CITY OF ALBUQUERQUE

DEPARTMENT OF MUNICIPAL DEVELOPMENT

HYDROLOGY DIVISION

BELL/COMMERCIAL PUMP STATION MODFICIATIONS

100% SUBMITTAL

FEBRUARY 3, 2010

Smith Engineering Company
A Full-Service Engineering Company

Purpose

The purpose of this report is to investigate the feasibility of completing modifications to the Bell/Commercial pump station and associated force main to handle the anticipated flows that will reach the station. Currently, the pump station configuration is not adequate to convey the flow in the area up to the Broadway Storm Drain because the pumps in the station are not large enough to handle the flow.

The goal of this study is to identify the required improvements to the pump station and to the force main to increase the pumping capacity of the pump station and to divert the flow from the existing Broadway Storm Drain system. During the course of this study, several routes were considered for the new force main. However, after meetings with COA Hydrology Division personnel, a preferred alternative was developed. This alternative is to replace the smallest (and oldest) pump in the station and upsize and relay the discharge line from the pump station to an existing storm drain in William Street. This study examines the feasibility for this project and provides an estimate of the construction cost for budgeting purposes.

Hydrology

Smith Engineering Company (SEC) was provided two studies for the area surrounding the Bell/Commercial pump station. One report is the South Broadway Sector Drainage Management Plan completed by Bohannan-Huston, Inc. (BHI) and dated August, 1990. The second report is the Final South Broadway Detention Basin Analysis Phase Report and was completed by Resource Technology, Inc. (RTI) in July of 1991. These reports were used as the starting point for the analysis of the current conditions.

During the review of the drainage reports referenced above and through meetings with COA Hydrology staff, it was determined that there have been several drainage projects in the area that substantially change the hydrology in the study area. The BHI report pre-dates the constructed improvements in the area. The scope of work did not include a detailed re-analysis of the impacts of the improvements in the area to the hydrology. However, some reasonable assumptions were made and a brief analysis was performed that takes into account the effect of the improvements to the overall drainage in the study area.

SEC reviewed the 1990 BHI study and determined which basins still contributed to the Bell/Commercial pump station. The BHI report provided recommendations for several improvements in the area. These included the proposed Santa Fe Detention Basin and improvements to the Bell/Commercial pump station. The RTI report provided additional information related to the improvements for the Santa Fe Detention Basin and the impact that this would have on the Broadway Storm Drain system.

Based on review of the RTI report and the constructed improvements for the Santa Fe Detention Basin, flows north of Lewis Avenue and East of Broadway, and all flows north of Santa Fe Road are diverted to the Santa Fe Detention Pond. This removes

several drainage basins identified in the BHI report that had previously contributed to the Bell/Commercial pump station and the Broadway Storm Drain. It should be noted that the Santa Fe Detention Basin project included a principal spillway (30-inch storm drain) from the detention basin that conveys approximately 25 cubic feet-per-second (cfs) to the pump station. This flow is included in the anticipated peak flows that reach the pump station.

The construction of the Santa Fe Detention Basin freed up flow capacity in the Broadway Storm Drain. Therefore, it was assumed that the flows that are generated from the east side of Broadway and south of Lewis Road will be intercepted by the existing Broadway Storm Drain and will not reach the Bell/Commercial pump station. Therefore, the only drainage basin that contributes to the pump station is Basin SJ2. The boundaries for basin SJ2 are Commercial Street to the West, approximately Trumbell Avenue to the South, Broadway Boulevard to the East, and approximately Pacific Avenue to the North. This drainage basin is shown on Plate 1 in this report and on Plate 10 of the BHI report.

The 1990 BHI report hydrology was calculated using the HYMO program in conjunction with curve numbers as was the standard for that time. There have been updates to both the AHYMO program and the rainfall data from NOAA since that time. There has been recent analysis performed to provide some approximation for the correlation between AHYMO_97 and the old HYMO. These analyses have typically shown an increase of between 20 and 30 percent in peak runoff rates. Therefore, it is reasonable to assume that the flows from Basin SJ2 would be higher with new hydrology than was shown in the BHI report. Therefore, a revised hydrologic analysis of that basin was performed using AHYMO_97. The analysis assumed that all flows from Basin SJ2 to the pump station would be overland. This is not entirely correct as there are storm drains in the area that will move flows to the pump station. However, for this simple analysis, flows were considered to be overland only. The peak flow through the principal spillway from the Santa Fe Detention Basin was added to the peak flows in the re-analysis of Basin SJ2 for this analysis. This is a conservative assumption because there is a delay between the peak time from the detention basin and the peak time produced from the AHYMO_97 hydrology in Basin SJ2. However, this was considered to be conservative for this feasibility analysis.

In order to cross-check the amount of increase, data for seven (7) random basins in the 1990 BHI were recalculated using AHYMO_97 and the peak discharge rates were compared to those published in the BHI report. The basins used for comparison are SJH109, SJ3, SJH152, SJ90L, SJH106, SJH100, and SJ2. In performing this comparison, SEC used the percent of impervious listed in the BHI report as land treatment "D". We then split the remaining percent land treatment into 15% "B" and the remainder in the land use "C" category. This area is generally fully developed and has little or no areas that could be considered land treatment "A". The exception to this approach was Basin SJH109. This basin is undeveloped in the BHI report; therefore, the pervious areas were classified as "A" land treatment. The high and low peak runoff rates were omitted and the increase in flow rate for each basin was calculated for the remaining five (5) basins. This produced

BASIN SJ-2 IS BOUND BY BELL AVENUE ON THE SOUTH, BROADWAY BOULEVARD TO EAST, APPROXIMATELY PACIFIC AVENUE TO THE NORTH, AND COMMERCIAL STREET TO THE WEST.

FLOW NORTH OF LEWIS AVENUE AND EAST OF BROADWAY BOULEVARD IS INTERCEPTED BY THE BROADWAY STORM DRAIN SYSTEM AND DIVERTED NORTH TO THE SANTA FE DETENTION POND.

FLOW SOUTH OF LEWIS AVENUE AND EAST OF BROADWAY BOULEVARD IS INTERCEPTED BY THE BROADWAY STORM DRAIN SYSTEM.

BASIN BOUNDARY

LONGEST REACH FOR BASIN

NOTE:

BASIN SJ-2 IS DEFINED BASED UPON THE BOHANNAN-HUSTON INC. REPORT TITLED "SOUTH BROADWAY SECTOR DRAINAGE MANAGEMENT PLAN" DATED AUGUST, 2009.

150' 0 150' 300' 450'

HORIZONTAL SCALE: APPROX. 1" = 150'

SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

BENCH MARKS

AS BUILT INFORMATION
CONTRACTOR DATE
STARTED BY DATE
INSPECTION BY DATE
FIELD VERIFICATION BY DATE
DRAWINGS CORRECTED BY DATE
MICRO-FILM INFORMATION
RECORDED BY DATE
NO.

ENGINEERS SEAL

NO.	DATE	REMARKS	BY
		REVISIONS	
		DESIGN	
DESIGNED BY	SEC	DATE	11/2009
DRAWN BY	SEC	DATE	11/2009
CHECKED BY	SEC	DATE	11/2009

109104E
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CITY OF ALBUQUERQUE
DEPARTMENT OF MUNICIPAL DEVELOPMENT
ENGINEERING DIVISION

TITLE: BELL/COMMERCIAL PUMP STATION FEASIBILITY STUDY
EXHIBIT #2

Design Review Committee | City Engineer Approval | Last Design Update

City Project No. | Zone Map No. L-14/K-14 | Sheet No. | Sheet PLATE 1

an average increase factor of 36% for the AHYMO_97 results over the values from the BHI report. The results of this AHYMO_97 analysis are presented in the appendix.

A separate peak runoff calculation was performed for Basin SJ2 as this is the only basin that contributes to the Bell/Commercial Pump Station. This revised runoff rate uses the same percent land use as described above. However, the Time-to-Peak was recalculated using procedures from the DPM. This results in a much longer Tp (0.41 versus 0.2894 from 1990). This results in a peak runoff rate of 110 cfs. Therefore, the total flow reaching the pump station is 135 cfs (110 cfs from Basin SJ2 and 25 cfs from the Santa Fe Detention Basin). A printout of the results of the AHYMO_97 analysis is included in Appendix 1.

Hydraulic Analysis

SEC personnel visited with Mr. Gary Gonzales of the ABCWUA to discuss the operation of the lift station and the flooding that occurred at the lift station in 2006. Mr. Gonzales reported that the flood occurred on July 31, 2006 and resulted in the lift station malfunctioning. Mr. Gonzales reported that there was an electrical short in the valve actuators due to penetrations in the wall between the wet well and the dry well that were not properly sealed. This allowed the storm runoff to flood the dry well and short the actuators. Subsequently, the pumps did not operate and the area flooded. He reports that these penetrations have since been repaired. Mr. Gonzales' concerns regarding the lift station are as follows:

- The existing pump configuration does not have the capacity that is required. The original vertical turbine pump is too old and is no longer cost effective to continue servicing. The recommendation by the lead operator is to keep the two Flygt pumps and replace the vertical turbine pump. This would require that modifications be made inside the pump station in order to house the proposed pump. These include re-piping from the new pump back to the manifold, up-sizing the existing suction line piping form a 36" diameter to a 42" diameter pipe from the wet well to the pump, power for the new pump, and upgrading and re-programming the controls. The manifold itself can remain unaltered.

- The actuators for the existing electric valves in the station are currently located in an area of the dry well that, if the dry well were to become flooded (as in 2006), an electrical short of the actuators could occur resulting in inoperable valves. The improvements in the pump station should include relocating the actuators out of the dry well.

- The sump pump (for low flows) is not operating effectively because a large amount of debris is clogging the surrounding screen. This has, in the past, caused the wet well to fill high enough that the larger pumps turn on and operate evacuate the nuisance flows. The bar screen has been replaced recently and this may reduce or eliminate this problem. The operator suggested the installation of a grinder pump to

alleviate the potential of clogging of the sump pump. However, this type of pump requires a higher suction head. This would require that the bottom of the wet well be lowered. This would require modification of the structural slab below the location of the sump pumps.

Based on the information from Mr. Gonzales and input from the COA Engineering Division, the recommended improvements are as follows:

- Replace the existing vertical turbine pump with a new submersible pump with increased pumping capacity.
- Relocate the valve actuators.
- Re-plumb the piping from the new pump to the existing manifold in the pump station.
- Increase the suction piping for a 36" line to a 42" line.
- Keep the existing manifold configuration in the pump station.
- Observe the operation of the new bar screen as it relates to keeping the sump pumps clear of debris. Replace the sump pumps only after it is determined that the bar screen is not providing adequate protection to the sump pumps.
- Replace the existing 36-inch steel force main outside the pump station with a 42-inch ductile iron (DI) force main.
- Re-align the force main to discharge east on Bell to William, then south on William to Trumbell and connect to the existing 72-inch storm drain in William.

The relocated discharge line to William and Trumbel will reduce the flows in the Broadway Storm Drain thereby allowing for more interception capacity of this system for the basins located to the east of Broadway.

Four analyses were performed for the report. These are listed below and include the existing conditions scenarios and three scenarios with modifications to the systems. The pump and system curves are presented in graphical form in Appendix 2 and are labeled "Analysis #1" through "Analysis #4".

Analysis #1: Existing Conditions
The pump station currently has one sump pump (for low flows), two Flygt submersible pumps (replacement pumps for two of the original vertical turbine pumps) and one original vertical turbine pump. Using manufacturer's data for the existing Flygt pumps and information from the BHI report for the performance of the existing vertical turbine pump, the total pumping capacity of the lift station was calculated based on the current discharge point of Broadway and Bell.

