CITY OF SHAVANO PARK
WATER ADVISORY COMMITTEE MEETING
900 SADDLETREE COURT, SHAVANO PARK, TX 78231
MONDAY, JUNE 8, 2020
5:30 PM
AGENDA

THIS MEETING WILL BE CLOSED TO IN-PERSON ATTENDANCE BY THE PUBLIC.

In accordance with Order of the Office of the Governor issued March 16th, 2020, the governor has suspended various provisions of the Open Meetings Act pursuant to his state disaster authority, which now authorize the participation of a meeting by live-video stream or telephone. The City of Shavano Park Water Advisory Committee will conduct the Regular Meeting on Monday, June 8, 2020 at 5:00 p.m. at 900 Saddletree Court, Shavano Park Council Chambers in part by Livestream / telephone conference in order to advance the public health goal of limiting face-to-face meetings (also called "social distancing") and slow down the spread of the Coronavirus (COVID-19).

Livestream. The livestream of the meeting is available via the Youtube website from your computer, tablet or smartphone at: https://youtu.be/co3n6s3admg

Telephone Participation. The public toll-free dial-in number to participate in the telephonic meeting is 1-877-568-4106 and requires access code 879-926-653. If you have issues accessing Telephone Participation or Livestream, please call City Secretary Zina Tedford at 210-787-0366.

The telephone conference will be available to join at 4:30 pm (30 minutes prior to the meeting).

The public will be permitted to offer comments telephonically as provided by the agenda during Citizen's to be Heard. Citizens who want to speak during this period, should sign up to speak prior to the beginning of the meeting by stating their intent and providing Name, Address, and Topic to be addressed. Follow the guidelines under agenda item 3. If unable to participate in the meeting, you may submit public comments by email to ztedford@shavanopark.org.

The meeting agenda and agenda packet are posted online at www.shavanopark.org.

A recording of the telephonic meeting will be made, and will be available to the public in accordance with the Open Meetings Act upon written request.

1. **CALL TO ORDER**

2. **ROLL CALL**

3. **CITIZENS TO BE HEARD**

The Water Advisory Committee welcomes Citizens to be heard, we request that if you wish to speak that you follow these guidelines. Pursuant to Resolution No. R-2019-011 citizens are given three (3) minutes to speak during Citizens to be heard. Members of the public may only speak once and cannot pass the individual's allotted time to someone else. In compliance with the Texas Open Meetings Act, the Water Advisory Committee may no deliberate on comments (Attorney General Opinion – JC0169)

4. CONSENT AGENDA
   a. Approval – Water Advisory Committee Meeting Minutes, May 11, 2020

5. **REPORTS - Public Works Director Update**
   a. Water system
      i Water System Infrastructure Updates
   b. Financial Report – April 2020

6. **REGULAR BUSINESS**
   a. Discussion / Update - Trinity Well Update - PW Director / Engineer
   b. Discussion – Water Goals and Objectives for FY 2020 Budget – PW Director
   c. Discussion/review – FY 2020-21 Budget Revenues – Finance Director

7. **FUTURE ITEMS**
   d. NW Military Water Line relocation

8. **ADJOURNMENT**

I, the undersigned authority, do hereby certify that the above Notice of Meeting of the governing body of the above named City of Shavano Park Water Advisory Committee is a true and correct copy of said Notice and that I posted a true and correct copy of said Notice on the bulletin boards, of the City Hall of said City Shavano Park, Texas, a place convenient and readily accessible to the general public at all times, and said Notice was posted on this the 5th day of June 2020 at 7:15 a.m. and remained so posted continuously for at least 72 hours preceding the scheduled time of said meeting.

Zina Tedford
City Secretary

CITY OF SHAVANO PARK
WATER ADVISORY COMMITTEE MEETING
900 SADDLETREE CT, SHAVANO PARK, TX 78231
MONDAY, MAY 11th, 2020

5:00 P.M.
MINUTES

1. CALL TO ORDER
   The meeting was called to order at 5:07 p.m. by Chairman Walea. This is a Live Stream/telephone meeting with those in attendance as follows:

2. ROLL CALL

PRESENT:	ABSENT:
Al Walea, Chairman	None
Tommy Peyton	
Sam Bakke	
Tomas Palmer	
Matt Trippy	
Steve Fleming	

3. CITIZENS TO BE HEARD
   None

4. CONSENT AGENDA
   a. Approval - Water Advisory Committee Meeting Minutes, April 20th, 2020, with correction.
   Member Palmer moved to approve above minutes with correction, Member Peyton seconded. Motion passed.

5. REPORTS – Public Works Director Update
   a. Water System
      i. Water System Infrastructure Update
      Director Peterson relayed that there have been issues with Well # 5 chlorine pump, waiting for replacement and well # 6 chlorine pump was replaced. Annual tank inspections were completed last week. All tanks passed, but there are a few things to monitor; Huebner exterior roof is continuing to flake but it doesn't need immediate attention. Shavano GST has paint peeling off on the interior, staff will monitor and take action when required. Huebner GST and Shavano EST cathodic protection systems are both in manual mode currently, awaiting Corrpro to call back with instructions. TCEQ is taking well #5, well #6, and two distribution samples on Friday as part of the annual inspections.

      ii. NW Military Water Line Replacement Updates
      There are 3 areas on NW Military that need to be relocated. Wagon trail to the drainage culverts south of End gate, 15608 NW Military to Fawn, and between Bent Oak and Cliffside approximately 200 ft. Staff located the approximate tie in locations

and determine the size of the main we were replacing and the tie in sizes. KFW is working on getting us a cost (approximately $400,000). City Manager Hill indicated that he has been in contact with Bexar County looking for support to help fund the project and has applied for a TxDOT SIB loan to be re-paid over 20 years. Discussion regarding the COVID-19 monies sent to Texas was held and determined that those monies are for cities and counties over 500K population for COVID-19 incurred expenses or shortfalls.

b. Financial Report March 2020
Finance Director Morey reviewed the revenues and expenditures for March. The Revenues look better than last year and Expenditures were below expectations. Debt Service payment will be done in August – interest only. Payroll is below due to vacancy of Superintendent position. This does not include the Budget Amendment. Member Palmer made a motion to accept the financials as is, Member Bakke seconded. Motion passed.

6. REGULAR BUSINESS
   a. Discussion/action – Replacement options for future water meters: "Drive-by" vs "Cellular" data collection – PW Director
   Director Peterson reviewed the options available to the City with regard to either the ME or Cellular meters. Residents if interested in the Cellular would be able to monitor their usage easily with any cellular device (phone, I-pad, etc.) There is a fee of $.89/ month that is added to their bill for software costs, there is currently 6 residents that have opted for cellular meters. Currently the City pays $.06/month for all the other meters. The ME meter – drive-by system can be switched to Cellular by changing out the register. This fiscal year there are monies for 82 meter to be replaced. City Manager Hill said that for the rest of this year it's probable that the City could absorb the cost of the cellular $.89 per meter. As the replacements continue, the committee might want to add an additional fee, this would be up for further discussion at a later date. Member Palmer moved that the committee recommend to City Council that we move forward with the Cellular meters. Member Peyton seconded. Motion passed. Chairman Walea asked that we look into how we could recover some of these costs.

   b. Discussion/Update - Trinity Well Update - PW Peterson/Engineer
   Director Peterson reviewed the 3 options – Restoration - $120,000, Abandon – not an option, or Idling - $ 32,000. After discussion Member Palmer moved that we move the well to "stand-by" position, make sure all equipment is in reasonable condition and preserve all equipment, documentation and put in storage for future if necessary. Member Trippy seconded, motion passed. Member Peyton would like more information regarding any corrosion equipment.

   c. Discussion – Water Goals and Objectives for FY 2020 Budget – PW Director
   Director Peterson reviewed his goals and objectives with the committee. Member Palmer moved to accept the Goals and Objectives for FY 2020 as presented. Member Fleming Seconded. Motion passed.

7. FUTURE ITEMS

d. NW Military Water Line relocation

8. ADJOURNMENT
   Member Palmer made a motion to adjourn, Member Peyton seconded. Motion to adjourn passed. Meeting adjourned at 6:03p.m.

_____
Peggy Stone
PW/Water Utility
Office Manager

_____
Al Walea, Chairman

Date: _____

WATER ADVISORY COMMITTEE STAFF SUMMARY

Meeting Date: June 8, 2020 Agenda item: 5.b.

Prepared by: Brenda Morey Reviewed by: Bill Hill

AGENDA ITEM DESCRIPTION: Presentation of April 2020 Monthly Report

[X] **Attachments for Reference**: 1) April 2020 Revenue and Expense Report

BACKGROUND / HISTORY:

The information provided in the attachment is for the FY 2019-20 budget period, month ending April 30, 2020. The "Current Budget" column contains the original adopted budget and one approved budget amendment. This summary highlights a number of points related to the current month's activity.

DISCUSSION:

As of April 30, 2020, the Water Fund total revenues are $564,997 or 50.27% of the total annual budgeted amount. Water Fund (Water Department & Debt Service) expenses total $574,753 or 51.14% of amended budget.

Revenues:

-Water consumption (5015) billed in April 2020 for the month of March 2020 is $43,686. Total consumption for the month is approximately 877,000 gallons more than the same month, prior year or $1,421 of revenue.

-The Debt Service (5018) and Water Service Fee (5019) remain on target with annual budgeted amounts as these are flat fees and are not related to volume charges recognized, at 58.53% and 58.88% respectively.

-The EAA Pass Thru (5036) fees are charged to customers based on usage, $5,716 was recorded for the month and 52.04% of the annual budgeted amount has been recognized to date.

-Lease of Water Rights (7012) – the Utility received the full lease payment of $7,500 from the laundry for the 3/1/2020 – 12/31/2020 lease term for 50-acre feet.

Expenses:

Water department (606) expenses for the day-to-day operations are below budget with $66,704 spent this month or 45.23% utilized. Travel/mileage/lodging (3040) reflects expenditures related to the PW Director and one serviceman attending the TWUA conference in Corpus Christi in March. Water Analysis fees (3082) includes the annual testing fees from the Department of State Health Services. Chemicals (6011) reflects normal replenishment, nothing unusual or significant. Well Site #6 – Muni Tract (6066) – includes the costs to pull well #6 pump, troubleshoot and diagnose problem, replace motor, re-install pump, start up and test. Well Site #9 - Trinity (6069) – reflects the costs to pull pump and motor, video survey well, inspect and report on condition of

well components. SCADA System Maintenance (6070) includes cost for technician to address alarm issues – communication errors/failures and pressure alarms.

The next debt service payments are due in August, for interest only.

Payroll:
The City is on a bi-weekly payroll; there have been 15 pay periods out of 26 so 57.69% of the budget should be expensed in the line items directly related to personnel. The Utility is below budget in the Salaries (1010) due to the vacancy in the superintendent position from before the start of the fiscal year to the end of February, which is charged 50/50 between Public Works and the Water Utility. Overtime is ahead of budget for the year at 80.56%. On top of the normal overtime for weekend well readings, this fiscal year the crew has addressed two main breaks, both on Happy Trail. TMRS (1040) expense is at 56.14%, on track with the related compensation accounts. Expense for Workers' Comp Insurance (1037), recognized quarterly, is at 34.59%, below budget due to the position vacancy with the next calculation and expense posting in June. Special allowances and employee insurance accounts are also below budget due to superintendent vacancy.

COURSES OF ACTION: None related to the Report.

FINANCIAL IMPACT: N/A

STAFF RECOMMENDATION: N/A

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: APRIL 30TH, 2020

20 -WATER FUND
FINANCIAL SUMMARY % OF YEAR COMPLETED: 58.33

	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	BUDGET BALANCE	% OF BUDGET
REVENUE SUMMARY					
NON-DEPARTMENTAL	1,123,858.00	80,655.74	564,997.04	558,860.96	50.27
TOTAL REVENUES	1,123,858.00	80,655.74	564,997.04	558,860.96	50.27
EXPENDITURE SUMMARY					
WATER DEPARTMENT	935,824.00	66,703.55	423,288.01	512,535.99	45.23
DEBT SERVICE	188,034.00	0.00	151,465.46	36,568.54	80.55
TOTAL EXPENDITURES	1,123,858.00	66,703.55	574,753.47	549,104.53	51.14
REVENUES OVER/(UNDER) EXPENDITURES	0.00	13,952.19	(9,756.43)	9,756.43	0.00

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: APRIL 30TH, 2020

20 -WATER FUND
FINANCIAL SUMMARY % OF YEAR COMPLETED: 58.33

REVENUES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	BUDGET BALANCE	% OF BUDGET
NON-DEPARTMENTAL					
WATER SALES					
20-599-5015 WATER CONSUMPTION	627,000.00	43,686.50	329,322.75	297,677.25	52.52
20-599-5016 LATE CHARGES	6,000.00	(475.01)	2,463.77	3,536.23	41.06
20-599-5018 DEBT SERVICE	188,317.00	15,783.42	110,212.98	78,104.02	58.53
20-599-5019 WATER SERVICE FEE	58,092.00	4,895.08	34,206.84	23,885.16	58.88
20-599-5036 EAA PASS THRU CHARGE	83,681.00	5,716.00	43,634.50	40,046.50	52.14
TOTAL WATER SALES	963,090.00	69,605.99	519,840.84	443,249.16	53.98
MISC./GRANTS/INTEREST					
20-599-7000 INTEREST INCOME	12,000.00	85.43	7,308.92	4,691.08	60.91
20-599-7011 OTHER INCOME	0.00	27.67	40.13	(40.13)	0.00
20-599-7012 LEASE OF WATER RIGHTS	10,000.00	7,500.00	7,500.00	2,500.00	75.00
20-599-7028 TCEQ GRANT	46,718.00	0.00	0.00	46,718.00	0.00
20-599-7060 CC SERVICE FEES	1,200.00	128.18	1,067.67	132.33	88.97
20-599-7075 SITE/TOWER LEASE REVENUE	37,200.00	3,094.87	21,653.98	15,546.02	58.21
20-599-7090 SALE OF FIXED ASSETS	0.00	213.60	621.84	(621.84)	0.00
TOTAL MISC./GRANTS/INTEREST	107,118.00	11,049.75	38,192.54	68,925.46	35.65
TRANSFERS IN					
20-599-8072 TRF IN-CAPITAL REPLACEMENT	53,650.00	0.00	6,963.66	46,686.34	12.98
TOTAL TRANSFERS IN	53,650.00	0.00	6,963.66	46,686.34	12.98
TOTAL NON-DEPARTMENTAL	1,123,858.00	80,655.74	564,997.04	558,860.96	50.27
TOTAL REVENUES	1,123,858.00	80,655.74	564,997.04	558,860.96	50.27

