

**NOTICE
GLENPOOL UTILITY SERVICE AUTHORITY
REGULAR MEETING**

A Regular Session of the Glenpool Utility Service Authority will be held at 6:00 p.m. immediately following the Glenpool City Council Meeting on Monday, April 2, 2018, at Glenpool City Hall, City Council Chambers, 12205 S. Yukon Ave., 3rd Floor, Glenpool, Oklahoma.

AGENDA

	Page
A) Call to Order - Timothy Lee Fox, Chairman	
B) Roll Call, Declaration of Quorum – Susan White, Secretary; Timothy Lee Fox, Chairman	
C) Public Works Director Report - Wes Richter	
D) Scheduled Business	
1) Discussion and possible action to approve minutes from March 19, 2018. (Susan White, Secretary) GUSA - 19 Mar 2018 - Minutes - Html	2 - 3
2) Discussion and possible action to approve an Agreement Pursuant to Section 10(f) of the May 2015 Agreement of Compromise, Settlement, and Release between the City of Glenpool and the Glenpool Utility Services Authority (acting jointly) and Creek County Rural Water District No. 2 and authorizing the Chairman of the Board of Trustees for GUSA to execute said Agreement. (Lowell Peterson, City Attorney and GUSA Counsel) Staff Memo - Acceptance of Audit and Recon Agreement 040218 Agreement Pursuant to Section 10(f)	4 - 8
3) Presentation, review and discussion of engineering design study conducted by Crafton Tull, concerning Speedy's Lift Station. (Lynn Burrow, Community Development Director) GUSA Presentation - Speedy's Liftstation	9 - 27
E) Adjournment	
This notice and agenda was posted at Glenpool City Hall, 12205 S. Yukon Ave., Glenpool, Oklahoma, on March 29, 2018 at 4:00 p.m. Signed: <u>Susan White</u> City Clerk	

MINUTES
GUSA Special Meeting
Monday, March 19, 2018 Council Chambers 6:00 PM

COUNCIL PRESENT: Tim Fox
Momodou Ceesay
Brandon Kearns

COUNCIL ABSENT: Trish Agee
Jacqueline Triplett-Lund

STAFF PRESENT: David Tillotson
John Gonsalves
Lowell Peterson
Susan White
Wes Richter
Lynn Burrow

STAFF ABSENT: Dennis Waller
Rick Malone

A Call to Order - Timothy Lee Fox, Chairman

- 1) Chairman Fox called the meeting to order at 6:54 p.m.

B Roll Call, Declaration of Quorum – Susan White, Secretary; Timothy Lee Fox, Chairman

- 1) Secretary White called the roll and Chairman Fox declared a quorum was met.

C Public Works Director Report - Wes Richter

- 1) Wes Richter, Public Works Director reviewed the activities in the Water/Wastewater departments during the previous month. David Tillotson, City Manager reported the Wastewater Treatment Plant was noticed a year ago by ODEQ concerning the testing process. Glenpool personnel are cooperating with ODEQ to find a solution. A change to the process is being considered by ODEQ. Mr. Tillotson will keep the Board apprised of the developments.

D Scheduled Business

- 1) Discussion and possible action to approve minutes from February 5, 2018 meeting.

(Susan White, Secretary)

Moved by Momodou Ceesay, seconded by Brandon Kearns

To approve minutes as presented.

	For	Against	Abstained	Absent
Tim Fox	x			
Momodou Ceesay	x			
Trish Agee				x
Brandon Kearns	x			
Jacqueline Triplett-Lund				x
	3	0	0	2

CARRIED.

E Adjournment

- 1) The meeting was adjourned at 6:58 p.m.

To: City of Glenpool, Mayor and City Council
Glenpool Utility Services Authority, Chair and Board of Trustees

From: Lowell Peterson, Attorney for City of Glenpool and Glenpool Utility Services Authority

Date: April 2, 2018

Subject: Annual Audit of Compliance with Agreement of Settlement, Compromise and Release ("Settlement Agreement"); and Reconciliation Agreement (Sec. 10(f) of Settlement Agreement)

Background:

In the Settlement Agreement that terminated the litigation between the City of Glenpool and the Glenpool Utility Services Authority (together "Glenpool") and Creek County Rural Water District #2 ("Creek-2") in May of 2015, the Glenpool proposed, and Creek-2 accepted, a methodology for minimizing and hopefully preventing any future disputes or claims based on multiple years of real or perceived non-compliance by either party. The parties agreed to retain, annually, an independent auditor who will examine all pertinent records and accounts to determine whether the parties have met their respective reporting and payment obligations during the "Auditable Period" under review. Auditable Period has been defined, to conform to the parties' fiscal years, as the 12-month period from July 1 - June 30 of each year of the Agreement.

Sec. 10 of the Agreement requires the Independent Accountant's Audit Report to be completed within 90 days of the close of the Auditable Period. The Audit Report for FY 2016-2017 was dated September 7, 2017, approximately 67 days following the end of the Auditable Period, and was presented by Ms. Anne Elfrink, CPA, to the Creek-2 Board of Directors on September 12, 2017, and to the Glenpool Council and Board of Trustees on October 16, 2017.

If the Audit Report discloses any non-compliance by either party, the other party is allowed 90 days following the date of submission in which to put the non-compliant party on notice of potential default. Any such notices, to be effective, must have been communicated by no later than January 15, 2018. If the non-compliant party corrects any actual deficiencies within 90 days following the notice, then the Settlement Agreement continues to direct the relationship of the parties. Any potential claims or disputes that are not noticed by either party to the other within 90 days following submission of the Audit Report are forever waived.