The existing conditions pump curves were developed for the existing pumps and 36-inch discharge up to the Broadway Storm Drain system. This shows the existing system curves for two conditions: 1) the minimum system curve is when the level of the wet well is high and the discharge pipe is empty, and; 2) the maximum system curve is when the level of the water in the wet well is low and the level of the discharge pipe is high. The existing pump curves are also shown on the graph. The existing three pumps combined with the existing discharge piping can pump a maximum of 80 cfs, less than the 135 cfs that will reach the pump

station. A problem with the existing system is the diameter of the discharge piping. The 36-inch pipe results in high head losses in the system directly due to the diameter. As can be seen on the system curves, they are very steep and this results in the low pumping capacity for the existing system.

Analysis #2: Existing Pumps with New 42-Inch Discharge Line to William/Trumbell

Analysis #2 includes the existing pumps in conjunction with a new 42-inch discharge line to William/Trumbell. This alignment is shown on Plate 2 in the report. This analysis was performed to see if the existing pumps can handle the anticipated peak flow of 135 cfs along the preferred discharge route with a larger discharge line to reduce the total dynamic had (TDH) of the system. Although the 42-inch line does reduce the TDH, it is not enough for the existing pumps to move the peak flows from the pump station to William/Trumbell. The existing three pumps combined with the relocated and larger discharge piping can pump a maximum of 105 cfs, again less than the 135 cfs that will reach the pump station.

Analysis #3: Existing Flygt Pumps and New 42-Inch Discharge Line to William/Trumbell

This analysis shows the replacement of the existing vertical turbine pump with a new submersible pump while keeping the two existing Flygt pumps in place. A mid-point in the system curves was selected to size the new pump. By picking 135 cfs from the x-axis and moving upward between the system curves, the maximum allowable TDH for pumping this flow is 36 feet. At a TDH of 36 feet, the two Flygt pumps are capable of pumping 37 cfs. Based on a requirement of 135 cfs and a TDH of 36 feet, the additional pump will need to have a capacity of 98 cfs.

Analysis 4: Existing Flygt Pumps and One New Submersible Pump and New 42-Inch Discharge Line to William/Trumbell

This chart shows the pump curves of the two existing Flygt pumps along with the proposed replacement pump. A Patterson Type F36B, horizontally mounted, end suction, solids handling, centrifugal pump was selected for the replacement pump. The new pump and the two existing Flygt pumps, in conjunction with the proposed 42-inch force main, can pump between 135 cfs and 165 cfs depending on the water level in the wet well and the water level in the discharge junction box at William/Trumbull. Based on this scenario, it may be possible to install a slightly smaller pump than the one that is selected in this report. The final design will provide for more accurate TDH calculations and subsequently, allow for possible selection of a more efficient pump. The pumping range shown on the graph will allow for some degree of variation in the system during actual operating scenarios. The data used to generate the pump and system curves for all analysis scenarios is presented in Appendix 3 which also includes the cut sheet for the proposed new pump.

Existing Utilities

The horizontal and vertical alignment of the new force main pipe may need to be adjusted due to potential utility conflicts within Bell Avenue and William Street from the pump station to the junction box at the intersection of William and Trumbull. It is anticipated that the invert of the force main will be at approximately the same elevation as the existing 36-inch force main from the pump station to William. The elevation of

THE NEW 42" DIP DISCHARGE IS CONNECTED AT THE PUMP STATION. THE NEW 42" LINE CONTINUES EAST TO THE INTERSECTION OF BELL AND WILLIAM STREET, THEN SOUTH ON WILLIAM AND DISCHARGES INTO AN EXISTING JUNCTION BOX AT THE INTERSECTION OF WILLIAM AND TRUMBULL.

42" DIP FORCE MAIN

SJ-2 BASIN BOUNDARY

NOTE:

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ENGINEERS SEAL

NO.	DATE	REMARKS	BY
		REVISIONS	
		DESIGN	
		DESIGNED BY SEC	DATE 11/2009
		DRAWN BY SEC	DATE 11/2009
		CHECKED BY SEC	DATE 11/2009

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a Pate Harrison Engineering Company

CITY OF ALBUQUERQUE
DEPARTMENT OF MUNICIPAL DEVELOPMENT
ENGINEERING DIVISION

TITLE: BELL/COMMERCIAL PUMP STATION FEASIBILITY STUDY
EXHIBIT #1

Design Review Committee | City Engineer Approval | Last Design Update

City Project No. | Zone Map No. L-14/K-14 | Sheet No. | Sheet PLATE 2 Of

the line in William from Bell to Trumbell may vary depending on possible utility conflicts. An as-built drawing of the existing pump station is provided in Appendix 4 and proposed improvements are delineated for that area. An as-built drawing of the existing 36-inch force main in Bell is also provided in Appendix 4 which shows the general vertical alignment that the new system will have in that area.

Cost Estimate

An estimate of the probable construction cost was prepared for the proposed option. This estimate uses the latest 2009 City of Albuquerque prices. Because this is a conceptual design at a fairly high level, a 30% contingency is added to this estimate. The estimate for construction of this project is $1,216,300. The estimate assumes that there will be a 12-foot wide cut and cover installation for the proposed 42-inch force main, some removal and replacement of curb-and-gutter, and construction of a junction box at William/Trumbell for the new discharge point of the proposed system. A breakdown of the costs is included in Appendix 5.

APPENDIX 1

Bell & Commercial Pump Station runoff comparison to bhi 020210AHYMO.SUM

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =02/03/2010

INPUT FILE = C:\DOCUME~1\patc\Desktop\BELL&C~2.TXT USER NO.= AHYMO-S-9702c01SEC01A-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S	Bell/Commercial Force Main									
*S	Basin Runoff Comparisons to BHI Report									
START										
TIME=	.00									
*S	RAINFALL SECTION 22.2 ZONE 2									
RAINFALL	TYPE= 2									
RAIN24=	2.750									
*S	TP FOR ALL BASINS IS TAKEN FROM THE BHI REPORT DATED AUGUST 1990									
*S	BASIN SJH109									
COMPUTE NM HYD		1.00	- 1	.10420	96.22	3.827	.68859	1.550	1.443	PER IMP= 8.00
*S	BASIN SJ3									
COMPUTE NM HYD		2.00	- 2	.02370	53.61	1.962	1.55256	1.500	3.534	PER IMP= 35.00
*S	BASIN SJH152									
COMPUTE NM HYD		3.00	- 3	.13200	278.87	10.930	1.55256	1.500	3.301	PER IMP= 35.00
*S	BASIN SJ90L									
COMPUTE NM HYD		4.00	- 4	.05040	62.35	4.173	1.55256	1.750	1.933	PER IMP= 35.00
*S	BASIN SJH106									
COMPUTE NM HYD		5.00	- 5	.09500	181.19	7.866	1.55256	1.550	2.980	PER IMP= 35.00
*S	BASIN SJH100									
COMPUTE NM HYD		6.00	- 6	.09700	210.21	9.841	1.90220	1.550	3.386	PER IMP= 60.00
*S	BASIN SJ2									
COMPUTE NM HYD		7.00	- 7	.09890	139.32	8.189	1.55256	1.650	2.201	PER IMP= 35.00
FINISH										

Bell & Commercial Pump Station comparison to bhi 020210AHYMO.OUT

AHYMO PROGRAM (AHYMO_97) - - Version: 1997.02c
RUN DATE (MON/DAY/YR) = 02/03/2010
START TIME (HR:MIN:SEC) = 14:33:41 USER NO.=
AHYMO-S-9702c01SEC01A-AH
INPUT FILE = C:\DOCUME~1\patc\Desktop\BELL&C~2.TXT

```
*S        Bell/Commercial Force Main
*S        Basin Runoff Comparisons to BHI Report
START               TIME=0.0  PUNCH=0.0
*LOCATION               ALBUQUERQUE
*
*
*S                  RAINFALL SECTION 22.2 ZONE 2
*
RAINFALL                TYPE=2
                              QUARTER= 0.0  ONE= 2.01 IN
                              SIX= 2.35 IN  DAY= 2.75 IN  DT= 0.05 HR
```

COMPUTED 24-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.

DT = .050000 HOURS END TIME = 24.000000 HOURS

.0000	.0024	.0049	.0075	.0102	.0130	.0158
.0188	.0219	.0252	.0286	.0321	.0358	.0397
.0439	.0482	.0529	.0578	.0631	.0689	.0751
.0836	.0930	.1201	.1842	.2944	.4649	.7103
1.0460	1.3107	1.4303	1.5302	1.6176	1.6959	1.7667
1.8313	1.8906	1.9452	1.9955	2.0421	2.0851	2.0946
2.1034	2.1115	2.1191	2.1262	2.1330	2.1394	2.1455
2.1513	2.1569	2.1622	2.1673	2.1723	2.1771	2.1817
2.1862	2.1905	2.1948	2.1989	2.2028	2.2067	2.2105
2.2142	2.2178	2.2213	2.2248	2.2282	2.2315	2.2347
2.2379	2.2410	2.2440	2.2470	2.2500	2.2529	2.2557
2.2585	2.2613	2.2640	2.2666	2.2693	2.2719	2.2744
2.2769	2.2794	2.2818	2.2842	2.2866	2.2889	2.2913
2.2935	2.2958	2.2980	2.3002	2.3024	2.3046	2.3067
2.3088	2.3109	2.3129	2.3150	2.3170	2.3190	2.3209
2.3229	2.3248	2.3267	2.3286	2.3305	2.3323	2.3342
2.3360	2.3378	2.3396	2.3414	2.3431	2.3449	2.3466
2.3483	2.3500	2.3517	2.3534	2.3551	2.3569	2.3586
2.3602	2.3619	2.3636	2.3653	2.3669	2.3686	2.3703
2.3719	2.3736	2.3752	2.3768	2.3785	2.3801	2.3817
2.3833	2.3849	2.3865	2.3881	2.3897	2.3913	2.3929
2.3944	2.3960	2.3976	2.3991	2.4007	2.4022	2.4038
2.4053	2.4068	2.4084	2.4099	2.4114	2.4129	2.4144
2.4159	2.4174	2.4189	2.4204	2.4219	2.4234	2.4248
2.4263	2.4278	2.4292	2.4307	2.4322	2.4336	2.4350
2.4365	2.4379	2.4394	2.4408	2.4422	2.4436	2.4450
2.4464	2.4478	2.4493	2.4506	2.4520	2.4534	2.4548
2.4562	2.4576	2.4589	2.4603	2.4617	2.4630	2.4644
2.4658	2.4671	2.4685	2.4698	2.4711	2.4725	2.4738