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: APRIL 30TH, 2020

20 -WATER FUND
WATER DEPARTMENT % OF YEAR COMPLETED: 58.33

EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	BUDGET BALANCE	% OF BUDGET
PERSONNEL					
20-606-1010 SALARIES	206,130.00	15,932.99	105,539.34	100,590.66	51.20
20-606-1015 OVERTIME	8,000.00	769.23	6,445.08	1,554.92	80.56
20-606-1020 MEDICARE	2,990.00	243.44	1,644.38	1,345.62	55.00
20-606-1025 TWC (SUI)	720.00	0.00	432.00	288.00	60.00
20-606-1030 HEALTH INSURANCE	27,450.00	2,288.00	14,586.00	12,864.00	53.14
20-606-1031 HSA	170.00	14.80	94.35	75.65	55.50
20-606-1033 DENTAL INSURANCE	1,360.00	120.86	774.92	585.08	56.98
20-606-1035 VISION CARE INSURANCE	330.00	30.42	187.59	142.41	56.85
20-606-1036 LIFE INSURANCE	280.00	22.43	142.36	137.64	50.84
20-606-1037 WORKERS' COMP INSURANCE	6,890.00	0.00	2,382.94	4,507.06	34.59
20-606-1040 TMRS RETIREMENT	28,750.00	2,399.18	16,141.01	12,608.99	56.14
20-606-1070 SPECIAL ALLOWANCES	10,650.00	496.18	3,721.35	6,928.65	34.94
TOTAL PERSONNEL	293,720.00	22,317.53	152,091.32	141,628.68	51.78
SUPPLIES					
20-606-2020 OFFICE SUPPLIES	1,500.00	93.09	859.73	640.27	57.32
20-606-2030 POSTAGE	3,130.00	494.31	2,311.06	818.94	73.84
20-606-2035 EMPLOYEE APPRECIATION	100.00	0.00	22.49	77.51	22.49
20-606-2050 PRINTING & COPYING	600.00	0.00	425.75	174.25	70.96
20-606-2060 MED EXAMS/SCREENING/TESTING	100.00	0.00	0.00	100.00	0.00
20-606-2070 JANITORIAL SUPPLIES	100.00	0.00	69.75	30.25	69.75
20-606-2075 BANK/CREDITCARD FEES	5,100.00	431.63	5,675.05	(575.05)	111.28
20-606-2080 UNIFORMS	1,200.00	212.49	621.63	578.37	51.80
20-606-2090 SMALL TOOLS	2,000.00	70.62	2,046.31	(46.31)	102.32
20-606-2091 SAFETY SUPPLIES/EQUIPMENT	1,200.00	0.00	655.61	544.39	54.63
TOTAL SUPPLIES	15,030.00	1,302.14	12,687.38	2,342.62	84.41
SERVICES					
20-606-3012 ENGINEERING SERVICES	10,000.00	42.50	7,746.25	2,253.75	77.46
20-606-3013 PROFESSIONAL SERVICES	2,000.00	0.00	0.00	2,000.00	0.00
20-606-3020 ASSOCIATION DUES & PUBS	2,215.00	350.00	1,102.00	1,113.00	49.75
20-606-3030 TRAINING/EDUCATION	2,700.00	0.00	1,725.00	975.00	63.89
20-606-3040 TRAVEL/MILEAGE/LODGING/PERD	1,500.00	1,324.94	1,448.20	51.80	96.55
20-606-3050 INSURANCE - LIABILITY	4,075.00	0.00	3,797.87	277.13	93.20
20-606-3060 UNIFORM SERVICES	2,500.00	271.76	1,493.41	1,006.59	59.74
20-606-3070 INSURANCE - PROPERTY	1,985.00	0.00	1,850.00	135.00	93.20
20-606-3075 CONSERV. ED./REBATES	100.00	0.00	0.00	100.00	0.00
20-606-3080 SPECIAL SERVICES	500.00	19.95	471.00	29.00	94.20
20-606-3082 WATER ANALYSIS FEES	6,500.00	1,700.22	4,387.92	2,112.08	67.51
TOTAL SERVICES	34,075.00	3,709.37	24,021.65	10,053.35	70.50
CONTRACTUAL					
20-606-4075 COMPUTER SOFTWARE/INCODE	9,066.00	170.24	5,500.26	3,565.74	60.67
20-606-4085 EAA -WATER MANAGEMENT FEES	84,084.00	6,586.52	47,365.67	36,718.33	56.33
TOTAL CONTRACTUAL	93,150.00	6,756.76	52,865.93	40,284.07	56.75

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: APRIL 30TH, 2020

20 -WATER FUND
WATER DEPARTMENT % OF YEAR COMPLETED: 58.33

EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	BUDGET BALANCE	% OF BUDGET
MAINTENANCE					
20-606-5005 EQUIPMENT LEASES	1,500.00	0.00	150.00	1,350.00	10.00
20-606-5010 EQUIPMENT MAINT & REPAIR	5,000.00	0.00	4,192.91	807.09	83.86
20-606-5015 ELECTRONIC EQPT MAINTENANCE	500.00	0.00	177.29	322.71	35.46
20-606-5020 VEHICLE MAINTENANCE	3,000.00	269.01	701.40	2,298.60	23.38
20-606-5030 BUILDING MAINTENANCE	2,500.00	0.00	258.43	2,241.57	10.34
20-606-5060 VEHICLE & EQPT FUELS	4,000.00	128.78	2,058.49	1,941.51	51.46
TOTAL MAINTENANCE	16,500.00	397.79	7,538.52	8,961.48	45.69
DEPT MATERIALS-SERVICES					
20-606-6011 CHEMICALS	16,500.00	2,234.23	7,682.68	8,817.32	46.56
20-606-6050 WATER METERS & BOXES	4,500.00	0.00	1,460.20	3,039.80	32.45
20-606-6055 FIRE HYDRANTS & VALVES	7,000.00	0.00	8,940.59	(1,940.59)	127.72
20-606-6060 HUEBNER STORAGE TANK	5,000.00	100.00	10,388.46	(5,388.46)	207.77
20-606-6061 ELEVATED STORAGE TANK- #1 W	4,750.00	0.00	198.75	4,551.25	4.18
20-606-6062 WELL SITE #2-EAA MONITORED	1,300.00	0.00	0.00	1,300.00	0.00
20-606-6063 WELL SITE #3-NOT OPERATION	1,800.00	0.00	0.00	1,800.00	0.00
20-606-6064 WELL SITE #4-NOT OPERATION	1,300.00	0.00	910.48	389.52	70.04
20-606-6065 WELL SITE #5-EDWARDS BLENDI	1,000.00	0.00	4,031.83	(3,031.83)	403.18
20-606-6066 WELL SITE #6-MUNI TRACT	4,000.00	14,974.65	16,745.28	(12,745.28)	418.63
20-606-6067 WELL SITE #7	4,000.00	0.00	3,897.89	102.11	97.45
20-606-6068 WELL SITE #8	4,000.00	0.00	222.89	3,777.11	5.57
20-606-6069 WELL SITE #9-TRINITY	4,000.00	7,212.50	7,775.00	(3,775.00)	194.38
20-606-6070 SCADA SYSTEM MAINTENANCE	7,000.00	1,362.33	6,184.78	815.22	88.35
20-606-6071 SHAVANO DRIVE PUMP STATION	22,500.00	0.00	9,388.78	13,111.22	41.73
20-606-6072 WATER SYSTEM MAINTENANCE	22,500.00	719.35	12,091.35	10,408.65	53.74
20-606-6080 STREET MAINT SUPPLIES	1,500.00	0.00	2,406.00	(906.00)	160.40
TOTAL DEPT MATERIALS-SERVICES	112,650.00	26,603.06	92,324.96	20,325.04	81.96
UTILITIES					
20-606-7040 UTILITIES - ELECTRIC	75,000.00	5,231.71	30,086.94	44,913.06	40.12
20-606-7042 UTILITIES - PHONE/CELL	825.00	111.00	777.00	48.00	94.18
20-606-7044 UTILITIES - WATER	300.00	36.49	255.00	45.00	85.00
TOTAL UTILITIES	76,125.00	5,379.20	31,118.94	45,006.06	40.88
CAPITAL OUTLAY					
20-606-8015 NON-CAPITAL - COMPUTERS	750.00	0.00	724.40	25.60	96.59
20-606-8020 NON-CAPITAL MAINTENANCE EQU	1,000.00	237.70	1,077.94	(77.94)	107.79
20-606-8050 CAPITAL - VEHICLES	46,718.00	0.00	0.00	46,718.00	0.00
20-606-8080 WATER SYSTEM IMPROVEMENTS	28,700.00	0.00	23,856.67	4,843.33	83.12
20-606-8087 WATER METER REPLACEMENT	30,150.00	0.00	6,963.66	23,186.34	23.10
20-606-8091 CAPITAL - WELL #1	23,500.00	0.00	0.00	23,500.00	0.00
20-606-8095 CAPITAL - WELL #5	17,686.00	0.00	17,156.50	529.50	97.01
TOTAL CAPITAL OUTLAY	148,504.00	237.70	49,779.17	98,724.83	33.52

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: APRIL 30TH, 2020

20 -WATER FUND
WATER DEPARTMENT % OF YEAR COMPLETED: 58.33

EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	BUDGET BALANCE	% OF BUDGET
INTERFUND TRANSFERS					
20-606-9010 TRF TO GENERAL FUND	22,050.00	0.00	0.00	22,050.00	0.00
20-606-9020 TRF TO CAPITAL REP. FUND 72	124,020.00	0.00	0.00	124,020.00	0.00
20-606-9050 BAD DEBT EXPENSE	0.00	0.00	860.14	(860.14)	0.00
TOTAL INTERFUND TRANSFERS	146,070.00	0.00	860.14	145,209.86	0.59
TOTAL WATER DEPARTMENT	935,824.00	66,703.55	423,288.01	512,535.99	45.23

REVENUE & EXPENSE REPORT (UNAUDITED)
AS OF: APRIL 30TH, 2020

20 -WATER FUND
DEBT SERVICE % OF YEAR COMPLETED: 58.33

EXPENDITURES	CURRENT BUDGET	CURRENT PERIOD	YEAR TO DATE ACTUAL	BUDGET BALANCE	% OF BUDGET
CAPITAL OUTLAY					
20-607-8014 2009 GO REFUND - PRINCIPAL	40,073.00	0.00	40,072.50	0.50	100.00
20-607-8015 2009 GO REFUND - INTEREST	801.00	0.00	801.45	(0.45)	100.06
20-607-8016 2017 GO REFUNDING (2009) PR	70,000.00	0.00	70,000.00	0.00	100.00
20-607-8017 2017 GO REFUNDING (2009) IN	66,400.00	0.00	33,550.00	32,850.00	50.53
20-607-8030 BOND AGENT FEES	200.00	0.00	200.00	0.00	100.00
20-607-8056 2018 GO REFUNDING (2009) PR	3,083.00	0.00	3,082.50	0.50	99.98
20-607-8057 2018 GO REFUNDING (2009) IN	7,477.00	0.00	3,759.01	3,717.99	50.27
TOTAL CAPITAL OUTLAY	188,034.00	0.00	151,465.46	36,568.54	80.55
TOTAL DEBT SERVICE	188,034.00	0.00	151,465.46	36,568.54	80.55
TOTAL EXPENDITURES	1,123,858.00	66,703.55	574,753.47	549,104.53	51.14
REVENUES OVER/(UNDER) EXPENDITURES	0.00	13,952.19	(9,756.43)	9,756.43	0.00

Water Advisory Committee Agenda Form

Meeting Date: June 8, 2020 | Agenda item: 6.a

Prepared by: Brandon Peterson | Reviewed by: Bill Hill

AGENDA ITEM DESCRIPTION:

Discussion/Update – Trinity Well Discussion/Update – PW Director

[X] **Attachments for Reference**: a. Chapman Engineering Company qualifications
b. Chapman rates

BACKGROUND / HISTORY: Updates highlighted. On March 14, 2019 the Miox stopped generating chlorine to treat the water produced by the Trinity well, thus requiring the Trinity well to be taken offline.

The initial quote received from Miox was to replace the Miox cabinet for approximately $60k. I initiated an assessment to determine whether we needed to continue using Miox or switch to an alternate hyper chlorite system.

In June, I later engaged subject matter experts Grant Snyder (Geologist who helped start the initial Trinity Well, and Lou Portillo who is a water treatment engineer. Grant Snyder suggested the City take water sample of the Trinity Aquifer to determine the water quality. The water tests results came back with equal results as the startup tests. Grant recommended keeping the Miox system due to the water quality test results.

On July 30th Water Resources Corp. (WRC) removed the cabinet and shipped to Miox in Sugarland Texas. In early August, Miox sent a quote with 3 options for repairs or replacements, City selected replacement of components that were necessary.

In mid-October, WRC installed and tested the Miox cabinet. Upon completion of the install, Public Works staff continued other preparations in order to place the well back in operation. Staff noticed a decline in production, and called upon Advanced Water Well Technologies (AWWT) for a professional opinion. November 1st, AWWT determined there is either a hole in a bowl (Trinity has 14 bowls), or the pump. AWWT advised that there could be risk and if we ran the well it could cause further damage to other equipment. City considered their advice and decided to place the well back online and monitor closely.

On November 15th I placed the well back in operation with a pump rate of 205 gal/min. and by November 20th the pump rate dropped to 182 gal/min. which is a significant drop in 5 days. The resulting drop is gals/min results in the Well running almost constantly (not good). Again, consulting with AWWT they believe there is a hole in the pump or one of the bowls, which need repairing.

On February 6th AWWT pulled the Trinity well to determine the reason for why the well lost production. A meeting with AWWT, Engineer Consultant and City Staff was held on February 11th to show the motor seals were blown, and pump cast iron bowls 1-4 were pitted, while ductile iron bowls 5-14 were fine; as well as all the stainless steel impellers.

On March 9th WAC members discussed the next step to run a camera survey and a gamma test to determine the integrity of the well and see if additional funds should be utilized to get the well restored and placed back in operation. March 17th camera survey was completed and sent to the engineer consultant for his review and recommendations. Engineer provided his review in attachment A.

DISCUSSION: Over the winter break I sent another water chemistry sample off to the lab for further analysis. Results came back a week later, and I requested Grant Snyder to review the results and provide some guidance as to what can be done. If any of the results differ from when the well originally started, then to explain the good and the bad.

Things to keep in mind also, since the Trinity has been down for so long:

- Residents have not complained about the water quality (yellow/rusty color)
- Less staff time checking all the equipment at Well #1.
- Lots of maintenance expenses too annually or every other year.

Basic review of the engineers report is as follows:

- From 16 ft to 40 ft in the hole the casing is moderately corroded with significant surface delamination and pitting.
- Some minor corrosion the rest of the way down the casing to the water surface elevation.
- Mineral precipitation on the screened zone is heavy, with very significant blockage of the 1/8 inch slots
- Mineral precipitation below the screened interval from 1006 ft to the well bottom at 1173 ft, is moderate.
- There is a 16 ft section of broken pipe, a section of 1 inch sample tubing that was broken off in a previous exploration.
- The aquifer static water level has declined since the initial install. Water quality often degrades as the aquifer level declines, due to contributing flows shifting toward deeper water bearing strata that often contain higher TDS concentrations.

In order to restore the well, the following actions are likely:

- Agitate the well screens via brushing or acidizing the well
- Install a new stainless steel pump and motor (Motor only if needed)

- Refurbish existing stainless steel water column pipe/couplings where needed
- Adjust chemical treatment process, convert to different treatment injections

After the April 13 meeting, members requested a cost update to place the trinity well into a "moth ball state".

COURSES OF ACTION: Therefore, this leaves the City with limited options.

1. City can abandon the well and plug it completely – No, leave as a future reserve in case of drought.
2. City can restore the well – This will cost approximately $120,000 to rehab and to received an average of 3 years operation
3. City can cap the well and hold it in an idle position until needed in the future. – Members requested an approximate cost to place the well and all its equipment in a moth ball state.

FINANCIAL IMPACT: A couple options are as follows:

#1 – Pull and inspect the pump, will cost approximately $3,500 (Completed)

#2 – If we restore the well back to service, estimated cost is $70,000, this includes casing corrosion evaluation, casing cathodic protection, casing plug for the lower 10 ft, casing cleaning, well pump test, installation of new/existing equipment, sodium hypochlorite (liquid bleach) and potassium permanganate (mitigate taste and odor), iron filter replacement (replacing the media inside the sand filters)

#3 – If the City abandons the well and plugs it per TCEQ requirements, the estimated cost is $70,000 this includes, plugging the well and all supplies required, and restorations and landscaping needed on the surface.

#4 – If the City caps the well and leaves it opened for future use, the estimated cost is $5000 to $32,000 depending on final actions. This may include casing corrosion evaluation, casing cathodic protection, temporary well cap, transmission line temporary cap/clean out, and treatment system cleaned out for temporary storage. Some options with cost estimates:

- AWWT - Capping the well with a blind flange and welding to the well casing. - $400
- Water Resources – Cleaning out all parts and equipment within the Miox - $1,500
- Bob Johnson – Clean all the sand media out of the filter tanks, clean the backwashing system, and place into a "moth ball state" - $2,400
- Prior to the last WAC, PW Director contacted Trinity Glen Rose Authority (TGRA) and confirmed no permit or documentation is needed.