Essential terms of the Settlement Agreement that are audited include:

- Whether Glenpool has accurately reported all new water customer connections within the “Permissive Area” and paid to Creek-2 the corresponding Meter Connection Fees in the initial amount of \$800 per tap of less than 1-inch and \$1,200 per tap for lines of 1-inch or more diameter, as adjusted annually in accordance with the CPI-U.
- Whether Glenpool has accurately reported all Active Water Connections maintained by Glenpool within the Permissive Area and paid to Creek-2 a monthly Royalty in the initial amount of \$7.75 per month for each such connection, as adjusted annually in accordance with the CPI-U.
- Confirm that no Meter Connection Fees and no Royalty payments have been paid to Creek-2 for Glenpool water customers situated in the Released Area, defined as the Glenpool city limits as of March 2, 2012.
- Whether Creek-2 has charged its water customers who choose to connect to the Glenpool sanitary sewer system the applicable sewer rate, based on water usage, and remitted the corresponding amount to Glenpool on a monthly basis (whether or not the customer pays Creek-2 the amount of the bill).

The Audit Report for the Auditable Period of July 1, 2016 – June 30, 2017 determined that, “Based on the agreed-upon procedures performed, we find that the purpose and intent of the [Settlement] Agreement has been met by both Creek-2 and Glenpool for the Audit Period.”

Reconciliation of Records

The Settlement Agreement also requires that, upon the conclusion of each mandatory annual audit, the parties shall reconcile their records in accordance with the results of such audit. The Settlement Agreement further requires that, upon expiration of the 90-day notice period without notice of default, the Auditable Period under audit is deemed compliant and the parties are required to sign a written agreement setting out certain calculations explained in further detail in this memorandum. “The resulting reconciliation agreement shall be binding on both parties as a definitive statement of compliance with this Agreement [the Settlement Agreement] as of the date of such reconciliation agreement.” Settlement Agreement § 10(g).

The written reconciliation agreement is required to state that:

(i) With respect to Glenpool:

- The present number of Active Water Connections in the Permissive Area for which monthly Royalties are due and being paid at that point in time:
 - This number remains two (2), the taps at Triumph Church in Glenpool, which predate the Settlement Agreement;
- Non-Active Water Connections subject to reconnection and resumption of monthly Royalty payments at the applicable rate:

- There are no Non-Active Water Connections for which Royalty payments would otherwise be payable and due.
- The total of new meter connections installed since the preceding annual audit, as well as a calculation of Meter Connection Fees paid for such meter connections;
 - New Meter Connections throughout all Glenpool Territory during the Auditable Period: 120 in the Released Area, for which no connection fees are required; and -0- in the Permissive Area.

And (ii) with respect to Creek- 2:

- The present number of Shared Utility Customers for which Creek-2 administers the assessment and collection of wastewater collection service usage charges:
 - Thirteen (13); and
- The total water consumption of said Shared Utility Customers over the Auditable Period that is the subject of this audit (July 1, 2016 – June 30, 2017): 482,000 gallons.
- The Audit Report also determined that:
 - There were no unreported or unpaid meter connection fees during the Auditable Period.
 - Glenpool sent the required monthly report form throughout the Auditable Period.
 - Royalty payments were made in a timely manner and otherwise conformed to the Settlement Agreement, including the annual CPI-U adjustment.
 - Shared Utility Customer payments for sewer usage were properly remitted by Creek-2 to Glenpool (except those not reported to Creek-2 as discussed above).

Reconciliation Agreement

Upon review, concurrence and execution by the parties, this memorandum shall satisfy the requirement of the Settlement Agreement, at § 10(f), that the parties shall reconcile their records in accordance with the results of the annual audit and, at § 10(g), that the resulting reconciliation agreement shall be binding on both parties as a definitive statement of compliance or non-compliance with the Settlement Agreement as of the date hereof.

Recommendation:

Legal counsel for both parties to the Settlement Agreement recommend that the City Council, the Glenpool Utilities Services Authority's Board of Trustees and the Creek-2 Board of Directors approve this memorandum acknowledging and confirming that the Independent Accountant's Report on Applying Agreed-Upon Procedures, dated September 7, 2017, accurately reflects the records of both parties as of that date, that all recommendations contained therein have been followed, and that all parties are hereby deemed to be in compliance with so much of the Settlement Agreement as is the subject of said Audit Report.

Agreement Pursuant to Section 10(f) of the May 2015
Agreement of Compromise, Settlement, and Release

This Agreement is entered into by Creek County Rural Water District No. 2 ("Creek-2"), the City of Glenpool ("Glenpool") and the Glenpool Utility Services Authority ("GUSA") for the purpose of complying with Section 10(f) of the May 2015 Agreement of Compromise, Settlement, and Release ("2015 Settlement"). Glenpool and GUSA are collectively referred to as "Glenpool." This Agreement complies with said Section 10(f) to the extent, but only to the extent, that it applies to the Auditable Period (as defined in the 2015 Settlement, as amended) of July 1, 2016 - June 30, 2017.

1. Creek-2 and Glenpool warrant to each other that they have reconciled their records in compliance with Section 10(f).
2. In accordance with Section 10(f) Glenpool represents and warrants to Creek-2:
 - (a) The present number of Active Water Connections in the Permissive Area for which monthly Royalties are due and being paid as of the date of this Agreement: Two (2) (the taps at Triumph Church in Glenpool).
 - (b) Non-Active Water Connections subject to reconnection and resumption of monthly Royalty payments at the applicable rate: None.
 - (c) The total of new meter connections installed since the preceding annual audit, as well as a calculation of Meter Connection Fees paid for such meter connections: 120 situated in the Released Area (for which no royalties are paid) and 0 in the Permissive Area.
3. In accordance with Section 10(f) Creek-2 represents and warrants to Glenpool:
 - (a) The present number of Shared Utility Customers for which Creek-2 administers the assessment and collection of wastewater collection service usage charges: 13
 - (b) The total water consumption of the Shared Utility Customers over the Auditable Period that is the subject of the July 1, 2016 – June 30, 2017 Audit is: 482,000 gallons.

