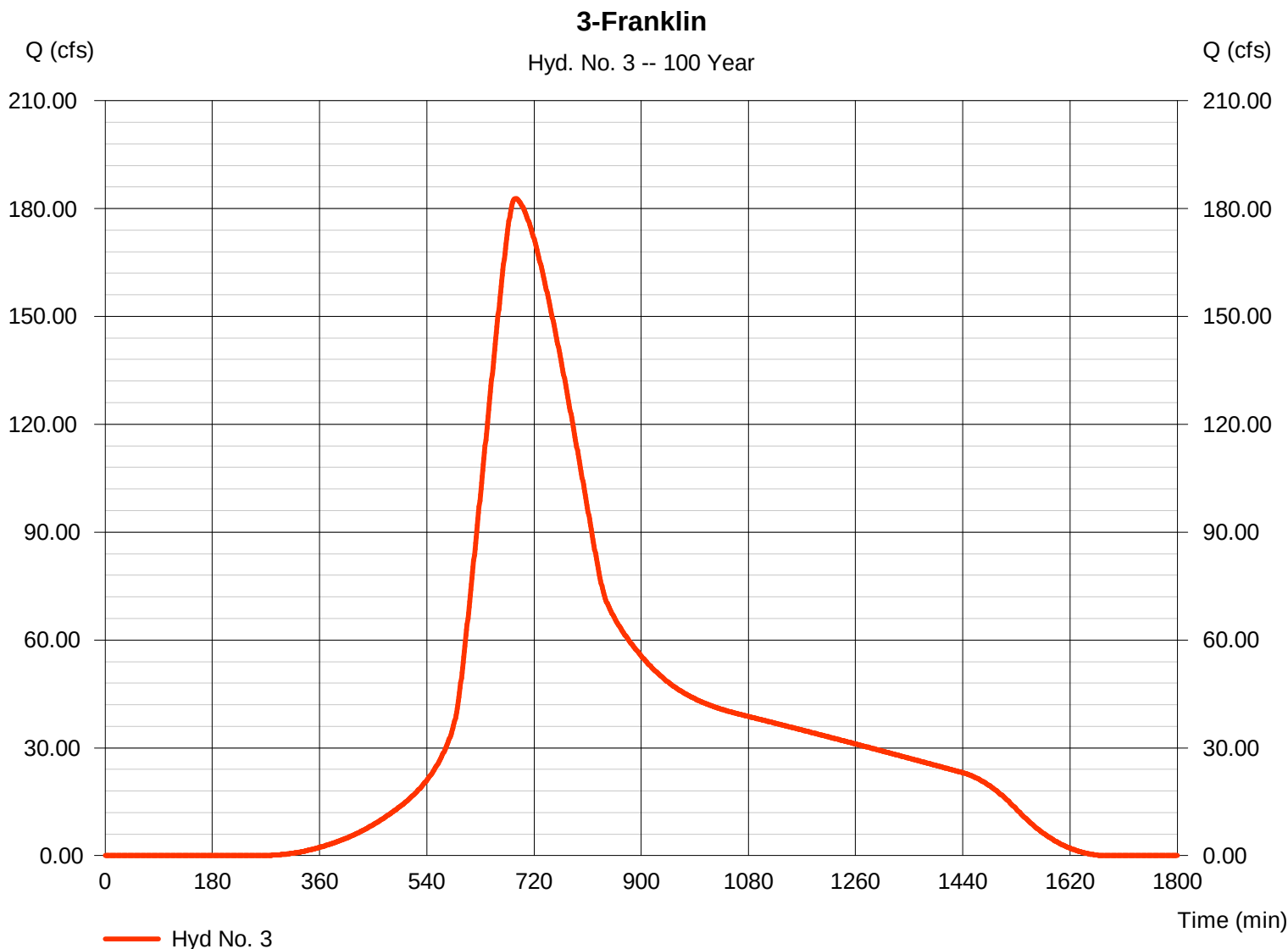
Tuesday, Jun 9, 2009

Hyd. No. 3

3-Franklin

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 425.200 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 182.80 cfs
Time to peak = 689 min
Hyd. volume = 83.102 acft
Curve number = 88.8
Hydraulic length = 9300 ft
Time of conc. (Tc) = 155.00 min
Distribution = Type I
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

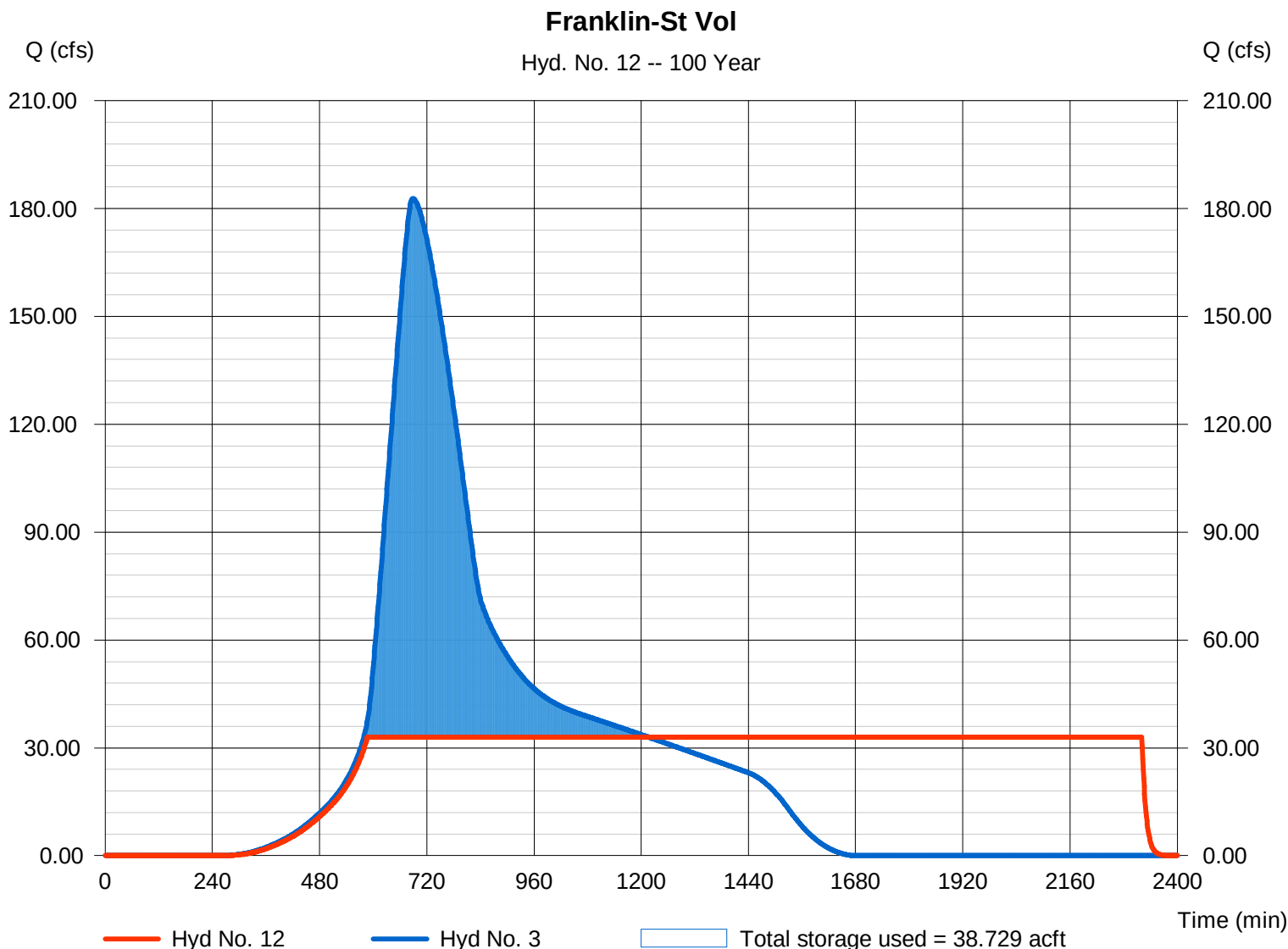
Tuesday, Jun 9, 2009

Hyd. No. 12

Franklin-St Vol

Hydrograph type	= Reservoir	Peak discharge	= 33.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 587 min
Time interval	= 1 min	Hyd. volume	= 83.102 acft
Inflow hyd. No.	= 3 - 3-Franklin	Max. Elevation	= 3.09 ft
Reservoir name	= Req. Ponding Volume, DS3	Max. Storage	= 38.729 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Pond No. 3 - Req. Ponding Volume, DS3

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 1.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1.75	87,120	0.000	0.000
0.10	1.85	261,360	0.400	0.400
0.20	1.95	435,600	0.800	1.200
0.30	2.05	609,840	1.200	2.400
0.40	2.15	784,080	1.600	4.000
0.50	2.25	958,320	2.000	6.000
0.60	2.35	1,132,560	2.400	8.400
0.70	2.45	1,306,800	2.800	11.200
0.80	2.55	1,481,040	3.200	14.400
0.90	2.65	1,655,280	3.600	18.000
1.00	2.75	1,829,520	4.000	22.000
1.10	2.85	2,003,760	4.400	26.400
1.20	2.95	2,178,000	4.800	31.200
1.30	3.05	2,352,240	5.200	36.400
1.40	3.15	2,526,480	5.600	42.000

