CITY OF KINGMAN
MUNICIPAL UTILITY COMMISSION
Council Chambers
310 N. 4th Street

5:30 p.m. **AGENDA** **Thursday, March 24, 2016**

REGULAR MEETING

COMMISSION MEMBERS: **Chairman Allen Burgett, Vice Chairman Mike Van Zandt, Toby Orr, Aline Parker, Paul Shuffler, Marvin Yarbrough Pat Yarush**

COUNCIL LIAISON: **Mayor Richard Anderson**

CALL TO ORDER AND ROLL CALL

APPROVAL OF MINUTES

The Regular Meeting Minutes of February 25, 2016.

1. PAST COUNCIL ACTION:

None

2. OLD BUSINESS: (for review, comment and/or action)

a) Review of Water and Wastewater Report including Financial Condition, Cash Reserves and Five Year Capital/Infrastructure Improvements Plan; MUC Recommendation to Council for Use of Funds or Rate Modifications.

3. NEW BUSINESS: (for review, comment and/or action)

a) Review and Recommendation of Request for Variance of Sewer Extension Requirements for 569 Anson Smith Road (305-14-010D), by applicants Gene & Jennifer Chambers.

b) Review and Recommendation of Request for Variance of Sewer Extension Requirements for Parcel Numbers 311-20-032, 311-20-033 & 311-20-036, by applicant Mohave Land Holdings, agents Doug Angle and Bob Albrecht.

c) Presentation of Sewer Master Plan Study, ENG14-112

d) Presentation of Reclaimed Water, ENG15-047

4. CONSIDERATION & DISCUSSION OF PUBLIC COMMENTS

Those wishing to address the Commission need not request permission in advance. Action taken as a result of public comment will be limited to directing staff to study the matter or rescheduling the matter for further consideration and decision at a later date, pursuant to A.R.S. 38.431 et al.

5. COMMISSIONER'S COMMENTS

Limited to announcements, availability/attendance at conferences and seminars, requests for agenda items for future meetings and requests for reports from staff.

ADJOURNMENT

ANYONE REQUIRING SPECIAL ASSISTANCE AND/OR ACCOMMODATIONS AT THE PUBLIC MEETING SHOULD CONTACT THE CITY ENGINEERING DEPARTMENT AT 928-753-8122 AT LEAST 24 HOURS IN ADVANCE, SO THAT APPROPRIATE ARRANGEMENTS CAN BE MADE

Posted- Date/Time/Initials _____

CITY OF KINGMAN

MUNICIPAL UTILITY COMMISSION MEETING

Council Chambers
310 N. 4th Street

5:30 p.m. **Minutes** **Thursday, February 25, 2016**

Commissioners	**Staff Present**	**Visitors Signed in**
Allen Burgett, Chairman	Greg Henry, City Engineer	Susan Gilbert
Mike Van Zandt, Vice Chairman	Tina Moline, Finance Director	Harley Pettit
Toby Orr	Rob Owen, Public Works Director	
Aline Parker-Excused	Kathy Lind, Recording Secretary	
Paul Shuffler	Melody Stewart, Recording Secretary	
Marvin Yarbrough-Absent		
Pat Yarush		
Council Liaison Anderson		

REGULAR MEETING

CALL TO ORDER AND ROLL CALL

Chairman Burgett called the meeting to order at 5:30 p.m. with five Commissioners present at time of roll call.

APPROVAL OF THE MINUTES

Commissioner Yarush made a **MOTION** to **APPROVE** the minutes from the January 28, 2016 meeting. Commissioner Shuffler **SECOND** the **MOTION** and it was **APPROVED** by a vote of **5-0**

1. **PAST COUNCIL ACTION:**

   None

2. **OLD BUSINESS:** (for review, comment and/or action)

   None

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3. **NEW BUISNESS:** (for review, comment and/or action)

a. Review of Water and Wastewater Report including Financial Condition, Cash Reserves and Five Year Capital/Infrastructure Improvement Plans; MUC Recommendation to Council for Use of Funds or Rate Modifications.

Finance Director Tina Moline stated she would be providing water and wastewater audited financial statements, including the revenue and operating expenses, the 5-Year proposed capital improvements plan and an overall discussion of the customer rate burden, desired collection system expansion and water system improvements. After the review and discussion a recommendation to the City Council is requested.

Ms. Moline began by providing background information on the water and wastewater systems. The water system serves 19,050 and the wastewater system serves 9,700 customers. The water and wastewater utilities are operated as enterprise funds, which are effectively separate business units.

The sources of revenue for the water fund are water sales and water meter connection fees. The wastewater fund revenues are the wastewater charges and sewer investment fees. Over the past 8-9 years the rate structure changed to a tiered structure.