CREEK COUNTY RURAL WATER DISTRICT NO. 2

Signature: _____ Dated: _____
Name: Harvey Morris
Position: President of the Board of Directors

CITY OF GLENPOOL

Signature: _____ Dated: _____
Name: Timothy Lee Fox
Position: Mayor

GLENPOOL UTILITY SERVICES AUTHORITY

Signature: _____ Dated: _____
Name: Timothy Lee Fox
Position: Chairman of the Board of Trustees



MEMORANDUM

TO: CHAIRMAN AND BOARD OF TRUSTEES
GLENPOOL UTILITY SERVICES AUTHORITY (GUSA)

FROM: LYNN BURROW, PE
COMMUNITY DEVELOPMENT DIRECTOR

RE: REVIEW OF ENGINEERING DESIGN STUDY -
SPEEDY'S SANITARY SEWER LIFT STATION REHAB. PROJECT

DATE: APRIL 2, 2018

BACKGROUND

This item is for Board of Trustees information and project update regarding the results of a design study performed by Crafton/Tull Engineering Co. as part of the previously approved Professional Services Agreement covering the complete rehab. of the Speedy's liftstation facility. The attached Executive Summary and associated excerpts from the actual Engineering Study cover the research into the existing sewage pumping capacities at this facility and those to be anticipated in the future. The intent of the study was to determine current peak sewage flows at this liftstation and what to anticipate from the upstream watershed in the future. The goal is to accurately predict the future development of the watershed as the City continues to grow - in the areas generally south of 151st Street. The resulting predictions regarding peak flows are to be considered from a pumping capacity standpoint and, in turn, used as the basis of an appropriate facility up-grade project.

As stated in the attached Executive Summary, the full development of the upstream watershed will greatly exceed not only the pumping capacity of this liftstation, but the handling and treatment capacity of the existing downstream wastewater treatment facility. Therefore, the study is recommending that the up-grade to this pumping facility be limited to a capacity that will accommodate the growth within the watershed equivalent to approximately 2630 new homes or an additional 1.22 million gallons of sewage per day (MGD). This additional sewage flow will approximate the total permitted capacity of the existing wastewater treatment plant. The additional 1.22 MGD of sewage flow is projected to adequately cover the growth within the watershed for approximately the next 15 years. To address growth beyond the current discharge limits placed on the existing treatment plant by ODEQ, the plant will need to be expanded and/or replaced. As a result, the future replacement of the existing treatment facility should be accounted for as an important part of the City's adopted Capital Improvement Program.



Having reviewed the seven (7) upgrade scenarios developed and detailed within the design study as suggested options to address the projected additional pumping capacity needed for future growth, the design engineers and Staff have selected Scenario No. 7 as the basis for the upgrades to the existing liftstation and downstream forcemain. As noted in the study, the total cost anticipated for Scenario 7 is approximately \$799,000 which is within the \$805,000 cost originally estimated for funding purposes. Upon final engineering design, the project will be advertised for public bid. The resulting bids and contract award recommendations will be presented to the GUSA Board for consideration at that time. From a project schedule standpoint, final design documents are anticipated to be complete by May 1st, 2018. The bidding and contract award period should be complete by June 15, 2018 with actual construction started on or before July 1st. Construction completion should be accomplished by November 1st, 2018.

Attachments:

- A. Executive Summary
- B. Liftstation Study

Lynn Burrow

From: Lynn Burrow
Sent: Tuesday, March 27, 2018 12:54 PM
To: Lynn Burrow
Subject: FW: GUSA Presentation - Speedy's Liftstation Rehab.

1. Executive Summary

The Speedy's Lift Station pumps and force main are undersized for new developments underway in Glenpool and require an upgrade in the short term to meet current flows and future flows from projected growth. This report analyzes the current system and recommends improvements to upgrade the station to meet these flow demands.

The goal for the improvements is to maximize the existing infrastructure and provide for future expansion within the limits of feasibility and budget. Since south Glenpool's full future build out sewer requirements will greatly exceed the capacity of what this station can handle, and constructing for that scenario now is not feasible and is cost prohibitive, additional lift stations or total reconstruction of this station would be needed to serve all future needs sometime within the next 40 years. By that time large scale upgrades to the Glenpool WWTP will be needed to treat the flows that will be coming to the plant.

The proposed improvements are based on a reasonable estimate of growth and cost effective approach which triples the output capacity of the current station. The flow rate increases from 0.4 MGD peak day to 1.22 MGD. This is equivalent to the flow produced by 2,630 new homes. The recommended improvements based on this study are to install 3,640 LF of 14" force main to connect the lift station to a larger gravity receiving line; install three new 50 HP chopper pumps in the existing wet well; epoxy coat the wet well and valve vault to protect the concrete from degradation due to the harsh environment; install new piping within the wet well; upgrade the SCADA, control system, electrical system; and add an emergency back-up generator required by ODEQ. The Engineer's Opinion of Probable Cost for the recommended Scenario 7 is **\$799,200.00**.

Kyle Sewell, P.E.
Project Manager



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220 East 8th Street
Tulsa, OK 74119
www.craftontull.com



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3-26-18

Speedy's Lift Station Study

Glenpool, OK

Prepared for: City of Glenpool



CT JOB NO. 17404700



Prepared by:



220 E. 8th Street | Tulsa, Oklahoma 74119 | 918-584-0347 | www.craftontull.com



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APPENDICES:

- A. 2011 Speedy's Lift Station Plans
- B. Comprehensive Plan
- C. Flow Determination
- D. Scenario Calculations
- E. Proposed Lift Station Schematic
- F. Force Main Path Options
- G. Pump Quote and Information

1. Executive Summary

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2. Project Overview

The City of Glenpool hired Crafton Tull & Associates (CTA) with a contract dated November 17, 2017 to perform a study of the Speedy's Lift station in Glenpool. The lift station serves as a collection point in the sanitary sewer basin for the area of Glenpool along the HWY 75 Corridor and surrounding areas starting at approximately 146th Street and south to 201st Street. The lift station pumps through a 349 LF 8" force main to a gravity sewer to the north of the lift station. The Purpose of this study is to determine current and projected flows from the sewer basin contributing to the lift station, determine limiting factors within the sewer system that may affect development within the basin, and make recommendations for an approach to upgrading the lift station and sewer collection system to account for future growth and development within the basin. The proposed improvements will include a force main to carry the flows to a large gravity main near 141st Street and possible upgrades to the lift station wet well, pumps, valves and controls.