Culvert / Orifice Structures

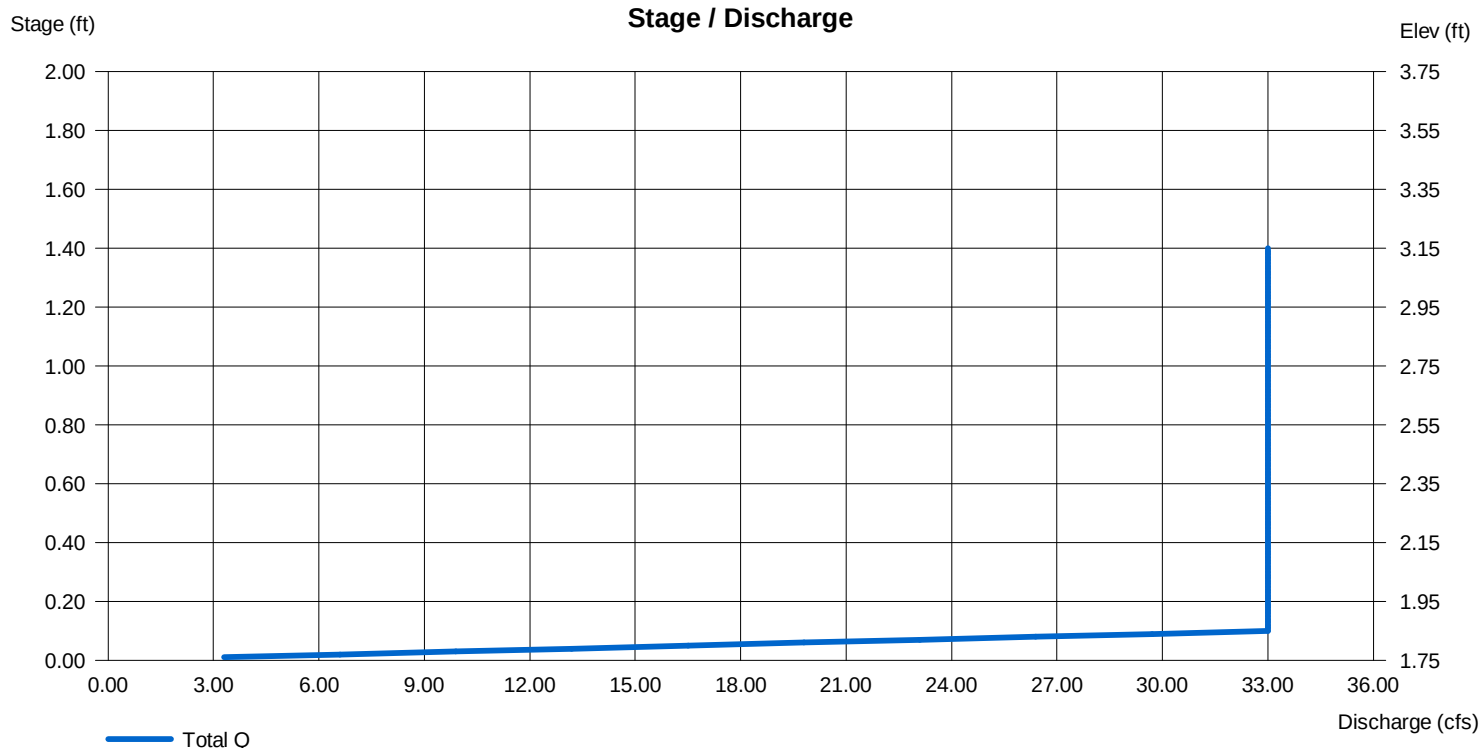
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge



**Subarea
Plymouth Dr.**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Hyd. No. 4

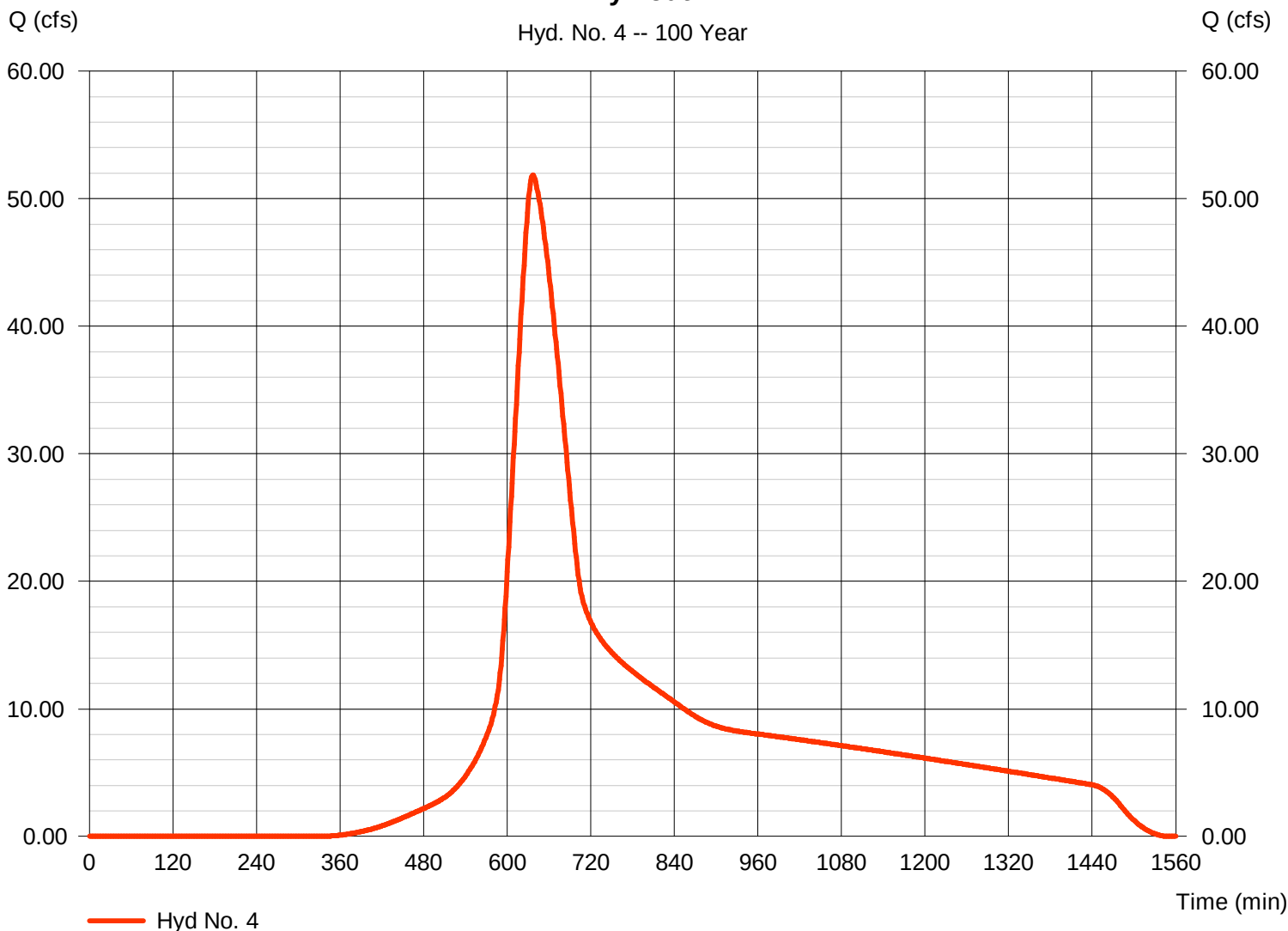
4-Plymouth

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 90.400 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 51.86 cfs
Time to peak = 637 min
Hyd. volume = 14.952 acft
Curve number = 84.5
Hydraulic length = 4225 ft
Time of conc. (Tc) = 70.40 min
Distribution = Type I
Shape factor = 484

4-Plymouth

Hyd. No. 4 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

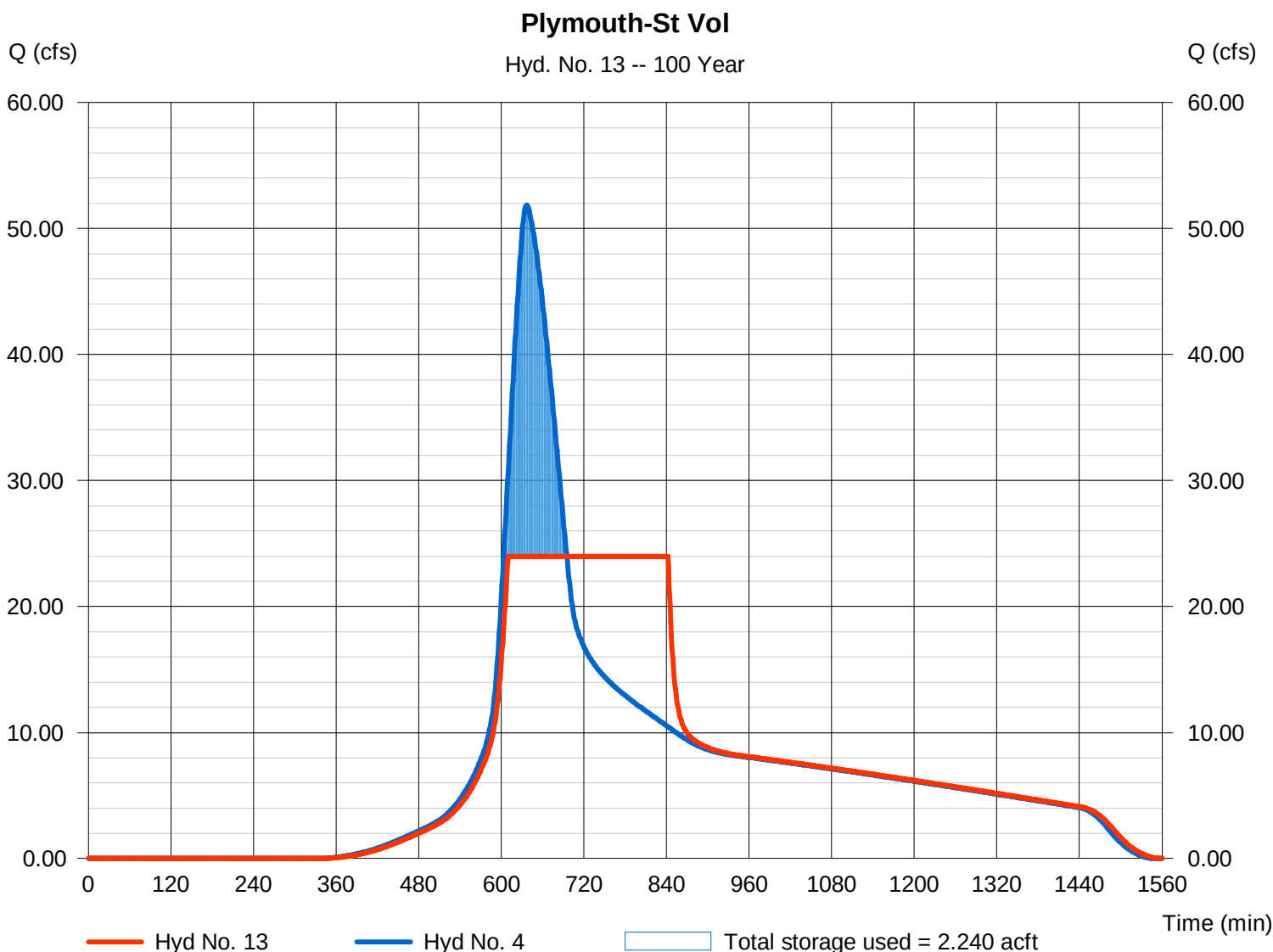
Tuesday, Jun 9, 2009

Hyd. No. 13

Plymouth-St Vol

Hydrograph type	= Reservoir	Peak discharge	= 24.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 611 min
Time interval	= 1 min	Hyd. volume	= 14.952 acft
Inflow hyd. No.	= 4 - 4-Plymouth	Max. Elevation	= 1.01 ft
Reservoir name	= Req. Ponding Volume, DS4	Max. Storage	= 2.240 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Pond No. 4 - Req. Ponding Volume, DS4

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 0.45 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	0.45	88,862	0.000	0.000
0.10	0.55	119,354	0.239	0.239
0.20	0.65	149,846	0.309	0.548
0.30	0.75	180,338	0.379	0.927
0.40	0.85	210,830	0.449	1.376
0.50	0.95	241,322	0.519	1.895
0.60	1.05	271,814	0.589	2.484
0.70	1.15	302,306	0.659	3.143
0.80	1.25	332,798	0.729	3.872
0.90	1.35	363,290	0.799	4.671
1.00	1.45	393,782	0.869	5.540