2.4751	2.4765	2.4778	2.4791	2.4804	2.4817	2.4830
2.4843	2.4856	2.4869	2.4882	2.4895	2.4908	2.4921
2.4934	2.4946	2.4959	2.4972	2.4984	2.4997	2.5010
2.5022	2.5035	2.5047	2.5060	2.5072	2.5085	2.5097
2.5109	2.5122	2.5134	2.5146	2.5158	2.5170	2.5183
2.5195	2.5207	2.5219	2.5231	2.5243	2.5255	2.5267
2.5279	2.5291	2.5303	2.5314	2.5326	2.5338	2.5350
2.5361	2.5373	2.5385	2.5396	2.5408	2.5420	2.5431
2.5443	2.5454	2.5466	2.5477	2.5488	2.5500	2.5511
2.5523	2.5534	2.5545	2.5556	2.5568	2.5579	2.5590
2.5601	2.5612	2.5623	2.5635	2.5646	2.5657	2.5668
2.5679	2.5690	2.5701	2.5711	2.5722	2.5733	2.5744
2.5755	2.5766	2.5776	2.5787	2.5798	2.5809	2.5819
2.5830	2.5841	2.5851	2.5862	2.5872	2.5883	2.5893
2.5904	2.5914	2.5925	2.5935	2.5946	2.5956	2.5966
2.5977	2.5987	2.5997	2.6008	2.6018	2.6028	2.6038
2.6049	2.6059	2.6069	2.6079	2.6089	2.6099	2.6109
2.6119	2.6129	2.6139	2.6149	2.6159	2.6169	2.6179
2.6189	2.6199	2.6209	2.6219	2.6229	2.6238	2.6248
2.6258	2.6268	2.6278	2.6287	2.6297	2.6307	2.6316
2.6326	2.6336	2.6345	2.6355	2.6364	2.6374	2.6384
2.6393	2.6403	2.6412	2.6421	2.6431	2.6440	2.6450
2.6459	2.6469	2.6478	2.6487	2.6497	2.6506	2.6515
2.6524	2.6534	2.6543	2.6552	2.6561	2.6571	2.6580
2.6589	2.6598	2.6607	2.6616	2.6625	2.6634	2.6644
2.6653	2.6662	2.6671	2.6680	2.6689	2.6698	2.6707
2.6715	2.6724	2.6733	2.6742	2.6751	2.6760	2.6769
2.6778	2.6786	2.6795	2.6804	2.6813	2.6821	2.6830
2.6839	2.6848	2.6856	2.6865	2.6874	2.6882	2.6891
2.6900	2.6908	2.6917	2.6925	2.6934	2.6942	2.6951
2.6959	2.6968	2.6976	2.6985	2.6993	2.7002	2.7010
2.7019	2.7027	2.7035	2.7044	2.7052	2.7061	2.7069
2.7077	2.7085	2.7094	2.7102	2.7110	2.7119	2.7127
2.7135	2.7143	2.7151	2.7160	2.7168	2.7176	2.7184
2.7192	2.7200	2.7209	2.7217	2.7225	2.7233	2.7241
2.7249	2.7257	2.7265	2.7273	2.7281	2.7289	2.7297
2.7305	2.7313	2.7321	2.7329	2.7337	2.7344	2.7352
2.7360	2.7368	2.7376	2.7384	2.7392	2.7399	2.7407
2.7415	2.7423	2.7431	2.7438	2.7446	2.7454	2.7462
2.7469	2.7477	2.7485	2.7492	2.7500		

```
*
*********************************************************************
*S TP FOR ALL BASINS IS TAKEN FROM THE BHI REPORT DATED AUGUST 1990
*
*
*S                  BASIN SJH109
*
*
COMPUTE NM HYD           ID= 1  HYD NO= 1  DA= 0.1042 SQ MI
                                PER A=92 PER B=0 PER C=0 PER D=8
                                TP= 0.1806  MASSRAIN= -1
```

K = .099097HR TP = .180600HR K/TP RATIO = .548710 SHAPE CONSTANT, N = 7.044969
UNIT PEAK = 24.158 CFS UNIT VOLUME = .9993 B = 523.38 P60 = 2.0100
AREA = .008336 SQ MI IA = .10000 INCHES INF = .04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .050000

K = .210138HR TP = .180600HR K/TP RATIO = 1.163553 SHAPE CONSTANT, N = 3.046916
UNIT PEAK = 151.61 CFS UNIT VOLUME = .9998 B = 285.63 P60 = 2.0100
AREA = .095864 SQ MI IA = .65000 INCHES INF = 1.67000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .050000

*

*

PRINT HYD ID= 1 CODE=1

OUTFLOW HYDROGRAPH REACH 1.00

RUNOFF VOLUME = .68859 INCHES = 3.8267 ACRE-FEET
PEAK DISCHARGE RATE = 96.22 CFS AT 1.550 HOURS BASIN AREA = .1042 SQ. MI.

*

*

*S BASIN SJ3

*

COMPUTE NM HYD ID= 2 HYD NO= 2 DA= 0.0237 SQ MI
PER A=0 PER B=15 PER C=50 PER D=35
TP= 0.1313 MASSRAIN= -1

K = .071559HR TP = .131300HR K/TP RATIO = .545000 SHAPE CONSTANT, N = 7.106420
UNIT PEAK = 33.248 CFS UNIT VOLUME = .9990 B = 526.28 P60 = 2.0100
AREA = .008295 SQ MI IA = .10000 INCHES INF = .04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .050000

K = .111435HR TP = .131300HR K/TP RATIO = .848706 SHAPE CONSTANT, N = 4.194777

UNIT PEAK = 43.171 CFS UNIT VOLUME = 1.002 B = 367.95
P60 = 2.0100
AREA = .015405 SQ MI IA = .38462 INCHES INF = .92692
INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000

*

*

PRINT HYD ID= 2 CODE=1

OUTFLOW HYDROGRAPH REACH 2.00

RUNOFF VOLUME = 1.55256 INCHES = 1.9624 ACRE-FEET
PEAK DISCHARGE RATE = 53.61 CFS AT 1.500 HOURS BASIN AREA =
.0237 SQ. MI.

*

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*

*

*S BASIN SJH152

*

COMPUTE NM HYD ID= 3 HYD NO= 3 DA= 0.1320 SQ MI

PER A=0 PER B=15 PER C=50 PER D=35

TP= 0.1476 MASSRAIN= -1

K = .081355HR TP = .147600HR K/TP RATIO = .551183 SHAPE
CONSTANT, N = 7.004612
UNIT PEAK = 163.23 CFS UNIT VOLUME = 1.000 B = 521.47
P60 = 2.0100
AREA = .046200 SQ MI IA = .10000 INCHES INF = .04000
INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000

K = .122806HR TP = .147600HR K/TP RATIO = .832019 SHAPE
CONSTANT, N = 4.287062
UNIT PEAK = 217.33 CFS UNIT VOLUME = 1.001 B = 373.88
P60 = 2.0100
AREA = .085800 SQ MI IA = .38462 INCHES INF = .92692
INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000

*

```
     *
     PRINT HYD                 ID= 3  CODE=1

                                        OUTFLOW HYDROGRAPH REACH     3.00

          RUNOFF VOLUME =     1.55256 INCHES     =      10.9299 ACRE-FEET
          PEAK DISCHARGE RATE =     278.87 CFS  AT    1.500 HOURS   BASIN AREA =
.1320 SQ. MI.


     *
     *********
     *
     *
     *S                  BASIN SJ90L
     *
     COMPUTE NM HYD            ID= 4  HYD NO= 4  DA= 0.0504 SQ MI
                                      PER A=0  PER B=15  PER C=50  PER D=35
                                      TP= 0.3508  MASSRAIN= -1

          K =   .191186HR    TP =   .350800HR    K/TP RATIO =   .545000     SHAPE
CONSTANT, N =  7.106420
          UNIT PEAK =   26.464    CFS   UNIT VOLUME =    .9996       B =   526.28
  P60 = 2.0100
          AREA =      .017640 SQ MI    IA =    .10000 INCHES    INF =    .04000
INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000

          K =   .297726HR    TP =   .350800HR    K/TP RATIO =   .848706     SHAPE
CONSTANT, N =  4.194777
          UNIT PEAK =   34.362    CFS   UNIT VOLUME =    .9996       B =   367.95
  P60 = 2.0100
          AREA =      .032760 SQ MI    IA =    .38462 INCHES    INF =    .92692
INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000

     *
     *
     PRINT HYD                 ID= 4  CODE=1

                                        OUTFLOW HYDROGRAPH REACH     4.00

          RUNOFF VOLUME =     1.55256 INCHES     =       4.1733 ACRE-FEET
```

PEAK DISCHARGE RATE = 62.35 CFS AT 1.750 HOURS BASIN AREA = .0504 SQ. MI.

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*

*S BASIN SJH106

*

COMPUTE NM HYD ID= 5 HYD NO= 5 DA= 0.0950 SQ MI

PER A=0 PER B=15 PER C=50 PER D=35

TP= 0.1799 MASSRAIN= -1

K = .098566HR TP = .179900HR K/TP RATIO = .547891 SHAPE CONSTANT, N = 7.058440
UNIT PEAK = 96.851 CFS UNIT VOLUME = .9995 B = 524.02 P60 = 2.0100
AREA = .033250 SQ MI IA = .10000 INCHES INF = .04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .050000

K = .151278HR TP = .179900HR K/TP RATIO = .840903 SHAPE CONSTANT, N = 4.237358
UNIT PEAK = 127.24 CFS UNIT VOLUME = 1.000 B = 370.70 P60 = 2.0100
AREA = .061750 SQ MI IA = .38462 INCHES INF = .92692 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .050000

*

*

PRINT HYD ID= 5 CODE=1

OUTFLOW HYDROGRAPH REACH 5.00

RUNOFF VOLUME = 1.55256 INCHES = 7.8662 ACRE-FEET
PEAK DISCHARGE RATE = 181.19 CFS AT 1.550 HOURS BASIN AREA = .0950 SQ. MI.

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*

```
     *
     *S                  BASIN SJH100
     *
     COMPUTE NM HYD            ID= 6  HYD NO= 6  DA= 0.0970 SQ MI
                                      PER A=0  PER B=15  PER C=25  PER D=60
                                      TP= 0.1755  MASSRAIN= -1

          K =   .096186HR    TP =   .175500HR    K/TP RATIO =   .548069     SHAPE
CONSTANT, N =  7.055507
          UNIT PEAK =   173.73    CFS   UNIT VOLUME =    .9998       B =   523.88
  P60 = 2.0100
          AREA =      .058200 SQ MI    IA =    .10000 INCHES    INF =    .04000
INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000

          K =   .151894HR    TP =   .175500HR    K/TP RATIO =   .865493     SHAPE
CONSTANT, N =  4.106455
          UNIT PEAK =   80.077    CFS   UNIT VOLUME =    1.000       B =   362.21
  P60 = 2.0100
          AREA =      .038800 SQ MI    IA =    .40625 INCHES    INF =    .98750
INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000
     *
     *
     PRINT HYD                 ID= 6  CODE=1

                                          OUTFLOW HYDROGRAPH REACH     6.00

         RUNOFF VOLUME =     1.90220 INCHES     =       9.8407 ACRE-FEET
         PEAK DISCHARGE RATE =     210.21 CFS  AT   1.550 HOURS   BASIN AREA =
.0970 SQ. MI.


     *********
     *
     *
     *S                  BASIN SJ2
     *
     COMPUTE NM HYD            ID= 7  HYD NO= 7  DA= 0.0989 SQ MI
                                      PER A=0  PER B=15  PER C=50  PER D=35
                                      TP= 0.2894  MASSRAIN= -1
```

```
          K =   .158660HR    TP =   .289400HR    K/TP RATIO =   .548238     SHAPE
CONSTANT, N =  7.052740
          UNIT PEAK =   62.645    CFS   UNIT VOLUME =    1.000       B =   523.75
  P60 = 2.0100
          AREA =      .034615 SQ MI    IA =    .10000 INCHES    INF =    .04000
INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000


          K =   .243086HR    TP =   .289400HR    K/TP RATIO =   .839966     SHAPE
CONSTANT, N =  4.242532
          UNIT PEAK =   82.417    CFS   UNIT VOLUME =    1.000       B =   371.03
  P60 = 2.0100
          AREA =      .064285 SQ MI    IA =    .38462 INCHES    INF =    .92692
INCHES PER HOUR
          RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =
.050000
     *
     *
     PRINT HYD                 ID= 7  CODE=1

                                          OUTFLOW HYDROGRAPH REACH     7.00

          RUNOFF VOLUME =     1.55256 INCHES      =       8.1892 ACRE-FEET
          PEAK DISCHARGE RATE =     139.32 CFS  AT   1.650 HOURS   BASIN AREA =
.0989 SQ. MI.


     *
     *
     *
     *
     FINISH

         NORMAL PROGRAM FINISH          END TIME (HR:MIN:SEC) = 14:33:41
```

TABLE 1

Bell/ Commercial Pump Station
HYDROLOGY

AHYMO BASIN PARAMETER WORKSHEET
FOR Tp

EXISTING CONDITIONS

BASIN	AREA (sq. ft.)	AREA (acres)	AREA (sq.mi.)	LENGTH (ft.)	ELEV. DIFF. (ft.)	SLOPE (%)	K	VEL (fps)	T(c) (hr.)	T(p) (hr.)
SJ-2	2,531,280	58.11	0.090800	2450	14.0	0.57	1.5	1.10	0.62	0.41
			SUBTOTAL =	**2450**					**0.62**	**0.41**

NOTE: T(p) taken from basin map using subbasin reach lengths < 4000 feet methodology from DPM.