Ms. Moline explained water rates are comprised of a base rate, capital renewal fee and a consumption charge. Consumption charges are based on a tiered rate depending on the quantity of water used in each tier. There are different rates for customers inside the City limits vs. outside the City limits. Water connection fees are determined by the size of the meter connected to the system. Most residential customers use a 5/8" x 3/4" meter which cost around $2,500 plus tax for customers inside the City limits and $2,625 plus tax for customers outside the City limits. When meter size increases charges increase as well.

Ms. Moline stated wastewater rates are comprised of a base rate, capital renewal fee and a monthly sewer user charge. Last year this Commission recommended and Council approved implementing $1.00 of the base rate to be dedicated as a Capital Renewal fee, which is why there is now a Capital Renewal Fund. Sewer user charges are computed based on actual monthly metered volume of water used and the expected wastewater strength rate. Winter quarter averaging is used for residential sewer user based on the actual monthly metered volume of water used during the months of December, January and February with that average becoming the sewer usage for the next 9 months. She explained that the only time this does not apply is if the customer has a lower consumption. Sewer investment fees are charged to new users connecting to the system at $91.00 per drainage fixture unit connecting to the sewer system.

Ms. Moline gave an overview of the Water Fund Financial condition for Fiscal Year 2015. Water usage continues to decline, resulting in a $340,000 reduction in revenues. Mohave County Water Authority Trust fees have decreased by around $500,000, varies year to year. The Water

Meter Connection fees have increased, offsetting the decreased in revenues by about $700,000. The fund has a net income of about $1.2 million. City policy states that the enterprise fund reserve should have about 45-180 days of operating expenses for any revenue shortfalls or unexpected expenses. Ms. Moline is conservative and prefers to use the 180 days of reserve to keep on hand, which is around $2.8 million. After that $2.8 million is set aside, the available fund balance would be $19 million at the end of Fiscal year 2015 in cash balances. Fiscal year 2016-2021 Capital Improvement program totals $23 million, leaving $4 million of Capital Improvement Projects unfunded.

Commissioner Orr asked if water usage is still declining even with the city growth.

Ms. Moline stated that water usage continues to decline due to conservation, which is partially a result of the high sewer rates.

Ms. Moline went on to review the Water Capital Improvement Projects for 2016-2021. Some of the funded projects include; $10 million dollars for the Automated Meter Reading Project, $1.9 Million for the East Bench 16" Transmission as well as many other projects in the pipeline that are considered important projects to be completed. There have been discussions about using the cash balance for system expansions, economic development and securing future water resources. In 2013 water customers received a $2.00 reduction in the base rate decreasing revenues by $450,000, which is a $1.3 million dollar decrease in revenues to date. Consideration of any reduction in the water fund would impact the funding of the future Capital Improvement Projects.

Ms. Moline moved on to reviewing the Wastewater Fund. The Hilltop Wastewater Treatment Plant was expanded and upgraded in 2011 and the Downtown Wastewater Treatment plant in 2012. The cost to upgrade and expand the Hilltop plant was $33.7 million and the Downtown Treatment Plan was over $16 million dollars but we were only required to pay back $14.4 million, a $2 million dollar benefit. Additional infrastructure replacement and/or upgrades are needed such as; the Downtown Sewer Outfall Line at a cost of $8.8 million. There are also operational costs that continue to increase. Wastewater rate adjustments have been necessary to ensure compliance with lending requirements and to meet cash flow needs due to the decline in the economy and diminished new construction during 2008-2013. Our sewer investment fees decreased and did not meet the projection that we had hoped when the treatment plants were built, so in order to meet our debt service payments rates had to be increased.

Ms. Moline went on to review the Wastewater Financial Condition. To determine the wastewater financial condition the following was presented for review; FY15 unaudited financial Statements, FY16 estimated revenues and expenses, FY17 projected revenues and expenses and FY17-FY21 funds available for CIP program. From FY17-FY21 there are about $18 million dollars in CIP Programs. There are many projects in the sewer CIP program that staff has put together for the next five years. Excluded from the list of projects is the reclaimed water

project that staff has not received direction on how to proceed. This could be a $10 million dollar project that is not included in this report.

In FY15 unaudited financial statement there was a slight decrease of $200,000 in revenues from FY14 as a result of continued decrease in sewer investment fees. Capital expenditures increased by $400,000 and an unaudited net income of $2.5 million. The fund balance at year end is $10,082,012 and in addition a repair and replacement reserve of $1 million and a debt service reserve of $3.6 million. The debt service reserve cannot be spent on operating expenditures until the loan has been paid in full so there is only the 10 million available to use.

FY16 revenues will be about the same as 2015. Capital expenditures will increase by $1.2 million dollars leaving an estimated net income of $2.0 million dollars. The City policy is to set aside 45-180 days of operating expenses, about $3.0 million dollars. The estimated available fund balance at the end of FY16 after the reserve is $8.3 million dollars.

FY17 is projected to have increased revenues by about 2%, which are $8.9 million which is a slight increase over FY16. It is estimated to have a net income of $2.6 million dollars. The FY17 CIP Programs are estimated at $2.4 million dollars, so the available fund balance would decrease to $7.7 million dollars.