Culvert / Orifice Structures

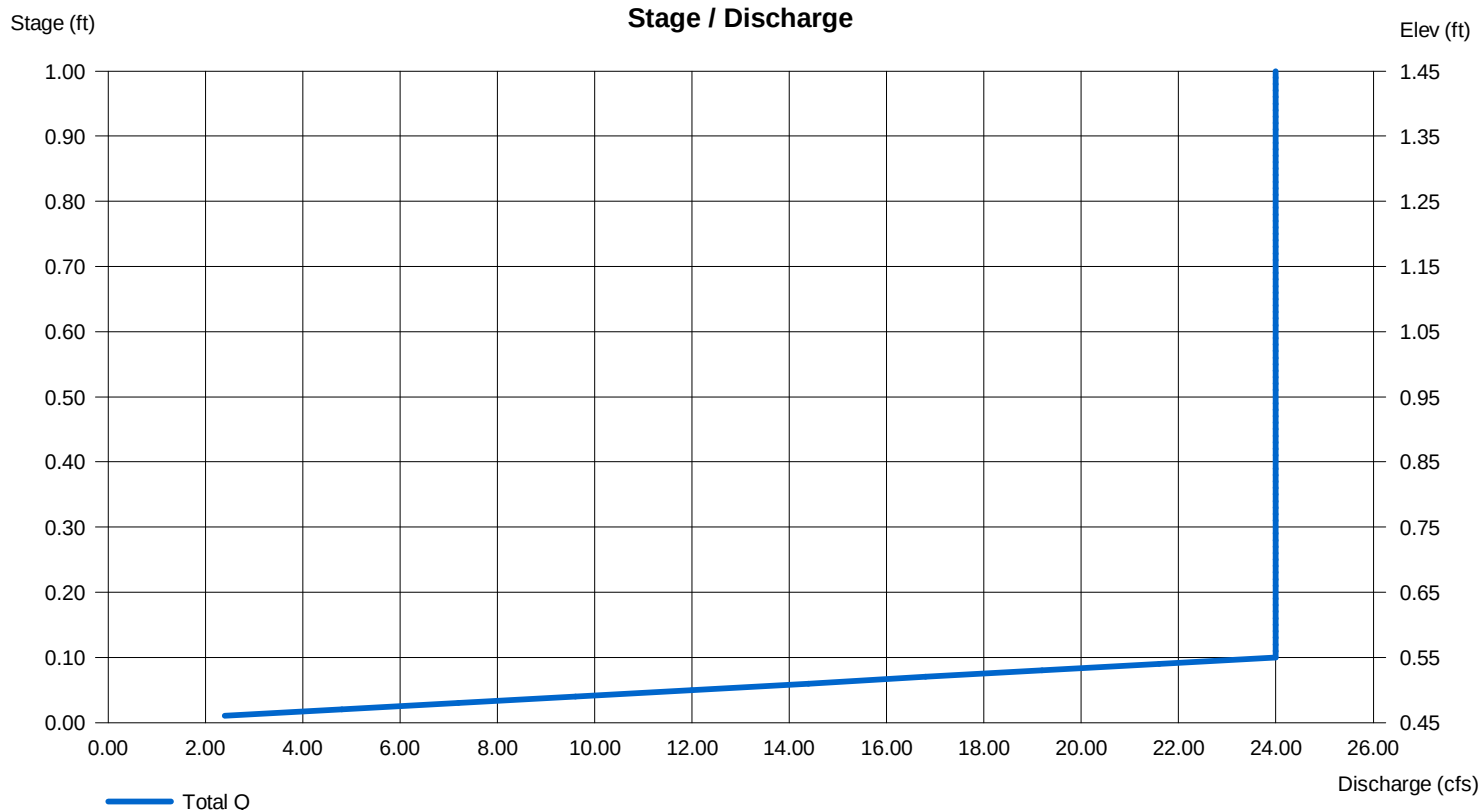
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge



**Subarea
Gardena St.**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Hyd. No. 5

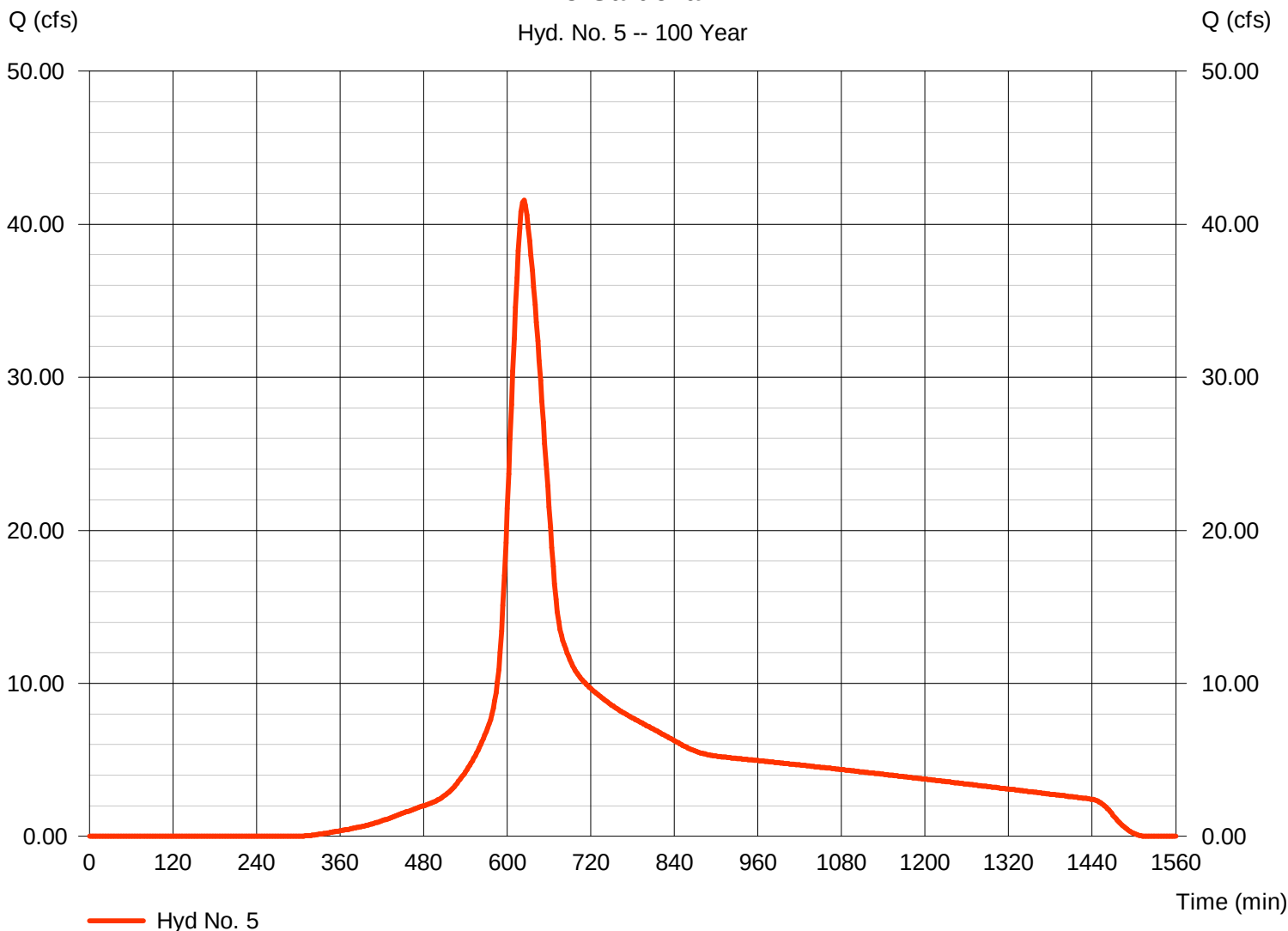
5-Gardena

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 54.600 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 41.55 cfs
Time to peak = 624 min
Hyd. volume = 9.664 acft
Curve number = 86.2
Hydraulic length = 3000 ft
Time of conc. (Tc) = 50.00 min
Distribution = Type I
Shape factor = 484

5-Gardena

Hyd. No. 5 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

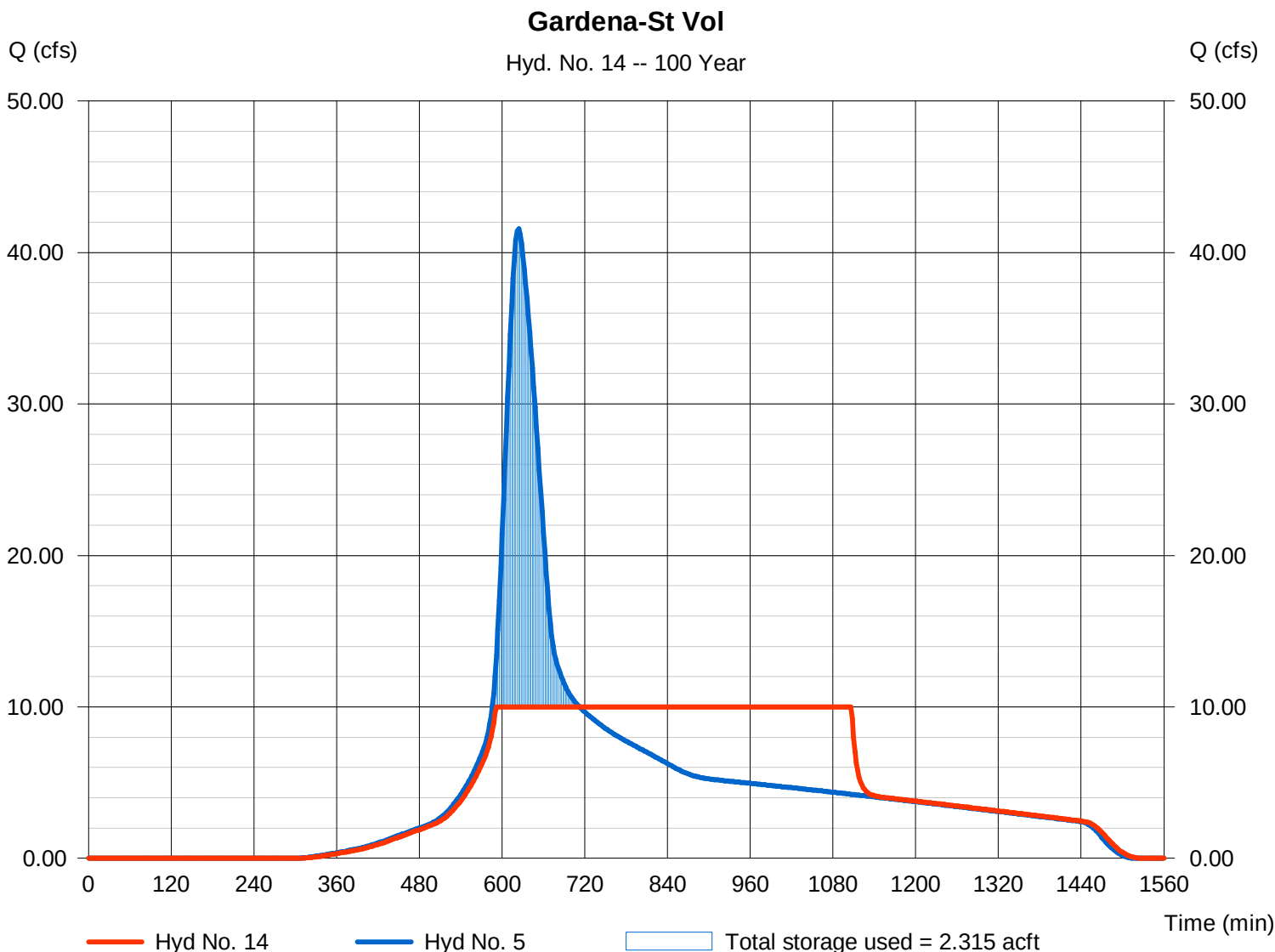
Hyd. No. 14

Gardena-St Vol

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 5 - 5-Gardena
Reservoir name = Req. Ponding Volume, DS5

