OPTION 20 – SWMM MODEL OUTPUT

Option Description

This option was not modeled using SWMM; however, approximate calculations were carried out based on the attached discussion.
All proposed system curves and calculations that were approximated are attached.

SIMPLE COMPUTATION OF THE REQUIRED FORCE MAIN DIAMETER FOR

OPTION 20 - FACILITY X14

Location –

From Broadway Pump Station follow the same alignment as the existing 54-inch force main to Mountain, then west on Mountain towards the Rio Grande – see Figure attached for the alignment

Purpose –

The purpose of Option 20 Facility X14, was to determine if an alternate route for the Broadway Pump Station force main would provide an increase pipe capacity and assist in the achieving the existing pump station capacity of 130 cfs, or the proposed capacity of 150 cfs if it is rebuilt. The concept was derived assuming that pumping downhill with an outfall to the Rio Grande may be more efficient that pumping uphill to the North Diversion Channel. Option 20 was not modeled in SWMM. The additional purpose of this Option is to determine the cost differences of this option as compared to the other pump station force main improvement options.

Facility X14 –

Pump capacity at Broadway Pump Station at 130 or 150 cfs with a new pump station. This would also require an additional new 54-in. force main to the Rio Grande beginning at Mountain and continuing west. See Figure attached for the possible alignment.

Broadway Lift Station Options

The Broadway Storm Water Lift Station No. 31 currently discharges to the North Diversion Channel (about 1.3 miles along Broadway Boulevard and Mountain Road). The current pumping capacity is 127 CFS (*Molzen Corbin and Associates, Broadway Pump Station DAR, July 2008*). The maximum static head at the pumps is about 177 feet (based on as-builts of the station, and contours at the Channel inlet). The existing discharge pipe is a 54-inch diameter concrete cylinder pipe. The report recommended that when the pumps are replaced (due to age and maintenance issues), they should be up-sized to pump this maximum capacity of the discharge pipe (increase of 23 CFS would provide 150 cfs capacity).

The city requested that Smith Engineering Company (SEC) perform a simple computation to examine an alternative to pump replacement, that could increase the capacity of the station.

Appendix Volume 1.2 Option 20 Facility X14

This alternative was to discharge (downstream) to the Rio Grande. This would decrease the static head, and therefore increase the capacity. In order to examine the pumping capacity of the existing pumps with a different discharge scenario, a manufactures pump curve is necessary. However, no pump curves are available and therefore, SEC "assumed" a pump curve based on the know information including the existing system curve (Appendix A, EXIST 54" line) and a known operating point (see point 1 illustrated in the chart in attached). SEC proposed one possible route from the pump station to the Rio Grande (see Figure attached for alignment).