- TGRA has expressed interest in televising the well and determine if placing a pressure node and level indicator into the well is acceptable by the City. It is unknown whether we could collect a monetary fee "rent" from TGRA.

- Corrosion and cathodic protection engineer/installation costs – approximately $2,500 to $17,500
  - Mark (Consultant) recommended we work with Chapman Engineering. After discussions with Cal Chapman (President), they require a basic analysis (site visit and casing thickness/corrosion test) and would provide recommendation for requirements in the form of a report. The cost of the report is estimated to be approximately $2,500. The actual cathodic protection system installed if needed may cost up to $15,000 more.

STAFF RECOMMENDATION: **To** recommend to City Council that the Trinity Well (Well #9) be placed into an idle state until further need arises.

Chapman Engineering

Statement of Qualifications

Prepared for:

CITY OF SHAVANO PARK

May 2020

Chapman Engineering

City of Shavano Park
Review of Internal Corrosion & Future Well Use Possibilities
One Trinity Formation Public Water Well, Installed 2010

Pre-Proposal Number	1770
Proposal Date	May 28, 2020
Proposal Writer	Cal Chapman, P. E.
Proposal Reviewer	Mike Ames, Anita Bowen
Client Contact Name	Mr. Brandon S. Peterson, P. E.
Client Company Name	City of Shavano Park
Client Contact Title	Public Works/Water Utilities Director
Client Contact Street Address	900 Saddletree Court, Shavano Park, TX 78231
Client Contact E-mail Address	pwdirector@shavanopark.org

Dear Mr. Peterson:

As you and I discussed by phone on Tuesday, we want to come see the inactive public water well, installed into Trinity Formation geology and ground water, and which has an internal wall corrosion issue near the ground surface.

This letter is written to better introduce our firm, and so that you can review our credentials shown in the accompanying "Statement of Qualifications." A copy of our rate sheet is also attached, per your request.

We appreciate the opportunity to work with you on this project. Once you have reviewed this information, please give me a call so we can schedule an on-site meeting.

CHAPMAN ENGINEERING AUTHORIZED SIGNATURES

William M. Ames
Vice President, Technical Operations
NACE CP Specialist #4343
Senior Corrosion Technologist #4343

Cal Chapman, P. E.
President
NACE CP Specialist #23357
Texas Professional Engineer #81268
Model Law Engineer #35248, NCCER

CC/ab

Chapman Engineering

Corporate Summary

Chapman Engineering, founded in 1988, offers corrosion control and engineering, environmental engineering, fuel systems design, leak detection monitoring and compliance support, environmental assessment and corrective action, and asset integrity management services. Mr. Cal Chapman, an environmental and corrosion engineer, Mr. Bill Hayes, a research chemist, and Mr. Jim Velvin, a gasoline retailer and engineer who also had over a hundred U. S. patents to his credit, teamed to create a concept for "Underground Storage Tank" (UST) release detection. The company began work in early 1989 with this UST release detection system, trade-named **Chapman Engineering Fuel Finder™**. Mr. Chapman and Mr. Hayes developed the company through 1995, and Mr. Chapman has been sole principal since that time.

The company offers professional engineers, cathodic protection specialists, geologists, and staff certified in corrosion protection/corrosion control, UST installation and removal, and other sub-specialty areas. Chapman Engineering also works closely with a network of other engineering and environmental service firms to offer a full suite of corrosion control, environmental consulting/contracting, and other services ranging across a number of disciplines.

Starting in UST release detection and cathodic protection of steel underground tanks, Chapman Engineering has learned the corrosion protection marketplace since the mid-1990's. It participates with clients in corrosion control for bulk storage tanks, pipelines, well casings and internals, tank batteries and pump stations, water, wastewater and electric utilities, and other infrastructure. Integrity management and risk assessment work are regular staples of this customer support.

In 2015, after years of collaborating and teaching one another, Mike Ames joined Chapman Engineering. This brought much greater technical capability to the firm, and added a significant "oil and gas" client base to our company, especially in the Gulf Coast region and the American Midwest.

Chapman Engineering is a "Certified Small Business" through the South Central Texas Regional Certification Agency. It has trained its personnel in the SafeGulf/SafeLand oil and gas safety program for onshore and offshore work in the oil and natural gas sector. Most of its field personnel are trained and certified as "Pipeline Operator-Qualified" for pipeline corrosion control, in accordance with U. S. Department of Transportation rules. The company is listed with ISNetWorld® for oil and gas industry services, safety program tracking, and vendor certification. Its personnel meet training qualifications through both Veriforce® and NCCER.

Company Services

Engineering/Design

- Cathodic Protection (CP) System Designs for Pipelines & Other Structures;
- CP System Evaluations and Designs for Internal Corrosion Control on Tanks, Heater Treaters, Pressure Vessels, etc.;
- Coating Evaluations on All Manners of Infrastructure, Vessels, Tanks, Pipelines, Etc.;

- Studies of high-voltage AC (HVAC) interaction with pipelines, modeling of interactions, design and installation of HVAC mitigation systems;
- Other specialty corrosion control evaluations;
- CP interference studies on pipelines;
- Forensic Evaluations of Failures.

Construction/Contracting for Installations and Commissioning

- Installation of Impressed-Current CP systems, including the drilling of deep anode beds (maximum depth capability of 1,000 feet), for pipelines, well casings, etc.;
- Installation of high-voltage AC mitigation systems for pipelines;
- Alternative power systems for CP, such as Solar, Thermo-electric Generators, etc.;
- Installations of RMU's on rectifiers or important monitoring sites for regulated pipelines;
- Installation of pipeline CP test stations, coupon test stations;
- Rectifier installations;
- Installation of galvanic anodes with test station connections;
- Pipeline Coating Inspections and Recoating.

Survey

- Annual and baseline CP surveys;
- Surveys for HVAC power interactions with well-coated steel pipelines;
- Close-Interval Potential Survey (or CIS);
- Direct-Current Voltage Gradient (DCVG) Survey;
- Alternating-Current Voltage Gradient (ACVG) Survey;
- C-Scan Coating Conductance Survey;
- CP Interference Survey;
- Electrical isolation fitting tests/repairs/replacement;
- Bell-hole pipeline inspections;
- Atmospheric Corrosion Surveys/Inspections for Above-Grade Assets.

Asset Integrity Management

- Pipeline Integrity Management Program (Company-wide) & Plans (Line-specific);
- Depth-Of-Cover (DOC) Surveys for Pipelines;
- Preparation of As-Built and Alignment Info on Existing, Newly Regulated Pipelines;
- ILI Anomaly Digs;
- ECDA Digs and assessments;
- API 653 Tank Inspections.

Environmental Engineering Services

- Spill Prevention, Control and Countermeasures Plans (also called SPCC Plans, and required under federal rule) for Oil, Condensate, Refined Petroleum Product and Produced Water Above-Ground Storage Tank (AST) Facilities;

- Environmental Assessment, Including Site and Risk Assessment, Geologic Assessment and Aquifer Studies, Environmental Corrective Action and Site Remediation (Cleanup) for Petroleum Hydrocarbons, Heavy Metals, Chlorinated Hydrocarbons, Pesticides, Herbicides.

Troubleshooting

- CP System Troubleshooting;
- Rectifier Adjustments and Testing/Troubleshooting;

- CP-Related Current Requirement Testing, often in combination with electrical isolation studies;
- CP system interactions with regional AC power neutral wire systems.

Explanation of Various Company Services

CORROSION ENGINEERING & DESIGN

All external corrosion protection work is a combination of good coatings and good cathodic protection. It is vital that every infrastructure set uses suitable coatings, which are properly applied and safeguarded from damage during equipment installation. And because a coating is never 100-percent effective in isolating a buried or submerged metallic structure for the full service life, a cathodic protection system must be properly designed, installed, and tested over time to assure that the structure remains a valuable asset over its service life, rather than suffering corrosion damage and becoming, in many cases, a liability over time.

As additional information, Chapman Engineering designs and constructs CP systems using the following approaches:

- Impressed-Current Cathodic Protection (ICCP) systems with deep anode beds, and AC-powered rectifiers;
- ICCP systems using directionally placed anodes under existing bulk above-ground storage tanks with leak liners;
- ICCP systems with DC-only solar power supplies, thermo-electric generators for AC power and rectifier, or other alternative power sources;
- galvanic CP systems using magnesium or zinc anodes in soil or fresh-water applications; galvanic CP systems inside produced-water tanks, heater treaters, pressure vessels and slimier equipment, often using aluminum anodes for salty water conditions.

Installation of CP rectifier (left) and anode junction box

High-Voltage Line AC Power Interactions with Steel Pipelines

When high-voltage AC power lines run near buried pipelines, safety and corrosion issues are of concern. Chapman Engineering provides AC voltage surveying, modeling of induced AC voltages, and the design and installation of mitigation systems to protect health and safety, and to reduce the risks of AC-induced external corrosion on pipelines.

Installation of AC Mitigation Materials

A study of high-voltage AC (HVAC) power line interaction with a pipeline is conducted to consider the following risks:

- Induced AC voltages and estimated current drains related to them (it is AC power that builds on the pipeline);
- Touch and step potential differences at above-grade pipeline appurtenances, which represent possible electrical shock hazards to personnel, general public and animals;
- Coating stress and arcing distances related to AC current discharges (whether from AC induction, from AC-power-system fault currents, or from lightning strikes);
- AC-induced corrosion risk.

Safety can be a factor, along with risk of AC-induced corrosion. If a worker were to touch off to the pipeline, and then ground himself, there could be a lot of AC current flow off the pipeline. If AC voltages are present at 15 V or greater (this is judged to be the maximum "safety" voltage in industry standards

– see National Fire Protection Association Standard 70 E), then mitigation of AC induction must be done just to protect the safety of workers and the public.

A recent NACE evaluation of AC-induced corrosion risk, SP21424-2018, is titled, "Alternating Current Corrosion on Cathodically Protected Pipelines: Risk Assessment, Mitigation and Monitoring." This standard provides more detailed methods for field measurement, modeling options and other risk drivers related to high-voltage AC interactions. One outcome of recent studies shows that over-protection of pipeline metal by cathodic protection can actually worsen AC-induced corrosion rates. This shows the need to more properly "right-size" cathodic protection systems for at-risk pipelines. This usually leads one to the design and installation of more CP systems, but each with smaller output, and thereby avoiding over-protection on pipe segments closest to each CP system.

Installation of AC mitigation, vertical elements, Houston Ship Channel Site

CONSTRUCTION/CONTRACTING FOR INSTALLATIONS AND COMMISSIONING

We are a turn-key "Engineering/Procurement/Contracting" (EPC) operation that owns and operates our own drill rig, complete with installation crews and all necessary tools and equipment. Our crews are trained and operator-qualified on all industry equipment (backhoes, excavators, loaders, dozers, trenchers, skid steers, etc.). Our crew members have completed "OSHA 30" construction safety training and have their TWIC cards, and are US DOT and Pipeline Operator Qualified. Please visit us at www.chapmanengineeringdrilling.com for more information.

SURVEY PERFORMANCE

Annual Surveys, Baseline Surveys

When a cathodic protection system is installed, and as part of "optimizing" the amount of CP being applied, pipe-to-soil (P/S) voltage measurements are taken to learn whether sufficient protection is in place. It is appropriate, too, for CP readings to be taken on pipelines and facilities when no actual CP system is in place or working, and these readings are referred to as "native voltages" or "baseline" numbers.

According to NACE Standard Practice SP0169-2002, three criteria are used to determine whether adequate cathodic protection is being applied to a pipeline for control of external corrosion. (Please bear in mind that for pipelines regulated under U. S. Department of Transportation standards at 49 CFR Part 192 or Part 195, those rules still cite RP0169-2002.) The criteria are:

1. A (cathodic) potential difference of at least -850 millivolts (-0.850 V) is measured with the cathodic protection applied, and with any "IR drop" in the measurement circuit factored out. This potential difference is with respect to a saturated copper/copper sulfate reference electrode (or CSE) contacting the electrolyte. Note that in all CP reporting, the word "potential" refers to the P/S potential in comparison to the CSE. "Potential difference" is the same as voltage;
2. A polarized potential of at least -850 millivolts (-0.850 V) is measured relative to a saturated CSE, with the CP current interrupted. Measurement of this "immediate off" (or "instant off") voltage is done at least 0.1 second after the protective current is interrupted, but not longer than 0.25 second after interruption begins;
3. A minimum of 100 millivolts (-0.100 V) of cathodic polarization is found between the structure surface and a stable reference electrode contacting the electrolyte. The formation or decay of polarization can be measured to satisfy this criterion. This polarization "shift" is obtained by comparing the "immediate off" voltage to the unprotected (or "native") voltage of the structure.

If any one of these criteria is met, then a pipeline is under adequate cathodic protection. Please note that many practitioners do not feel that the "system on" criterion is valid in most cases, because estimating the contribution of "IR drop" to a "system on" voltage is so cumbersome. Chapman Engineering usually relies on the second and third criteria to judge whether adequate CP is being applied.

If there is no CP applied, or if galvanic anodes are in use, then the only criterion against which measurements are evaluated is the first one for "system on" conditions. Unless anodes are wired through test station connections to pipeline or other structure, and those connections can be interrupted in synchronized fashion, the second and third criteria cannot be employed. There are methods for use of coupons to do current-interrupted survey work, but these must be retrofitted to pipelines/structures and test points.

Close-Interval Potential Survey (Includes "Depth-of-Cover" Survey Work)

Close-Interval Potential Survey (CIPS, and often called CIS) is a survey most often performed during current interruption of an impressed-current CP system (or multiple systems). It is possible to perform when galvanic anodes are attached to a pipeline or structure, but usually more difficult to apply. The analysis and interpretation of CIS data requires both the evaluation of field technical procedures and the actual analysis and interpretation of the data. Applying proper technique and procedures is vital, as is good "pre-assessment" preparation for each survey.

When one or more rectifiers are in use to power CP systems for a given pipeline, network of pipelines, or other structures, synchronized current interruption of the multiple rectifiers must be done. Portable current-interruption units can be installed, which are synchronized to millisecond cycles using the GPS system. Also, permanently mounted "remote monitoring units" (RMU's) can be installed at each rectifier, and these are built to allow remote programming of GPS-synchronized current interruption schedules.

With one or more rectifiers controlled for current interruption, the CP system is cycled with "system on" for what may be as short a cycle as 0.700 second, and "system off" for a cycle time of 0.300 second, and sometimes cycles as long as "eight seconds on, two seconds off." The CIS crew performs the following steps:

1. Lead crew member uses a pipe locator tool to find "top centerline" of the target pipeline, and set pin flags or painted markings on 100-foot centers. Measuring "depth of cover to top of pipe" may be done as part of this scope item, though it is not done for every CIS job;

2. 2nd crew member attaches a thin copper wire to test station lead or other structure connection to target pipeline, and begins walking the pipe centerline using two reference cells wired back to a digital volt-ohm-meter (VOM) and data logger. With one CSE in soil contact for at least two cycles of "system on" and "system off" time, P/S voltages are taken at each discrete point over the pipe, two to four feet apart. With time and distance walked, these "close-interval" voltages for "on" and "immediate off" conditions are collected for later evaluation;
3. Third crew member attaches structure wire to next "forward" test station lead/structure connection, helps crew members advance the survey, and picks up wire behind the technician taking readings.

Example of Rectifier Interruption

Data collected is then compared to mapped pipeline information, and the voltage patterns checked in comparison to the three NACE criteria, and with respect to foreign pipelines crossed, or other unusual field conditions observed.

DCVG and ACVG

These survey types are used to identify specific locations where coating defects allow an electromagnetic current to leave a pipeline. In "direct-current voltage gradient" (DCVG) survey work, an impressed-current CP system is used, and interrupted on a set cycle. The survey crew walks down the pipeline with two reference cells wired back to a volt-meter. When DC current (put on the pipeline by the CP system) leaves a pipeline in a small area (usually being lost from a coating holiday, scrape, or other coating defect that exposes bare pipe metal), there is a DC voltage field created by the localized current travel. Using the two reference cells, this "voltage gradient" is noted, then measured in detail by varying the positions of the cells. In this way, the survey crew is often able to pinpoint the defect location to within just a few feet. Also, the severity of the current loss is indicated by the "strength" of the voltage field, which in turn is used to estimate the size and severity of the coating issue.