Peak discharge = 10.00 cfs
Time to peak = 592 min
Hyd. volume = 9.664 acft
Max. Elevation = 0.93 ft
Max. Storage = 2.315 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Pond No. 5 - Req. Ponding Volume, DS5

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 0.20 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	0.20	26,136	0.000	0.000
0.10	0.30	56,628	0.095	0.095
0.20	0.40	87,120	0.165	0.260
0.30	0.50	117,612	0.235	0.495
0.40	0.60	148,104	0.305	0.800
0.50	0.70	178,596	0.375	1.175
0.60	0.80	209,088	0.445	1.620
0.70	0.90	239,580	0.515	2.135
0.80	1.00	270,072	0.585	2.720
0.90	1.10	300,564	0.655	3.375
1.00	1.20	331,056	0.725	4.100

Culvert / Orifice Structures

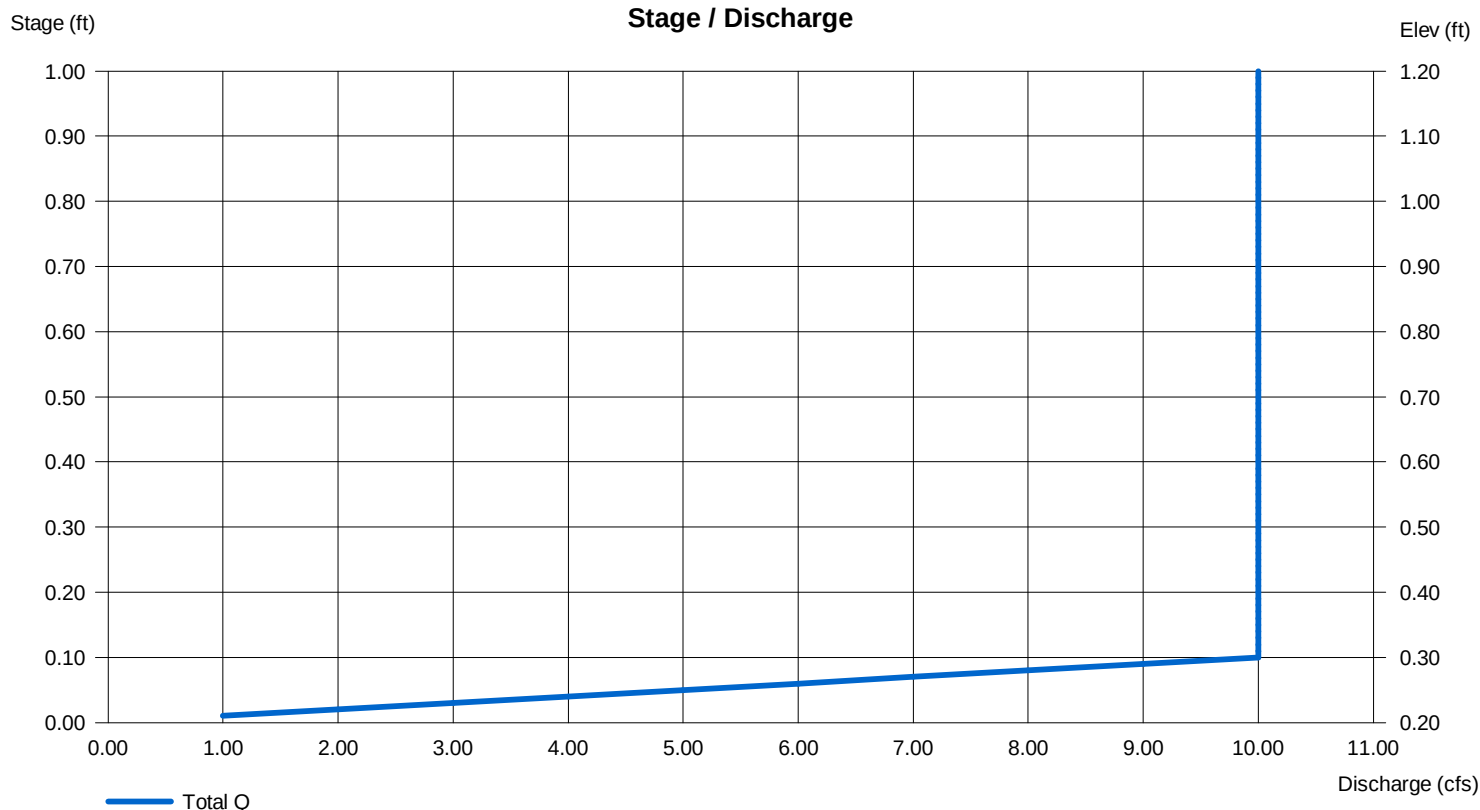
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge



**Subarea
Moreing St.**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Hyd. No. 6

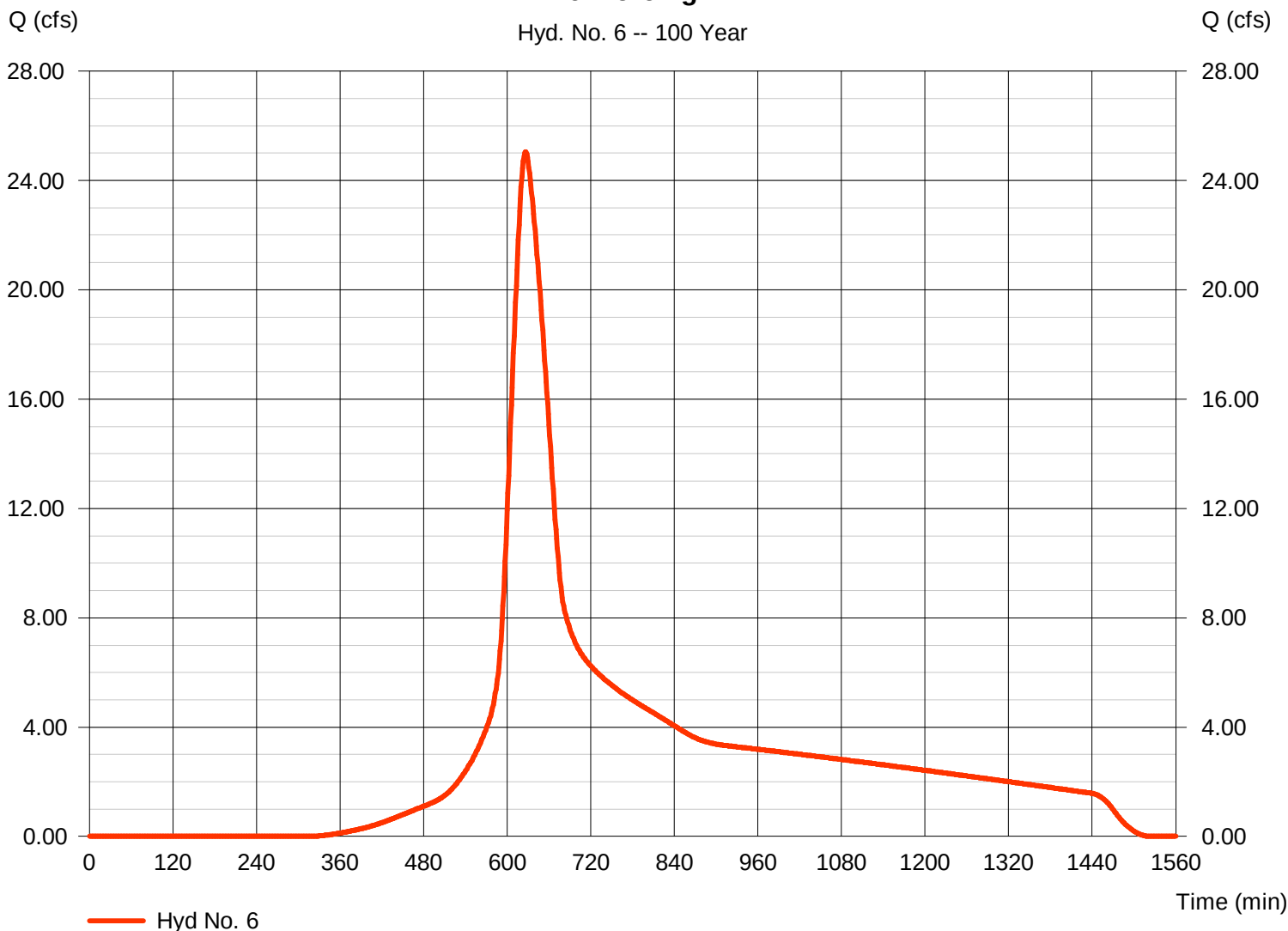
6-Moreing

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 35.900 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 25.05 cfs
Time to peak = 626 min
Hyd. volume = 6.083 acft
Curve number = 85.2
Hydraulic length = 3200 ft
Time of conc. (Tc) = 53.30 min
Distribution = Type I
Shape factor = 484