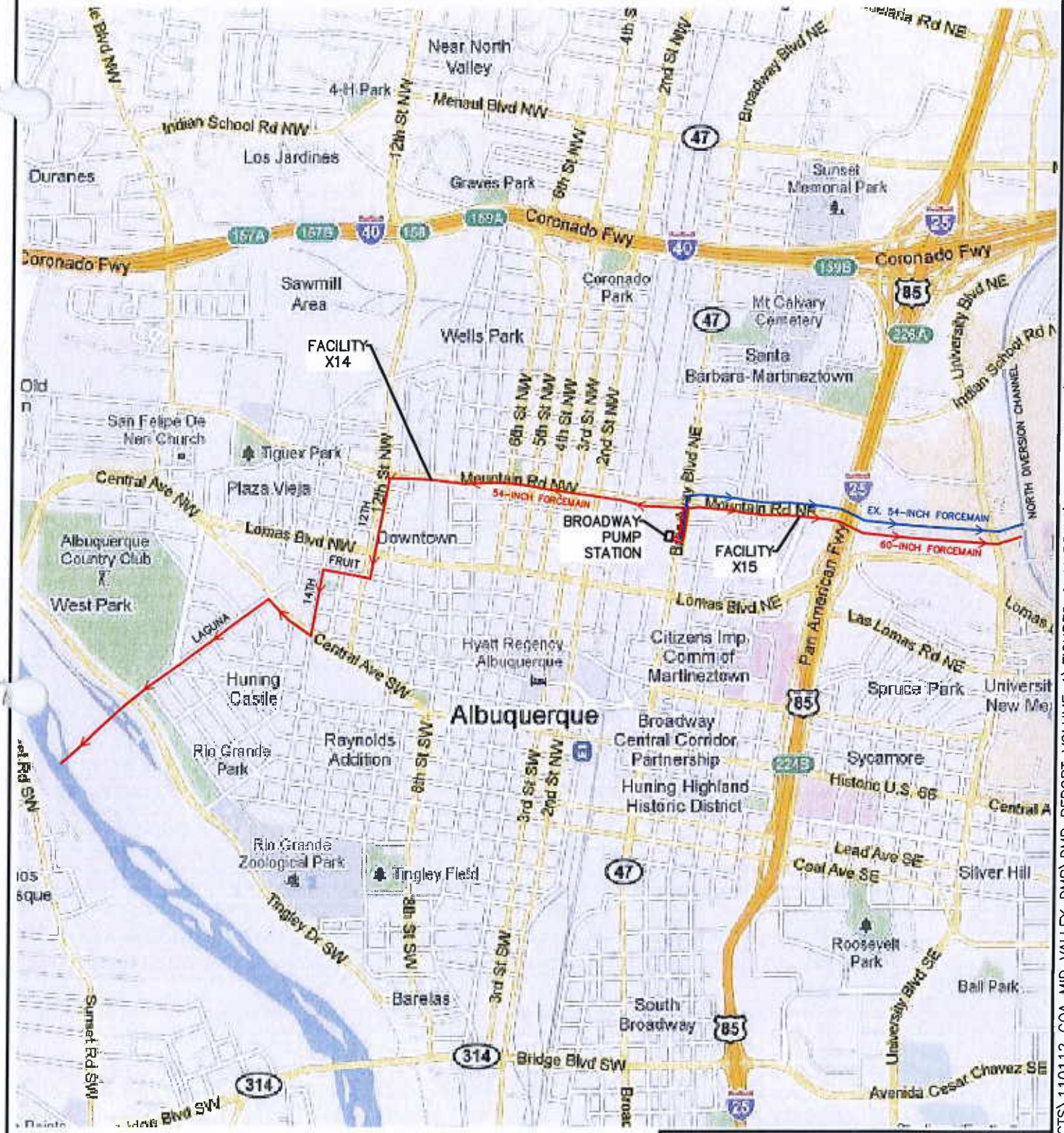
The route would be from the station west on Mountain Road, to 12th Street, to Fruit Street, to Central, to Laguna to the Rio Grande (about 2.7 miles). The discharge from the existing pumps through this proposed pipeline depends upon the pipe diameter of the force main. Essentially, as the pipe diameter increases, the discharge increases.

The Chart attached illustrates the system curves for proposed pipe sizes varying from 42-inch to 60-inch diameter. Only a 48-inch diameter or larger pipe would result in an increased capacity of the existing pumps (>127 CFS). A 48-inch diameter pipe would result in an increase of 15 CFS (142 CFS total); a 60-inch discharge pipe would result in an increased capacity of 29 CFS (156 CFS total).

CONCLUSION –

A 54-inch discharge pipe would allow a capacity of 150 cfs and that would match the proposed pump station capacity if the station is rebuilt per the DAR report described previously.