In "alternating-current voltage gradient" (ACVG) surveys, the same general approach is used. But instead of an impressed-current CP system used to put current on the pipe, an AC current is put on the pipeline. When that AC current leaves the coating defect to flow "back to ground," an AC voltage field can be measured. In the same way that DCVG data is interpreted, the strength of the AC voltage field indicates anomaly size range, and the coating defect can be located quite closely.

The ACVG work is done using a tool called the "Pipeline Current Mapper." It is valuable for accurate line locating, and can also be used as a "current attenuation" monitoring tool.

Both of the above-described surveys are generally described as valuable tools under the "External Corrosion Direct Assessment" (ECDA) approach for pipeline corrosion integrity management. They are, by using voltage gradient measurements, very similar in approach.

C-Scan Coating Conductance Survey

The C-Scan survey, done with proprietary tools supplied by only one vendor worldwide, consists of applying an AC electromagnetic signal, or current, to a pipeline through a conductor attachment. In the same general area as this conductive attachment, an electrical ground is also established in soil 50 to 300 feet away from the pipeline under study.

The signal generator is then turned on and current "signal" applied to the pipeline. The C-Scan detector is then walked down the pipeline, and measurements of an electromagnetic field strength coming from the pipeline are made. C-Scan provides GPS location information on pipe centerline to what is usually sub-meter accuracy. Of even more value, it gives "depth of cover" information to the nearest inch, and can reliably identify "top of pipe" or "center of pipe" to depths exceeding 30 feet below grade.

As one surveys down the pipeline, multiple antennas in the detector provide the amount of signal loss, compared to the original signal strength at the first test point. Between a previous test point and the newest test point, average coating conductance and signal attenuation are computed. Within each pipeline interval "bracketed" by test points, the operator can compare whether the pipeline coating across that interval has shown the same characteristics as other sections, or if more signal is lost, and coating conductance "averaged across" that section is poor. If this is the case, additional measurements are taken in smaller pipe-length increments. Using this technique of multiple segments, and then using a "Current-Only Close-Interval Survey" with the same tool, a particular coating defect can be pinpointed to within feet or inches, from "top centerline" position over the pipeline.

Bakken of North Dakota, Summer 2015 Survey

C-Scan should be performed on a pipeline that does not have current-interrupted CP survey being done at the same time. It may also have interference from high-voltage AC power line fields. Otherwise, this survey is applicable in any case where a reasonably well-coated pipeline is in use. If a pipeline has very poor coating quality, or is bare, the signal loss is so rapid that meaningful coatings anomaly information is not likely to be obtained.

Current Demand Survey/Testing (also called Current Requirement Testing) for CP System Sizing

When a pipeline network or other structure needs CP, it is wise for a qualified contractor to use a temporary CP system to apply protective current, and learn how much current provides a certain amount of protection. In this way, the needed permanent CP system can be designed and sized properly. This work must be done by qualified personnel, and is accompanied by testing across a network of test points. At all the test points used, voltages are measured before any CP is applied. Also, any isolation fittings in the area are also tested, to assure that the metal needing protection is not accidentally connected to other metal that either does not need CP, or may be getting CP from another, independent system.

Once the temporary CP system is energized, “system on” P/S voltages are monitored for minutes to hours. Then the temporary system’s current flow is interrupted in synchronized fashion, and both “system on” and “immediate off” P/S voltages are obtained. This allows the buildup of polarization shift to be monitored, which is the best measure of CP being applied.

This technique can be used for sizing CP systems on well casings, whether for water, oil and gas, or other industrial uses.

Cathodic Protection for Commercial Water Well Casing

ASSET INTEGRITY MANAGEMENT

Some pipeline assets are required to be managed under a formal "Pipeline Corrosion Integrity Management Program" at corporate level, and then by line-specific "integrity management plan" documentation. Chapman Engineering regularly recommends to clients that all buried steel pipelines be treated as if they are regulated, for integrity management, minimization of risk, and reduction in operating costs over time. The wisdom of "pay me now for minor maintenance costs, or pay me later for major issues" definitely applies.

Chapman Engineering has created company-wide integrity management programs to meet regulatory and asset management goals, since federal rules began requiring these in the early 2000's. It has created line-specific integrity management plans for many operators.

Mike Ames has unique experience in the pipeline integrity management field, having helped the nations of Venezuela, Colombia and Bolivia create their integrity management programs between 2000 and 2004.

With U. S. federal pipeline rule changes anticipated to arrive in late 2019 or early 2020, some previously unregulated pipelines will need new record sets built. One specific need is addressed immediately below.

Depth-of-Cover Survey

Often when CIS is performed, "depth of cover" from ground surface to top of pipeline is also obtained as part of centerline staking on the pipeline. When an existing pipeline becomes regulated, for instance, there may not be information on file showing accurate "plan view" alignment of the pipeline, or its depth below grade versus distance (profile view). Pipe-locating instruments can often obtain depth-of-cover

(DOC) to the nearest 0.1 foot, to depths of at least six to eight feet. If the client needs this data obtained, then the interval of DOC collection must also be decided. Most operators get DOC at 100-foot intervals, unless there are significant topographic changes encountered (stream crossings, sharp topographic breaks, etc.). DOC might be needed at 20-foot or 50-foot intervals in these instances.

ENVIRONMENTAL ENGINEERING & CONSULTING

The company regularly involves its personnel in new rule-making packages at the U.S. Environmental Protection Agency, Texas Commission on Environmental Quality (TCEQ) and other state agencies, ground-water districts, and other regulatory entities, applying its experience to the realistic formulation of new policies and rules. Chapman Engineering also provides pipeline leak detection surveys using hand-held detectors, backpack- or roof-mounted methane-specific laser systems, and other devices.

Environmental assessment and remedy for subsurface contamination are performed in roles as simple as Phase I Environmental Site Assessments (ESA's), and as complex as "Affected Property Assessment Reports" and similar reporting under the Texas Risk Reduction Program. The company is actively involved in remedy and redevelopment of former dry cleaner sites, gas stations and convenience stores, illegal dumping sites, ranches with former animal dipping vats, oil and gas releases, heavy metal concerns, and formerly used defense sites.

Many projects involve a Client's interaction with regulatory agencies, and Chapman Engineering is retained to help the parties – regulated entity and the regulators – reach solutions to perceived problems. These matters may stem from compliance inspection results, permitting requirements, or the expansion of a Client's business activities.

Assessment work may be performed to ASTM standards, to rules under USEPA and TCEQ, and even under Texas Railroad Commission rules and standards.

KEY RÉSUMÉS

CALVIN C. CHAPMAN, P.E.

President & CEO, Chapman Engineering, Inc.

EDUCATION

B.S. Engineering, cum laude, Trinity University, San Antonio, Texas, 1981
Post Graduate: Geology, Exploration and Mining Geology, Arctic Engineering, Surveying, University of Alaska, Fairbanks 1981-1982

REGISTRATIONS

Professional Engineer, Texas (#81268), Oklahoma (#26056), New Mexico (#19169), North Dakota (#8268)
Model Law Engineer #35248, National Council of Examiners for Engineering & Surveying
NACE International Cathodic Protection Specialist #23357
State of Texas Corrective Action Project Manager #00255
TCEQ Class D Water System Operator #W00017399 (inactive)

PROFESSIONAL EXPERIENCE

Since co-founding Chapman Engineering, Inc. in 1989, Mr. Chapman has managed approximately 1,500 storage tank leak detection studies and accounts, 150 Phase I and Phase II ESA's, several hundred cathodic protection surveys and system installations on pipeline networks, bulk tanks and vessels, and more than 200 risk-based corrective action, soil and ground-water assessment and/or remediation projects. Mr. Chapman has directed or supported project work in many states across the U. S. He has offered expert testimony in a range of legal cases. Other specific areas of expertise include:

- Obtained three U. S. patents (#5,003,813 with William V. Hayes, and #5,767,390 and #5,922,943 individually) in UST leak detection, created the proprietary and third-party-certified **Chapman Engineering Fuel Finder™** UST leak detection method based on those patents, and managed approximately 1,700 UST leak detection studies and accounts across Texas, Louisiana, New Mexico, and in other states since 1989;
- Performed design, troubleshooting, installation oversight, and testing of cathodic protection systems on UST systems, oil and natural gas pipelines, "master meter operator" natural gas distribution systems, water tanks and lines, and other subsurface metallic structures. Also provided pipeline integrity management, asset integrity management services to oil and gas production companies, midstream companies, and transmission pipeline companies;
- Taken and passed the NACE CP Tester (1999) exam, and the NACE "Cathodic Protection Specialist" class/testing, January 2009, with certification awarded in June 2009 (NACE CP Specialist #23357);
- Designed new UST and AST fuel systems in Texas, New Mexico and Oklahoma, and overseen installation of these systems;
- Performed regulatory compliance audits and program reviews for various clients in the areas of Pipeline Integrity, Petroleum Storage Tank (PST), Public Water System (PWS), "Voluntary Environmental Audit," air permitting, solid waste, storm-water planning, pipeline and oil/gas facilities, and other subject areas;
- Provided corrosion control consulting for external corrosion, internal corrosion, interference issues involving both stray-current and high-voltage AC concerns;
- Performed and interpreted gas chromatography analyses for fuel and other petroleum fraction fingerprinting evaluation, refined petroleum product leak detection, and studies of relative release "aging;"

- Over the last 28 years, conducted and/or directed more than 450 Environmental Site Assessments (ESAs), including work under the U. S. EPA Petroleum Brownfields Grant program, Texas Voluntary Cleanup Program (VCP) and Innocent Owner/Operator Program (IOP), the Texas "Leaking Petroleum Storage Tank" (LPST) Program, Spill Response actions related to fuel tank roll-overs, and many Phase I and Phase II ESA's related to property transactions. Dealt with contamination patterns involving petroleum hydrocarbons (whether crude oil, condensates, or refined products), chlorinated hydrocarbon solvents and "daughter products," heavy metals, pesticides and herbicides, disinfection byproduct (DBP) compounds, and other environmental contaminants;
- Worked on TCEQ Statewide Drinking Water Sampling contract program in 2004 and 2005, as project Quality Assurance Manager;
- Participated in numerous TCEQ rule-writing projects for soil, water, waste, storage tanks, corrosion protection, environmental laboratory operation and other issues. This included co-chairing the Texas Risk Reduction Program "TRRP 13" Data Quality Guidance Task Group from 2000 through 2003;
- Designed public water systems in Texas, and conducted ground-water studies for residential development in the Texas Hill Country; directed aquifer studies and pumping tests for environmental and potable water projects; troubleshot and solved water quality issues in Texas public water systems, and for private water well owners. Provided "conservation development" planning, water conservation and recycling plans, drought contingency plans, resource management and policy guidance, and other planning support to developers, larger engineering firms, property managers, and ground-water conservation districts;
- Offered periodic expert testimony in Texas and other state and federal legal cases related to UST's, AST's, refined and crude oil petroleum contaminant patterns, corrosion control, and unauthorized releases to the environment;
- Regularly writes articles for technical journals and magazines, with more than 15 published papers or articles since 2012.

TECHNICAL PRESENTATIONS

- NACE International Rocky Mountain Section Corrosion Short Course, Presentation for "Electrical Resistance and Cathodic Protection Done Well," January 2019, Colorado Springs, Colorado
- NACE International Permian Basin Section, Presentation for "AC-Induced Corrosion and Interference Risks for Pipelines," September 2018, Midland, Texas
- NACE International Permian Basin Section, Presentation for "Cathodic Protection Interference Risks for Pipelines," May 2018, Midland, Texas
- NACE International Rocky Mountain Section Corrosion Short Course, Presentations for "How NOT to Do Close-Interval Survey" and "Soil Survey & Geology Info Related to External Corrosion," January 2018, Colorado Springs, Colorado
- NACE International Permian Basin Section, Presentation for "AC-induced Corrosion and Safety Risks for Pipelines," October 2017, Midland, Texas
- North American Oil & Gas Pipelines "Pipeline Leadership Conference," Pipeline & Asset Integrity Management Panelist, University of Denver, Colorado, November 2016
- Presentation of "Pipeline & Oil/Gas Asset Integrity Management" Seminar, Exploration and Production Company Engineering Offices, Minot, North Dakota and Houston, Texas, May and September 2016 (In Person and web-cast);
- NACE International San Antonio Section, Presentation for "How NOT to Do Close-Interval Survey," September 2016, San Antonio, Texas
- NACE International Central Area Conference, Presentation for "How NOT to Do Close-Interval Survey," August 2016, New Orleans, Louisiana
- NACE Omaha Section Corrosion Short Course, "Electrochemistry and Corrosion Protection," January 2016, Omaha, Nebraska
- NACE International Corrosion Technology Week Conference, Presentation on C-Scan Coating Conductance Surveys, Austin, Texas, 2015
- NACE International Central Area Conference, "C-Scan Coating Conductance/Current Attenuation Survey on Pipelines," 2015, St. Louis, Missouri
- NACE International Central Area Conference, "Soil Survey & Geology Info Related to External Corrosion," 2014, Tulsa, Oklahoma

- TCEQ All-Region Field Investigator Training Seminar, "UST Leak Detection Methods," 2011, New Braunfels, Texas
- Texas Association of Storage Tank Professionals (TASTP) Compliance Training, UST Leak Detection, 2010, Round Rock, Texas
- San Antonio Water System Inspector Group, Cathodic Protection Overview, 2009, San Antonio, Texas
- TCEQ Environmental Trade Fair, 2011, "UST Leak Detection Methods"
- TCEQ/Industry UST Compliance/Assistance Seminar, 2009, 2008, 2007, 2006, 2005, 2004, 2003, 2002, Austin, Texas, "UST Leak Detection Methods" (each year) and "Statistical Inventory Reconciliation" (2002)
- North American Development Bank, TNRCC Waste Tire Program Overview, 2002, San Antonio, Texas
- Texas Natural Resource Conservation Commission (TCEQ) Innovative Technology Demonstrations, Austin, Texas 1996, 1992, 1991, 1990

WILLIAM M. (MIKE) AMES

Vice-President, Director of Technical Operations

EDUCATION

B.S. Electrical Engineering, Trinity University, Delaware 1996
B.S. Business Administration, Upper Iowa University 2012

REGISTRATION

NACE International Cathodic Protection Specialist and
Senior Corrosion Technologist #4343

PROFESSIONAL EXPERIENCE

Mr. Ames has worked in pipeline operations, integrity management and corrosion control for 40 years, creating internal and external corrosion management programs for multiple operators over that time. He served with Northern Natural Gas in the Liberal, Kansas area for more than 15 years, before joining a major Houston-based natural gas production, transmission and distribution company. Mike has worked with the US Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) and many state agencies in rulemaking, guidance document preparation, and regulatory audit protocols since the early 1990's. Work areas have included internal and external corrosion control of pipeline and compressor station facilities, transmission and gathering lines, smart pigging interpretation and recommendations, risk assessment program implementation and analysis.

Mr. Ames has been an active NACE member for over 30 years. He served in several offices of NACE's Gas Capitol Section from 1988-1992 and as the NACE Central Area Treasurer, Vice Chair, Chairman and Trustee from 2000-2006. He has participated in numerous NACE technical committees for more than 25 years, mainly focusing on those committees promoting pipeline corrosion control. Mr. Ames received the Eben Junkin Award from the Central Area in 1998, in recognition of his excellent work in promoting corrosion science. He was then awarded the NACE 2014 Distinguished Service Award for his many-year efforts in promoting the organization and providing guidance to future NACE leaders.