3. Demographics

Population and Growth

The City of Glenpool population growth has been strong over the last 8 years since the 2010 census. From 2010 to 2016 the population grew at a rate of approximately 4% annually. Assuming this rate

continues, it results in a current population estimate of 14,800. At that rate, the population of Glenpool would double in approximately 18 years.

Sewer Basin Zoning

Within the sewer basin potentially served by Speedy's Lift Station, the current Comprehensive Plan shows that 75% of the area is zoned for residential development with the majority of the remaining 25% being predominately zoned commercial with some limited industrial areas. A copy of the City's current zoning can be found in Appendix B.

Future Development

The basin that Speedy's Lift Station has potential of serving covers the majority of the southern portion of Glenpool. This area encompasses the most likely areas for future development within the city. Capacity of the lift station and sewer collection system serving this area, therefore, will likely have a major impact on future growth and development for the entire City of Glenpool.

4. Flow Determination

Existing Flow to Station

In the absence of flow monitoring data available for the existing Speedy's Lift Station, the current flow to the station was estimated using a variety of methods. Due to the limited residential development feeding the station, the number of residences contributing to the existing flow was easily quantified. Using an average of three residents per household and a typical usage rate of 105 gallons per capita per day, we estimated the total daily flow from residential development at a rate of 315 GPD per home.

For uses other than residential, a combination of research data for similar uses, industry standard estimates, and flows used in similar studies, along with engineering judgement to tailor the estimates to known conditions within Glenpool, were used to determine an estimate of total sewer flow per acre for each type of non-residential zoning. These standard flow estimates were then multiplied by the acreage of each zoning class served by the current system to generate an average daily flow contribution from the non-residential uses.

Finally, Glenpool Elementary contributes to the flow. Per the schools website there are 1430 students. Using an average flow estimate of 10 GPD per student we determined the flow contributed to the system from the school.

Using a peaking factor of 2.75 composite peak flow (3.0 domestic, 2.5 industrial) the average daily and peak flow calculations for the existing station were determined and are shown in Appendix C. The peak flow currently produced within the Speedy's Lift Station basin is estimated to be **777 gallons per minute (GPM).**

Future Flow Projections

The future flow projections were calculated based on the zoning class. To determine future residential flows, the total number of residences was estimated by using the minimum acreage allowed for each residential zoning class to determine the maximum potential density in units per acre. This number was then multiplied by the acreage of each zoning class within the study basin to determine the total number of units for each zoning class. This was then used to determine average daily flow. All non-residential zoning classes, were estimated expected flow generated per acre for the allowed uses. Calculation tables showing the unit flows, and maximum peak flow for each zoning class are found in Appendix C. Based on these calculations the total flow that could potentially be generated in the future, if the basin is fully developed, is estimated to be approximately **8,192,178 GPD** resulting in a peak flow to the lift station of **17,067 GPM**.

This flow would be too large for the city's existing wastewater treatment plant to accommodate. It would represent a city population of about 5.5 times the current population. Although an interesting number to keep in mind, even based on current trends, this flow would not be expected for approximately 45 years. For this reason, the capacity of the existing sewer mains feeding the lift station seems to be a better estimate of the maximum allowable flow to Speedy's Lift Station. There are three main sewer lines that feed the lift station. Two 8 inch mains entering from the east and west, and one 15 inch main from the South. The total capacity of these three lines is approximately **2.5 million gallons per day (MGD)**.

This is still more than the 1.4 MGD capacity of the city's wastewater treatment plant and Speedy's Lift Station only contributes about one-third of the current flow to the plant. Therefore, assuming upgrades to the plant will be required before total build out is attained within the Speedy's Lift Station basin, the limiting factor would then be the wet well volume and capacity of force main. The 10", 12", and 14" force main sizes considered later in this report provide for an increased capacity to 0.520 MGD, 1.07 MGD, and 1.22 MGD respectively, without upgrading the wet well. As this new capacity is approached, the City would need to provide another regional lift station and force main to direct flows to the wastewater plant.

Refining Flow Estimates

Crafton Tull has worked with the City of Glenpool staff in an attempt to more accurately estimate current flows using data from the city's SCADA system. From that data we calibrated the current and projected flow estimates to more closely reflect actual conditions and more accurately account for factors such as inflow and infiltration in the sewer system. This will help to more precisely design a phased approach to the lift station and force main upgrades, ensuring efficient operation under both existing and future conditions. However, we believe using the estimation methods described herein, is a conservative approach as is appropriate for long term planning, especially considering the City of Glenpool's recent rapid growth.

5. Analysis Scenario 1

Ex. Lift Station with Ex. Flows

See Appendix D for detailed Scenario Calculations.

We studied the existing lift station configuration by reference to the available design plans provided by City of Glenpool staff and field observation. The original lift station wet well was built long

before 1997. The current wet well was installed in 1997 and the old wet well was converted to a diverter manhole to bring the flows to the new well. In 2011 the lift station was upgraded with new pumps, float, jib crane, and SCADA controls. We also analyzed SCADA flow data to measure run times and filling times for the lift station. The installed pumps are Tsurumi 100C411, 15 HP motors. The pump system is a triplex pump configuration with each pump set to run alternatingly with Pump 1 running a cycle, then Pump 2, and last Pump 3. Pump 3 was set to “OFF” during the SCADA monitoring study so Pump 1 would come on for a 2nd cycle when the alarm level was reached and would run for longer than a normal cycle. We recommend adjusting the controls to cycle through each pump one at a time so that Pump 1 does not wear out faster than the others. If the lag float is engaged a duplex pumping scenario is possible, however the current 8” force main flows to a nearby 8” gravity main that cannot handle the flow from two pumps at once for more than a few minutes. The current flow configuration is set so that Pump 1 float comes on at 9’ depth (684.44 ft), Pump 2 (lag pump) comes on at 9.5’ (684.94 ft) with the alarm set at 9.7’ (685.14 ft) (lag lag pump). The lag lag pump should only ever engage in the event that a failure has occurred with Pump 1 or Pump 2. The station is not intended to run three pumps at once.