Q:\SEC---PROJECTS\2010 Projects\110112 COA MID VALLEY DMP\DMP Appendices Volume 2\Possible Force Main Comptuations\Force main to Rio Grande.docx



MID-VALLEY DRAINAGE MANAGEMENT PLAN

FOR THE CITY OF ALBUQUERQUE & ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY

October – 2011

SEC PROJECT NO. 110112

POSSIBLE NEW FORCEMAIN ALIGNMENTS

FIGURE 6-2

Q:\SEC---PROJECTS\2010 PROJECTS\110112 COA MID VALLEY DMP\DMP REPORT VOLUME 1\FIGURES & MAPPING\AUTOCAD FILES\FIGURE 6-2 POSSIBLE NEW FORCEMAIN ALIGNMENTS 10/

Mid-Valley DMP

Smith Engineering Company

10/12/2011

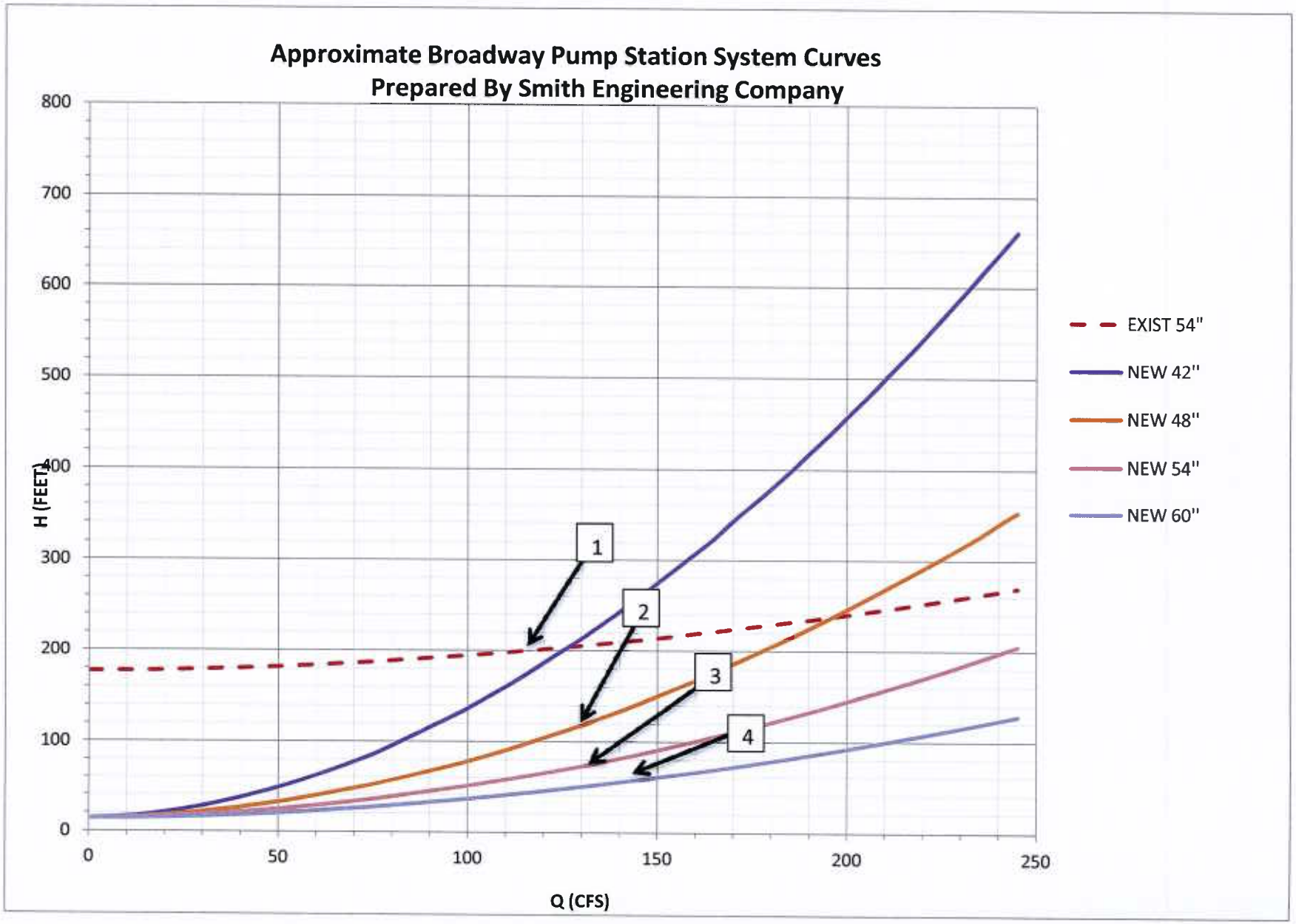
Approximate Calculations for Proposed Broadway Pump Station System Curves prepared by Smith Engineering Company