Mr. Ames has been a crisis management member and field investigator of significant incidents for major energy companies to determine root cause, consequence management, and procedure and specification changes related to the investigated failures. He is a Cathodic Protection Specialist, Senior Corrosion Technologist, and is accredited by NACE as Navigator #5. Programs Mike has mastered include Bass CPDM, FERA, PILARS, IAP, PHD, RSTRNG2, KAPA, CI Surveys, as well as spreadsheet generation for analysis of problems. He has provided project coordination in field operations and ISAT task forces.

Mike provides cathodic protection system design, troubleshooting and support. He reviews CP survey data and makes recommendations for system improvements and remedies. Mike regularly supports clients in their preparation for regulatory audits by state and federal agencies, and has helped clients through many such audits. He is also expert in AC-power-induced safety and corrosion issues on pipelines, and in design/installation of mitigation for those issues. In addition, Mike holds credentials and significant experience in internal corrosion control, in-line inspection (or "smart pigging"), maintenance pigging, and integrity management. Mike is a fluent Spanish speaker and writer, and has performed corrosion control work across a lot of South America, Central America and Mexico, in addition to work across the United States and Canada.

PROFESSIONAL EXPERIENCE

Mike has provided presentations worldwide on corrosion control, intelligent pigging and data interpretation, AC mitigation, and "EnvirAnode" technology. He also authored an article featured in the June 2015 NACE Materials Performance magazine. It describes his CP system design and installation oversight for a deep anode bed in Las Vegas, Nevada, with the complication of an over-pressured aquifer being drilled without the use of a permanent casing. Earlier attempts by other contractors to install anode beds into this formation had resulted in wash-outs and substantial financial losses for the project owner.

An earlier two-part article in Materials Performance, from June and August 2008, was co-authored by Mr. Ames. It described Mike's co-development and management of the pipeline integrity processes for Promigas in Colombia. Serving as senior technical director over an eight-year period, Mike and his Promigas cohorts created a mature Pipeline Integrity program, combining two sets of intelligent pigging runs for defect growth analysis. They also completed a large coating rehabilitation program of gas transmission pipelines based on Pipeline Integrity surveys and evaluations.

Mike and Cal Chapman co-authored "OIL/GAS OPERATORS: Managing Risk When Energy Prices Are Down," Pipeline & Gas Journal Magazine Article, June 2015.

Samuel F. Williams, EIT – Project Manager

Sam Williams joined Chapman Engineering in early 2019, and serves as Project Manager for cathodic protection (CP) system testing, annual surveys, and other specialty corrosion surveys on steel pipelines for utilities and the oil and gas industry. He has built an eight-year career in corrosion control thus far.

One area in which Sam has performed regular survey and planning work is high-voltage AC power line interactions with well-coated steel pipelines. In his prior employment and with Chapman Engineering, Sam has worked with these interactions, studies of them, and the design and construction of specialty grounding and safety systems used to mitigate the interactions.

Sam is certified through NACE International as CP-2, CP-1 and Coatings Inspector Level 1 (CIP-1).

Continuing Education

- B. S., Civil Engineering, University of Kansas, 2012
- Engineer in Training (EIT) #17809, Kansas Board of Technical Professions
- NACE-Certified Cathodic Protection Technician (CP-2) and CP Tester (CP-1), #43971
- NACE-Certified Coating Inspector, Coatings Inspection Program (CIP-1), #66564
- North Carolina DOT Bridge Coating Inspector Level 1, #14376

Pat O. Bailey – Construction Supervisor/Project Manager
NACE Corrosion Technologist #35648
US Department of Transportation "Pipeline Operator Qualified"

Mr. Bailey began welding on pipeline and other projects in the Texas Panhandle in the 1980's, got involved with cathodic protection in the late 1990's, and has performed CP system installation, pipeline CP surveys, and other projects since then. For Chapman Engineering, he directs field crews in both survey work, and for construction of CP systems, AC mitigation systems, and other specialty work. Pat is especially adept at conducting and supervising pipeline anomaly digs/evaluations.

"Anomaly digs" are typically determined using "in-line inspection" (ILI) or "smart pig" tool results from regulated pipeline ILI surveys. Chapman Engienering helps customers choose ILI vendors, evaluate data, determine locations for digs, and then performs/supervises those digs. Pat has worked on such evaluations since 2012.

Pat holds the NACE International Corrosion Technologist rating, #35648. He has trained construction and survey crews in CP work in the municipal, oil and gas, and industrial settings. He holds pipeline operator qualifications through both the NCCER and Veriforce programs.

Technical Training/Continuing Education

PEC Premier SafeGulf/SafeLand® Oil & Gas Safety Training, San Antonio, Texas, 2015
OSHA 30-Hour Construction Safety Training Program
H_2S Internal Corrosion Control
Aqua-Wrap Pipeline Repair Application

Derek Moellendorf – Project Supervisor
NACE Certification #18337, Licensed Cathodic Protection Tester
US Department of Transportation "Pipeline Operator Qualified"

Derek manages Chapman Engineering's **Master Meter Operator (MMO)** natural gas distribution services program at over 130 apartment complexes throughout the state of Texas. Inspections include cathodic protection (CP) system testing on steel pipelines, leak surveys of natural gas pipelines and distribution lines, key valve inspections and maintenance. He has over 18 years of experience working with CP system installation, testing, repair and maintenance on utility pipelines, oil and gas pipelines, various types of storage tanks, and at all the military bases in the San Antonio area. He regularly works with Texas Commission on Environmental Quality (TCEQ) and Texas Rail Road Commission (RRC) to assist customers in maintaining compliance with state and federal rules and regulations.

Derek has been a NACE-Certified CP-1, Cathodic Protection Tester #18337, since 2008. Additional certifications held include Pipeline Operator Qualification (OQ) through NCCER #10546320.

Continuing Education

- PEC Premier SafeGulf/SafeLand® Oil & Gas Safety Training, Boerne, Texas, 2011
- US DOT Pipeline Operator Qualification School, Guardian Corrosion Control, Pampa, Texas, 2011
- NACE International Cathodic Protection Tester Training & Test, TSTI Campus, Sweetwater, Texas, 2008
- Universal Rectifier 16-hour "Rectifier School" through NACE International, Corpus Christi, Texas, 2008
- NACE International External Pipeline Corrosion Protection Training, Norman, Oklahoma, 2008
  OSHA/SARA 40-Hour Waste Site Worker Protection and Supervisory Training Course w/updates, 2002, Boerne, Texas

Chapman Engineering

PROTECTING ASSETS AND THE ENVIRONMENT SINCE 1989

We are Professional Engineers, NACE certified Corrosion Specialists, CP Technicians, and Coating Inspectors qualified to perform corrosion control. This includes evaluation, design, installation, testing, and maintaining cathodic protection systems on a variety of facilities, pipelines, storage tanks and industrial piping systems.

We are experts with over 30 years of experience in the analysis and mitigation design for AC and DC Interference and AC-induced corrosion issues on pipeline. Utilizing our highly experienced staff we model, analyze, and design quality solutions to mitigate asset integrity issues.

We are recognized as an industry leader identifying interference issues and have extensive experience designing or mitigating solutions to reduce these effects on facilities or pipelines. Our staff has experience in projects from single facilities to pipelines running in all sorts of terrain within the United States.

Cathodic Protection Design and Construction
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Old before their time

Cal Chapman, P. E., Chapman Engineering, Inc., USA, asks: who really wants to install a liability?

Chapman Engineering, Inc. works on pipelines and other industry assets that are sometimes 70 years old, maybe older. The company also works on some assets – be they related to oil and gas, petrochemical production, water and wastewater, transportation or even the electric utility industry – that are historically young, but appear so 'aged'. Just in the last seven years, these asset examples have become old before their time.

Gathering pipeline

Oil gathering pipelines in a Texas (USA) shale region were hustled into the ground with terrible 'in the field' coating work, and no cathodic protection (CP) was applied until 30 months later (Figure 1). How was trouble identified? Three liquid product leaks were found in a local river crossing area within a 45 day span, with threat of environmental consequences. Alignment sheets generally showed reasonable materials specified, bored crossings of roads and creeks laid out well in design documents. Construction inspectors had been on the pipeline installation work full

time. Chapman Engineering, Inc. reviewed files of inspection worksheets, photos etc., but none of the problems were documented. Evaluation, based in part on the company's field work, strongly suggested that company representatives, the contract inspectors and pipeline contractor were all motivated to simply hurry up and get product flowing through the line. In 2011, everybody thought this field might pay back for 10 - 15 years. The industry now knows the shale play is likely to give 25 - 35 years of production. But the pipelines had grave issues at two years and onwards.

Transmission pipeline

A major oil and gas transmission pipeline company had a new, large diameter pipeline designed by reputable engineering group. Right-of-way was acquired and the pipeline was constructed with a budget of hundreds of millions of dollars. Before this line could be commissioned to flow product, several points failed under a hydrotest and the high voltage alternating current power line interaction with the pipeline was identified as a major issue. This was completely missed during design work. The pipeline had to be replaced or rehabilitated for many miles of length before any product ever flowed or any income was realised.

International pipeline

A 200 mile long pipeline was constructed of pipe that was purchased 8000 miles away, shipped that long distance and transferred several times during transit by methods that damaged external coatings. Once in the field, the pipe was then treated by field bending at certain positions, with the bending carried out by inexperienced contractors using substandard methods. The pipeline coating was damaged severely in hundreds of locations. Field inspection during construction failed to catch and properly remediate these issues. With the pipeline backfilled and offered for commissioning, the CP requirement was found to be 75 times greater than design estimates. The reason for this was because resultant coating quality on the entire pipeline length was greatly compromised. This set of concerns led to months of discussion and disagreement among the pipeline owner, its engineering design group and the contractor. Final decision? All decided to only install the CP called out in the original design, and then monitor going forward. This choice was probably made because no one wanted to shine light on the significantly changed economics for the capital project costs. Long-term, this pipeline is at much greater risk for external corrosion, at many locations. It also has significant integrity risks now in place, both from stresses introduced by the field bending processes used and by external corrosion. It is true, too, that corrosion may occur even more rapidly in high stress regions of the pipe.

Figure 1. A 0.3 in. wall, 6 in. elbow with field coating. Pits were not evident until the removal of never-adhered (but intact) field-applied coating in the shop; corrosion product still partially fills both pits, one of which was 0.24 in. deep (80% wall loss). Note that coating had not cured before backfilling began. A through-wall external corrosion pit was found several inches to the right, at a girth weld.

Asset example outcomes

What does one conclude from this review? Each case involves installation of an asset, certainly. In every case, the asset owner/operator created a project plan, a budget and a desired service life. But what actual cost was incurred, and what useful life was really purchased and installed? Worse yet, what risks were worsened and future costs 'built in'? In every one of these matters, the predicted capital economics and financial operating plan for each asset were changed for the worse, thanks to design choices or omissions, poor contractor experience and construction methods, poor construction inspection and generally poor project management.

The result? Liabilities got installed. Yes, there is an asset that has been constructed. But it is compromised from day one and the risk of failure is much greater. The new structure suffers from premature old age, with terrible effect on the service life. On top of all that, the costs to operate the asset are much larger, because of remediation needs early in the service life. What happens when failures occur? Public and personnel safety threats are real and visible. Environmental responses may be needed with significant costs and, again, visible consequences. Public relations 'negatives' are almost always involved, along with the threat of legal actions. Every failure causes reduction in company profitability/return on capital. Admittedly, these risks are always present. But how are they escalated when poor quality work is performed and accepted?

Certainly, there are different perspectives for creating a new physical asset, depending on the owner and industry. A crude oil or gas transmission pipeline company, a natural gas distribution company or an electric utility building transmission towers out of steel

structures, for instance, will probably design for a service window of 50 years, and possibly longer. This should mean that all the design, construction and inspection work is done more deliberately and with good quality achieved. Obviously, that is also the outcome desired by a corporation's board and its shareholders/investors.

Contrast this with an oil and gas production company's new onshore or offshore lease area. The well field is making product, or will soon be. The new network of pipelines and facilities is needed as soon as possible. Yes, it gets designed, but for what service life? Does the company's process pay attention to qualifications and experience of the design engineering company and their on-staff project managers available now? Does this operating company choose a thinner pipe wall? Does it choose a less expensive steel type for the line? Does it scrimp on the quality of other equipment and materials to make overall project economics look more desirable? Is a low bid approach used for hiring the contractor bringing on contract inspectors? How about qualifications and experience of the contractor or inspection group? Always taking the low bidder, without screening of qualifications and experience, is a risk-increasing approach.

Conclusion

What are the lessons to be learned? First, integrity management of the asset(s) really starts before the assets are built. A project must be designed and managed using technically sound judgment with good co-operation among financial planners, the internal engineering group and the contracted design engineers. Once the design package is built and vetted, contractors and material providers along with their products should be heavily screened before they are chosen. To know that quality work will be done, assure that these vendors have consistently provided quality in the past before they are brought into the new project.

Field inspection is prescribed by job specifications and, in some ways, by state and federal law and rule. Assure that inspection work is done not just to meet specifications, but to clearly meet integrity requirements, long-term. An experienced and qualified inspector, when reviewing work done by an experienced and qualified welder, is probably going to drive the processes to a result – an asset – that can last 50 years.

Should the project be done right the first time? That is the desired outcome. But the following is also heard: 'if you cannot do it right the first time, you had better get it right the second time'. And what happens to the person or the team who did not get it right the first time?

Chapman Engineering, Inc. wonders too about the pride and professionalism that, most would think, should be put into these projects. As the President of Chapman Engineering, Inc., there are some physical monuments to which I can point, in which I've had a small hand. So, these physical assets represent legacy and pieces of the world that are in better shape now than when I arrived. Is this a motivating factor for good work to be done? I certainly hope so.

CATHODIC PROTECTION

Publicly Available Soils Data for External Corrosion Control

Cal Chapman, *Chapman Engineering, Inc., Boerne, Texas*

External corrosion risks are always present for steel structures in contact with soils. For cathodic protection design and management, it is very helpful to learn about soil resistivity, ion content, moisture, and temperature changes with time. A U.S. Department of Agriculture detailed soil sampling program from the early 1900s through the 1990s generated descriptions and chemical analyses across much of the United States. These data are available through county-by-county soil survey books, and in a Web-based format.

Which soil properties affect the corrosion behavior of exposed steel? The simple answer is "all of them." Soil resistivity, ion content (especially sodium chloride [NaCl]), moisture, and temperature are all of interest. Resistivity is often field-measured at a significant cost. Measurement of ion and moisture content requires soil sampling and analysis by a qualified laboratory. Again, costs are considerable.

When a pipeline is constructed, it goes into soil and shallow geology that have been in place for thousands or even millions of years. Is there a way to learn about the soil properties without spending large sums of money on field surveys and soil sampling? In the United States, and some other countries, there is.

A particular U.S. program related to agriculture was established to study soils throughout most of the country. Originating in the 1890s and run by the U.S. Department of Agriculture (USDA) since the 1930s, this program involved a tremendous amount of field investigation. Cooperation among land-grant universities, county agricultural extension agents, and federal employees generated detailed soil sampling with descriptions and chemical analyses. County-based soil survey books were created for most of the land across the United States. The data are now online and accessible through the Web Soil Survey[1] (websoilsurvey.nrcs.usda.gov), which is administered by the USDA's Natural Resources Conservation Service (NRCS).

When using this database, the detailed properties of many soils can be reviewed. The data sets are geared toward agricultural usage, irrigation of crops, soil mechanics, and structural/civil engineering factors. Applicability for septic system installations, use as fill material, or building foundation support can all be checked. External corrosion risk also can be studied.

What is a high-risk soil for corrosion? These soils often have significant clay content, elevated soil moisture, and aggressive chemical ions present. These properties make the soil across the United States a good electrical conductor that can support the electrochemical exchanges of corrosion cells. Typically, any soil with resistivity <1,000 Ω-cm is considered highly corrosive;[2] but a soil with 10,000 Ω-cm resistivity may still be quite corrosive. More specific factors must be reviewed, including long-line effects between areas of different resistivities.