Ms. Moline began review of the loan requirements. One of the loan requirements is called a debt service ratio calculation which requires that the net income must cover the highest debt service payment by 1.2 times; the annual debt service payment, is about $3.6 million dollars. There is also the reserve requirement that must be met. There is an annual funding of the repair and replacement reserve and a debt service reserve which is $778,000 dollars that is set aside in those special funds that cannot be touched. The operating reserve is about $3.0 million dollars. When we review the use of fund balances there are discussions around the four different areas of what we should spend the monies on. Funding the 5 year CIP Program is a very important one, increasing wastewater customer connections to spread the burden of the rate among the capacity we have at the plant, the appropriate level of user rates, and economic and environmental impacts. Our sewer rates are currently one of the highest in the state. So, rather than fund the CIP program or connect new users we can consider a rate reduction. There are four different options presented. There is a 25% reduction to residential base charge and user rates, a $2.00 reduction in all users' base charges, a $1.00 reduction in base rate and a 5% reduction in usage rates and a $3.75 one-time credit each year allocated to users on a monthly basis. A thing to keep in mind is there are critical projects in the CIP Program; our loan coverage ratio needs to exceed 1.5. There is a repair and replace reserve that must be funded and also the 180 day reserve policy.

The WIFA board is in the process of reviewing our request for the restructuring of our current loan and one of the stipulations of that loan is that we exceed the 1.5 loan coverage calculation. In FY16-17 the plan is to exceed that loan requirement. The restructuring of the loan will decrease the annual debt service payment by about $350,000 and City Council has discussed using that savings to give back to the users of the system, which is not projected in the options

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presented. The dollar amounts projected are the full dollar amount of our debt service payments.

Ms. Moline went on to review the sewer options attachment and how it will impact the sewer fund. There are five different options presented, the first one is a projection for FY17 which shows the current rates and each of the options with 25% reductions on residential water rates, reduction to everyone's base charge, the reduction to base charge and user rates and a one-time credit of $.3.75. On the total operating revenue there is a reduction; option 1 decreases revenues by $1.2 million, option 2 decreases revenues by a couple of hundred thousand dollars, option 3 by a few hundred thousand and option 4 by about $400,000. Further down on the attachment it shows what the net operating income would be for each option. If we kept the rates the way they are now we would end up with 2.6 million in net operating income. Option 1 is almost a 50% decrease in operating income and option 2, 3, 4 decreased $200,000-$450,000. Also included on the attachment is the estimated coverage ratio which we must meet the 1.5 if the board approves the loan reconstruction. In most all scenarios presented we meet the 1.5 ratio requirement, other than option 1. The next section provides an analysis of funding for the next five years of Capital Improvement Projects and shows what the fund balance would be using the projections from FY17. The first column has an estimated beginning fund balance of $8.3 million and after funding CIP programs and the $778,000 replacement extension provision it gives us an estimate ending fund balance of $7.7 million. As we look at FY18 and FY19 it quickly depletes and by FY20 there would only be about $604,000 left in the fund balance, meaning in FY21 we would not be able to fund those projects.

Commissioner Shuffler stated that to stay out of the red we either have to do less Capital Improvements or charge more money.

Ms. Moline said that the goal is to get more users. We need to fund these CIP programs but it's difficult to get the money to be able to fund all of those years. The water fund is a healthy fund and we still end up with under funding by about $4 million. We don't want to sell ourselves short and provide a reduction in rate and then only be able to fund three years of the projects or take projects out of the pipeline. The goal is to have the cash on hand to pay for these projects. There are other ways to fund these projects by issuing more debt. Currently, there is not enough cash to fund the 5-year Capital Improvement Project.

Commissioner Shuffler asked if there are any outside funding and other capital funding that staff or City Council is looking at that might impact these numbers; like funding for sewer improvements for Kingman Crossing and the other side of town.

Ms. Moline stated that there haven't been any conversations about borrowing money for Kingman Crossing.

Commissioner Shuffler asked if these CIP programs presented are what staff is looking at right now?

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Public Works Director, Rob Owen stated the Sewer Master Plan is currently going through an update and would identify capacity issues in the future and some of those projects could end up on the east side of town.

Chairman Burgett asked if we have received any new plans or new residential developments that would need wastewater connection.

City Engineer Henry said there are some preliminary talks but most are platted subdivisions that were shelfed due to the economy that are now coming back to life.

Commissioner Yarush said based on the options presented, it looks like an across the board rate reduction is not going to be healthy in the long run without increasing the customer base. Could we offer incentives to new customer, for example; as in option 1, existing sewer customers would receive a 25% reduction and potential new sewer customers would have an estimated time period to connect to receive the 25% reductions, similar to how we waive the DFU's for customers connecting within one year of the sewer line extension to create an incentive to connect sooner and broaden the base.