Title 252:656 of the DEQ regulations recommends that wet wells be sized for manufacturer recommended run times. This is to prevent heat build up and because the voltage surge at pump on results in wear of the motor coil so frequent starts leads to premature failure. The wet well should not be so large that maximum average time is more than 30 minutes to prevent septic conditions in the wet well. The current wet well is appropriately and has some additional capacity for growth.

The system head curve represents the head that must be overcome by the pumps, for a set flow, given the losses from friction and minor losses that occur in fittings. The pump curve is the output flow that the pump will produce against a given head. In a simplex (one pump) condition, the duty point is where the simplex pump curve intersects the system head curve. In Appendix D, output results are provided showing the calculation of the head losses for various flows. These are graphed to create the system head curve for the lift station in its current configuration and the pump curve for the existing pumps. Table 5.1 below shows the duty point for the pumps for Scenario 1.

Table 5.1

Duty Point		
Pump Configuration	Flow (GPM)	Head (FT)
Single	495	41
Double	810	50

The duty point was then entered into the wet well sizing component of the spreadsheet to determine pump cycling times. Table 5.2 below shows the flows and pump cycle times for the Low Flow, Average Flow, Peak Flow conditions. The estimated current system flow through the station is 0.4 MGD.

Table 5.2

Pump Chart		
Flow Condition	Inflow (GPM)	Pump Cycling Time ¹ (Minutes)
Low Flow	56	27.98
Average Flow	282	11.54
Peak Flow	777	43.81

¹ Pump Cycling Time refers to time for pump on to on. The pumps will alternate in service in a 1,2,3 order in single flow, or 1+2, 2+3, 1+3 order for double pump condition.

The force main velocities were checked to verify that the minimum flow rate of 2.0 FPS is achieved with one pump running and that the maximum flow rate of 8.0 FPS is not reached under duplex pumping. The existing force main flows at 3.16 FPS in single pump mode and 5.17 FPS in double pump mode and is acceptable.

In order to prepare the lift station to receive future growth from the south 15" gravity main, an extension of the force main should be done from the lift station to the 15" gravity sewer under 141st street.

6. Analysis Scenario 2

Ex. Lift Station With 8" Force Main to 15" Gravity Sewer

See Appendix D for detailed scenario calculations.

This scenario considers using the existing lift station, pumps, and wet well with an extension of the 8" force main to the 15" gravity sewer under 141st street.

Table 6.1 below shows the duty point for the pumps for Scenario 2.

Table 6.1

Duty Point		
Pump Configuration	Flow (GPM)	Head (FT)
Single	415	49
Double	590	59

Table 6.2 below shows the flows and pump cycle times for the Low Flow, Average Flow, Peak Flow conditions. The estimated current system flow through the station is 0.4 MGD.

Table 6.2

Pump Chart		
Flow Condition	Inflow (GPM)	Pump Cycling Time ¹ (Minutes)
Low Flow	56	28.69
Average Flow	282	15.52
Peak Flow	777	N/A

¹ Pump Cycling Time refers to time for pump on to on. The pumps will alternate in service in a 1,2,3 order in single flow, or 1+2, 2+3, 1+3 order for double pump condition.

Due to increased head pressure in 8" force main extension to 15" gravity sewer at 141st st., the existing pumps cannot meet peak flow. Scenario 3 considers a 10" force main.

7. Analysis Scenario 3

Ex. Lift Station With 10" Force Main to 15" Gravity Sewer

See Appendix D for detailed scenario calculations.

This scenario considers using the existing lift station, pumps, and wet well with an extension of the 10" force main from the station to the 15" gravity sewer under 141st street.

Table 7.1 below shows the duty point for the pumps for Scenario 3.

Table 7.1

Duty Point		
Pump Configuration	Flow (GPM)	Head (FT)
Single	460	43
Double	730	54

Table 7.2 below shows the flows and pump cycle times for the Low Flow, Average Flow, Peak Flow conditions. The estimated current system flow through the station is 0.4 MGD.

Table 7.2

Pump Chart		
Flow Condition	Inflow (GPM)	Pump Cycling Time ¹ (Minutes)
Low Flow	56	28.25
Average Flow	282	12.84
Peak Flow	777	N/A

¹ Pump Cycling Time refers to time for pump on to on. The pumps will alternate in service in a 1,2,3 order in single flow, or 1+2, 2+3, 1+3 order for double pump condition.

Due to increased head pressure in 10" force main extension to 15" gravity sewer at 141st st., the existing pumps cannot meet peak flow. Higher flow pumps are required.

8. Analysis Scenario 4

Ex. Lift Station, New Pumps With 10" Force Main to 15" Gravity Sewer

See Appendix D for detailed scenario calculations.

This scenario considers using the existing lift station, valves, and wet well with new pumps and an extension of the 10" force main from the station to the 15" gravity sewer under 141st street.

The pumps selected for this analysis were Vaughn S4S-100, 25 HP chopper pumps. A pump with a similar pump curve could be substituted to suit the City preference for manufacturer and materials.

Table 8.1 below shows the duty point for the pumps for Scenario 4.

Table 8.1

Duty Point		
Pump Configuration	Flow (GPM)	Head (FT)
Single	850	60
Double	1040	67

Table 8.2 below shows the flows and pump cycle times for the Low Flow, Average Flow, Peak Flow conditions. With the upgrade to the pumps and the force main, the station could accommodate 0.52 MGD.