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =02/03/2010

INPUT FILE = C:\DOCUME~1\patc\Desktop\BELL&C~1.TXT USER NO.= AHYMO-S-9702c01SEC01A-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	PER ACRE NOTATION
									CFS PAGE = 1
*S	Bell/Commercial Force Main								
*S	Basin SJ2								
START									
TIME=	.00								
*S	RAINFALL SECTION 22.2 ZONE 2								
RAINFALL	TYPE= 2								
RAIN24=	2.750								
*S	BASIN SJ2 CALCULATIONS WITH NEW TP PER SEC CALCAULTIONS								
*S	BASIN SJ2								
COMPUTE NM HYD		7.00	- 7	.09890	110.14	8.189	1.55256	1.800	1.740 PER IMP= 35.00
FINISH									

Bell & Commenrcial Pump Station with new SJ2 Tp 0.41 020310 AHYMO.OUT

AHYMO PROGRAM (AHYMO_97) - - Version: 1997.02c
RUN DATE (MON/DAY/YR) = 02/03/2010
START TIME (HR:MIN:SEC) = 15:00:26 USER NO.=
AHYMO-S-9702c01SEC01A-AH
INPUT FILE = C:\DOCUME~1\patc\Desktop\BELL&C~1.TXT

```
*S        Bell/Commercial Force Main
*S        Basin SJ2
*
START               TIME=0.0  PUNCH=0.0
*LOCATION               ALBUQUERQUE
*
*
*S                  RAINFALL SECTION 22.2 ZONE 2
*
RAINFALL                TYPE=2
                              QUARTER= 0.0  ONE= 2.01 IN
                              SIX= 2.35 IN  DAY= 2.75 IN  DT= 0.05 HR
```

COMPUTED 24-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.

DT = .050000 HOURS END TIME = 24.000000 HOURS

.0000	.0024	.0049	.0075	.0102	.0130	.0158
.0188	.0219	.0252	.0286	.0321	.0358	.0397
.0439	.0482	.0529	.0578	.0631	.0689	.0751
.0836	.0930	.1201	.1842	.2944	.4649	.7103
1.0460	1.3107	1.4303	1.5302	1.6176	1.6959	1.7667
1.8313	1.8906	1.9452	1.9955	2.0421	2.0851	2.0946
2.1034	2.1115	2.1191	2.1262	2.1330	2.1394	2.1455
2.1513	2.1569	2.1622	2.1673	2.1723	2.1771	2.1817
2.1862	2.1905	2.1948	2.1989	2.2028	2.2067	2.2105
2.2142	2.2178	2.2213	2.2248	2.2282	2.2315	2.2347
2.2379	2.2410	2.2440	2.2470	2.2500	2.2529	2.2557
2.2585	2.2613	2.2640	2.2666	2.2693	2.2719	2.2744
2.2769	2.2794	2.2818	2.2842	2.2866	2.2889	2.2913
2.2935	2.2958	2.2980	2.3002	2.3024	2.3046	2.3067
2.3088	2.3109	2.3129	2.3150	2.3170	2.3190	2.3209
2.3229	2.3248	2.3267	2.3286	2.3305	2.3323	2.3342
2.3360	2.3378	2.3396	2.3414	2.3431	2.3449	2.3466
2.3483	2.3500	2.3517	2.3534	2.3551	2.3569	2.3586
2.3602	2.3619	2.3636	2.3653	2.3669	2.3686	2.3703
2.3719	2.3736	2.3752	2.3768	2.3785	2.3801	2.3817
2.3833	2.3849	2.3865	2.3881	2.3897	2.3913	2.3929
2.3944	2.3960	2.3976	2.3991	2.4007	2.4022	2.4038
2.4053	2.4068	2.4084	2.4099	2.4114	2.4129	2.4144
2.4159	2.4174	2.4189	2.4204	2.4219	2.4234	2.4248
2.4263	2.4278	2.4292	2.4307	2.4322	2.4336	2.4350
2.4365	2.4379	2.4394	2.4408	2.4422	2.4436	2.4450
2.4464	2.4478	2.4493	2.4506	2.4520	2.4534	2.4548

2.4562	2.4576	2.4589	2.4603	2.4617	2.4630	2.4644
2.4658	2.4671	2.4685	2.4698	2.4711	2.4725	2.4738
2.4751	2.4765	2.4778	2.4791	2.4804	2.4817	2.4830
2.4843	2.4856	2.4869	2.4882	2.4895	2.4908	2.4921
2.4934	2.4946	2.4959	2.4972	2.4984	2.4997	2.5010
2.5022	2.5035	2.5047	2.5060	2.5072	2.5085	2.5097
2.5109	2.5122	2.5134	2.5146	2.5158	2.5170	2.5183
2.5195	2.5207	2.5219	2.5231	2.5243	2.5255	2.5267
2.5279	2.5291	2.5303	2.5314	2.5326	2.5338	2.5350
2.5361	2.5373	2.5385	2.5396	2.5408	2.5420	2.5431
2.5443	2.5454	2.5466	2.5477	2.5488	2.5500	2.5511
2.5523	2.5534	2.5545	2.5556	2.5568	2.5579	2.5590
2.5601	2.5612	2.5623	2.5635	2.5646	2.5657	2.5668
2.5679	2.5690	2.5701	2.5711	2.5722	2.5733	2.5744
2.5755	2.5766	2.5776	2.5787	2.5798	2.5809	2.5819
2.5830	2.5841	2.5851	2.5862	2.5872	2.5883	2.5893
2.5904	2.5914	2.5925	2.5935	2.5946	2.5956	2.5966
2.5977	2.5987	2.5997	2.6008	2.6018	2.6028	2.6038
2.6049	2.6059	2.6069	2.6079	2.6089	2.6099	2.6109
2.6119	2.6129	2.6139	2.6149	2.6159	2.6169	2.6179
2.6189	2.6199	2.6209	2.6219	2.6229	2.6238	2.6248
2.6258	2.6268	2.6278	2.6287	2.6297	2.6307	2.6316
2.6326	2.6336	2.6345	2.6355	2.6364	2.6374	2.6384
2.6393	2.6403	2.6412	2.6421	2.6431	2.6440	2.6450
2.6459	2.6469	2.6478	2.6487	2.6497	2.6506	2.6515
2.6524	2.6534	2.6543	2.6552	2.6561	2.6571	2.6580
2.6589	2.6598	2.6607	2.6616	2.6625	2.6634	2.6644
2.6653	2.6662	2.6671	2.6680	2.6689	2.6698	2.6707
2.6715	2.6724	2.6733	2.6742	2.6751	2.6760	2.6769
2.6778	2.6786	2.6795	2.6804	2.6813	2.6821	2.6830
2.6839	2.6848	2.6856	2.6865	2.6874	2.6882	2.6891
2.6900	2.6908	2.6917	2.6925	2.6934	2.6942	2.6951
2.6959	2.6968	2.6976	2.6985	2.6993	2.7002	2.7010
2.7019	2.7027	2.7035	2.7044	2.7052	2.7061	2.7069
2.7077	2.7085	2.7094	2.7102	2.7110	2.7119	2.7127
2.7135	2.7143	2.7151	2.7160	2.7168	2.7176	2.7184
2.7192	2.7200	2.7209	2.7217	2.7225	2.7233	2.7241
2.7249	2.7257	2.7265	2.7273	2.7281	2.7289	2.7297
2.7305	2.7313	2.7321	2.7329	2.7337	2.7344	2.7352
2.7360	2.7368	2.7376	2.7384	2.7392	2.7399	2.7407
2.7415	2.7423	2.7431	2.7438	2.7446	2.7454	2.7462
2.7469	2.7477	2.7485	2.7492	2.7500		

```
*
*******************************************************************************
*S                    BASIN SJ2      CALCULATIONS WITH NEW TP PER SEC
CALCAULTIONS
*
*
*S                    BASIN SJ2
*
COMPUTE NM HYD              ID= 7  HYD NO= 7  DA= 0.0989 SQ MI
                                   PER A=0  PER B=15  PER C=50  PER D=35
                                   TP= 0.4100  MASSRAIN= -1
```

K = .224778HR TP = .410000HR K/TP RATIO = .548238 SHAPE CONSTANT, N = 7.052740
UNIT PEAK = 44.218 CFS UNIT VOLUME = .9998 B = 523.75 P60 = 2.0100
AREA = .034615 SQ MI IA = .10000 INCHES INF = .04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .050000

K = .344386HR TP = .410000HR K/TP RATIO = .839966 SHAPE CONSTANT, N = 4.242532
UNIT PEAK = 58.175 CFS UNIT VOLUME = .9998 B = 371.03 P60 = 2.0100
AREA = .064285 SQ MI IA = .38462 INCHES INF = .92692 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = .050000

*

*

PRINT HYD ID= 7 CODE=1

OUTFLOW HYDROGRAPH REACH 7.00

RUNOFF VOLUME = 1.55256 INCHES = 8.1892 ACRE-FEET
PEAK DISCHARGE RATE = 110.14 CFS AT 1.800 HOURS BASIN AREA = .0989 SQ. MI.