Ms. Moline said that's a great idea and is certainly another option that can be looked at.

Commissioner Yarush said he thinks providing incentives to motivate people to connect will be better in the long run for the City.

Ms. Moline confirms with Commissioner Yarush that his suggestion is to give some sort of discount to existing customers and then provide some sort of incentive to new customers.

Commissioner Yarush responded that if they don't connect within a certain time period they won't get that 25% reduction. The customers that are now paying that additional amount to compensate for people that aren't connected will receive some relief. It's a gamble but we are trying to generate more customers and broaden the base. There have also been previous discussions on a sewer availability fee. If there's a lateral or a sewer line available in front of a property that property owner could help absorb some of the cost by paying that sewer availability fee and lightning the load for existing customers.

Commissioner Shuffler said he would personally like to see development on the other side of town. There are 3- 12" lines there that all dump into each other and wants to know what capacity is left in that system for future development in that area.

Public Works Director, Rob Owen said that the line in Airway is near capacity so any development in that area is limited without a new trunk line.

Mr. Shuffler asked about the new overlay that we have. Have any estimates been done as far as getting the main trunk over there and let the developments pay for it , whatever it takes to tie in.

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City Engineer Henry said the Sewer Master plan does size the lines for the anticipated developments and there are estimates for that. That report should be finalized in the next couple of weeks and will bring a presentation to the next MUC meeting.

Commissioner Shuffler thinks that needs to be looked at on the CIP and maybe bump some of the other items.

Mr. Henry said whether the City pays to get the trunk line to the development or the developer pays needs to be answered.

PW Director Owen said the possibility of the City's participation to upsize some of those lines would be required. The Developers are required to run an 8" line to service their development but if we know in the future we will need a 12" or 16" line there have been cases where the City has participated in upsizing the lines for future capacity.

Commissioner Orr wanted to know when the $3.6 million dollar debt would be paid off and if we can accelerate the payoff of that loan.

Ms. Moline responded that the loan will be paid off in 2028. The lender will not allow us to pre-pay anything on the loan for up to 10 years.

Ms. Moline continued, In conclusion, construction of infrastructure with additional capacity to support growth, necessary replacement and repair of infrastructure, and ongoing operations and maintenance all require adequate financial resources with the water and wastewater enterprise funds. Established rate structures and sound financial condition of the City's utility systems are necessary to assure loan compliance, continual infrastructure improvements, and maintenance and operation of the utility systems in order to provide adequate, safe and reliable utility services. Ms. Moline state that she was hoping for some type of recommendation to take to Council tonight but can come back next meeting with other options with what the impacts might be.

Commissioner Yarush said that there's a lot of maintenance that needs to be done on the line down in the canyon and flood plain and fixing or replacing the outfall line. What's the plan for the re-design needed to get it out of the flood plain or are we using a similar design?

Mr., Henry responded, that it would come out of the flood plan and require a couple of lift stations to lift it up and construction of a new gravity line along the Old Trails alignment. The problem with the Downtown plant is there is a large box culvert that crosses the wash to get it to the plant. At some point we will bring that study to this commission.

Mayor Anderson commented that the City Council approved the last rate increase in 2012. At that time there were 9,030 customers and at the end of 2015 there were 9,700; which is about

a 2-2.5% growth. There are a number of studies that Public Works has been doing in terms of efficiency increases in their operations.

Chairman Burgett asked if the options presented are the same as last year and what option was suggested last year.

Ms. Moline responded that Option 4 was suggested last year. Each year would be reassessed so we're not tied to certain dollars, it's based on the net income that year and the CIP programs for 5 years.

Mr. Burgett said some of the CIP programs seem to get pushed aside because the money isn't there. Are there any CIP programs on the 5-year plan that staff are concerned about if development picks up.

PW Director, Owen responded that the one project of concern is the influent/infiltration project. There are 46 manholes identified that need to be rebuilt. There are serious issues at the Downtown Treatment Plant. During monsoon storms there is a lot of drainage run-off infiltration being treated in the sewer system and we are doing everything possible from discharging into the wash. The Downtown Outfall line is also a very important project; if not replaced or repaired it could be a major violation of sewer overflow to the wash.

Chairman Burgett said it looks like it's not in actual construction until FY19.

Mr. Henry added that it's likely that the project will be a multiple phase project. There will be a considerable amount of design time, possible ROW acquisitions and then construction, which will likely be phased over several years.

Chairman Burgett asked Ms. Moline if she needed a decision tonight or can we come back next month to give us more time to look at the option talked about.

Ms. Moline responded that she can bring it back next month with the different options requested. The reason she was looking for a recommendation now was there is a City Council work session on March 14th. The actual budget work session is not until May so would like a recommendation to Council by the second meeting in April.

Commission Orr wanted to know how many sewer taps are outside the City limits?

Ms. Moline said there are about 1000 existing sewers customers outside the City. There are currently 19,000 water customers and only 9,700 are on sewer. That's a pretty big difference; these could serve another 9,000 potential customers.