Table 8.2

Pump Chart		
Flow Condition	Inflow (GPM)	Pump Cycling Time ¹ (Minutes)
Low Flow	72	21.20
Average Flow	361	6.74
Peak Flow	992	30.70

¹ Pump Cycling Time refers to time for pump on to on. The pumps will alternate in service in a 1,2,3 order in single flow, or 1+2, 2+3, 1+3 order for double pump condition.

In this scenario, the pumps can keep up with the flow demands and provide an increased capacity from 0.4 MGD to 0.52 MGD (30% increase). The average wet well cycling time of 6.74 minutes results in pump start times of 26.7 minutes under average conditions. The allowable start times for the Vaughn S4S-100 pump is 8.8 starts per hour. Start times under peak flow with double pumps would result in longer run times and fewer starts.

The flow through the 10" force main is too small to provide adequate future expansion. Scenarios 5-7 consider larger force main sizes.

9. Analysis Scenario 5

Ex, Lift Station, New Pumps With 12" Force Main to 15" Gravity Sewer

See Appendix D for detailed scenario calculations.

This scenario considers using the existing lift station, valves, and wet well with new pumps and a new 12" force main from the station to the 15" gravity sewer under 141st street.

The pumps selected for this analysis were Vaughn S4S-106, 30 HP chopper pumps. These pumps use 4" discharge piping and since the station has 8" piping in place, a reducer after the pumps is needed. A pump with a similar pump curve could be substituted to suit the City preference for manufacturer and materials.

Table 9.1 below shows the duty point for the pumps for Scenario 5.

Table 9.1

Duty Point		
Pump Configuration	Flow (GPM)	Head (FT)
Single	1095	62
Double	1390	81

Table 9.2 below shows the flows and pump cycle times for the Low Flow, Average Flow, Peak Flow conditions. With the upgrade to the pumps and the force main, the station could accommodate 0.67 MGD.

Table 9.2

Pump Chart		
Flow Condition	Inflow (GPM)	Pump Cycling Time ¹ (Minutes)
Low Flow	93	16.45
Average Flow	465	5.25
Peak Flow	1279	13.67

¹ Pump Cycling Time refers to time for pump on to on. The pumps will alternate in service in a 1,2,3 order in single flow, or 1+2, 2+3, 1+3 order for double pump condition.

In this scenario, the pumps can keep up with the flow demands and provide an increased capacity from 0.4 MGD to 0.67 MGD (68% increase). The average wet well cycling time of 5.25 minutes results in pump start times of 15.75 minutes under average conditions. The allowable start times for the Vaughn S4S-106 pump is 8.2 starts per hour. Start times under peak flow with double pumps would result in longer run times and fewer starts.

The 12" force main can handle more flow with larger pumps so Scenario 6 considers the largest pump with a reasonable horsepower to determine the maximum future output of the 12".

10. Analysis Scenario 6

Ex. Lift Station, New Pumps With 12" Force Main to 15" Gravity Sewer

See Appendix D for detailed scenario calculations.

This scenario considers using the existing lift station, valves, and wet well with new pumps and a new 12" force main from the station to the 15" gravity sewer under 141st street.

The pumps selected for this analysis were Vaughn S8P-B, 60 HP chopper pumps. The discharge piping was switched to an 8" to reduce head loss in the lift station at the higher flow rates. A pump with a similar pump curve could be substituted to suit the City preference for manufacturer and materials.

Table 10.1 below shows the duty point for the pumps for Scenario 6.

Table 10.1

Duty Point		
Pump Configuration	Flow (GPM)	Head (FT)
Single	1800	75
Double	2100	95

Table 10.2 below shows the flows and pump cycle times for the Low Flow, Average Flow, Peak Flow conditions. With the upgrade to the pumps and the force main, the station could accommodate 1.07 MGD.

Table 10.2

Pump Chart		
Flow Condition	Inflow (GPM)	Pump Cycling Time ¹ (Minutes)
Low Flow	148	10.27
Average Flow	742.75	3.21
Peak Flow	2042.55	25.06

¹ Pump Cycling Time refers to time for pump on to on. The pumps will alternate in service in a 1,2,3 order in single flow, or 1+2, 2+3, 1+3 order for double pump condition.

In this scenario, the pumps can keep up with the flow demands and provide an increased capacity from 0.4 MGD to 1.07 MGD (2.66 times existing flow). The average wet well cycling time of 3.21 minutes results in pump start times of 9.63 minutes (6.23 starts per hour) under average conditions. The allowable start times for the Vaughn S8P-B, pump is 7.2 starts per hour. Start times under peak flow with double pumps would result in longer run times and fewer starts.

A 14" force main can handle more flow so Scenario 7 considers the largest pump with a reasonable horsepower to determine the maximum future output of a 14" force main.

11. Analysis Scenario 7

Ex. Lift Station, New Pumps With 14" Force Main to 15" Gravity Sewer

See Appendix D for detailed scenario calculations.

This scenario considers using the existing lift station, valves, and wet well with new pumps and a new 14" force main from the station to the 15" gravity sewer under 141st street.

The pumps selected for this analysis were Vaughn S8P-C, 50 HP chopper pumps. The discharge piping was switched to an 8" to reduce head loss in the station at the higher flow rates. Note this pump is 10 HP less than the one needed for the 12" FM in Scenario 6 due to the lower total dynamic head from using a larger diameter force main. A pump with a similar pump curve could be substituted to suit the City preference for manufacturer and materials.

Table 11.1 below shows the duty point for the pumps for Scenario 7.

Table 11.1

Duty Point		
Pump Configuration	Flow (GPM)	Head (FT)
Single	1850	60
Double	2400	76

Table 11.2 below shows the flows and pump cycle times for the Low Flow, Average Flow, Peak Flow conditions. With the upgrade to the pumps and the force main, the station could accommodate 1.22 MGD.