6-Moreing

Hyd. No. 6 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

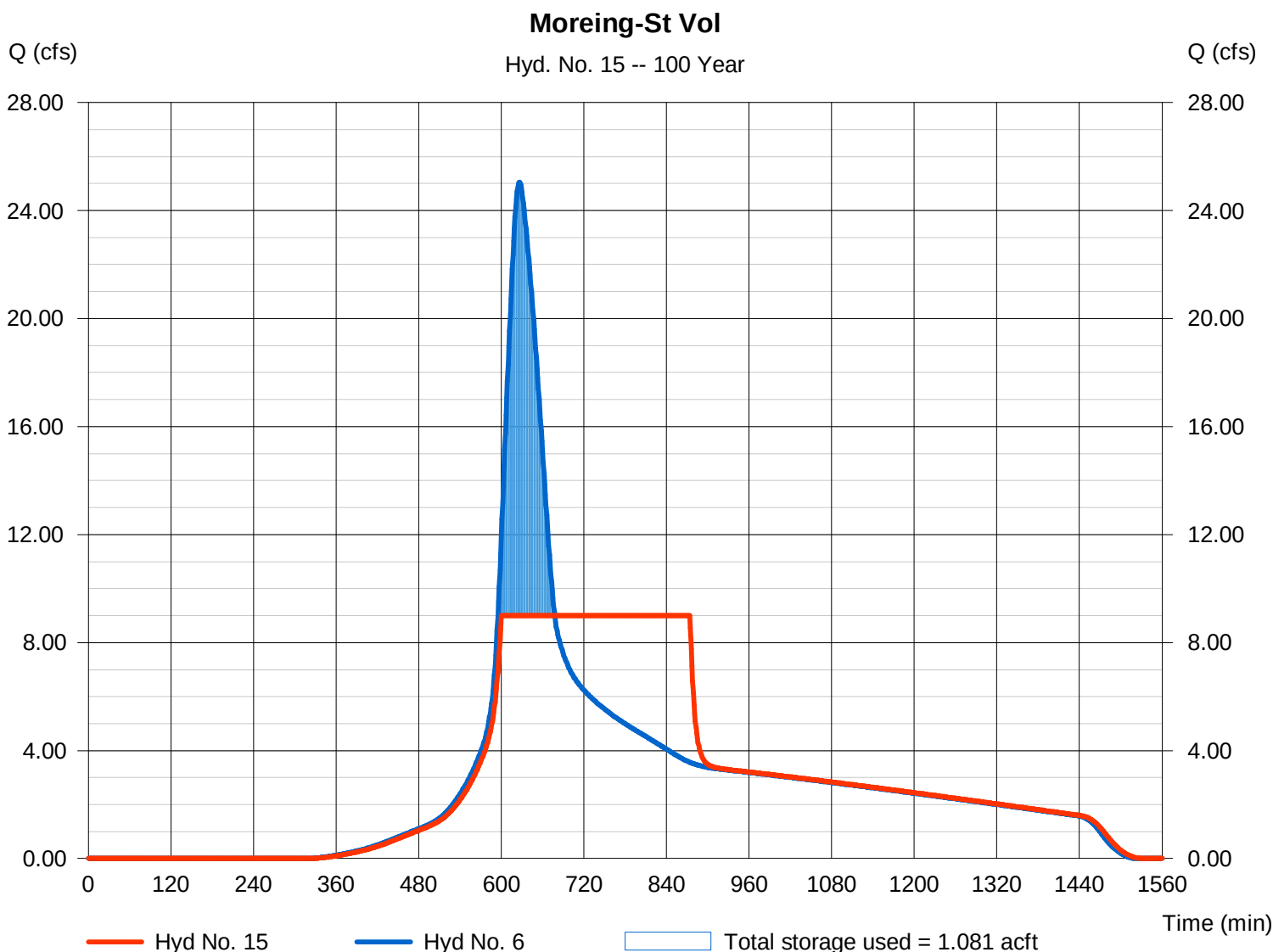
Hyd. No. 15

Moreing-St Vol

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyd. No. = 6 - 6-Moreing
Reservoir name = Req. Ponding Volume, DS6

Peak discharge = 9.000 cfs
Time to peak = 601 min
Hyd. volume = 6.083 acft
Max. Elevation = 0.68 ft
Max. Storage = 1.081 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Tuesday, Jun 9, 2009

Pond No. 6 - Req. Ponding Volume, DS6

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 0.01 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	0.01	26,136	0.000	0.000
0.10	0.11	39,204	0.074	0.074
0.20	0.21	52,272	0.105	0.179
0.30	0.31	65,340	0.135	0.314
0.40	0.41	78,408	0.165	0.479
0.50	0.51	91,476	0.195	0.673
0.60	0.61	104,544	0.225	0.898
0.70	0.71	117,612	0.255	1.153
0.80	0.81	130,680	0.285	1.438
0.90	0.91	143,748	0.315	1.753
1.00	1.01	156,816	0.345	2.098

Culvert / Orifice Structures

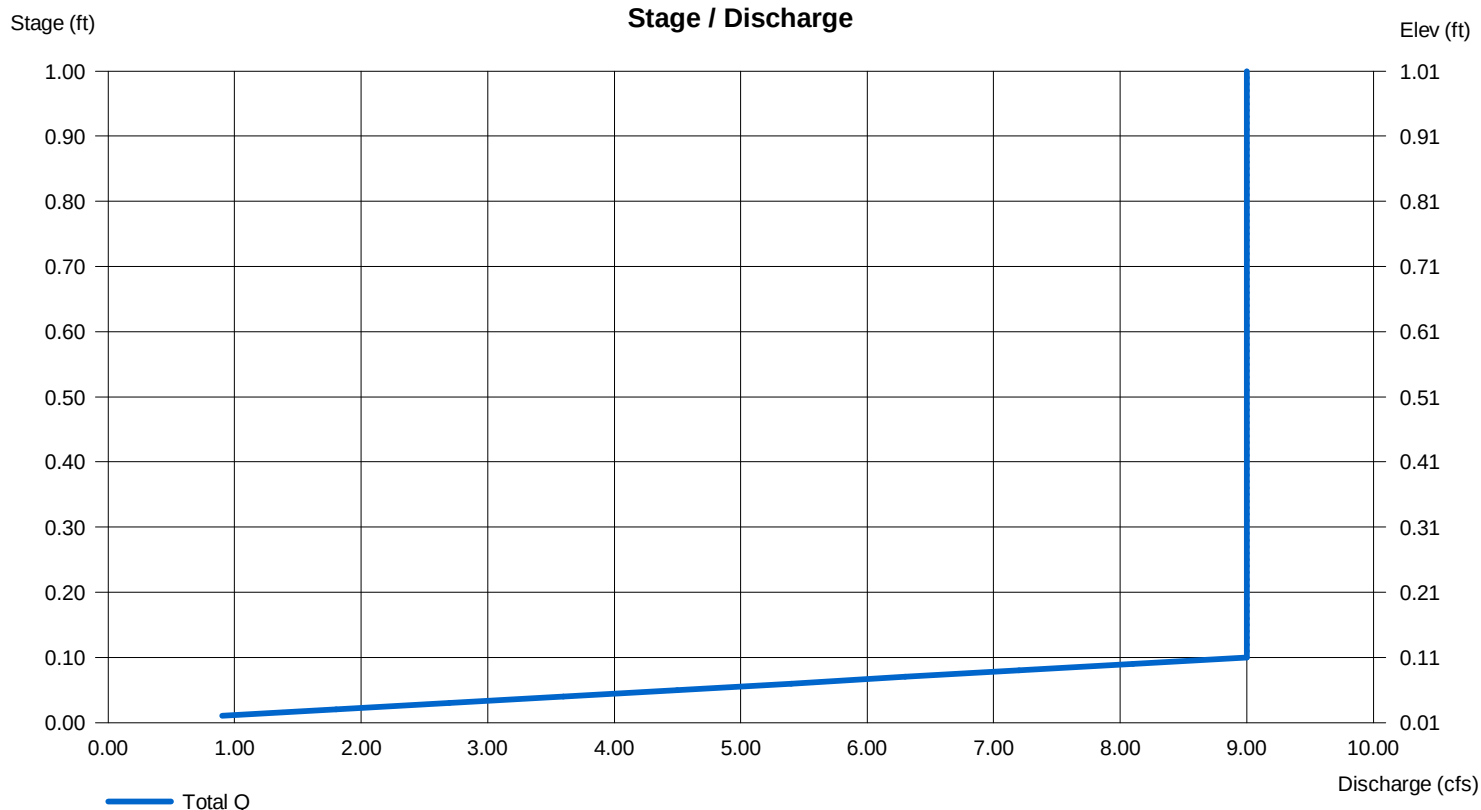
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000	(by Wet area)		
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge



**Subarea
Yosemite Lake**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

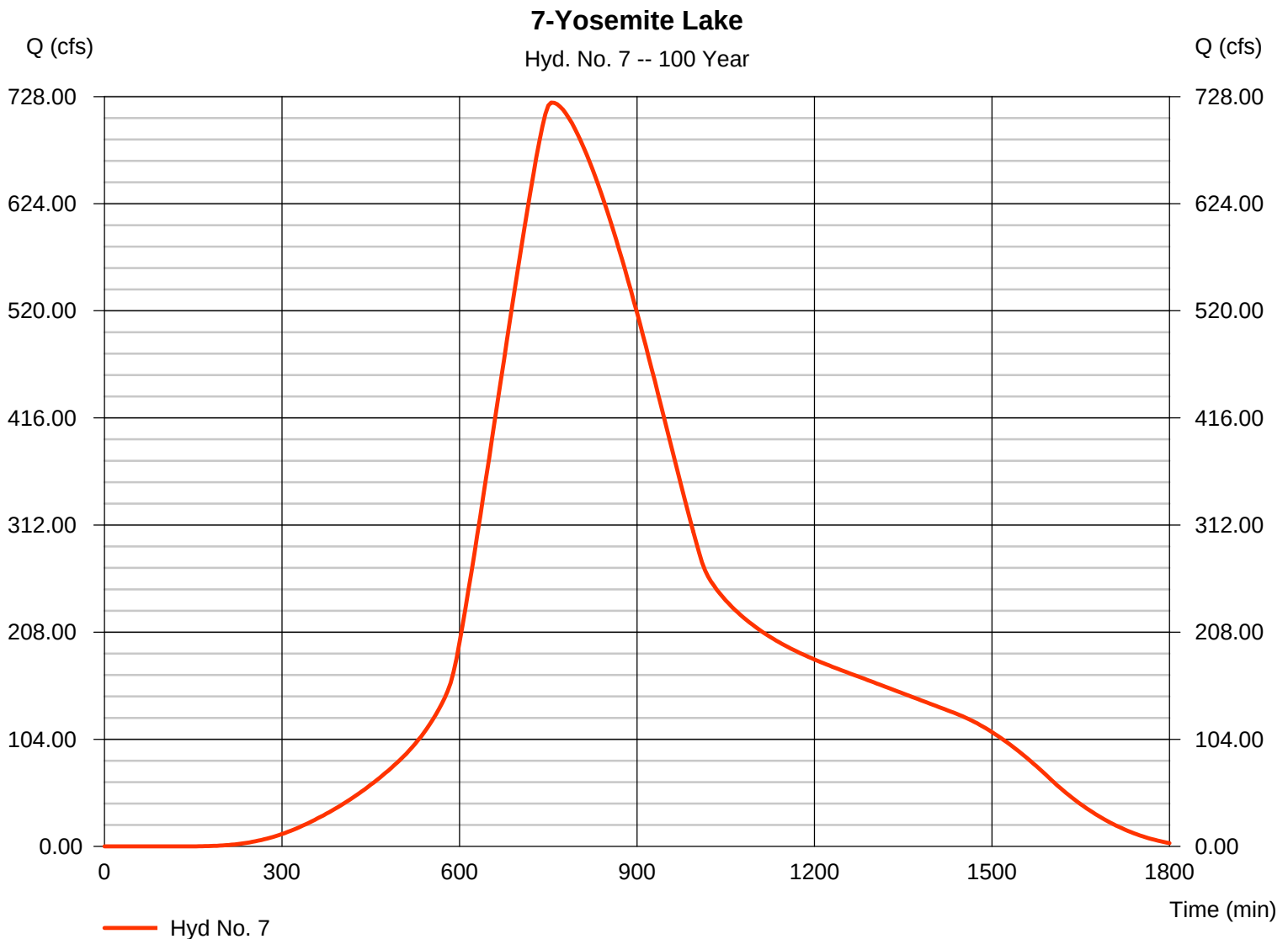
Monday, Apr 26, 2010

Hyd. No. 7

7-Yosemite Lake

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 5 min
Drainage area = 1935.900 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 722.21 cfs
Time to peak = 755 min
Hyd. volume = 457.237 acft
Curve number = 94
Hydraulic length = 15800 ft
Time of conc. (Tc) = 263.00 min
Distribution = Type I
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Apr 26, 2010