*

*

*

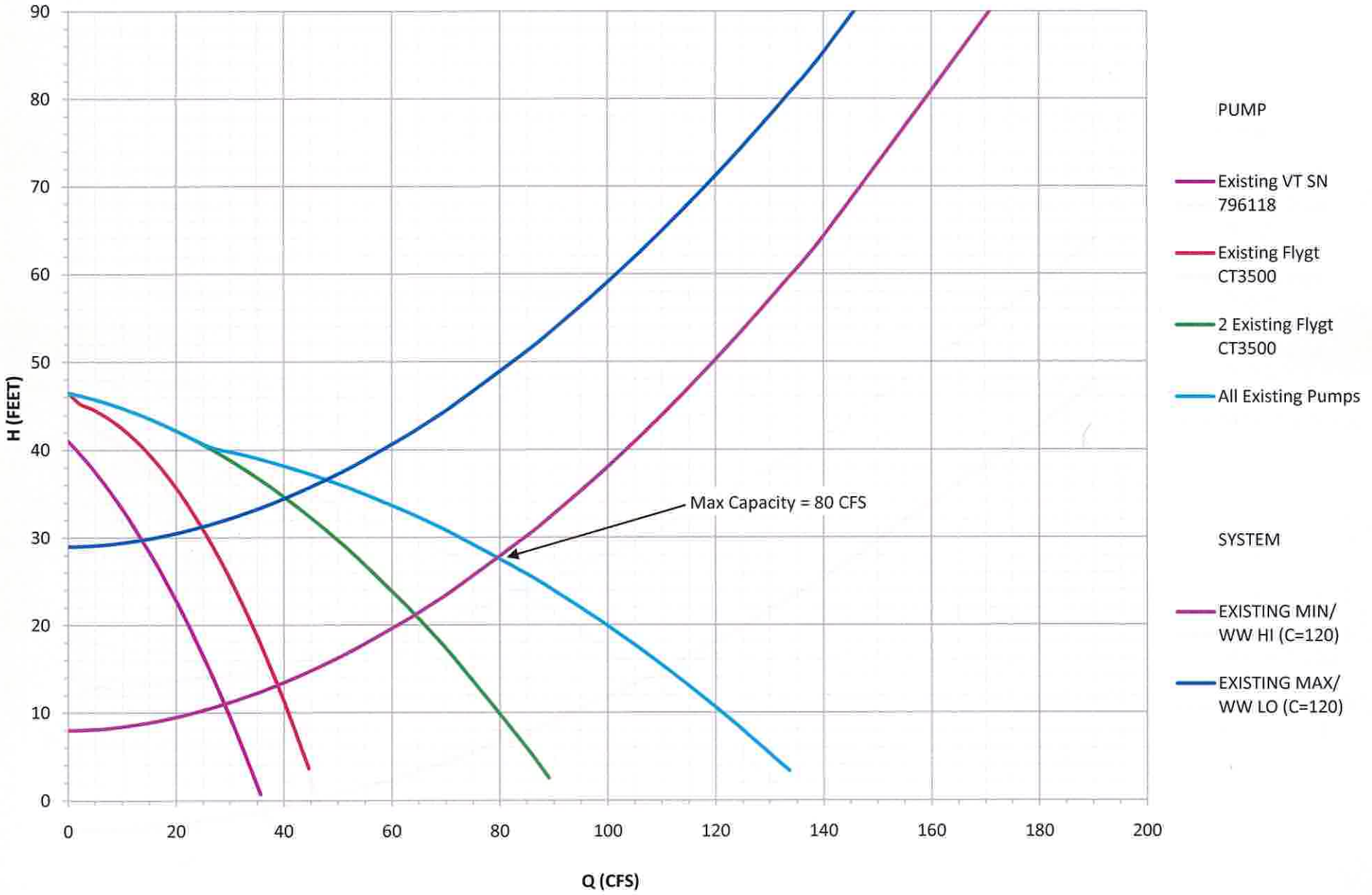
*

FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 15:00:27

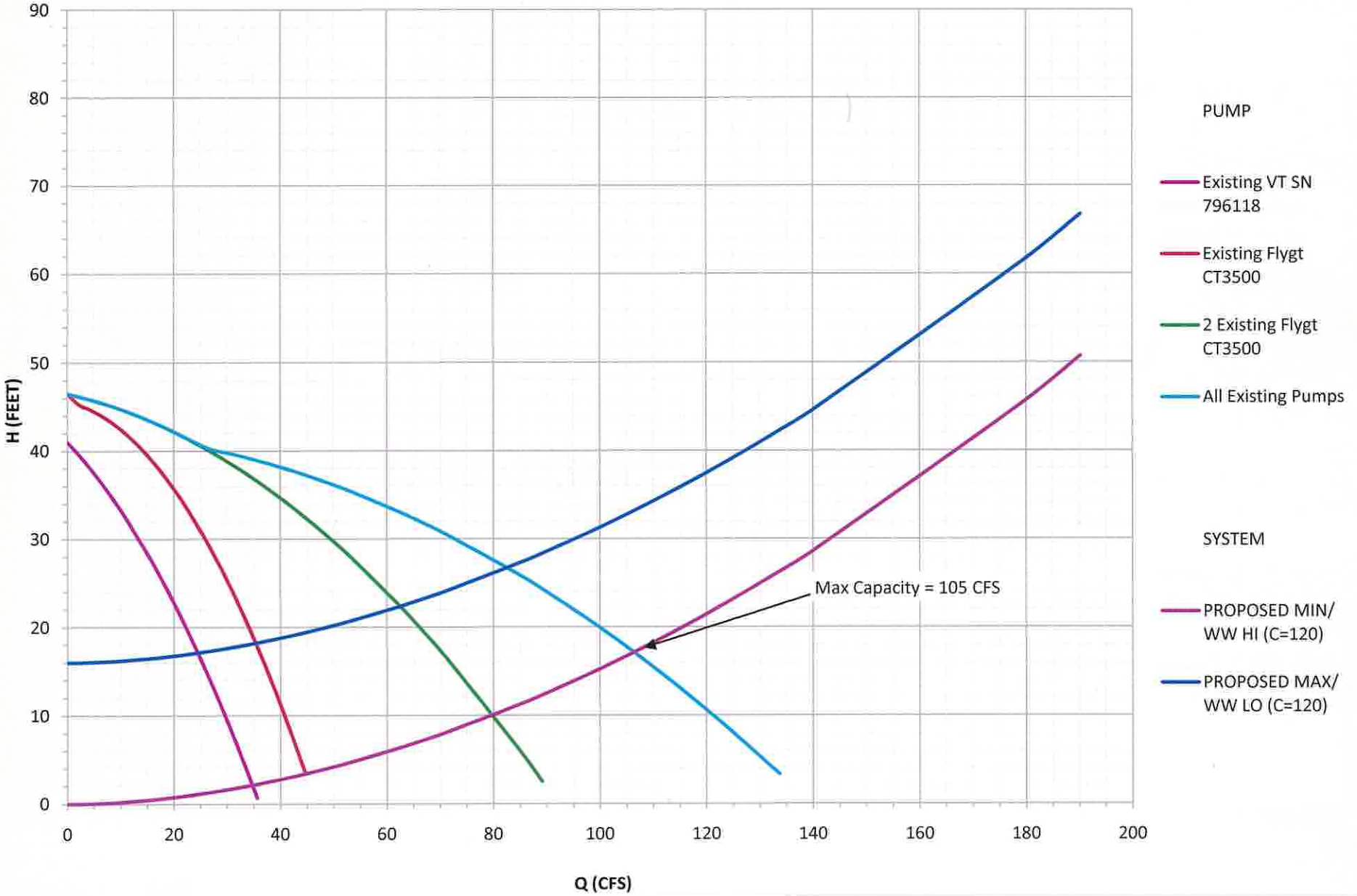
APPENDIX 2

Commercial/Bell Storm Water Lift Station
Analysis #1: Existing Pumps and Existing System Curves



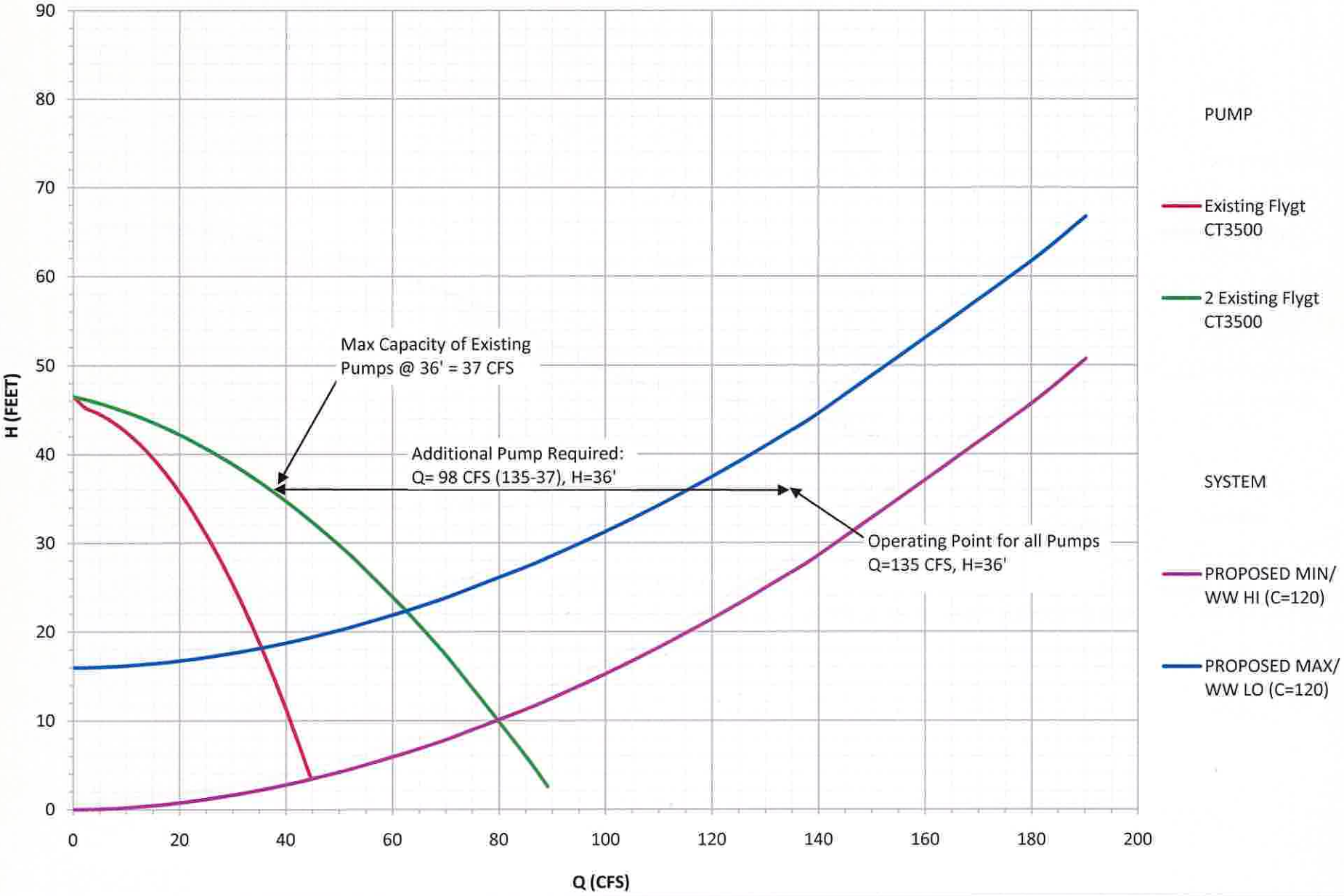
Q:\SEC---PROJECTS\2009 Projects\109104E COA on-call Bell Commercial Forcemain\Hydraulics\Becky's File.xlsEx Pumps & Ex Dis

Commercial/Bell Storm Water Lift Station
Analysis #2: Existing Pumps and Proposed 42-Inch System Curves