Commissioner Yarush asked Ms. Moline if she could elaborate on how many more existing customer we will need 5 years down the road. Rather than discounting the rates of existing customers and creating more of a deficit, we should provide incentives to new customers

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connecting. It will create more of a customer base with current customers knowing that in 4-5 years down there will be looking a rate reduction across the board due to the expansion.

Ms. Moline said those would be hard numbers to put together but can provide how many customers will be needed to break even.

Mr. Henry said before putting those numbers together we should check with the attorney to make sure the incentives would be legal.

Commissioner Yarush said generating more connections should be the main focus. If you go through areas in Butler and request "mandatory connections" how many people are really going to respond or just can't afford it.

Mr. Henry said in most cases the sewer is not there to have a mandatory connection so there's cost associated with extending it. The Sewer Master Plan looks at certain areas and what size line it needs to serve a certain area. It doesn't look at all the individual extension.

Commissioner Yarush said our primary focus should be to make it as inexpensive as possible for a new customer to get connected and then there would be a consistent income to the overall base. We want to concentrate on where it is going to do the most good and people are actually going to connect.

Chairman Burgett wants a motion to postpone the decision to make a recommendation to council at our meeting next month so staff can comeback with numbers on the options discussed tonight. Commissioner Orr made a **MOTION** to postpone discussion until next meeting for further information from staff, Commissioner Yarush **SECOND** the **MOTION** and it was **APPROVED** by a vote of **5-0**

4. CONSIDERATION & DISCUSSION OF PUBLIC COMMENTS

Mr. Harley Pettit wanted this Commission to know that the City of Bullhead has a current working model to bring in new sewer customers. They notify customers by section giving them two year notice to connect. They also offer a finance program giving the customer the option to pay in full or finance with a finance penalty. Mr. Pettit feels that if you want more people to hook-up you have to look at it as an investment, not an expense

The next thing is to establish a rate so one person isn't paying $5,000 and another paying $40,000. Make the investment and pro-rate with everyone involved so everyone pays the same, just like we do for curb and sidewalks. The City of Bullhead has a 20 year finance program that is doing so well that after 15 years they forgave the pre-pay penalty.

Mr. Pettit feels we should use our Capital money to get the rest of the sewer lines in and use the City of Bullheads working model as an approach to the City of Kingman's current situation.

He will ask the City of Bullhead how this finance program worked and where the money came from and get back to City staff with what he finds.

Next, Susan Gilbert addressed the Commission. She feels that it's a good idea to make sure there is enough money to fund Capital Improvement projects because if you need to get a loan to fund things that may not be anticipated it will cost more due to the interest. She also had some questions regarding Finance Director Moline's presentation, specifically attachment E, which she will address with staff after the meeting.

5. **COMMISSIONER'S COMMENTS**

There were no comments

ADJOURNMENT

Commissioner Yarush made a **MOTION** to adjourn at 6:33 p.m. **SECOND** by Commissioner Shuffler and it was **APPROVED** by a vote of **5-0.**

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AGENDA ITEM

2-A

CITY OF KINGMAN
MUNICIPAL UTILITIES COMMISSION

TO: Municipal Utilities Commission

FROM: Tina D. Moline, Financial Services Director

MEETING DATE: March 24, 2016

AGENDA SUBJECT: Review of Water and Wastewater Report Including Financial Condition, Cash Reserves and Five Year Capital/Infrastructure Improvements Plan; MUC Recommendation to Council for Use of Funds or Rate Modifications

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SUMMARY: A review of the City's unaudited financial statements including revenue and operating expenses, the 5 year proposed capital improvements plan, and overall discussion of the customer rate burden and desired collection system expansion and water system improvements was discussed at the Municipal Utilities Commission meeting on February 25, 2016.

Funding the 5-year CIP program and connecting existing homes to the sewer system were the main topics of discussion. After review and discussion, the Commission requested additional information related to the wastewater fund to be discussed at the March meeting. This will allow the Commission to make an informed recommendation to Council for the use of funds. The following items were requested:

1. Provide the impact of discounting wastewater rates to customers who are currently connected to the sewer system while imposing the normal rate to customers who connect to the sewer system after a designated period of time which would potentially create incentive. Staff discussed this option with the City and was informed that this option could not be instituted as it would be considered favoritism and unfair.
2. Provide the number of homes that may connect to the sewer system in subdivisions that are currently being developed.
3. Determine how many homes would need to connect to the sewer system in order to fund the 5-year CIP program with cash reserves.

A CIP planning work session with Council was held on March 14, 2016. At that meeting, the reclaimed water reuse projects for the airport and golf course were presented. Council did not remove

Tina D. Moline
Signature of Dept. Head

AGENDA ITEM:

those projects from the 5-year wastewater CIP program, so those have been included in the Item 2 and Item 3 attachments. These projects increase the 5-year wastewater CIP program by $18,724,000.