Hyd. No. 16

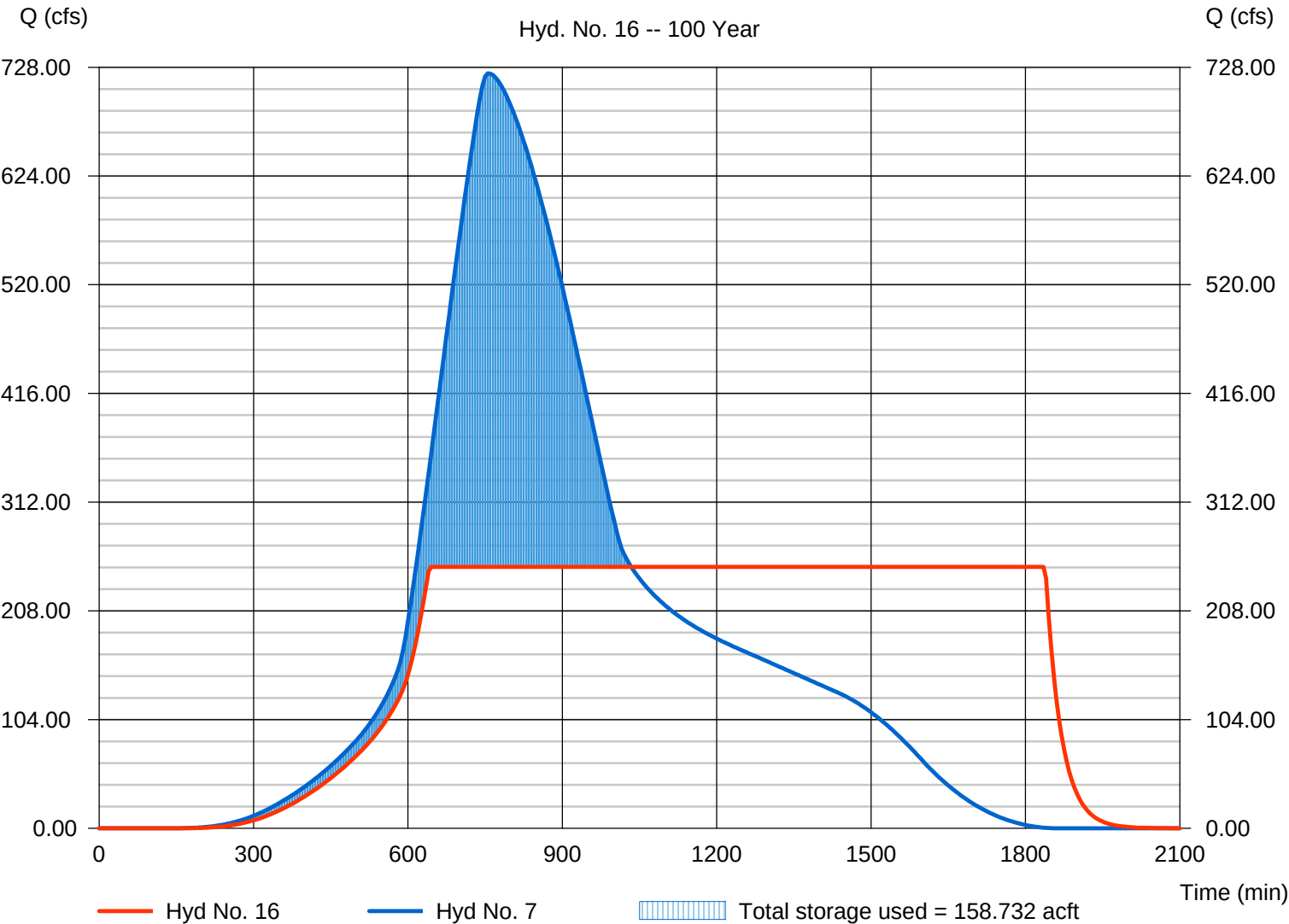
Yosemite Lake-St Vol

Hydrograph type	= Reservoir	Peak discharge	= 250.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 645 min
Time interval	= 5 min	Hyd. volume	= 457.237 acft
Inflow hyd. No.	= 7 - 7-Yosemite Lake	Max. Elevation	= 7.62 ft
Reservoir name	= Req. Ponding Volume, DS7	Max. Storage	= 158.732 acft

Storage Indication method used.

Yosemite Lake-St Vol

Hyd. No. 16 -- 100 Year



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Apr 26, 2010

Pond No. 7 - Req. Ponding Volume, DS7

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 6.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	6.75	827,640	0.000	0.000
0.10	6.85	8,293,824	10.470	10.470
0.20	6.95	8,311,248	19.060	29.530
0.30	7.05	8,328,672	19.100	48.630
0.40	7.15	8,346,096	19.140	67.770
0.50	7.25	8,363,520	19.180	86.950
0.60	7.35	8,380,944	19.220	106.170
0.70	7.45	8,398,368	19.260	125.430
0.80	7.55	8,415,792	19.300	144.730
0.90	7.65	8,433,216	19.340	164.070
1.00	7.75	8,450,640	19.380	183.450

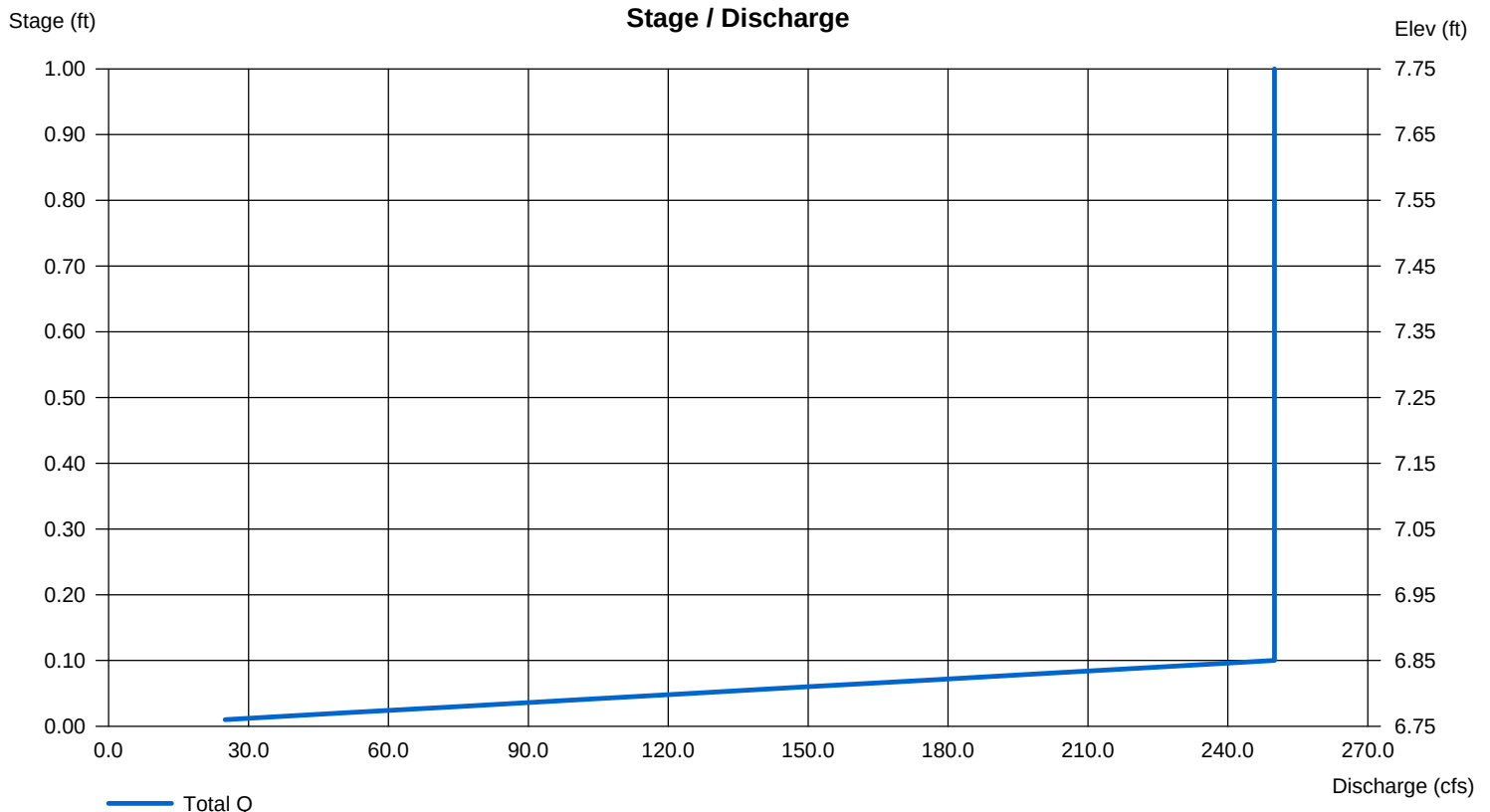
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