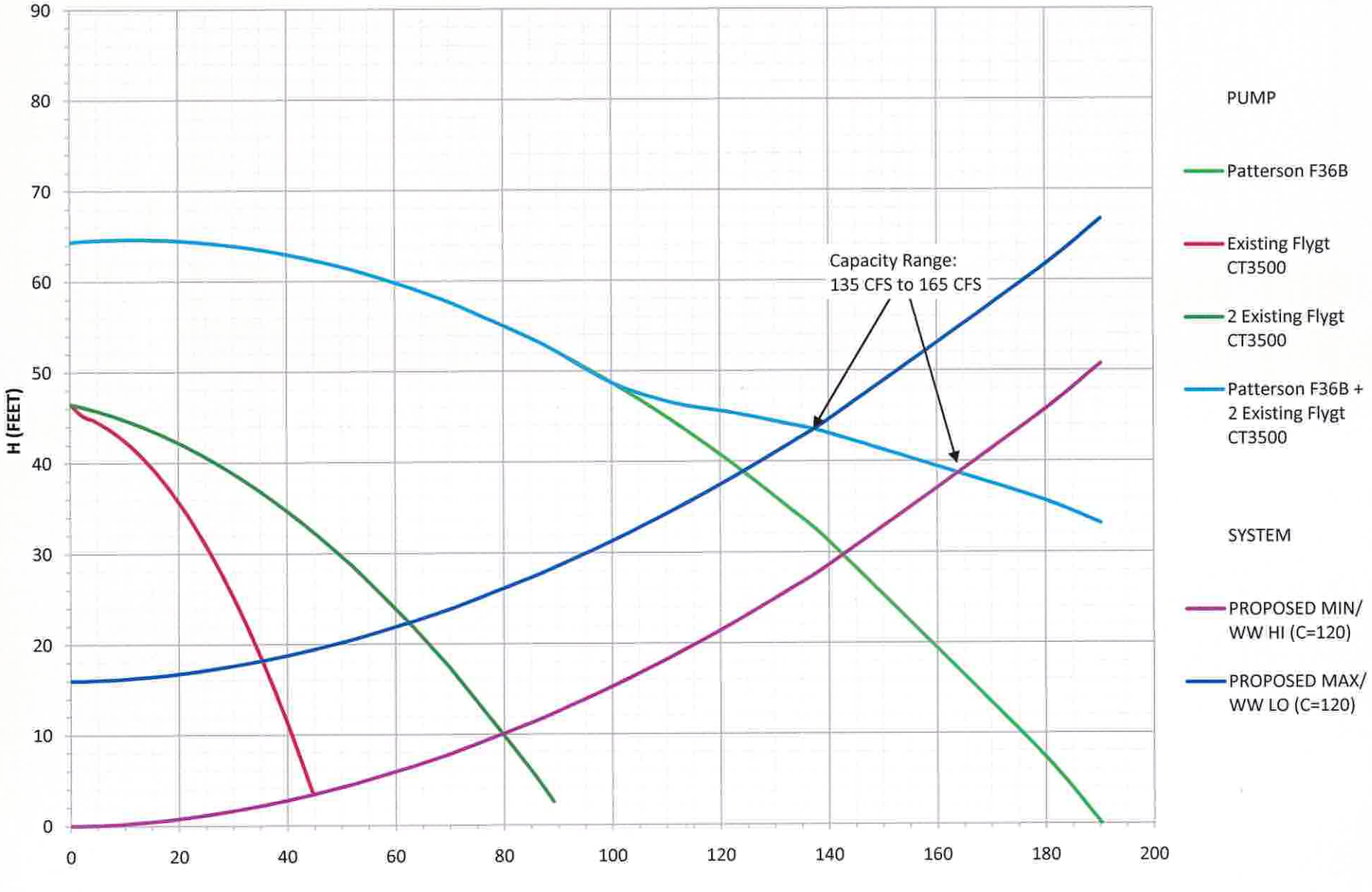
Q:\SEC---PROJECTS\2009 Projects\109104E COA on-call Bell Commercial Forcemain\Hydraulics\Becky's File.xlsEx Pumps & New Dis

Commercial/Bell Storm Water Lift Station
Analysis #3: Required New Pump Calculation and Proposed 42-Inch System Curves



Q:\SEC---PROJECTS\2009 Projects\109104E COA on-call Bell Commercial Forcemain\Hydraulics\Becky's File.xlsNew Pumps & New Dis (1)

Commercial/Bell Storm Water Lift Station
Analysis #4: Existing Pumps plus Proposed Pump and Proposed 42-Inch System Curves



Q:\SEC---PROJECTS\2009 Projects\109104E COA on-call Bell Commercial Forcemain\Hydraulics\Becky's File.xlsNew Pumps & New Dis (2)

Commercial/Bell Storm Water Lift Station
Pump and System Curves

System Curve Data

		Existing System		Proposed System (FM to Trumbull)	
	Total Pipe Length (ft)	1000		1000	
1 check valves and 3 90o elbows.	Minor Loss Equivilent Length (ft)	675		787.5	
	Total Equivilent Length (ft)	1675		1787.5	
	Pipe Diameter (in)	36		42	
	Min H-W C	120		120	DIP
	Max H-W C	120		120	DIP
	High Upstream WSE (ft)	4946	Top of the wet well	4946	Top of the wet well
	Low Upstream WSE (ft)	4928	Bottom of the wet well + 3'	4928	Bottom of the wet well + 3'
	High Downstream WSE (ft)	4957	Top of Pipe at Bell/Broadwa	4944	Top of Pipe at Bell/William
	Low Downstream WSE (ft)	4954	Invert of Pipe at Bell/Broad	4941	Invert of Pipe at Bell/Willian
	Maximum Static Lift (ft)	29		16	
	Minimum Static Lift (ft)	8		0	

		PUMP						SYSTEM			SYSTEM		
Q		Existing Flygt CT3500	Existing VT SN 796118	2 Existing Flygt CT3500	All Existing Pumps	Patterson F36B	Patterson F36B + 2 Existing Flygt CT3500	EXISTING MIN/ WW HI (C=120)	EXISTING MAX/ WW LO (C=120)	Vel	PROPOSED MIN/ WW HI (C=120)	PROPOSED MAX/ WW LO (C=120)	Vel
CFS	GPM	TDH	TDH	TDH	TDH	TDH	TDH	TDH	TDH	FPS	TDH	TDH	FPS
0	0	46.50	41.00	46.50	46.50	64.40	64.40	8	29	0.0	0	16	0.0
2	1000	45.25	39.53	46.18	46.18	64.49	64.49	8	29	0.3	0	16	0.2
4	2000	44.68	37.92	45.82	45.82	64.56	64.56	8	29	0.6	0	16	0.5
7	3000	43.93	36.17	45.42	45.42	64.61	64.61	8	29	0.9	0	16	0.7
9	4000	43.00	34.28	44.98	44.98	64.64	64.64	8	29	1.2	0	16	0.9
11	5000	41.89	32.25	44.50	44.50	64.65	64.65	9	30	1.5	0	16	1.1
13	6000	40.60	30.00	43.98	43.98	64.64	64.64	9	30	1.9	0	16	1.4
16	7000	39.13	27.77	43.42	43.42	64.61	64.61	9	30	2.2	0	16	1.6
18	8000	37.48	25.32	42.82	42.82	64.56	64.56	9	30	2.5	1	17	1.8
20	9000	35.65	22.73	42.18	42.18	64.49	64.49	10	31	2.8	1	17	2.0
22	10000	33.64	20.00	41.50	41.50	64.40	64.40	10	31	3.1	1	17	2.3
27	12000	29.08	14.12	40.02	40.26	64.16	64.16	11	32	3.7	1	17	2.7
31	14000	23.80	7.68	38.38	39.64	63.84	63.84	11	32	4.3	2	18	3.2
36	16000	17.80	0.68	36.58	38.94	63.44	63.44	12	33	4.9	2	18	3.6
40	18000	11.08		34.62	38.16	62.96	62.96	13	34	5.6	3	19	4.1
45	20000	3.64		32.50	37.30	62.40	62.40	15	36	6.2	3	19	4.5
49	22000			30.22	36.36	61.76	61.76	16	37	6.8	4	20	5.0
53	24000			27.78	35.34	61.04	61.04	17	38	7.4	5	21	5.5
62	28000			22.42	33.06	59.36	59.36	20	41	8.7	6	22	6.4
65	29000			20.98	32.44	58.89	58.89	21	42	9.0	7	23	6.6
67	30000			19.50	31.80	58.40	58.40	22	43	9.3	7	23	6.8
71	32000			16.42	30.46	57.36	57.36	24	45	9.9	8	24	7.3
85	38000			6.22	25.96	53.76	53.76	30	51	11.8	11	27	8.6
89	40000			2.50	24.30	52.40	52.40	32	53	12.4	12	28	9.1
100	45000				19.80	48.65	48.65	38	59	13.9	15	31	10.2
111	50000				14.80	44.40	46.47	45	66	15.5	19	35	11.4
123	55000				9.30	39.65	45.34	52	73	17.0	22	38	12.5
134	60000				3.30	34.40	43.97	60	81	18.6	26	42	13.6
140	62832					31.20	43.08	64	85	19.4	29	45	14.3
178	80000					8.40	35.97	96	117	24.7	45	61	18.2
190	85405					0.00	33.12	108	129	26.4	51	67	19.4

APPENDIX 3

Pump Data Sheet - Patterson 60 Hz Pumps

Company: Smith Engineering
Name: Rebecca Fink
Date: 11/19/2009

Pumping Technology for Tomorrow's World
Patterson
A Subsidiary of The Gorman-Rupp Company

Pump:

Size: F36B

Type: TypeFSewage
Synch speed: 400 rpm

Speed: 395 rpm
Dia: 37.5625 in

Curve: F36BJ

Impeller: C-7730

Specific Speeds:

Ns: 4259
Nss: ---

Dimensions:

Suction: 42 in
Discharge: 36 in

Pump Limits:

Temperature: 150 °F
Pressure: 80 psi g
Sphere size: 8.75 in

Power: ---
Eye area: ---

Search Criteria:

Flow: 49000 US gpm

Head: 38 ft

Fluid:

Water
SG: 1
Viscosity: 1.105 cP

Temperature: 60 °F
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a

NPSHa: ---

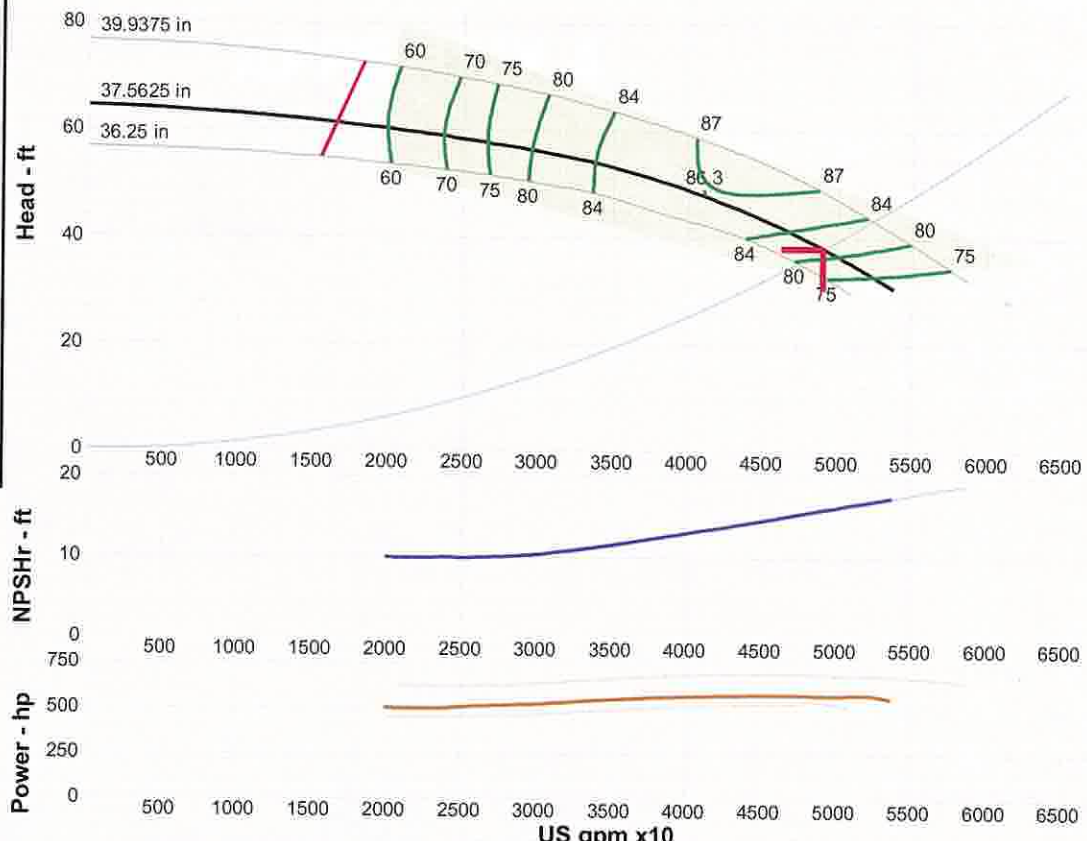
Motor:

Standard: NEMA
Enclosure: TEFC

Speed: ---
Frame: ---

Sizing criteria: Max Power on Design Curve

---- Data Point ----	
Flow:	49000 US gpm
Head:	38.1 ft
Eff:	81.2%
Power:	580 hp
NPSHr:	16 ft
---- Design Curve ----	
Shutoff head:	64.4 ft
Shutoff dP:	27.9 psi
Min flow:	16438 US gpm
BEP:	86.3% @ 41095 US gpm
NOL power:	581 hp @ 46718 US gpm
-- Max Curve --	
Max power:	699 hp @ 45836 US gpm