Following review and discussion, a recommendation from the Municipal Utilities Commission to the City Council is desired.

ATTACHMENT: Attachments include:

- Requested Items 2 and 3 from the Commission
- Water and Wastewater Report
- Water and Wastewater Unaudited FY2015 Financial Statements
- Water and Wastewater 5-Year CIP Program
- Wastewater FY2016 and FY2017 Projections
- Wastewater Rate Reduction Options

RECOMMENDATION: It is recommended the Municipal Utilities Commission review the water and wastewater reports and financial condition and forward any desired changes, amendments or recommendations to the City Council.

Tina D. Moline

Signature of Dept. Head

AGENDA ITEM:

Item 2

EXISTING CUSTOMER BASE

200 RESIDENTIAL AND 10 COMMERCIAL CONNECTIONS PER YEAR

CITY OF KINGMAN - WASTEWATER
Wastewater Rate Reduction Options and Projected Impact on Net Revenues and Expenses
Using Projected FY2016-2017 Revenues and Operating Expenses

	Projected FY17	Option 1	Option 2	Option 3	Option 4
		Reduction of 25% in Residential Base Charges and User Rates	Reduction of $2 to Base Charges	Reduction of $1 to Base Charges and a 5% Decrease to User Rates	One-Time Credit to be Allocated to All Users ($3.75/mo/user)
Operating revenues					
Charges for services:					
Sewer base/user fees & capital renewal fee	$8,612,606	$8,612,606	$8,612,606	$8,612,606	$8,612,606
Other	600	600	600	600	600
Development Investment Fees	275,000	275,000	275,000	275,000	275,000
Less: Est. decrease from sewer rates		(1,278,120)	(237,014)	(386,281)	(437,295)
Total operating revenue	**8,888,206**	**7,610,086**	**8,651,192**	**8,501,925**	**8,450,911**
Operating expenses					
Personnel expenses	900,000	900,000	900,000	900,000	900,000
Supplies & services	856,500	856,500	856,500	856,500	856,500
Internal services	100,000	100,000	100,000	100,000	100,000
Total operating expenses	**1,856,500**	**1,856,500**	**1,856,500**	**1,856,500**	**1,856,500**
Operating income (loss)	**7,031,706**	**5,753,586**	**6,794,692**	**6,645,425**	**6,594,411**
Transfers and other1					
Investment income	40,000	40,000	40,000	40,000	40,000
Miscellaneous	2,000	2,000	2,000	2,000	2,000
Transfers for Admin, PW & Engineer	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)
Operating Capital	(300,000)	(300,000)	(300,000)	(300,000)	(300,000)
ADOT land payment	(61,200)	(61,200)	(61,200)	(61,200)	(61,200)
WIFA Debt payments	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)
Net transfers and other	(4,453,260)	(4,453,260)	(4,453,260)	(4,453,260)	(4,453,260)
Net operating income (loss)	**$2,578,446**	**$1,300,326**	**$2,341,432**	**$2,192,165**	**$2,141,151**
Wastewater Operating Net Income	6,573,706	5,295,586	6,336,692	6,187,425	6,136,411
Less Debt payments	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)
Coverage sufficiency/(deficiency)	2,939,646	1,661,526	2,702,632	2,553,365	2,502,351
Estimated coverage ratio	**1.81**	**1.46**	**1.74**	**1.70**	**1.69**
FUND BALANCE ANALYSIS WITH OPTIONS:					
Estimated Beg. Fund Balance 7-1-16	8,332,022	8,332,022	8,332,022	8,332,022	8,332,022
Addition (Reduction) to Fund Balance	2,578,446	1,300,326	2,341,432	2,192,165	2,141,151
2017 CIP Program	(2,382,806)	(2,382,806)	(2,382,806)	(2,382,806)	(2,382,806)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-17	**7,749,115**	**6,470,995**	**7,512,101**	**7,362,834**	**7,311,820**
Fund Balance	7,749,115	6,470,995	7,512,101	7,362,834	7,311,820
Addition (Reduction) to Fund Balance	2,775,312	1,456,725	2,533,258	2,380,171	2,328,567
2018 CIP Program	(4,320,500)	(4,320,500)	(4,320,500)	(4,320,500)	(4,320,500)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-18	**5,425,380**	**2,828,672**	**4,946,311**	**4,643,959**	**4,541,340**
Fund Balance	5,425,380	2,828,672	4,946,311	4,643,959	4,541,340
Addition (Reduction) to Fund Balance	2,972,178	1,613,124	2,725,084	2,568,177	2,515,983
2019 CIP Program	(15,365,500)	(15,365,500)	(15,365,500)	(15,365,500)	(15,365,500)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-19	**(7,746,489)**	**(11,702,251)**	**(8,472,652)**	**(8,931,911)**	**(9,086,724)**
Fund Balance	(7,746,489)	(11,702,251)	(8,472,652)	(8,931,911)	(9,086,724)
Addition (Reduction) to Fund Balance	3,169,044	1,769,523	2,916,910	2,756,183	2,703,399
2020 CIP Program	(11,582,000)	(11,582,000)	(11,582,000)	(11,582,000)	(11,582,000)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-20	**(16,937,991)**	**(22,293,275)**	**(17,916,289)**	**(18,536,275)**	**(18,743,871)**
Fund Balance	(16,937,991)	(22,293,275)	(17,916,289)	(18,536,275)	(18,743,871)
Addition (Reduction) to Fund Balance	3,365,910	1,925,922	3,108,736	2,944,189	2,890,815
2021 CIP Program	(3,037,000)	(3,037,000)	(3,037,000)	(3,037,000)	(3,037,000)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-21	**(17,387,628)**	**(24,182,901)**	**(18,623,100)**	**(19,407,632)**	**(19,668,603)**