USDA soil scientists did not study resistivity directly, but rather electrical conductivity, its inverse. Measurements performed in the field were originally described as salinity. Because the studies' original emphasis was on agricultural production,

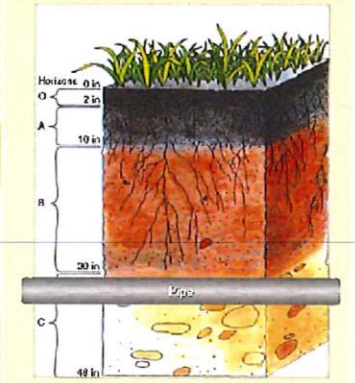
conductivity measurements showed whether the content of NaCl or similar ions was harmful to plant growth. NaCl often occurs naturally because the land lay under an ocean or shallow sea eons ago. This is true for much of the American West and for many desert and semi-desert locales around the world.

Measurements of soil conductivity (or resistivity) are extremely valuable when evaluating external corrosion risk. Generally, soil resistivity is figured as a bulk property of the soil. The USDA NRCS data typically involve the first 5 to 8 ft (1.5 to 2.4 m) of the soil column, which coincides nicely with pipeline burial depths. The Web Soil Survey descriptions also often give conductivity estimates within smaller depth intervals.

Chloride ions and sodium ions found in plain old table salt are bad for plants and soil quality. Chlorides stunt plant growth and even prevent seeds from germinating. Sodium reduces plant uptake of vital calcium, magnesium, and other mineral ions. It also destroys clay aggregation properties, thereby "clogging up" fine-grained soils so water no longer percolates effectively through the soil column. This latter property is called the sodium adsorption ratio (SAR). Any SAR number >10 for soil or irrigation water indicates excessive sodium ion concentration.

SOIL HORIZONS CHANGE WITH DEPTH

Horizon	Depth	Description
O	0 to 2 in (0 to 51 mm)	Rich in organisms, roots, vegetative debris (top soil from A)
A	2 to 10 in (51 to 254 mm)	Rich in roots and organic material
B	10 to 30 in (254 to 762 mm)	Less roots, less air recharge, more CO_2, and some methane (CH_4)
C	30 to 48 in (762 to 1,219 mm)	More like geology below, very little organic activity, low oxygen



Source: USDA NRCS Web Soil Survey, National Cooperative Soil Survey, 2014.

FIGURE 1 Soil layers by horizon. Source: U.S. Department of Agriculture Natural Resources Conservation Service.

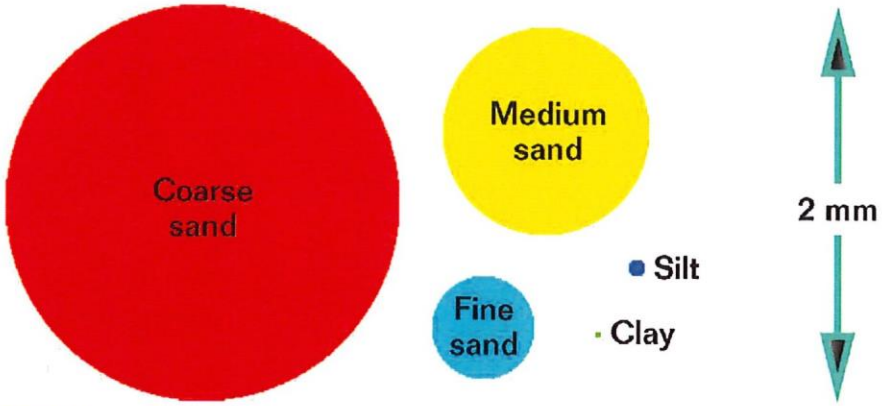


FIGURE 2 Soil grain types and sizes.

Soil Structure

What does a typical soil column look like? Soil scientists describe the top-most surface soil segment as the O horizon, speaking to its organics-rich nature (Figure 1).[3] Below this O portion is the A horizon, which is very heavily affected by plant roots and many flourishing subsurface organisms. Rich American farmland of the Midwest and Great Plains may have the A horizon more than 10 ft (3 m) below grade. In other areas, it may not reach more than a few inches. O and A horizons are often comprised of good quality soil that is dark brown to black, the color of top soil, and ideal for planting.

Shallow soils tend to exchange air with the atmosphere, so more oxygen is present there than in deeper soil. Many organisms grow in the shallow soil root zone much more effectively than in deeper soils, so the highest organic content is usually at shallow depths.

The B horizon has much less root volume and fewer active organisms, less air recharge from the atmosphere, more carbon dioxide (CO_2) accumulation from plant transpiration, and frequently some methane (CH_4). The CH_4 load is generated by anaerobic microbes. When sulfate ion content is elevated and oxygen content is depleted, sulfate-reducing bacteria (SRB) become a significant corrosion factor for exposed steel. The C horizon, found at even greater depth, is much more like the geology below it than the horizon above. It has very little organic activity, low oxygen content, and not much in common with shallower soils.

All of these horizons change with other factors, like excess moisture that moves through soil during prolonged rainfall/wet climate periods, or substantially dry soils, that can even suffer from desiccation cracking during extended drought conditions. Constructing a pipeline or other facility can change soil properties. By digging a ditch and breaking up soils for the first time in

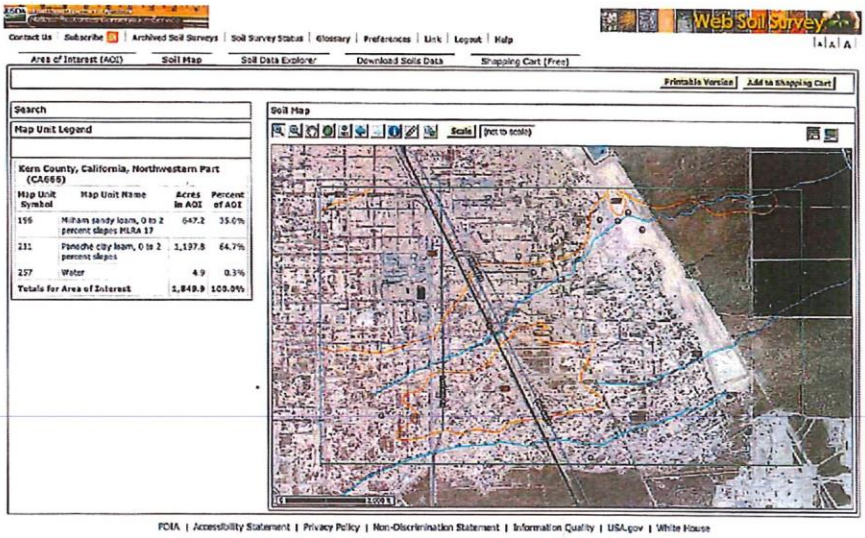


FIGURE 3 Web soil survey aerial overview, portion of Kern County, California. Source: USDA Web Soil Survey.

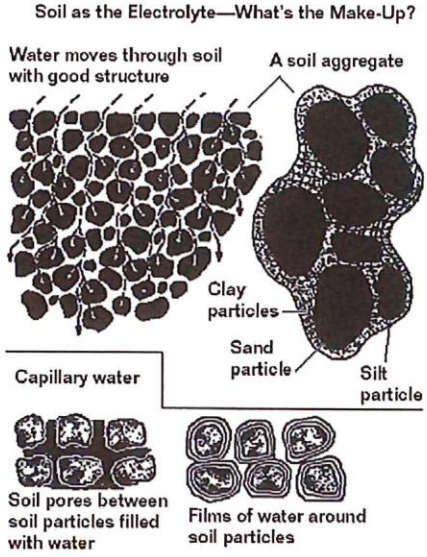


FIGURE 4 Soil structure and water held in the soil matrix electrolyte. Source: University of Queensland.

recent history, construction helps rainfall to get in and soak more of the soil column, and can actually lower the electrical resistance of soils. Compared to undisturbed soils, this increases rates of corrosion on any exposed metal.

Soils also have widely varying particle sizes, from pieces as big as chunks of rock down to tiny silt and clay particles (Figure 2).[4] The amount of organic carbon/vegetative matter, such as peat moss or decaying leaves and roots, may also factor into a soil's electrical properties. How easily water travels downward through a soil under gravity's influence varies a great deal depending on particle size and distribution. If the soil has laminar, fine-particle layers (often found eons later as shales), water moves very slowly downward. If soil is comprised of big, coarse sand particles, then water travels quickly downward.

In addition, soil pH often varies significantly with depth, commonly starting as acidic near the ground surface and becoming more alkaline with increasing depth. Features of local conditions, such as the breakdown of vegetative matter and oxidation of steel or other metal, often cause the pH to become more acidic.

Soil properties may vary greatly by depth but also laterally. If a river or creek has cut the area over time, some soil deposits may be very sandy, gravelly, and coarse. Other soils nearby, deposited in quiet water conditions, will have more silts and clays.

Soil temperature is yet another external corrosion factor. Pipelines with heated product will warm the soils around them. Even in cold climates, this temperature elevation will increase local biological activity, as well as corrosion rates.

Conductivity/ Resistivity Estimates

USDA soil science work in salinity levels and electrical conductivity were first measured as millimhos per centimeter (mmhos/cm). Later, the measurement unit was converted to decisiemens per meter (dS/m). Since these units are equivalent, the numbers do not change.

The Web Soil Survey was used in a particular study on the western part of Kern County, California (Figure 3). There is an oilfield development in one sandy, desert-appearing area that is bordered to the east by irrigated farmland. One major soil type present is the Milham sandy loam, with 0 to 2% slope.

Aerial photography shows sandy desert, irrigated farmland, and unimproved scrubland. In the list of soil properties shown in Table 1, the soil profile describes five different layers that approximately correspond to A, B, and C horizons. Their depths go from ground surface to 60 in (1.5 m).

In this Milham sandy loam soil, the soil survey data set indicates that salinity is measured from 0 to 8.0 mmhos/cm (8 dS/m) (depending on depth), or nonsaline to slightly saline. Average conductivity of this soil can be estimated at 4.0 mmhos/cm (4 dS/m). That equates to a resistivity of 250 Ω-cm, a truly high-corrosivity soil!

When reading the soils data, other factors rapidly come into focus. This soil is found in desert conditions, but what is the moisture content? Moisture is the dominant factor in the corrosion circuit's electrolyte. Dry soils often have 10 to 20% moisture by weight. The available water capacity by inches of water column in the Milham soil is stated as 9.1 in (231 mm) of water within the 60-in overall column. That is a moisture content of 15%.

Taking the area-specific data for Kern County into a model of cathodic protection (CP) needs, a piece of mild steel in contact with the soil creates an electrical potential difference, or voltage. What if this driving voltage is 0.5 V? For soil resistivity of 1,000 Ω-cm, many CP designers assign a current demand of 11 mA/m² for exposed steel, while others use 27.5 mA/m² (~2.5 times greater) for a typical CP design. If this local resistivity is actually 250 Ω-cm (conductivity of 4 mmhos/cm), what happens to the design current requirement? The low end must be increased from 11 to 44 mA/m². What if resistivity is 62.5 Ω-cm, which is four times lower yet? The current

requirement becomes 176 mA/m², and external corrosion conditions are 16 times worse than at the typical "bad soils" threshold of 1,000 Ω-cm.

If one cubic yard of this Milham sandy loam weighs 2,800 lb (1,270 kg) (as a rough estimate), then the 15% moisture level means 420 lb (191 kg) of water are present in just that one cubic yard. Some of this water is tied up in chemisorbed bonds, but much of it is freely held in the soil matrix. Every soil particle is "wetted" by that very substantial mass of water (Figure 4).[5]

Studies of new pipeline right-of-way conditions using the Web Soil Survey can provide a good understanding of CP requirements. Specifying a few field resistivity measurements to corroborate the Web Soil Survey understanding is also sound practice; however, much valuable knowledge can be gathered simply through use of a computer and the Internet. Study of the first several hundred feet of geology is also of great value, especially to learn how anode beds should be designed and constructed.

Studies of existing pipeline corridors can be of great value. In one case study, the pipeline operator thought that CP was needed (and being applied) in a range of ~1.5 A of protective current per km. However, external corrosion failures were occurring. Modeling the right-of-way for soil types and resistivities, chlorides, etc., through a Web Soil Survey review showed a more likely current requirement of 6 A per km.

There are many geology references available online. Some of these include state-by-state databases of water well installation reports, often with driller-generated descriptions of geologic materials encountered. U.S. Geological Survey reports abound, and many states have funded studies of geologic formations and groundwater aquifers. Tremendous information about the possibility of deep anode beds can be learned by interviewing local drillers and reading peer-reviewed publications.

One must also judge how pipeline or facility installation has affected shallow soil and geology conditions. In most cases, the pipeline installation process increases local soil permeability for water, increases soil moisture gain, and therefore increases local soil corrosivity. When a crushed limestone base is compacted over native ground, oxygen no longer recharges into underlying soils.

TABLE 1. SOIL DESCRIPTION FOR MILHAM SANDY LOAM, PORTION OF KERN COUNTY, CALIFORNIA

Kern County, California, Northwestern Part
196—Milham sandy loam, 0 to 2% slopes MLRA 17
Map Unit Setting
National map unit symbol: 2ss91
Elevation: 200 to 1,200 ft (61 to 366 m)
Mean annual precipitation: 5 to 8 in (127 to 203 mm)
Mean annual air temperature: 63 to 65 °F (17.2 to 18.3 °C)
Frost-free period: 250 to 300 days
Farmland classification: prime farmland if irrigated
Typical profile
Ap—0 to 4 in (0 to 102 mm): sandy loam
Bk—4 to 10 in (102 to 254 mm): sandy loam
Btk1—10 to 22 in (254 to 559 mm): loam
Btk2—22 to 49 in (559 to 1,245 mm): clay loam
2Ck—49 to 60 in (1,245 to 1,524 mm): sandy loam
Properties and qualities
Slope: 0 to 2%
Depth to restrictive feature: more than 80 in (2 m)
Natural drainage class: well drained
Runoff class: medium
Capacity of the most limiting layer to transmit water (Ksat): moderately high (0.20 to 0.60 in/h [5 to 15 mm/h])
Depth to water table: more than 80 in
Frequency of flooding: rare
Frequency of ponding: none
Calcium carbonate maximum in profile: 10%
Gypsum, maximum in profile: 1%
Salinity, maximum in profile: nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 25.0
Available water storage in profile: high (~9.1 in)

Source: USDA NRCS Web Soil Survey, National Cooperative Soil Survey, 2014.

An extreme example of moisture gain is what happens under bulk storage tank bottoms. For crude oil and refined petroleum product storage, bulk tanks are typically surrounded by a secondary containment berm. This containment fills with rain water, which soaks into shallow soils and the berm material. Any CP system designed for under-tank protection must take into account the likely water-saturated conditions plus local ion concentrations.

Summary

Soil resistivity is a key factor in determining effective CP current density requirements. Soil survey data will help the CP design practitioner do a far better job in predicting how much CP is needed along a right-of-way or at a facility.

Many factors need to be studied for external corrosion control design. Soil

resistivity conditions local to a pipeline or other metal structure in contact with soil must be estimated reliably. These numbers also tell a lot about soil ion content. In addition, the degree of moisture-wetting in soils should be understood, and virtually no soil condition should be considered to be completely dry.

Many other study results identify the aggressiveness of chloride ions in the external corrosion of steel. Any time salinity is found in soils, chloride ions will be detrimental to steel structures. Study of regional geologic publications may lead to better anode bed design and installation.

References

1 USDA Web Soil Survey, http://websoilsurvey (May 3, 2016).

2 A.W. Peabody, *Peabody's Control of Pipeline Corrosion*, 2nd Ed. (Houston, TX: NACE International, 2001).

3 USDA Natural Resources Conservation Service, "A Soil Profile," http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308 (May 3, 2016).

4 Colorado State University Extension, "Managing Soil Tilth: Texture, Structure, and Pore Space," http://www.ext.colostate.edu/mg/gardennotes/213.html (May 3, 2016).

5 University of Queensland, Australia, Soil Sciences, http://www.uq.edu.au/_School_Science_Lessons/Soils.html (May 3, 2016).