System Curves

System Curve Data

	Existing System		Proposed System		Proposed System		Proposed System		Proposed System	
Total Pipe Length (ft)	6864		14500		14500		14500		14500	
Minor Loss Equivilent Length (ft	686.4		1450		1450		1450		1450	
Total Equivilent Length (ft)	7550.4		15950		15950		15950		15950	
Pipe Diameter (in)	54		42		48		54		60	
Min H-W C	120		120	DIP	120	DIP	120	DIP	120	DIP
High Upstream WSE (ft)	4953	Top of the wet well	4953	Top of the wet well	4953	Top of the wet well	4953	Top of the wet well	4953	Top of the wet well
Low Upstream WSE (ft)	4936	Bottom of the wet well + 3'	4936	Bottom of the wet well + 3'	4936	Bottom of the wet well + 3'	4936	Bottom of the wet well + 3'	4936	Bottom of the wet well + 3'
High Downstream WSE (ft)	5113	NDC	4950	Rio Grande	4950	Rio Grande	4950	Rio Grande	4950	Rio Grande
Maximum Static Lift (ft)	177		14		14		14		14	

		EXIST 54"		NEW 42"		NEW 48"		NEW 54"		NEW 60"	
Q		EXISTING MAX/ WW LO (C=120)		PROPOSED MAX/ WW LO (C=120)		PROPOSED MAX/ WW LO (C=120)		PROPOSED MAX/ WW LO (C=120)		PROPOSED MAX/ WW LO (C=120)	
CFS	GPM	TDH	Vel FPS	TDH	Vel FPS	TDH	Vel FPS	TDH	Vel FPS	TDH	Vel FPS
0	0	177	0.0	14	0.0	14	0.0	14	0.0	14	0.0
11	5000	177	0.7	16	1.1	15	0.9	15	0.7	14	0.6
22	10000	178	1.4	22	2.3	18	1.7	16	1.4	15	1.1
33	15000	179	2.1	30	3.4	23	2.6	19	2.1	17	1.7
45	20000	181	2.7	41	4.5	28	3.5	22	2.7	19	2.2
56	25000	183	3.4	56	5.7	36	4.3	26	3.4	21	2.8
72	32331	187	4.4	81	7.3	49	5.6	34	4.4	26	3.6
78	35000	188	4.8	92	8.0	55	6.1	37	4.8	28	3.9
98	44006	194	6.0	132	10.0	78	7.7	49	6.0	35	4.9
100	45000	195	6.2	137	10.2	79	7.8	50	6.2	36	5.0
111	50000	196	6.9	164	11.4	92	8.7	58	6.9	41	5.6
127	56998	204	7.8	205	13.0	114	9.9	70	7.8	48	6.3
134	60000	207	8.2	224	13.6	124	10.4	78	8.2	51	6.7
145	65000	212	8.9	258	14.8	142	11.3	86	8.9	57	7.2
162	72745	220	10.0	314	16.5	171	12.7	103	10.0	67	8.1
167	75000	222	10.3	332	17.0	180	13.0	108	10.3	70	8.4
178	80000	228	11.0	372	18.2	201	13.9	120	11.0	78	8.9
189	85000	234	11.7	415	19.3	224	14.8	132	11.7	85	9.5
201	90000	241	12.4	460	20.5	247	15.7	146	12.4	93	10.0
212	95000	247	13.1	507	21.6	272	16.5	160	13.1	101	10.6
223	100000	254	13.7	556	22.7	297	17.4	174	13.7	110	11.1
234	105000	262	14.4	607	23.9	324	18.3	189	14.4	119	11.7
245	110000	269	15.1	660	25.0	352	19.1	205	15.1	129	12.2