Table 11.2

Pump Chart		
Flow Condition	Inflow (GPM)	Pump Cycling Time ¹ (Minutes)
Low Flow	169	9.10
Average Flow	847	3.05
Peak Flow	2329	20.32

¹ Pump Cycling Time refers to time for pump on to on. The pumps will alternate in service in a 1,2,3 order in single flow, or 1+2, 2+3, 1+3 order for double pump condition.

In this scenario, the pumps can keep up with the flow demands and provide an increased capacity from 0.4 MGD to 1.22 MGD (3.05 times existing flow). The average wet well cycling time of 3.05 minutes results in pump start times of 9.15 minutes (6.55 starts per hour) under average conditions. The allowable start times for the Vaughn S8P-C, pump is 7.7 starts per hour. Start times under peak flow with double pumps would result in longer run times and fewer starts.

12. Wet Well Discussion

The existing wet well capacity is adequate to expand the station up to 1.22 MGD as shown in Scenario 7. Scenarios 1-7 look at options to upgrade pumps and piping with the 14" force main being able to support a daily flow of up to 1.22 MGD. As discussed in section 4 of this report, the full south basin development would be 8.1 MGD which far exceeds the capacity of this station and the City of Glenpool waste water treatment facility. If the south part of town continues to grow, the plant would require upgrades in addition to a new lift station to provide for future growth. The option to upgrade the wet well for this station exists now which would involve replacing the existing wet well with a deeper 8' diameter or a larger diameter 12' wet well. These would provide for larger capacity through this station up to 2.5 MGD which would be limited by the gravity capacity of the two 8" and one 15" lines feeding the station. Ultimately, as the south part of Glenpool grows, another regional lift station and force main path would be needed that takes another route to the waste water treatment facility. The proposed lift station Scenario 7 with existing wet well allows for a growth from 0.4 MGD to 1.22 MGD which is equal to 2,630 new homes being served by this system. **At this time, upgrading this wet well for full future build out or even going up to 2.5 MGD may be beyond the budget for this project and therefore is not recommended.**

13. Force Main Path

The force main can be routed in a variety of ways to reach the 15" gravity sewer at 141st street. See Appendix F for the three options considered.

Option 1 is the shortest length of pipe to reach the gravity system. This option is the most direct path following existing Broadway St. right of way. This option happens to be estimated as the most expensive of the three due to the amount of street and driveway crossings and associated repair costs.

Force Main Cost Opinion - Option 1				
Item	Unit	Quantity	Unit Price	Total
14" C-900 PVC	L.F.	3,500.00	\$60.00	\$210,000.00
14" M.J. Bends	EA.	15.00	\$1000.00	\$15,000.00
Air Release Valves w/ Vault	EA.	2.00	\$5,000.00	\$10,000.00
Pavement Cut and Repair	S.Y.	470.00	\$150.00	\$70,500.00
Clearing and Grubbing	L.S.	1.00	\$10,000.00	\$10,000.00
Subtotal				\$315,500.00
Contingency (20%)				\$63,100.00
Total				\$378,600.00

Option 2 follows the platted Barber St./Oak Ave. right of way north from the station and takes a right turn at 142nd St. Option 2 has the lowest estimated cost. There appears to be public right of way and easements available which will be confirmed during design survey.

Force Main Cost Opinion - Option 2				
Item	Unit	Quantity	Unit Price	Total
14" C-900 PVC	L.F.	3,640.00	\$60.00	\$218,400.00
14" M.J. Bends	EA.	13.00	\$1000.00	\$13,000.00
Air Release Valves w/ Vault	EA.	2.00	\$5,000.00	\$10,000.00
Pavement Cut and Repair	S.Y.	220.00	\$150.00	\$33,000.00
Clearing and Grubbing	L.S.	1.00	\$15,000.00	\$15,000.00
Subtotal				\$289,400.00
Contingency (20%)				\$57,880.00
Total				\$347,280.00

Option 3 has the longest pipe length but the least amount of pavement repair and crossings. The path follows Barber St. up to 147th and takes a left turn over to follow the creek that parallels HWY 75 up to 142nd St. This option may require obtaining utility easements where private property is crossed. It is the second most expensive capital cost of the three options.

Force Main Cost Opinion - Option 3				
Item	Unit	Quantity	Unit Price	Total
14" C-900 PVC	L.F.	4,120.00	\$60.00	\$247,200.00
14" M.J. Bends	EA.	15.00	\$1000.00	\$15,000.00
Air Release Valves w/ Vault	EA.	2.00	\$5,000.00	\$10,000.00
Pavement Cut and Repair	S.Y.	165.00	\$150.00	\$24,750.00
Clearing and Grubbing	L.S.	1.00	\$12,500.00	\$12,500.00
Subtotal				\$309,450.00
Contingency (20%)				\$61,890.00
Total				\$371,340.00

We recommend using option 2 for the force main path due to the lower cost and available path through public right of way.

14. Cost Estimates for Scenarios 4-7

Scenario 4

Scenario 4				
Item	Unit	Quantity	Unit Price	Total
Vaughn S4S-100, 25 HP	EA.	3.00	\$24,617.00	\$73,851.00
Pump Installation	EA.	3.00	\$5,000.00	\$15,000.00
Piping Modification at Wet Well	L.S.	1.00	\$5,000.00	\$5,000.00
Variable Frequency Drive	EA.	3.00	\$6,000.00	\$18,000.00
Epoxy Coat Wet Well and Valve Vault	L.S.	1.00	\$30,000.00	\$30,000.00
Electrical and Controls	L.S.	1.00	\$25,000.00	\$25,000.00
Emergency Backup Generator & Automatic Switch	EA.	1.00	\$55,000.00	\$55,000.00
Generator Platform	EA.	1.00	\$7,500.00	\$7,500.00
Connect to Existing MH	EA.	1.00	\$1,500.00	\$1,500.00
10" C-900 PVC	L.F.	3,500.00	\$45.00	\$157,500.00
10" M.J. Bends	EA.	15.00	\$700.00	\$10,500.00
Air Release Valves w/ Vault	EA.	2.00	\$5,000.00	\$10,000.00
Pavement Cut and Repair	S.Y.	470.00	\$150.00	\$70,500.00
Clearing and Grubbing	L.S.	1.00	\$10,000.00	\$10,000.00
Subtotal				\$489,351.00
Contingency (20%)				\$97,870.00
Total				\$587,221.00