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OIL/GAS OPERATORS: Managing Risks When Energy Prices are Down


Ames


Chapman

By **Mike Ames** and **Cal Chapman,** Chapman Engineering, Boerne, TX

Today let's imagine that we are a company producing oil and gas in the Eagle Ford Shale, the Permian Basin, and the Denver-Julesburg Basin in Colorado. We own and operate well pads, pipelines flowing from wells to facilities treating those flows, and bigger pipelines which take our products to sales points and "ring the cash register."

What has happened in the past 10 months? Product prices have declined precipitously, our share price is down, and we've "pulled the horns in" financially in a number of ways. Times are tough for our imaginary company. Operating our for-profit business has a lot of potentially positive outcomes. It can provide goods and/or services for the customer base, employ people, and generate income for owners and shareholders.

At the same time every business has to manage risks. These risks include taking care of assets – or possibly ignoring their care and maintenance when times are bad. When the business is an oil/gas production operator or a company shipping oil and gas through transmission pipelines, managing risk in smart and cost-effective ways should always be high on the priority list.

Falling Prices and Rising Risks

Back to what has happened recently in our scenario: Our oil and gas production company may be worth less money now, with lower commodity prices, lower revenues and reduced profits. What if something bad happens? That event and its consequences represent a larger risk to our company in these lower-price, lower-profit times. So, taking good care of our assets is more important — not less — compared to times when we enjoyed higher oil and gas prices.

Maintenance is too important to eliminate. Remember the old ad on TV about oil changes that said, "Pay me now or pay me later?" That wisdom certainly applies to oil and gas production companies just as much as it does to cars.

One of the big-risk areas for these companies in our scenario is corrosion control. Expensive assets get built and put into use — pipelines, big bulk storage tanks and processing facilities. These assets need regular testing to show good control of internal and external corrosion processes.

Proper maintenance means pipeline rights-of-way get mowed and maintained, and that accurate pipeline locating is still done when 811 pipe location requests go out for excavation along those paths. The pipeline markers or "witness posts" need to be maintained, painted, repaired and/or replaced over time.

Accidents Can Lead to Corrosion

The single biggest risk to pipelines is having them hit accidentally by people who are digging without permits, or by fields plowed deeper than usual, or even by a knowledgeable contractor who is having a bad day. This is referred to as third-party damage. If damage happens and is covered up, the pipeline often rusts through at that damaged area, causing a product leak or worse.


External corrosion


External corrosion pit 6 inches

Then there is external corrosion. To combat external corrosion risks, a good external coating is essential. In addition, a cathodic protection system complements the protective coatings on each structure. Regular testing needs to be done continually to ensure both coatings and cathodic protection are doing their jobs over time.

Regulations often require all this work, but the best reasons for these protections are to keep the structure's integrity healthy, and to keep the product on the inside of the structure.

Fighting Corrosion on the Inside

There are other corrosion threats to deal with as well. Pipelines and tanks don't just corrode on the outside. They can also be damaged by corrosion occurring on the inside.

This internal corrosion risk is driven by several issues. Water is one of these issues. Whether as a tiny amount of the overall volume or as a larger fraction, water is produced from oil and gas wells.

We know water is never good for carbon steel. And whenever water shows up, bacteria and other microbes come along for the ride and stay alive under just about any conditions. When food and water are available they thrive. Unfortunately, many of these bugs cause rapid pipe damage that must be controlled.

Some oil and gas production also includes a toxic and acidic chemical called hydrogen sulfide. This chemical mixes with water to make sulfuric acid and other nasties.

Oil and gas wells can also produce paraffin. When you hear the term paraffin, think of candle wax — it sticks to most surfaces and once there pretty much hates to let go.

Even worse is when paraffin rides over a puddle of water in the bottom of a pipe and traps the water in that local area. The bacteria and other microbes in the water manage to get into just about every nook and cranny of every pipe, tank, or vessel.

These bacteria especially love water pools and will grow and multiply in them. As they multiply, they make waste products which are usually very acidic. Now we have multiple corrosion mechanisms making steel into rust. The areas of covered water pools cause especially rapid corrosion that must be controlled.

Fighting internal corrosion in pipelines requires a good maintenance pigging program as well as chemical treatments.

Prevention is Key

In the worst-case scenario, what if a pipeline ruptures when oil prices are low and revenues are down? This one event might destroy the company. The cost of that event can be massive. And the company's image can be devastated. Investors may choose to sell their shares. All of this, combined, might be too much for some companies to survive.

Will insurance help? What costs will the company have to cover because insurance won't? If the company survives this incident, what will be the impact on insurance costs going forward?

Then there's the regulatory arena. What about fines or damages that may be assessed? These issues can add substantial costs that may push the company beyond its ability to recover.

These are real-world scenarios. And they can, for the most part, be avoided if a comprehensive corrosion-control program is put in place.

Dealing with Economic Realities

More than likely, our imaginary company's net worth is smaller than it was before the price of oil and gas dropped drastically. But the cost of a disaster hasn't fallen. Nor has the impact that such an event can have in the form of bad publicity.

Managing risk is more important when a company is worth less money and has fewer resources. A negative event, like a pipeline leak, fire or explosion costs the company a larger portion of its total value when energy prices are low.

So, it's clear that managing risk and performing the tasks that protect pipelines, tanks and facilities from corrosion and third-party damage is even more vital in today's economy. And of course, taking these steps helps protect company employees and the general public.

In short, management of risk protects the company's value while also protecting people.

Bottom line: It's good business to pay for preventive maintenance, corrosion control and risk management on expensive infrastructure and assets that should have long service lives.

There really is no other choice. It's bad business to let assets suffer corrosion, be reduced in strength and integrity and become higher risk to operate – especially when the company has fewer reserves to use should a leak, fire, explosion or other disaster occur.

A prudent company that expects to survive and thrive for the long haul will manage its risks well even when energy prices are down. ***P&GJ***

Authors: Cal Chapman, P. E. *and* ***Mike Ames,*** *NACE-certified cathodic protection specialist, are with Chapman Engineering, a corrosion protection/environmental engineering company based in Boerne, TX.*

Chapman Engineering, Inc.
Protecting assets and the environment since 1989

CORROSION CONTROL SERVICES RATE SHEET
Calendar Year 2020

Labor Category	Hourly Rate
Principal Engineer	$195
Sr. Corrosion Engineer / CP Specialist (NACE CP4) / Sr. Project Manager / Professional Engineer	$175
Corrosion Engineer (NACE CP-3 or Senior Corrosion Technologist)	$135
Sr. Corrosion Technician (NACE CP-2 or Corrosion Technologist)	$115
Corrosion Technician (NACE CP-1)	$95
Project Coordinator / Superintendent	$135
Foreman / Driller	$105
Operator / Mechanic / CDL	$85
Field and Construction Assistant	$70
GIS Specialist	$105
CAD / Designer	$95
Admin. Support	$55

Expenses	Rate
Per Diem (Day trips over 10 hrs)	$25/ day
Per Diem (Overnight trips)	$50 / day
Lodging	Per GSA
Mileage	$0.58 / mile
Crew Cab Truck and trailer	$175 / day
Utility Bed Truck (1 ton) and trailer	$200 / day
Skid Steer w/forks	$700/week
Synchronized Current Interrupter	$50/day

These rates apply to work supporting corrosion engineering design, field work for cathodic protection system/anode installation, testing and troubleshooting, pipeline survey work, geographic information systems (GIS) work, environmental services, anode ground bed work, and travel time related to the work. For any air travel, vehicle or equipment rental, hotel or other lodging, supplies, or subcontractor costs, a markup on those expenses of 18% will be applied.

No overtime rates apply for professional services. Overtime for field personnel will be billed at time and a half on a day trip over 8 hours, or any hours worked beyond a 40-hour work week.

Standby time will be charged should normal work be interrupted by weather, abnormal operations beyond Chapman Engineering's control, or waiting on "Other Trades." Standby time will be based on crew/per job application.

Field equipment packages required for work by particular crews will be quoted per project.

P.O. Box 1305, Boerne, Texas 78006
Office: (830) 816-3311 | Fax (830) 816-1753

This entire schedule is subject to change without notice. For estimates and contract information, please contact us at 830-816-3311.

WATER ADVISORY COMMITTEE STAFF SUMMARY

Meeting Date: June 8, 2020 Agenda item: 6.b

Prepared by: Brandon Peterson Reviewed by: Bill Hill

AGENDA ITEM DESCRIPTION:
Water Department Budget Goals and Objectives for FY 2020-21 Proposed Budget

[X] **Attachments for Reference**: 1) Water Department Proposed Goals and Objectives

BACKGROUND / HISTORY: Water Utility Department is bringing the goals and objectives for FY 2020-21 to the Water Advisory Committee (WAC) for their review and comments.

DISCUSSION: This is the second review of the goals and objectives for FY 2020-21 presented to the Water Advisory Committee. Goals and Objectives were presented to Council on June 12. No additional Goals and Objectives were added or subtracted. This will be the first round for discussion, next month will be the final round before presenting it to City Council as the final from the WAC.

COURSES OF ACTION: Discuss the goals and objectives for FY 2020-21 and provide any recommendations as to what the Water Advisory Committee would like to see accomplished over the next year.

FINANCIAL IMPACT: Varies depending on the proposed studies and projects accepted.

STAFF RECOMMENDATION: Provide input for goals and objectives for FY 2020-21 Budget

Water Utility Department - 606

Mission Statement

The City of Shavano Park Water Utility Department continuously provides safe and reliable drinking water and maintains essential public water infrastructure for the service connections within Shavano Park in order to provide long-term first-class water utility support to our citizens.

Goals:

- Continually provide safe and reliable drinking water through efficient treatment and delivery of water, meet or exceed environmental and public health standards
- Resource and maintain appropriate equipment and assets
- Improve employee proficiency to include educational training and development opportunities
- Improve water system functions to achieve an efficient operation level while meeting State requirements
- Provide and maintain essential public water infrastructure services while anticipating future requirements

Objectives:

Continually provide safe and reliable drinking water through efficient treatment and delivery of water, exceeding environmental and public health standards

- Maintain 100% compliance of all State and Federal regulations and laws associated with a water system
- Maintain a Superior Water System rating
- Ensure State requirements are met by having ~~all employees~~ a min of 2 Class C groundwater operators, and 2 Class D water license operators within the Water Department ~~certified and licensed in groundwater operations~~
- Educate the public while implementing the backflow prevention program approved by Council in accordance with an appropriate strategy
- ~~Inventory~~ Monitor all backflow devices within the water system for compliance with City ordinance and TCEQ requirements
- Pass TCEQ Audit in 2021; inspections are every 3 years, last inspection was May 2018

Resource and maintain appropriate equipment and assets

- Maintain enough money in reserve to handle emergencies, and cushion for low water consumption years (approx. $500K)
- Annually re-evaluate adequacy of Edwards water rights and Trinity resources
- Continue to replace meters that have registered approximately 2 million gallons
- Actively apply for grants/funding for other equipment that would make crews more efficient
- Continue working with KFW (City Engineer) to initiate a geographic information system (GIS) program to include utilities, streets, and drainage information
- Continue preparing a schedule based on needs to replace all undersized water mains within the system
- Based on power supply needs, initiate applying for grants to pay a portion of or all costs for installation of emergency power supply (generators) for City ~~buildings~~ facilities

- ~~Actively support~~ Consider a water rate study to determine if the tiered water rates / water service fee should be restructured/increased

Improve employee quality to include educational training and development opportunities.

- Provide additional quality educational opportunities and send crews to classes to earn credits to upgrade and improve knowledge of water systems
- Continue to have a safe working environment and maintain the safety and training program on all equipment and water system functions
- Maintain a safe working environment and a zero (0) lost time accident rate, initiate lost accident tally board.
- Improve the preventative maintenance program by establishing a tracking schedule for each piece of equipment/vehicle and when they should be replaced

Improve water system functions to achieve an efficient operation level and meet State requirements

- ~~Investigate alternatives to increase productivity and life expectancy of the Trinity Well pump, motor, and ground storage tank~~
- Continue to take corrective action on dead end main issues to lessen flushing and reduce loss ratio rate
- Work with TxDOT ~~on preliminary reports for~~ to prepare relocating portions of the water mains on NW Military ~~prior to job bid for~~ during MPO project construction starting in February
- Identify cul-de-sac dead end mains, including gross cost estimate for each and prioritization for addressing. Complete remediation of at least one such dead end main each year until all resolved
- Stay current on new and proposed TCEQ water system requirements.
- Propose updates for Shavano Park Ordinances to meet all TCEQ and pertinent Edwards Aquifer Authority requirements
- Achieve annual water loss of less than 5%
- Respond to all water system complaints within one service day. Provide summary of complaints and resolutions to Water Advisory Committee
- Raise / install 5 fire hydrants with valves to proper height for Fire Department access per year
- Prepare drainage culvert to install boxes for crossing the creek to Well site # 8
- Consider outsourcing printing water utility bills
- Televise and investigate options of some or all wells not in production, evaluate possibilities to place back in production or plug. (Wells #1, #2, #3, and #4)
- Inspect all valves along NW Military prior to start of construction, repair/replace/install valves where needed to reduce number of residents that will be impacted during water line replacement.

Provide and Maintain essential public water infrastructure and services while anticipating future requirements.

- Develop and execute a fiscally responsible budget that meets mission requirements
- Update the capital equipment replacement schedule. (Water system, pumps, motors, VFD's, water mains, and hydrants)
- Maintain quality of new SCADA system and entire water system as changes and repairs are accomplished~~; update computers operating systems to Windows 10.~~

WATER UTILITY FUND PERFORMANCE MEASURES:				
Description:	Actual FY17-18	Actual FY18-19	Projected FY19-20	Target FY20-21
Number of Water Meters Installed	39	76	100	100
Number of Fire Hydrants Maintained or Repaired	5	10	8	5
Number of Dead End Mains Flushed	17	15	15	15
Number of Taste and Odor Complaints	31	26	7	0
Lost Water Ratio	4.46%	6.62%	4.03%	5.00%

The Shavano Park Water Utility has approximately 711 customers and provides water service only, no sanitary sewer.

WATER ADVISORY COMMITTEE STAFF SUMMARY

Meeting Date: June 8, 2020 | Agenda item: 6.c.

Prepared by: Brenda Morey | Reviewed by: Bill Hill

AGENDA ITEM DESCRIPTION: Discussion/Review – FY 2020-21 Budget Revenues

[X] **Attachments for Reference**:

1) Water Rate History
2) Water Consumption/Revenues History
3) Debt Service Fee
4) Edwards Aquifer Authority Fees
5) Proposed Budget Worksheet – Revenues only

BACKGROUND / HISTORY: The attached spreadsheets have been presented for information and background when discussing rates and revenues.

1.) Attachment 1 - Water Rate History. This spreadsheet shows the current/past adopted rates. Ordinance 300-08-04 approved on 9-21-2004 began the current tier rate structure for water in the FY 2004-05 after the 2004 Rate Study was completed. The rate structure was updated in FY 2009-10. Ordinance 500-02-09 approved on 9-15-2009 increased the water consumption tier portion only. The Debt Service Fee was increased to cover the Utility's full debt service beginning July 1, 2019, going from $6.40 to $22.58 per service address. The Edwards Aquifer Authority (EAA) Fee was increased to $0.60 per thousand gallons for FY 2011-12 and reduced to $0.50 per thousand gallons for FY 2012-13.

2.) Attachment 2 – Water Consumption/Revenues History with Averages. This spreadsheet includes revenues by budget years from FY 2007-08 to current with gallons sold for the corresponding year. See further discussion below.

3.) Attachment 3 - Debt Service Fee. City Council approved an increase in the Debt Service Fee to fully fund the Utility's average annual debt payments. The fee is a flat amount of $22.58 a month per account as of July 1, 2019. The spreadsheet reflects the fees collected and paid out for debt service from FY2009-10 to FY2019-20 and scheduled payments thru FY2025-26.