**Subarea
Buena Vista South**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

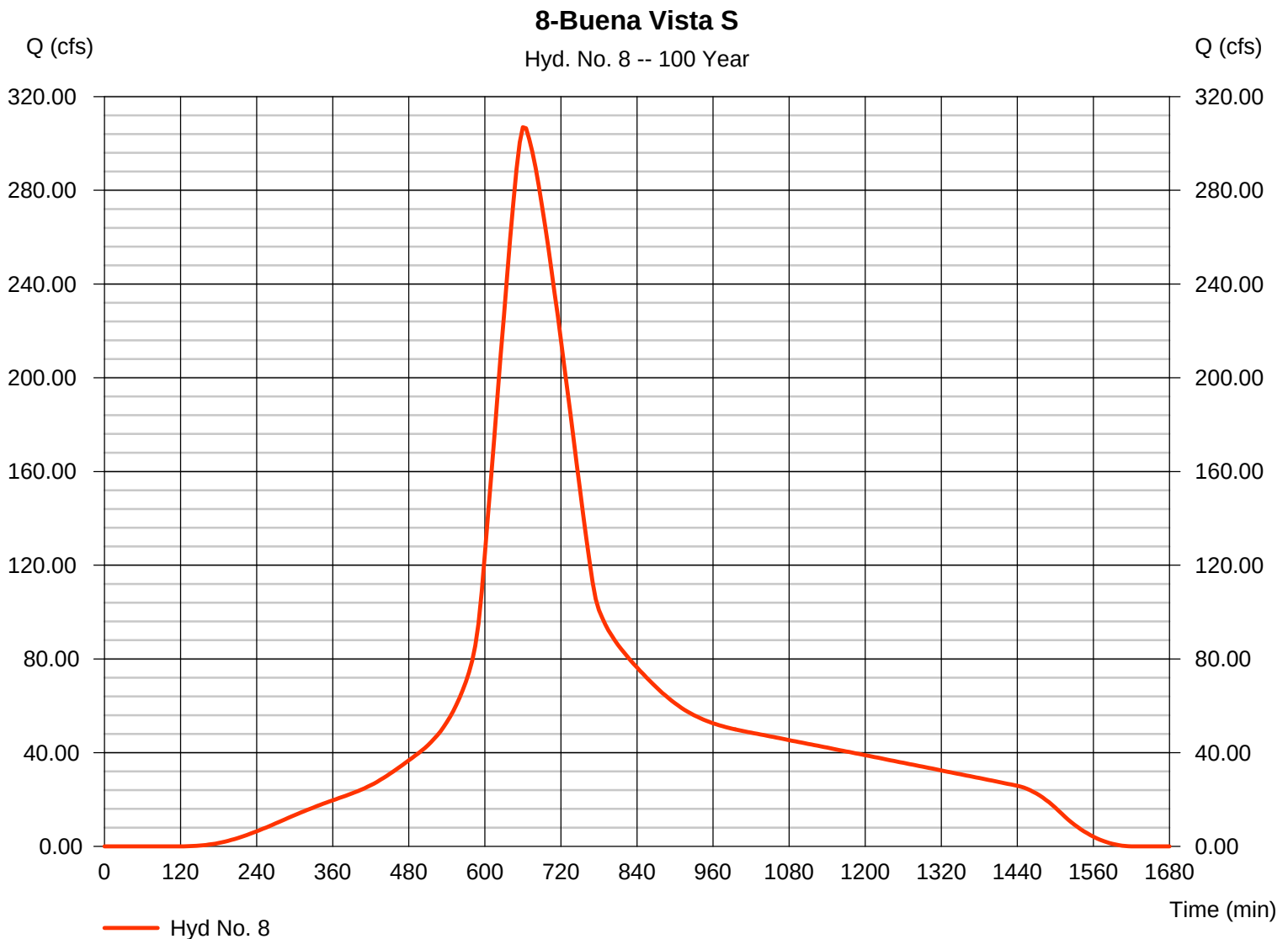
Monday, Apr 26, 2010

Hyd. No. 8

8-Buena Vista S

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 5 min
Drainage area = 477.470 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 306.90 cfs
Time to peak = 660 min
Hyd. volume = 116.286 acft
Curve number = 95
Hydraulic length = 7000 ft
Time of conc. (Tc) = 116.70 min
Distribution = Type I
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Apr 26, 2010

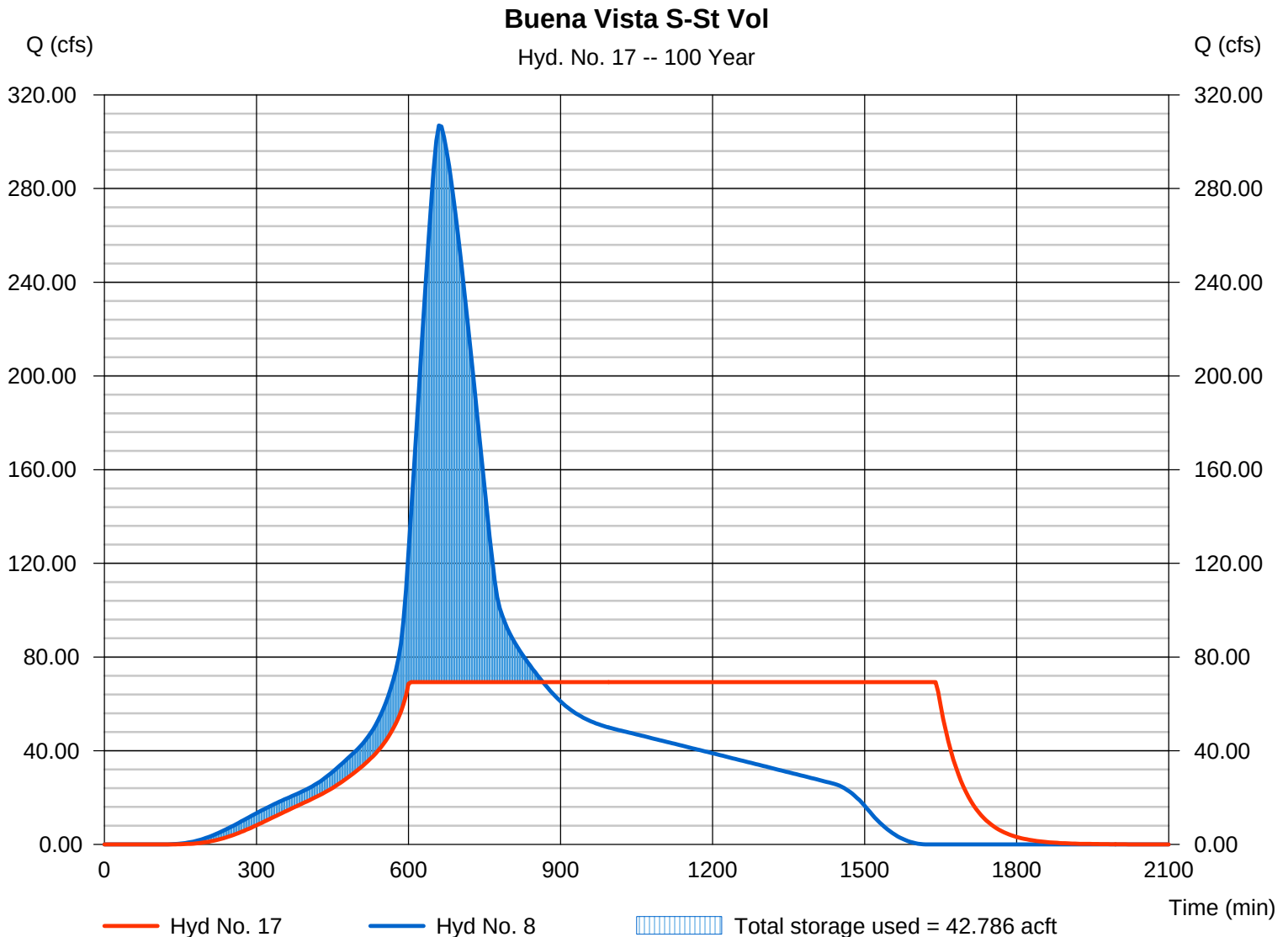
Hyd. No. 17

Buena Vista S-St Vol

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 5 min
Inflow hyd. No. = 8 - 8-Buena Vista S
Reservoir name = Req. Ponding Volume, DS8

Peak discharge = 69.29 cfs
Time to peak = 855 min
Hyd. volume = 116.286 acft
Max. Elevation = 5.62 ft
Max. Storage = 42.786 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Apr 26, 2010

Pond No. 8 - Req. Ponding Volume, DS8

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 4.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	4.75	2,134,440	0.000	0.000
0.10	4.85	2,137,925	4.904	4.904
0.20	4.95	2,141,409	4.912	9.816
0.30	5.05	2,144,894	4.920	14.736
0.40	5.15	2,148,379	4.928	19.664
0.50	5.25	2,151,864	4.936	24.600
0.60	5.35	2,155,348	4.944	29.544
0.70	5.45	2,158,833	4.952	34.496
0.80	5.55	2,162,318	4.960	39.456
0.90	5.65	2,165,803	4.968	44.424
1.00	5.75	2,169,288	4.976	49.400

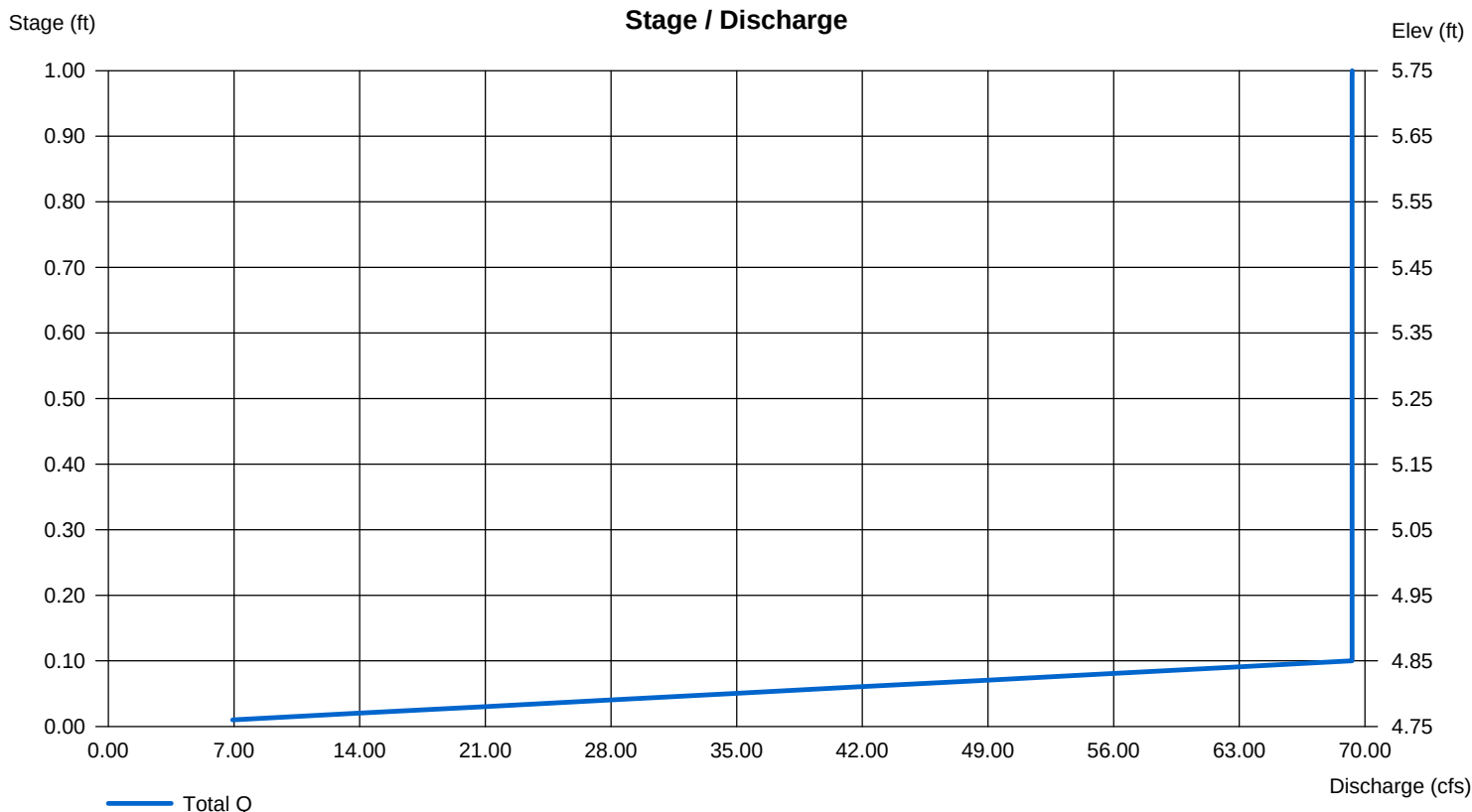
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