Scenario 5

Scenario 5				
Item	Unit	Quantity	Unit Price	Total
Vaughn SE4S6-C, 30 HP	EA.	3.00	\$25,317.00	\$75,951.00
Pump Installation	EA.	3.00	\$5,000.00	\$15,000.00
Piping Modification at Wet Well	L.S.	1.00	\$5,000.00	\$5,000.00
Variable Frequency Drive	EA.	3.00	\$6,000.00	\$18,000.00
Epoxy Coat Wet Well and Valve Vault	L.S.	1.00	\$30,000.00	\$30,000.00
Electrical and Controls	L.S.	1.00	\$25,000.00	\$25,000.00
Emergency Backup Generator & Automatic Switch	L.S.	1.00	\$55,000.00	\$55,000.00
Generator Platform	L.S.	1.00	\$7,500.00	\$7,500.00
Connect to Existing MH	EA.	1.00	\$1,500.00	\$1,500.00
12" C-900 PVC	L.F.	3,500.00	\$50.00	\$175,000.00
12" M.J. Bends	EA.	15.00	\$800.00	\$12,000.00
Air Release Valves w/ Vault	EA.	2.00	\$5,000.00	\$10,000.00
Pavement Cut and Repair	S.Y.	470.00	\$150.00	\$70,500.00
Clearing and Grubbing	L.S.	1.00	\$10,000.00	\$10,000.00
Subtotal				\$510,451.00
Contingency (20%)				\$102,090.00
Total				\$612,541.00

Scenario 6

Scenario 6				
Item	Unit	Quantity	Unit Price	Total
Vaughn S8P-B, 60 HP	EA.	3.00	\$61,000.00	\$183,000.00
Pump Installation	EA.	3.00	\$5,000.00	\$15,000.00
Piping Modification at Wet Well	L.S.	1.00	\$7,500.00	\$7,500.00
Variable Frequency Drive	EA.	3.00	\$6,000.00	\$18,000.00
Epoxy Coat Wet Well and Valve Vault	L.S.	1.00	\$30,000.00	\$30,000.00
Electrical and Controls	L.S.	1.00	\$30,000.00	\$30,000.00
Emergency Backup Generator & Automatic Switch	L.S.	1.00	\$80,000.00	\$80,000.00
Generator Platform	L.S.	1.00	\$8,500.00	\$8,500.00
Connect to Existing MH	EA.	1.00	\$1,500.00	\$1,500.00
12" C-900 PVC	L.F.	3,500.00	\$50.00	\$175,000.00
12" M.J. Bends	EA.	15.00	\$800.00	\$12,000.00
Air Release Valves w/ Vault	EA.	2.00	\$5,000.00	\$10,000.00
Pavement Cut and Repair	S.Y.	470.00	\$150.00	\$70,500.00
Clearing and Grubbing	L.S.	1.00	\$10,000.00	\$10,000.00
Subtotal				\$651,000.00
Contingency (20%)				\$130,200.00
Total				\$781,200.00

Scenario 7

Scenario 7				
Item	Unit	Quantity	Unit Price	Total
Vaughn S8P-C, 50 HP	EA.	3.00	\$55,000.00	\$165,000.00
Pump Installation	EA.	3.00	\$5,000.00	\$15,000.00
Piping Modification at Wet Well	L.S.	1.00	\$7,500.00	\$7,500.00
Variable Frequency Drive	EA.	3.00	\$6,000.00	\$18,000.00
Epoxy Coat Wet Well and Valve Vault	L.S.	1.00	\$30,000.00	\$30,000.00
Electrical and Controls	L.S.	1.00	\$30,000.00	\$30,000.00
Emergency Backup Generator & Automatic Switch	L.S.	1.00	\$75,000.00	\$75,000.00
Generator Platform	L.S.	1.00	\$8,500.00	\$8,500.00
Connect to Existing MH	EA.	1.00	\$1,500.00	\$1,500.00
14" C-900 PVC	L.F.	3,500.00	\$60.00	\$210,000.00
14" M.J. Bends	EA.	15.00	\$1,000.00	\$15,000.00
Air Release Valves w/ Vault	EA.	2.00	\$5,000.00	\$10,000.00
Pavement Cut and Repair	S.Y.	470.00	\$150.00	\$70,500.00
Clearing and Grubbing	L.S.	1.00	\$10,000.00	\$10,000.00
Subtotal				\$666,000.00
Contingency (20%)				\$133,200.00
Total				\$799,200.00

15. Conclusions and Recommendations

The current development in the south part of Glenpool is increasing sewer flow to the Speedy's Lift Station. The estimated increased flows in the areas zoned for commercial and residential development in south Glenpool will cause the gravity sewer receiving flow downstream from the pump station to be overloaded and could result in sanitary sewer overflows if the force main is not extended to a larger capacity line. CTA recommends construction of Scenario 7 to install a 14" force main and new pumps in the wet well. Scenario 7 allows for approximately 1.22 MGD through this lift station with the pumps recommended in this report. This is enough capacity to allow approximately 2,630 new homes.

As south Glenpool develops in the coming years, the flow through the station may increase to where the pumps cannot keep up with the required capacity. Therefore, the flow through the station should be monitored and when it approaches the upgraded 1.22 MGD threshold, alternative routing to the plant should be considered or possibly larger pumps. The options to upgrade the station in 5-10 years does exist as there is additional flow capacity in the 14" FM that can be achieved with higher head pumps which are impractical at this time due to energy costs of using high flow and friction loss through the 14" FM. A future study is recommended to determine if another regional lift station would be more practical than continuing to upgrade Speedy's.