Item 3

EXISTING CUSTOMER BASE

200 RESIDENTIAL AND 10 COMMERCIAL CONNECTIONS PER YEAR

1,500 EXISTING HOME CONNECTIONS WHERE SEWER IS CURRENTLY AVAILABLE - 300 PER YEAR

CITY OF KINGMAN - WASTEWATER
Wastewater Rate Reduction Options and Projected Impact on Net Revenues and Expenses
Using Projected FY2016-2017 Revenues and Operating Expenses

	Projected FY17	Option 1	Option 2	Option 3	Option 4
		Reduction of 25% in Residential Base Charges and User Rates	Reduction of $2 to Base Charges	Reduction of $1 to Base Charges and a 5% Decrease to User Rates	One-Time Credit to be Allocated to All Users ($3.75/mo/user)
Operating revenues					
Charges for services:					
Sewer base/user fees & capital renewal fee	$8,855,404	$8,855,404	$8,855,404	$8,855,404	$8,855,404
Other	600	600	600	600	600
Sewer investment fees	657,200	657,200	657,200	657,200	657,200
Less: Est. decrease from sewer rates		(1,338,819)	(244,214)	(397,016)	(450,795)
Total operating revenue	**9,513,204**	**8,174,385**	**9,268,990**	**9,116,188**	**9,062,409**
Operating expenses					
Personnel expenses	900,000	900,000	900,000	900,000	900,000
Supplies & services	856,500	856,500	856,500	856,500	856,500
Internal services	100,000	100,000	100,000	100,000	100,000
Total operating expenses	**1,856,500**	**1,856,500**	**1,856,500**	**1,856,500**	**1,856,500**
Operating income (loss)	**7,656,704**	**6,317,885**	**7,412,490**	**7,259,688**	**7,205,909**
Transfers and other1					
Investment income	40,000	40,000	40,000	40,000	40,000
Miscellaneous	2,000	2,000	2,000	2,000	2,000
Transfers for Admin, PW & Engineer	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)
Operating Capital	(300,000)	(300,000)	(300,000)	(300,000)	(300,000)
ADOT land payment	(61,200)	(61,200)	(61,200)	(61,200)	(61,200)
WIFA Debt payments	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)
Net transfers and other	(4,453,260)	(4,453,260)	(4,453,260)	(4,453,260)	(4,453,260)
Net operating income (loss)	**$3,203,444**	**$1,864,625**	**$2,959,230**	**$2,806,428**	**$2,752,649**
Wastewater Operating Net Income	7,198,704	5,859,885	6,954,490	6,801,688	6,747,909
Less Debt payments	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)
Coverage sufficiency/(deficiency)	3,564,644	2,225,825	3,320,430	3,167,628	3,113,849
Estimated coverage ratio	**1.98**	**1.61**	**1.91**	**1.87**	**1.86**
FUND BALANCE ANALYSIS WITH OPTIONS:					
Estimated Beg. Fund Balance 7-1-16	8,332,022	8,332,022	8,332,022	8,332,022	8,332,022
Addition (Reduction) to Fund Balance	$3,203,444	$1,864,625	$2,959,230	$2,806,428	$2,752,649
2017 CIP Program	(2,382,806)	(2,382,806)	(2,382,806)	(2,382,806)	(2,382,806)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-17	**8,374,113**	**7,035,294**	**8,129,899**	**7,977,097**	**7,923,318**
Fund Balance	8,374,113	7,035,294	8,129,899	7,977,097	7,923,318
Addition (Reduction) to Fund Balance	$3,643,108	$2,203,123	$3,386,654	$3,226,497	$3,169,363
2018 CIP Program	(4,320,500)	(4,320,500)	(4,320,500)	(4,320,500)	(4,320,500)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-18	**6,918,174**	**4,139,370**	**6,417,506**	**6,104,547**	**5,993,634**
Fund Balance	6,918,174	4,139,370	6,417,506	6,104,547	5,993,634
Addition (Reduction) to Fund Balance	$4,082,772	$2,541,621	$3,826,304	$3,666,147	$3,586,077
2019 CIP Program	(15,365,500)	(15,365,500)	(15,365,500)	(15,365,500)	(15,365,500)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-19	**(5,143,101)**	**(9,463,056)**	**(5,900,237)**	**(6,373,353)**	**(6,564,336)**
Fund Balance	(5,143,101)	(9,463,056)	(5,900,237)	(6,373,353)	(6,564,336)
Addition (Reduction) to Fund Balance	$4,522,436	$2,880,119	$4,253,728	$4,086,216	$4,003,421
2020 CIP Program	(11,582,000)	(11,582,000)	(11,582,000)	(11,582,000)	(11,582,000)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-20	**(12,981,212)**	**(18,943,484)**	**(14,007,056)**	**(14,647,684)**	**(14,921,462)**
Fund Balance	(12,981,212)	(18,943,484)	(14,007,056)	(14,647,684)	(14,921,462)
Addition (Reduction) to Fund Balance	$4,962,100	$3,218,617	$4,681,152	$4,506,285	$4,420,135
2021 CIP Program	(3,037,000)	(3,037,000)	(3,037,000)	(3,037,000)	(3,037,000)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-21	**(11,834,659)**	**(19,540,414)**	**(13,141,451)**	**(13,956,946)**	**(14,316,874)**