**Subarea
Ryde St.**

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

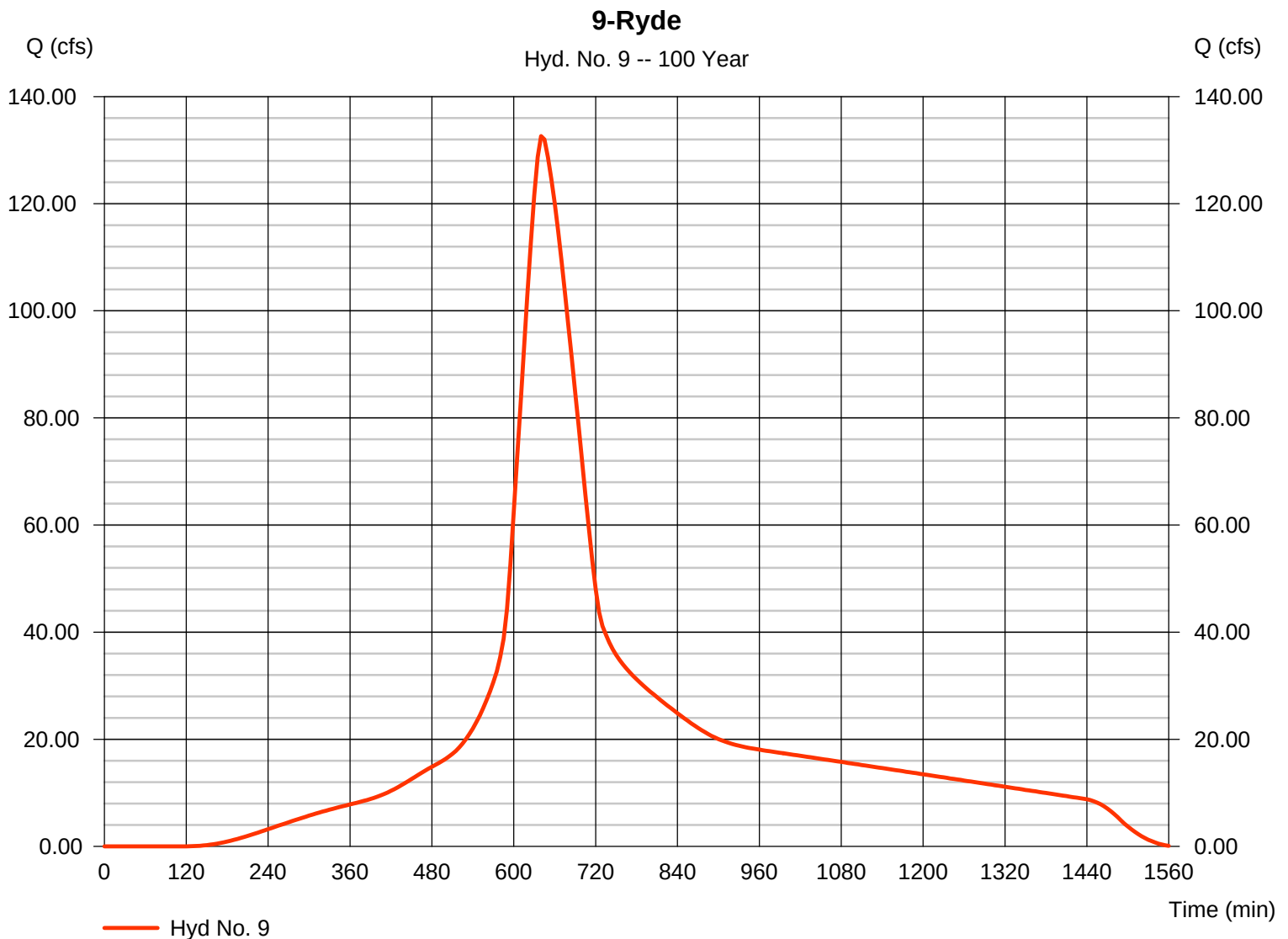
Monday, Apr 26, 2010

Hyd. No. 9

9-Ryde

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 5 min
Drainage area = 167.100 ac
Basin Slope = 0.1 %
Tc method = USER
Total precip. = 3.51 in
Storm duration = 24 hrs

Peak discharge = 132.63 cfs
Time to peak = 640 min
Hyd. volume = 41.576 acft
Curve number = 95
Hydraulic length = 4600 ft
Time of conc. (Tc) = 76.70 min
Distribution = Type I
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Apr 26, 2010

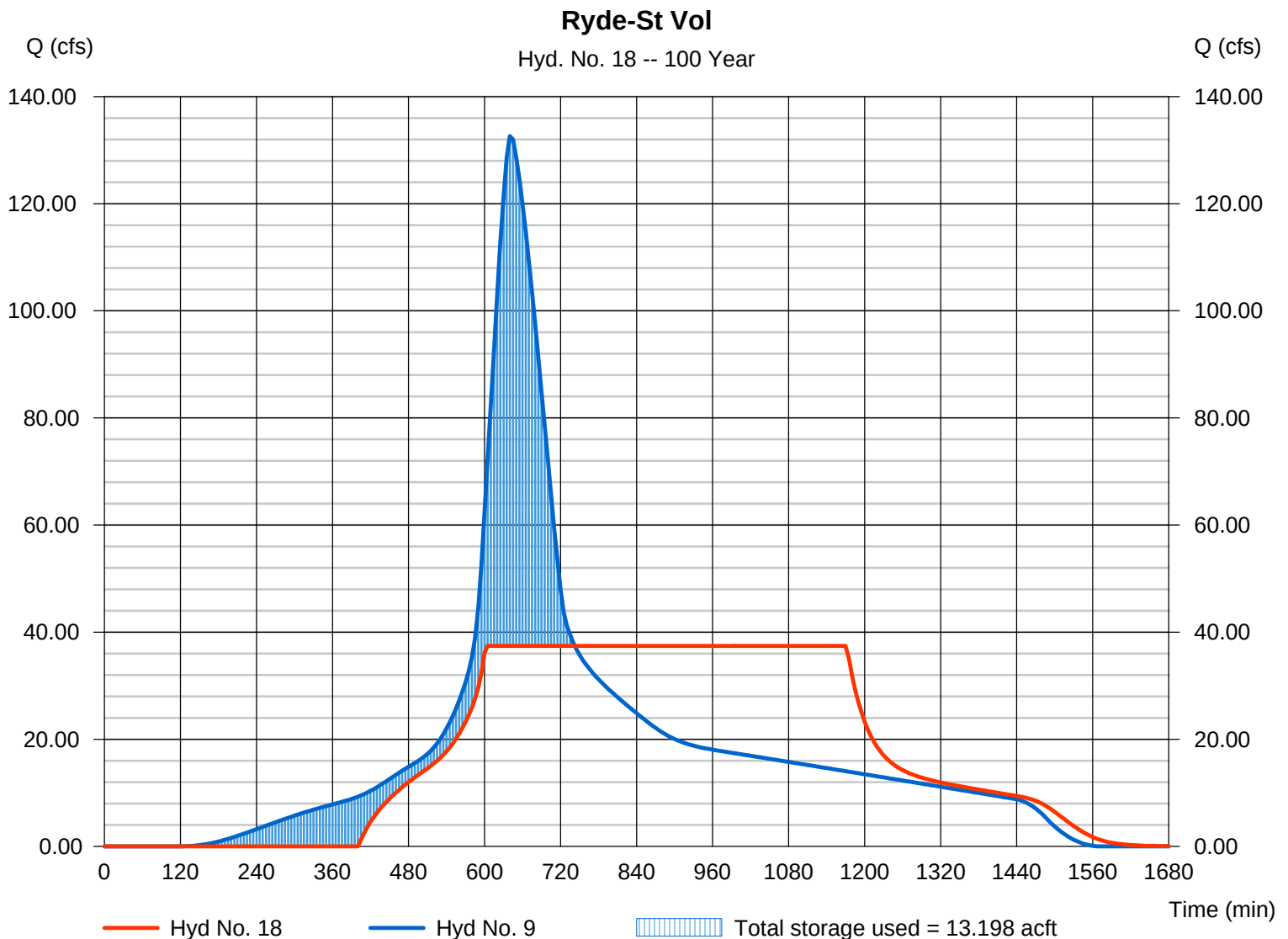
Hyd. No. 18

Ryde-St Vol

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 5 min
Inflow hyd. No. = 9 - 9-Ryde
Reservoir name = Req. Ponding Volume, DS9

Peak discharge = 37.42 cfs
Time to peak = 740 min
Hyd. volume = 39.973 acft
Max. Elevation = 2.56 ft
Max. Storage = 13.198 acft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Apr 26, 2010

Pond No. 9 - Req. Ponding Volume, DS9

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 1.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1.75	696,960	0.000	0.000
0.10	1.85	700,009	1.604	1.604
0.20	1.95	703,058	1.610	3.214
0.30	2.05	706,107	1.618	4.831
0.40	2.15	709,156	1.624	6.456
0.50	2.25	712,206	1.632	8.087
0.60	2.35	715,255	1.639	9.726
0.70	2.45	718,304	1.646	11.372
0.80	2.55	721,353	1.653	13.024
0.90	2.65	724,402	1.659	14.683
1.00	2.75	727,452	1.667	16.350
1.10	2.85	730,501	1.674	18.024
1.20	2.95	733,550	1.681	19.704
1.30	3.05	736,599	1.688	21.392
1.40	3.15	739,648	1.694	23.086

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