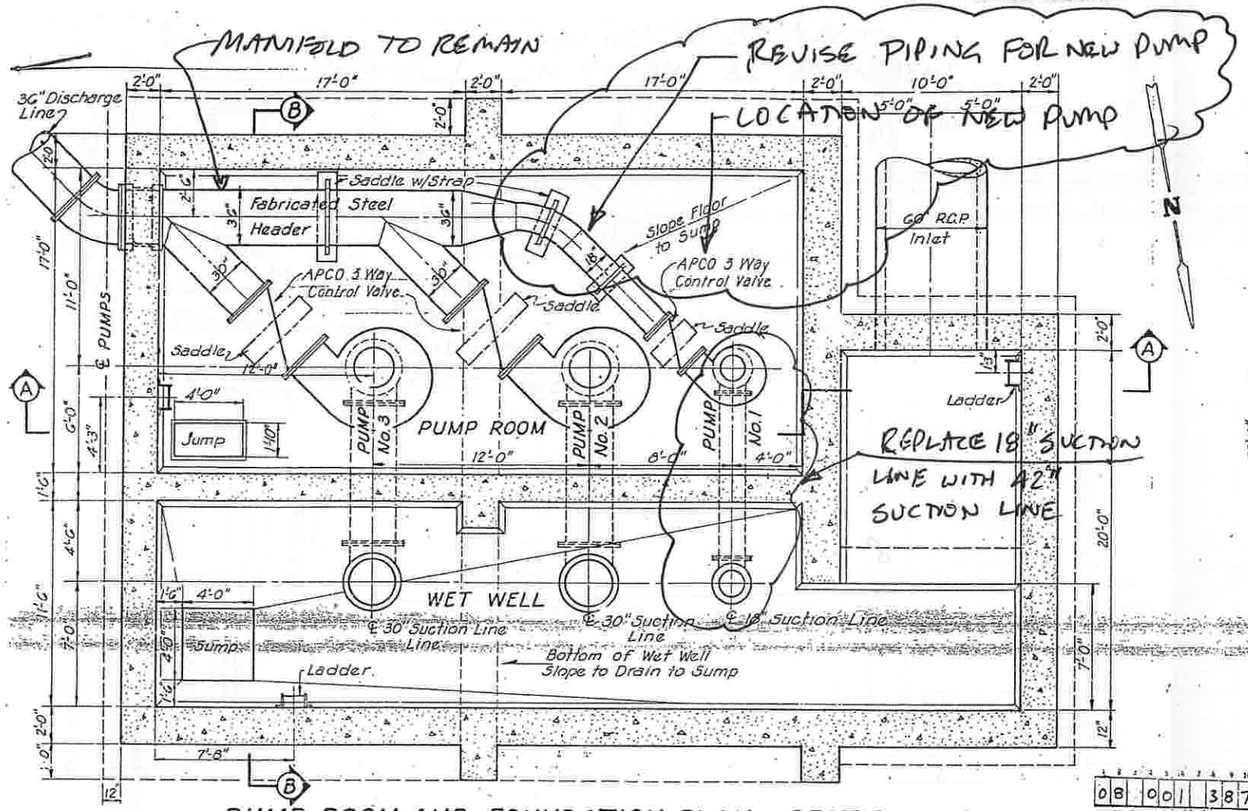
In accordance with the Hydraulic Institute Standards, pump is guaranteed for one set of conditions. Performance guarantees are based on shop test and when handling clear, cold, fresh water at sea level and at a temperature no greater than 85 degrees F. Suction lift must not exceed that shown on curve.

Performance Evaluation:

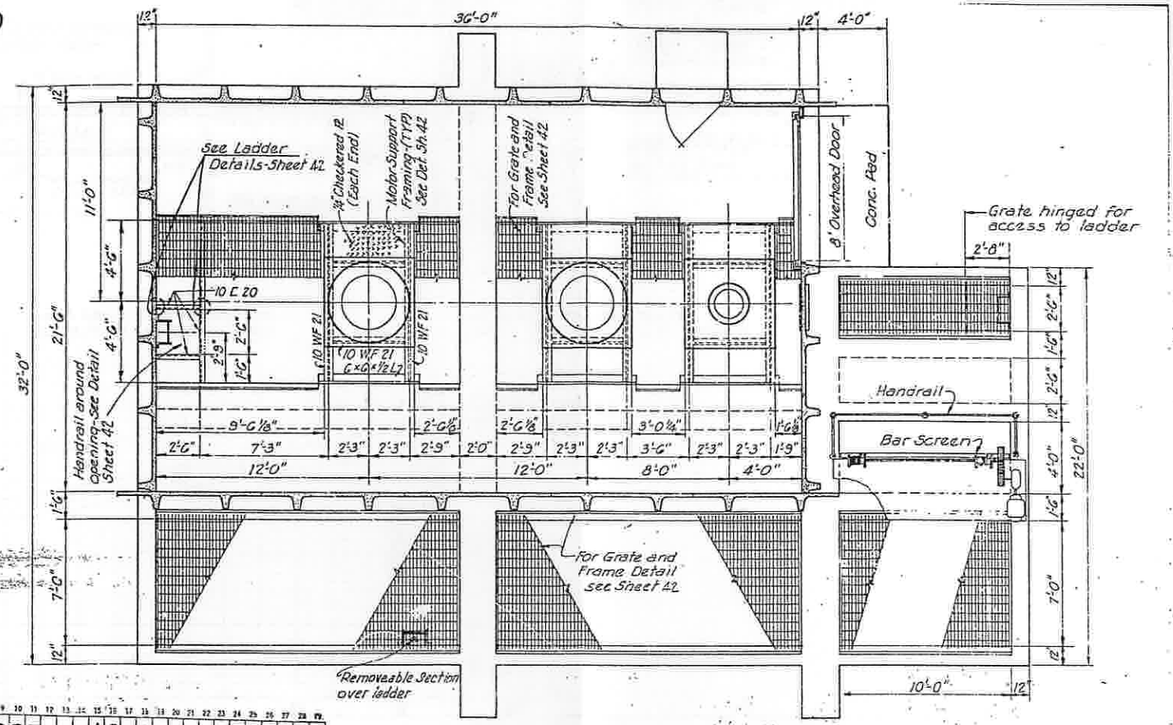
Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
58800	395	---	---	---	---
49000	395	38.1	81.2	580	16
39200	395	49.5	85.7	569	12.9
29400	395	56.4	79.8	525	10.4
19600	395	60.4	59.2	505	10

Selected from catalog: Patterson Pumps.60 Vers: 1.1

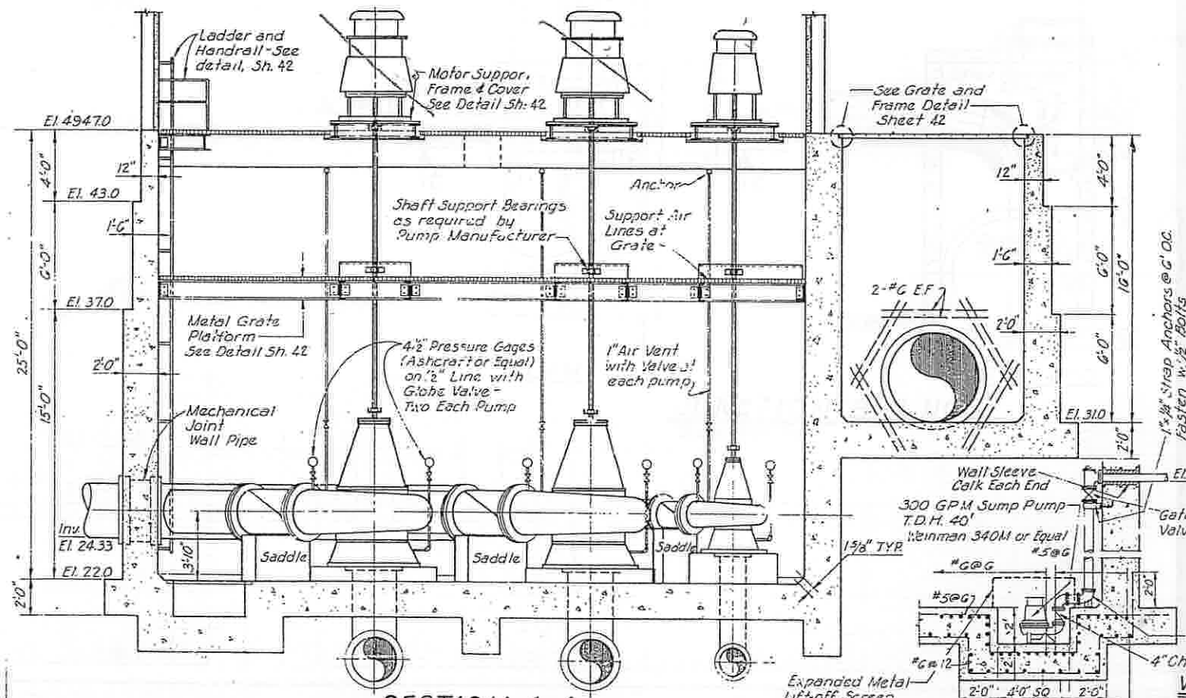
APPENDIX 4



PUMP ROOM AND FOUNDATION PLAN - SECTION C-C

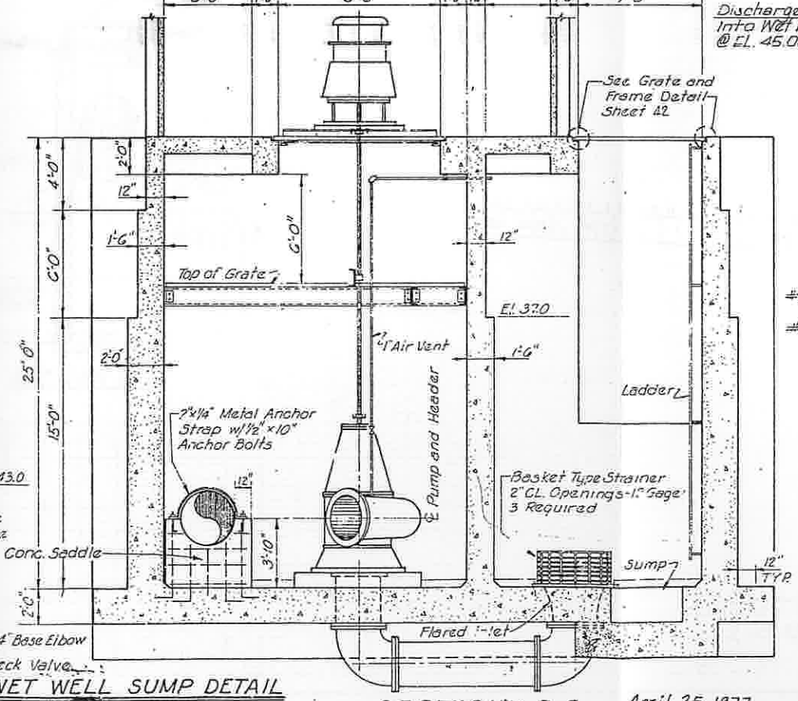


FLOOR PLAN

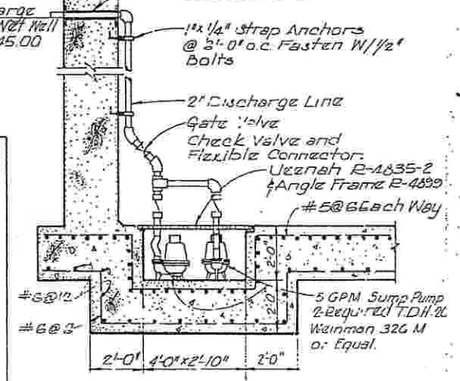


SECTION A-A

WET WELL SUMP DETAIL
Scale ½"=1'-0"