Approximate Broadway Pump Station System Curves
Prepared By Smith Engineering Company
H (FEET)
Q (CFS)
0
100
200
300
400
500
600
700
800
0
50
100
150
200
250
1
2
3
4
EXIST 54"
NEW 42"
NEW 48"
NEW 54"
NEW 60"

-----Original Message-----
From: Pat Conley, PE [mailto:patc@smithengineering.pro]
Sent: Thursday, July 28, 2011 2:21 PM
To: 'Curtin, John P.'; 'Pat Stovall'
Cc: 'Rebecca Fink'; 'Penttila, Roland V.'; 'Eisenberg, Jame J.'; 'Bingham, Brad'
Subject: RE: Pat Stovall - FW: New Broadway force main

John,

As I recall, the discussion during our meeting was that we would look at this to see if it was even feasible before we send in a proposal to increase the contract price. If the head losses are the same either way, it would not make sense to spend any more time or money to investigate this if the pumps were not going to be upsized (which is what we understand).

The scope of this work will fit into our overall schedule and that is what we intended to do after we got past the deadlines to which Pat S. is referring. I don't believe that either Pat S. or myself understood this to be a future improvements option that needed immediate attention and I don't remember it being addressed in this manner. We are still going to proceed with our brief analysis to look at the feasibility of this.

Please call me to discuss.

Thanks

-----Original Message-----

From: Curtin, John P. [mailto:JCurtin@cabq.gov]

Sent: Thursday, July 28, 2011 10:54 AM

To: Pat Stovall

Cc: Rebecca Fink; Pat Conley; Penttila, Roland V.; Eisenberg, Jame J.

Subject: RE: Pat Stovall - FW: New Broadway force main

Too bad! We have still decided to go with brand x.

John P. Curtin, P.E. Senior Engineer

Storm Drainage Design Section, Engineering Division

Department of Municipal Development, City of Albuquerque

Tel: 768-2727 FAX: 768-2765

-----Original Message-----

From: Pat Stovall [mailto:pats@smithengineering.pro]

Sent: Thursday, July 28, 2011 10:50 AM

To: Curtin, John P.

Cc: Rebecca Fink; Pat Conley

Subject: RE: Pat Stovall - FW: New Broadway force main

Hi John

Just got your email below,

Sorry we were not more responsive to your emails

We have all been very overwhelmed with deadlines

That are now past.

Pat

-----Original Message-----

From: Curtin, John P. [mailto:JCurtin@cabq.gov]

Sent: Thursday, July 28, 2011 10:39 AM

To: Pat Stovall; Pat Conley, PE

Cc: Rebecca Fink; Penttila, Roland V.; Eisenberg, Jame J.

Subject: RE: Pat Stovall - FW: New Broadway force main

Since we have not received a proposal from you, we rescinding the request and talking to brand x.

Thank You, John P. Curtin, P.E. Senior Engineer

Storm Drainage Design Section, Engineering Division

Department of Municipal Development, City of Albuquerque

Tel: 768-2727 FAX: 768-2765

-----Original Message-----

From: Rebecca Fink [mailto:rebeccaf@smithengineering.pro]

Sent: Tuesday, July 26, 2011 8:26 AM

To: Curtin, John P.

Cc: 'Pat Stovall'

Subject: RE: Pat Stovall - FW: New Broadway force main

John,

Can you get me copy of the existing pump curves (or a manufacturer and model

number), so I can quickly determine if increased capacity of the existing

pumps is possible?

Thanks,

Becky

-----Original Message-----

From: Pat Stovall [mailto:pats@smithengineering.pro]

Sent: Thursday, July 21, 2011 12:50 PM

To: Rebecca Fink

Subject: Pat Stovall - FW: New Broadway force main

-----Original Message-----

From: Curtin, John P. [mailto:]

Sent: Thursday, July 21, 2011 11:28 AM

To: Pat Conley; Pat Stovall

Cc: Penttila, Roland V.; Brad Bingham PE

Subject: RE: New Broadway force main

P & P,

Please bring Becky into this discussion. My impression from our conversation was that pumps designed for low head & high flow were rare (or at least the selection was limited and I assumed that translated into expensive). Instead of guessing I would like to hear from an expert.