4.) Attachment 4 – Edwards Aquifer Authority (EAA) Pass Thru Water Management Fee. The spreadsheet shows the fees charged, revenues collected, amounts paid by the City to the Authority, rebate received, ASR Lease Program revenues, and the difference between the revenues vs cost less rebated and ASR. In July 2012, the EAA began charging a new fee referred to as Habitat Fee and the City did increase the fee to cover the costs that year. The current fee charged to customers is $0.50 per 1,000 gallons. Up until FY 2013-14, the EAA had a rebate program that returned a portion of fees charged for unused acre feet.

With the discontinuance of this program, the fees collected were no longer covering the related expenses and a true pass thru did not exist. In FY2015, the EAA began offering other lease programs in which the City recouped some expenses and received funds for leasing unused acre feet. FY 2017-18 was the final year of the ASR program.

DISCUSSION: Attachment 5 – FY 2020-21 Proposed Budget Worksheet. This report is for revenues only. The first column is the line item account number and description. The next three columns are the actual balances for the indicated fiscal years. The next three columns reflect FY 2019-20 amounts for the amended budget, the Y-T-D Actual for revenues posted as of May 31, 2020 (preliminary – subject to change) and projected year-end amounts based on discussions with the PW director, review of account history, etc. The FY 2020-21 "Requested Budget" column is the draft proposed budgeted revenues developed thru analysis based on the attached documents and staff discussions. This is a rough draft, for discussion purposes and is not to be considered final. Staff will continue working on the FY 2020-21 proposed budget in accordance with WAC guidance.

Water Consumption (20-599-5015) – Staff currently has requested budgeted revenues of $623,000 which is based on the four-year average beginning with FY 2015-16 (see attachment #2). Based on the trending water usage and weather factors staff believes utilizing the last 4-year average of actual usage is appropriate.

Debt Service (20-599-5018) – Based on 701 accounts and the current flat fee of $22.58 per month, staff is proposing budgeted revenue of $189,900 as found on attachment #3. This fee is charged to fully fund the Utility's annual debt service payments.

Water Service Fee (20-599-5019) – Staff is proposing revenue of $58,800 based on the average monthly fees collected the last three fiscal years. This revenue is a flat/monthly fee based on the size of the meter as shown on attachment #1.

EAA Pass Thru Charge (20-599-5036) – Using the same assumption as above of four years average for gallons sold located on attachment #4, the proposed budgeted revenue amount is $82,700 which can be seen on attachment #3.

Interest Income (20-599-7000) - Interest paid on City investment accounts have sharply declined. While the City continues to explore investment opportunities, proposing budget of $2,000 for this line item.

Lease of Water Rights (20-599-7012) – The Utility had a lease for 50-acre feet of water to a laundry. The laundry has expressed interest in continuing to lease, with a possibility of increasing the number of acre feet. Proposing 100-acre feet under lease at $150AF.

Credit Card Service Fees (20-599-7060) – Historically, the Utility had not placed a credit card service fee on the automatic draft accounts, as an incentive to enroll in this service which provides cash flow earlier in the month after the bills are prepared. This budget proposes removing that incentive as the fees assessed by the credit card processor to the Utility have increased since ETS was purchased by Elavon in 2018.

COURSES OF ACTION:

1. Provide input to staff to accept the current assumptions for budgeted water revenues development as presented.
2. Provide input to staff to modify the current assumptions for budgeted water revenues development as presented.
3. Provide input to staff to update the projected revenues.

FINANCIAL IMPACT: Varies

STAFF RECOMMENDATION: Committee discuss and provide input and recommendations.

City of Shavano Park
Water Rate History

		Debt Service Flat Fee	Edwards Aquifer Fee	Water Service Fee						Water Consumption Charge -Tiers					
				5/8"	3/4"	1"	1 1/2"	2"	6"	0-5000	5,001 - 30,000	30,001 50,000	50,001 - 70,000	70,001 - 100,000	Excess of 100,000
		Per Month	Per Thousand Gallons	Per Month	Per Month	Per Month	Per Month	Per Month	Per Month	Rate/1000	Rate/1000	Rate/1000	Rate/1000	Rate/1000	Rate/1000
2004/2005	*	$ 6.72	$ 0.25	$ 5.10	$ 7.34	$ 13.06	$ 29.38	$ 52.22	$ 470.02	$ 2.82	$ 3.10	$ 3.53	$ 4.23	$ 5.64	$ 11.29
2009/2010	**	$ 6.72	$ 0.25	$ 5.10	$ 7.34	$ 13.06	$ 29.38	$ 52.22	$ 470.02	$ 3.07	$ 3.40	$ 3.83	$ 4.58	$ 6.29	$ 11.94
2010/2011	***	$ 6.72	$ 0.25	$ 5.10	$ 7.34	$ 13.06	$ 29.38	$ 52.22	$ 470.02	$ 3.07	$ 3.40	$ 3.83	$ 4.58	$ 6.29	$ 11.94
2011/2012	***	$ 6.72	$ 0.60	$ 5.10	$ 7.34	$ 13.06	$ 29.38	$ 52.22	$ 470.02	$ 3.07	$ 3.40	$ 3.83	$ 4.58	$ 6.29	$ 11.94
2012/2013	***	$ 6.40	$ 0.50	$ 5.10	$ 7.34	$ 13.06	$ 29.38	$ 52.22	$ 470.02	$ 3.07	$ 3.40	$ 3.83	$ 4.58	$ 6.29	$ 11.94
2018/2019	A	$ 22.58	$ 0.50	$ 5.10	$ 7.34	$ 13.06	$ 29.38	$ 52.22	$ 470.02	$ 3.07	$ 3.40	$ 3.83	$ 4.58	$ 6.29	$ 11.94

***** Ordinance 300-08-04 Approved on 9-21-2004 included the new tier rate structure for the 2004/2005 Fiscal Year. The tier rates not modified again until 2009/2010 Fiscal Year.

****** Ordinance 500-02-09 Approved on 9-15-2009 increased the tier rates only for the 2009/2010 Fiscal Year. No change to tier or water service fee have occurred since this date.

******* Ordinances were approved with changes to Debt Service Fee and EAA Fee only.

A Ordinance O-2019-004 approved on 5/13/2019 increased debt service fee to fully fund the Utility's average debt service, effective 7/1/2019

City of Shavano Park

Water Consumption/Revenues History with Averages
Water Consumption Charge on Tiers
FY 2020-21 Budget

Budget Year	Budget	Actual Revenues	Average	
2020/2021	**$ 623,000**	**Proposed**		
2019/2020	$ 627,000	**$ 635,000**	**Estimated**	
2018/2019	$ 621,347	$ 586,511	$ 586,511	1 yr Average
2017/2018	$ 609,034	$ 661,864	$ 624,188	2 yr Average
2016/2017	$ 670,185	$ 658,287	$ 635,554	3 yr Average
2015/2016	$ 675,000	$ 585,411	$ 623,018	4 yr Average
2014/2015	$ 735,000	$ 602,875	$ 618,990	5 yr Average
2013/2014	$ 735,000	$ 638,815	$ 622,294	6 yr Average
2012/2013	$ 700,000	$ 764,052	$ 642,545	7 yr Average
2011/2012	$ 700,000	$ 736,913	$ 654,341	8 yr Average
2010/2011	$ 700,000	$ 951,468	$ 687,355	9 yr Average
2009/2010	$ 752,725	$ 588,365	$ 677,456	10 yr Average
2008/2009	$ 672,500	$ 851,205	$ 693,251	11 yr Average
2007/2008	$ 650,000	$ 843,157	$ 705,744	12 yr Average

Budget Year	Gallons Sold	Average	
2020/2021	**165,367,000**	**Proposed**	
2019/2020	**167,017,000**	**Estimated**	
2018/2019	153,456,179	153,456,179	1 yr Average
2017/2018	177,674,665	165,565,422	2 yr Average
2016/2017	170,797,036	167,309,293	3 yr Average
2015/2016	159,541,015	165,367,224	4 yr Average
2014/2015	161,436,005	164,580,980	5 yr Average
2013/2014	174,778,180	166,280,513	6 yr Average
2012/2013	200,482,000	171,166,440	7 yr Average
2011/2012	196,846,000	174,376,385	8 yr Average
2010/2011	247,034,000	182,449,453	9 yr Average
2009/2010	139,915,000	178,196,008	10 yr Average
2008/2009	236,652,000	183,510,189	11 yr Average
2007/2008	232,099,000	187,559,257	12 yr Average

City of Shavano Park
Debt Service Fee

	*Payments for 2000 Debt Service Refinanced in 2009/Total DS beg FY2020	# of Customers in System	Calculated Debt Service Fee Per Meter/Per Month	Approved Debt Service Fee Per Meter/Per Month	Actual Revenue or Budget	
2009-10	$ 53,130	706	$ 6.27	$ 6.72	$ 60,386	**
2010-11	$ 53,710	706	$ 6.34	$ 6.72	$ 55,843	
2011-12	$ 52,349	706	$ 6.18	$ 6.72	$ 56,024	
2012-13	$ 52,629	706	$ 6.21	$ 6.40	$ 48,940	**
2013-14	$ 53,697	706	$ 6.34	$ 6.40	$ 53,161	
2014-15	$ 52,680	695	$ 6.32	$ 6.40	$ 53,498	
2015-16	$ 53,687	695	$ 6.44	$ 6.40	$ 53,382	
2016-17	$ 52,518	695	$ 6.30	$ 6.40	$ 53,555	
2017-18	$ 52,269	695	$ 6.27	$ 6.40	$ 53,376	
2018-19	$ 53,181	695	$ 6.38	$ 6.40	$ 44,663	Oct-July
***				$ 22.58	42,802	Aug- Sept
					$ 87,465	total
2019/2020	$ 187,833	695	$ 22.52	$ 22.58	$ 188,317	
2020/2021	$ 185,462	701	$ 22.05	$ 22.58	$ 189,943	

Future scheduled debt service:

2021-22	**$ 185,462**
2022-23	**$ 183,832**
2023-24	**$ 187,763**
2024-25	**$ 185,200**
2025-26	**$ 175,370**

* This fee was only for the original 2000 Certificate of Obligation. Does not include Trinity Well Project Debt (Covered by Water Service Fees/Tiers) Changed in FY2018-19 to include all debt service.

** End of Year Accrual Entries skewed the numbers, entries are no longer calculated this way.

*** FY2018-19 Budget is $53,376. Fee increase effective beginning 7/1/2019

City of Shavano Park

Edwards Aquifer Authority (EAA) Pass Thru Water Management Fee

	EAA Fee Per Thousand Gallons	EAA Revenue Collected		EAA Fee Paid by City To Authority		Rebate Received from EAA *	ASR Lease Program with EAA	Difference	Gallons Sold		Estimated Fee collected based on Gallons Sold
2008/2009	$ 0.25	$ 60,723		$ 59,558		$ 29,016	N/A	$ 30,181	236,652,000		$ 59,163
2009/2010	$ 0.25	$ 40,507		$ 63,049		$ 43,721	N/A	$ 21,179	139,915,000		$ 34,979
2010/2011	$ 0.25	$ 61,896		$ 63,898		$ 35,086	N/A	$ 33,084	247,034,000		$ 61,759
2011/2012	$ 0.60	$ 91,014		$ 86,123	**	$ 30,863	N/A	$ 35,754	196,846,000		$ 118,108
2012/2013	$ 0.50	$ 90,439		$ 121,143		$ 32,443	N/A	$ 1,739	200,482,000		$ 100,241
2013/2014	$ 0.50	$ 88,470		$ 108,516		$ -	N/A	$ (20,046)	174,778,180		$ 87,389
2014/2015	$ 0.50	$ 80,569		$ 109,748		$ -	$ 24,000	$ (5,179)	161,436,005		$ 80,718
2015/2016	$ 0.50	$ 79,313		$ 75,735		$ -	$ 36,000	$ 39,578	159,541,015		$ 79,771
2016/2017	$ 0.50	$ 87,732		$ 75,726		$ -	$ 24,000	$ 36,006	170,797,036		$ 85,399
2017/2018	$ 0.50	$ 89,139		$ 69,765		$ -	$ 24,000	$ 43,374	177,674,665		$ 89,139
2018/2019	$ 0.50	$ 76,975		$ 79,878		$ -	$ -	$ (2,903)	153,456,179		$ 76,975
2019/2020	$ 0.50	$ 83,509	Estimated	$ 84,078		$ -	$ -	$ (570)	167,017,000	***	$ 83,509
2020/2021	$ 0.50	$ 82,700	**Proposed**	$ 84,078		$ -	$ -	$ (1,378)	165,367,000	**Proposed**	$ 82,700

* The rebate listed is actually received in the following fiscal year for accounting purposes.

** The Habitat Fee was implemented by the Authority in July 2012.

****** Fiscal year end estimate from consumption schedule.**

PROPOSED BUDGET WORKSHEET
AS OF: MAY 31ST, 2020

20 -WATER FUND

REVENUES	2016-2017 ACTUAL	2017-2018 ACTUAL	2018-2019 ACTUAL	2019-2020 CURRENT BUDGET	2019-2020 Y-T-D ACTUAL	2019-2020 PROJECTED YEAR END	2020-2021 REQUESTED BUDGET	2020-2021 PROPOSED BUDGET
NON-DEPARTMENTAL								
WATER SALES								
20-599-5015 WATER CONSUMPTION	658,287	661,864	586,511	627,000	366,948	635,000	623,000	
20-599-5016 LATE CHARGES	4,412	6,010	7,401	6,000	2,467	2,467	6,000	
20-599-5018 DEBT SERVICE	53,555	53,530	87,465	188,317	126,042	189,000	189,900	
20-599-5019 WATER SERVICE FEE	58,605	58,646	59,270	58,092	39,136	58,700	58,800	
20-599-5036 EAA PASS THRU CHARGE	87,732	89,139	76,975	83,681	49,525	86,400	82,700	
20-599-5037 CONNECTION/DISCONNECT FEE	2,800	0	0	0	0	0	0	
20-599-5040 TAPPING FEES	750	0	1,800	0	0	0	0	
TOTAL WATER SALES	866,141	869,190	819,421	963,090	584,117	971,567	960,400	
MISC./GRANTS/INTEREST								
20-599-7000 INTEREST INCOME	6,852	11,822	15,964	12,000	7,337	9,500	2,000	
20-599-7011 OTHER INCOME	40	49	1,181	0	48	80	0	
20-599-7012 LEASE OF WATER RIGHTS	7,000	10,000	10,000	10,000	7,500	7,500	15,000	
20-599-7028 TCEQ GRANT	0	0	0	46,718	0	46,718	0	
20-599-7060 CC SERVICE FEES	337	788	1,404	1,200	1,156	1,500	5,000	
20-599-7075 SITE/TOWER LEASE REVENUE	14,749	15,491	15,647	37,200	24,749	37,200	38,600	
SPRINT 0	0.00						16,500	
T-MOBILE (FROM GF) 0	0.00						22,100	
20-599-7090 SALE OF FIXED ASSETS	(18,787)	4,705	641	0	622	622	0	
20-599-7097 INSURANCE PROCEEDS	45,707	9,838	0	0	0	0	0	
TOTAL MISC./GRANTS/INTEREST	55,897	52,693	44,837	107,118	41,413	103,120	60,600	
TRANSFERS IN								
20-599-8072 TRF IN-CAPITAL REPLACEMENT	0	37,048	58,645	53,650	6,964	53,650	0	
WATER METER REPLACEMENT 50	0.00						0	
20-599-8090 PRIOR PERIOD ADJUSTMENT	0	(4,839)	0	0	0	0	0	
20-599-8099 TRF IN - RESERVES	0	0	0	0	0	0	0	
TOTAL TRANSFERS IN	0	32,209	58,645	53,650	6,964	53,650	0	
TOTAL NON-DEPARTMENTAL	922,038	954,092	922,903	1,123,858	632,493	1,128,337	1,021,000	
TOTAL REVENUES	922,038	954,092	922,903	1,123,858	632,493	1,128,337	1,021,000	