SECTION B-B



PUMP ROOM SUMP DETAIL
Scale 3/8"=1'-0"

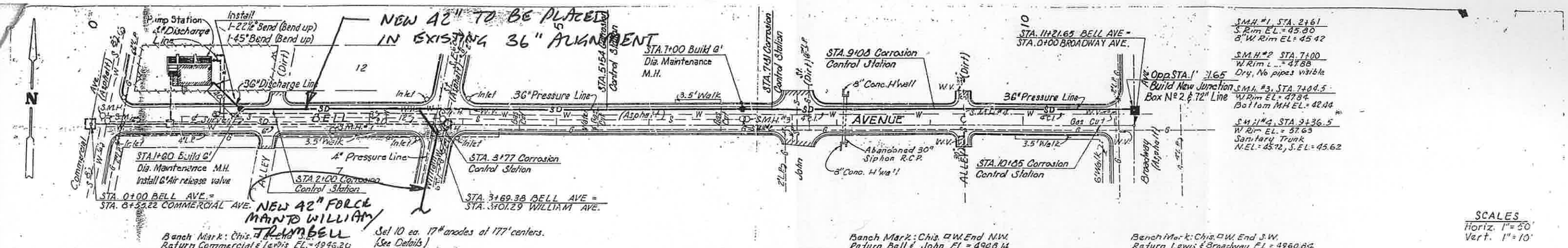
ALBUQUERQUE, NEW MEXICO
MODEL NEIGHBORHOOD AREA
DRAINAGE IMPROVEMENTS WSNM-20
COMMERCIAL AT BELL PUMP STATION

PIPING PLANS AND DETAILS

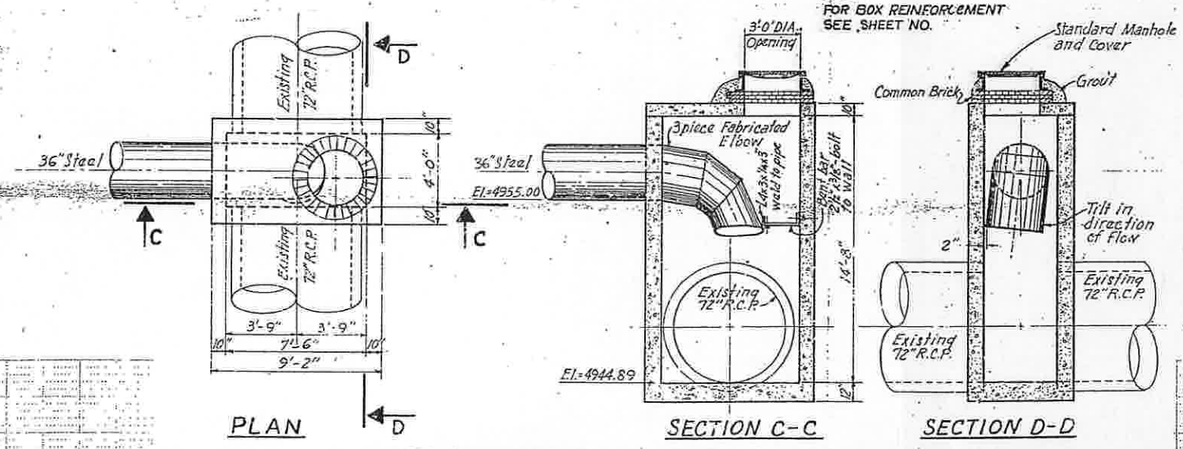
GORDON HERKENHOFF & ASSOCIATES, INC.
CONSULTING ENGINEERS
ALBUQUERQUE NEW MEXICO

SCALE	DATE	DRAWN: J.R.J	SHEET 38
1/4" = 1'-0"	JUNE 1971	CHECKED: G.A.J	OF 47.

April 25, 1977



SCALES
Horiz. 1" = 50'
Vert. 1" = 10'



PLAN — SECTION C-C — SECTION D-D

JUNCTION BOX NO. 2

Scale: ¼" = 1'-0"

April 25, 1977

PLATE 2 - DOUBLE PLAN - PROFILE - DOTTED
CHARLES BRUNING CO., INC.

APPENDIX 5

BELL / COMMERCIAL FORCE MAIN

CITY OF ALBUQUERQUE

ENGINEER'S PROBABLE ESTIMATED COST OF CONSTRUCTION

DATE: Friday, November 20, 2009

Pump Station Modifications and 42-Inch Force Main From Bell/Commercial Pump Station to William/Trumbell

BID LOT 1 - ROADWAY WORK

BID ITEM NUMBER	SPEC. ITEM NUMBER	DESCRIPTION	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED AMOUNT
1	4.010X	Construction Staking including staking of project, quantity verification, and as-built information, compl.	LS	1	$10,000.00	$10,000.00
2	6.010	Construction Project Sign, per Contract Special Provisions, cip.	EA	2	$700.00	$1,400.00
3	6.050	Construction Mobilization, compl.	LS	1	$40,000.00	$40,000.00
4	6.060	Construction Demobilization, compl.	LS	1	$10,000.00	$10,000.00
5	19.010	Construction Traffic Control & Barricading, compl.	LS	1	$10,000.00	$10,000.00
6	30.010	Flood Protection, compl.	LS	1	$3,500.00	$3,500.00
7	30.020	NPDES Compliance, complete	LS	1	$2,500.00	$2,500.00
8	301.020	Subgrade Prep. 12" at 95% compaction, cip.	SY	1,266	$2.00	$2,532.00
9	302.010	Aggregate Base Course, crushed, 8" at 95% compaction, cip. SD 2408	SY	1,266	$9.00	$11,394.00
10	336.010	Prime Coat, emulsified asphalt, cip.	SY	1,266	$0.42	$531.72
11	336.024	Asphalt Concrete Pavement, SP-III, 3 inch thick, machine laydown, cip.	SY	2,533	$19.10	$48,380.30
12	336.120	Tack Coat, cationic emulsified asphalt, cip.	SY	1,266	$0.25	$316.50
13	340.010	Sidewalk, 4" thick, Portland Cement Concrete, incl. subgrade compaction, cip. SD 2430	SY	40	$33.75	$1,350.00
14	340.050	Curb & Gutter, Standard, Portland Cement Concrete, incl. subgrade preparation, cip. SD 2415	LF	150	$20.50	$3,075.00
15	343.010A	Existing Pavement, Asphalt Concrete, remove & dispose, any thickness, including cement treated base course, compl.	SY	1,266	$9.75	$12,343.50

16	343.080A	Existing Curb & Gutter, PC Concrete, remove & dispose, complete	LF	150	$5.50	$825.00
17	343.085A	Existing Sidewalk, 4" PC Concrete, including wheel chair access ramps, remove & dispose, compl.	SY	70	$11.16	$781.20
18	441.001	Reflectorized Plastic Pavement Markings, 4" width, cip.	LF	0	$0.65	$0.00

a) BID LOT 1 BASE BID: $158,929.22

b) CONTINGENCIES @ 30% $47,678.77

c) BID LOT 1 ALLOWANCES:

Project Sign Screen, 2 @ $ 500.00 per sign	$1,000.00	
Dedicatory Plaque	$0.00	
Utility Relocation Allowance	$0.00	
Geotechnical Materials Testing	$10,000.00	
TOTAL ALLOWANCES:		$11,000.00

d) BID LOT 1 SUBTOTAL:
Line a) Bid Lot 1 Base Bid Subtotal plus Line b) Contingencies plus Line c) Bid Lot 1 Allowances: $217,607.99

e) BID LOT 1: NEW MEXICO GROSS RECEIPTS TAX (NMGRT):
on amount on Line d) Bid Lot 1 Subtotal @ 6.875% $14,960.55

f) BID LOT 1 BASE BID TOTAL:
Line d) Bid Lot 1 Subtotal plus Line e) Bid Lot 1 NMGRT: $232,568.54

BID LOT 2 - STORM DRAIN WORK

BID ITEM NUMBER	SPEC. ITEM NUMBER	DESCRIPTION	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED AMOUNT
1	701.150A	Trenching, Backfilling and Compaction, for 42" force main, up to 8' in depth, pipe not incl., compl.	LF	950	$85.00	$80,750.00
2	801.01X	42" DIP incl. fittings , furnish and install in open trench, cip.	LF	950	$200.00	$190,000.00
3	510.110	Structural Reinforced PC, 4,000 psi, incl. formwork, excavation and backfill for the junction box modifications at William/Trumbell	LS	1	$15,000.00	$15,000.00
4	920.210	Manhole, 8' dia., Type "C" or "E", 6' to 10' deep, cip. SD 2101	EA	4	$8,000.00	$32,000.00

g) BID LOT 2 BASE BID: $317,750.00

h) CONTINGENCIES @ 30% $95,325.00

i) BID LOT 2 ALLOWANCES:

Utility Relocation Allowance	$10,000.00	
Geotechnical Materials Testing	$5,000.00	
TOTAL ALLOWANCES:		$15,000.00

j) BID LOT 2 SUBTOTAL:
Line g) Bid Lot 2 Base Bid Subtotal plus Line h) Contingencies plus Line i) Bid Lot 2 Allowances: $428,075.00

k) BID LOT 2: NEW MEXICO GROSS RECEIPTS TAX (NMGRT):
on amount on Line j) Bid Lot 2 Subtotal @ 6.875% $29,430.16

l) BID LOT 2 BASE BID TOTAL:
Line j) Bid Lot 2 Subtotal plus Line k) Bid Lot 2 NMGRT: $457,505.16

BID LOT 3 - PUMPS

BID ITEM NUMBER	SPEC. ITEM NUMBER	DESCRIPTION	UNIT	ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED AMOUNT
1	510.XXX	Mods to pump station to include improvements to the piping to manifold & electrical/ controls)	LS	1	$50,000.00	$50,000.00
2	501.020	Lift station structure, remove and dispose for installation of the new 42" suction line, cip	CY	9	$650.00	$5,850.00
3	510.110	Structural Reinforced PC, 4,000 psi, incl. formwork, excavation and backfill for the suction line modifications at the Bell Lift Station, cip	CY	9	$1,800.00	$16,200.00
4	801.056	Existing waterline, 16" to 36", with fittings, remove and dispose, compl.	LF	18	$150.00	$2,700.00
5	801.01X	42" DIP suction line incl. fittings , furnish, install and backfill, cip.	LS	1	$4,000.00	$4,000.00
6	701.XXX	New centrifugal submersible pump, cip.	EA	1	$300,000.00	$300,000.00

m) BID LOT 3 BASE BID: $378,750.00

n) CONTINGENCIES @ 30% $113,625.00

o) BID LOT 3 ALLOWANCES:

None $0.00

TOTAL ALLOWANCES: $0.00

p) BID LOT 3 SUBTOTAL:

Line m) Bid Lot 3 Base Bid Subtotal plus Line n) Contingencies plus Line o) Bid Lot 3 Allowances: $492,375.00

q) BID LOT 3: NEW MEXICO GROSS RECEIPTS TAX (NMGRT):

on amount on Line p) Bid Lot 3 Subtotal @ 6.875% $33,850.78

r) BID LOT 3 BASE BID TOTAL:

Line p) Bid Lot 3 Subtotal plus Line q) Bid Lot 3 NMGRT: $526,225.78

s) BID TOTAL: Line f) Bid Lot 1 Base Bid Total plus Line l) Bid Lot 2 Base Bid Total plus Line r) Bid Lot 3 Base Bid Total: **$1,216,299.47**