Thank You, John P. Curtin, P.E. Senior Engineer

Storm Drainage Design Section, Engineering Division

Department of Municipal Development, City of Albuquerque

Tel: 768-2727 FAX: 768-2765

-----Original Message-----

From: Penttila, Roland V.

Sent: Thursday, July 21, 2011 10:58 AM

To: Curtin, John P.; 'Pat Conley'; 'Pat Stovall'

Cc: 'Brad Bingham PE'

Subject: RE: New Broadway force main

I'm assuming (that may be bad) that the costs for new pumps at the station are going to be almost the same for high head, low flow or high flow, low head. So, what I'm most interested in is the additional cost of a new force main to the river abandoning the current one to the NDC.

forwarded by:

Roland Penttila, P.E.

Manager, Storm Drainage Design Section

Engineering Division; City of Albuquerque

768-2778

-----Original Message-----

From: Curtin, John P.

Sent: Wednesday, July 20, 2011 2:50 PM

To: 'Pat Conley'; 'Pat Stovall'

Cc: Penttila, Roland V.; Brad Bingham PE

Subject: RE: New Broadway force main

P&P,

I talked to Becky and she said that this is not a simple matter of head, but a combination of head & flow. To pump to the Rio, it would be a case of low head & high flow, which is not the standard application (It would require a different pump than it would take to go to the NDC).

Roland/Brad,

I believe that Jerry requires a cost analysis of a pump station & force main that would meet the following criteria:

Q=250 cfs

13,000 lf of 36" Force Main

Is this what you want SEC to give us a proposal for?

Thank You, John P. Curtin, P.E. Senior Engineer

Storm Drainage Design Section, Engineering Division

Department of Municipal Development, City of Albuquerque

Tel: 768-2727 FAX: 768-2765

-----Original Message-----

From: Curtin, John P.

Sent: Wednesday, July 20, 2011 12:29 PM

To: Penttila, Roland V.

Cc: Pat Conley

Subject: RE: New Broadway force main

Smith is preparing a quick and dirty evaluation of the head required to push the water to the NDC vs to the River. If additional work is required, then they will submit a proposal for an additional service.

Thank You, John P. Curtin, P.E. Senior Engineer

Storm Drainage Design Section, Engineering Division

Department of Municipal Development, City of Albuquerque

Tel: 768-2727 FAX: 768-2765

-----Original Message-----

From: Penttila, Roland V.

Sent: Wednesday, July 20, 2011 12:21 PM

To: Curtin, John P.

Subject: New Broadway force main

Has Smith told you when they may provide us with a quote for the additional engineering?

Message from Roland's iPhone4

Pat Stovall

From: Curtin, John P. [JCurtin@cabq.gov]
Sent: Wednesday, July 27, 2011 9:35 AM
To: Rebecca Fink; Penttila, Roland V.; Brad Bingham PE
Cc: Pat Stovall; Pat Conley, PE
Subject: RE: Pat Stovall - FW: New Broadway force main

As a point of reference, I believe that Pump station #47, at Rio Grande & Montano, is the closest to the alternate force main that we are considering for Broadway. Based on the 1986 Wilson Report for #47, four 11,220 gpm pumps push 95 cfs thru 2,750 lf of 48" diameter force main at
7.56 fps. If we assume that 8 fps is a reasonable velocity:

Q36" FM = 8 fps * 7.07 sf = 56.5 cfs

Q54" FM = 8 fps * 15.9 sf = 127 cfs

Q72" FM = 8 fps * 28.3 sf = 226 cfs

I realize that this is simplistic, but I believe that it indicates that a 36" force main is unrealistic.

Thank You, John P. Curtin, P.E. Senior Engineer Storm Drainage Design Section, Engineering Division Department of Municipal Development, City of Albuquerque
Tel: 768-2727 FAX: 768-2765

-----Original Message-----
From: Curtin, John P.
Sent: Tuesday, July 26, 2011 2:36 PM
To: 'Rebecca Fink'
Cc: 'Pat Stovall'; 'Pat Conley, PE'; Penttila, Roland V.; 'Brad Bingham PE'
Subject: RE: Pat Stovall - FW: New Broadway force main

Becky,
Additional Service #3 will be a cost benefit study of a Force Main to the River. It will be constrained by the Pump Station Layout in the Molzen-Corbin Report. Basically the City wants to know how many cfs we can pump to the River and how much it will cost for the Force Main and any modification required for the Pumps. Give me a call and I will try to answer any questions that you have.

Thank You, John P. Curtin, P.E. Senior Engineer Storm Drainage Design Section, Engineering Division Department of Municipal Development, City of Albuquerque
Tel: 768-2727 FAX: 768-2765

-----Original Message-----
From: Rebecca Fink [mailto:rebeccaf@smithengineering.pro]
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Cc: 'Pat Stovall'
Subject: RE: Pat Stovall - FW: New Broadway force main

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Sent: Thursday, July 21, 2011 12:50 PM
To: Rebecca Fink
Subject: Pat Stovall - FW: New Broadway force main

-----Original Message-----
From: Curtin, John P. [mailto:]
Sent: Thursday, July 21, 2011 11:28 AM
To: Pat Conley; Pat Stovall
Cc: Penttila, Roland V.; Brad Bingham PE
Subject: RE: New Broadway force main

P & P,
Please bring Becky into this discussion. My impression from our conversation was that pumps designed for low head & high flow were rare (or at least the selection was limited and I assumed that translated into expensive). Instead of guessing I would like to hear from an expert.

Thank You, John P. Curtin, P.E. Senior Engineer
Storm Drainage Design Section, Engineering Division
Department of Municipal Development, City of Albuquerque
Tel: 768-2727 FAX: 768-2765

-----Original Message-----
From: Penttila, Roland V.
Sent: Thursday, July 21, 2011 10:58 AM
To: Curtin, John P.; 'Pat Conley'; 'Pat Stovall'
Cc: 'Brad Bingham PE'
Subject: RE: New Broadway force main

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Manager, Storm Drainage Design Section
Engineering Division; City of Albuquerque
768-2778
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To: 'Pat Conley'; 'Pat Stovall'
Cc: Penttila, Roland V.; Brad Bingham PE
Subject: RE: New Broadway force main

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Roland/Brad,
I believe that Jerry requires a cost analysis of a pump station & force main that would meet the following criteria:
Q=250 cfs
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Is this what you want SEC to give us a proposal for?
Thank You, John P. Curtin, P.E. Senior Engineer
Storm Drainage Design Section, Engineering Division
Department of Municipal Development, City of Albuquerque
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Sent: Wednesday, July 20, 2011 12:29 PM
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Storm Drainage Design Section, Engineering Division
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Sent: Wednesday, July 20, 2011 12:21 PM
To: Curtin, John P.
Subject: New Broadway force main

Has Smith told you when they may provide us with a quote for the additional engineering?

Message from Roland's iPhone4

PROJECT _____ SHEET NO. _____ OF _____

SUBJECT _____ PROJECT NO. _____

BY _____ DATE / / CHECKED BY _____ DATE / /

Pipe Type : Concrete Cylinder Pipe

ϕ = 54"

Distance = 1.3 mi. = 6864 ft

project #

BGAS #3

ELEV 4978' - Google Earth

PS

size 54"

length

type RCP

Length - Report

= 6864 ft

= 1.3 mi

ELEV 5144' - Google Earth

Discharge Point @

N. Div. Channel.

Smith Engineering Company

2201 San Pedro NE Bldg. #4, Suite 200 Albuquerque, New Mexico 87110 505/884-0700 Fax 505/884-2376