Water and Wastewater Report

Background

The City of Kingman utilities systems serve approximately 19,050 water and 9,700 wastewater customers. Each of the City's water and wastewater utilities are operated as enterprise funds, meaning they are effectively separate business units. The only sources of revenue for these individual units are water sales and connection fees; and wastewater charges and development investment fees *(note: wastewater development investment fees are solely dedicated to paying for the growth related portion of debt service for the expansion of the Hilltop and Downtown Wastewater Treatment Plants.)* No property taxes, fuel taxes, or other transaction privilege taxes flow directly into these enterprise funds; and enterprise funds are accounted for separately in the City's financial statements.

The City's water rates are a tiered structure whereby the cost per thousand gallons increases in tiers for higher usage. This structure was implemented as part of an active water conservation program. Together, with the added factor of a recessionary economy and increased wastewater rates, water consumption and the related revenue derived from sales has been reduced.

The utilities financial status is reviewed at municipal workshops and meetings no less than on an annual basis, during which maintenance and operational needs of the systems, capital projects, revenue from water and wastewater charges and overall customer rate burdens are reviewed and evaluated. The City's audited financial statements, adopted budgets and rate structures are reviewed annually by the Arizona Water Infrastructure Finance Authority. The last five years of the City's comprehensive audited financial reports, budgets and capital improvements plans, and rate study can be viewed on the City's website www.cityofkingman.gov.

Current Rates

Water Rates

The current water rates are comprised of a base rate and capital renewal fee (flat monthly charge per meter) plus a consumption charge with tiered rates depending on the quantity of water used in each consumption tier. On July 1, 2013, there was a $2 decrease in the water base rate.

Table 1
Water Rates (effective July 1, 2013)

Block	Blocks	Volume Rates	
		Inside City	*Outside City*
	(kgals)	$/kgal	$/kgal
1	0 to 10	$1.93	$2.60
2	10 to 45	$2.42	$3.28
3	Over 45	$3.64	$4.91
	Non-Residential		
	All Usage	$2.18	$2.95
	Irrigation		
1	0 to 200	$2.42	$3.28
2	Over 200	$3.64	$4.91
	All Customers		
Base Service Charge		$7.21	$9.64
Capital Renewal Charge		3.75	3.75
Total Base Charge		$10.96	$13.39

Water Connection Fees

Development investment (impact) fees were repealed in January 2012 and the funding source moved to a meter connection fee based on meter size.

STANDARD SIZE (INCHES)	CITY LIMITS	OUTSIDE CITY LIMITS	COMPOUND METER (INCHES)	CITY LIMITS	OUTSIDE CITY LIMITS	TURBO METERS (INCHES)	CITY LIMITS	OUTSIDE CITY LIMITS
5/8" by 3/4"	2,500.00	2,625.00	2" cost/materials plus	28,340.00	28,785.00	2" cost/materials plus	28,340.00	28,785.00
1"	9,405.00	9,710.00	3" cost/materials plus	56,500.00	57,345.00	3" cost/materials plus	56,725.00	57,645.00
1 1/2"	18,550.00	18,965.00	4" cost/materials plus	82,563.00	83,858.00	4" cost/materials plus	86,313.00	88,858.00
			6" cost/materials plus	176,180.00	178,725.00	6" cost/materials plus	183,680.00	188,725.00
						10" cost/materials plus	428,980.00	442,775.00

Wastewater Rates

The current wastewater rates are comprised of a base rate and capital renewal fee (flat monthly charge per connection) plus a monthly sewer user charge. The sewer user charge is computed based on the actual monthly metered volume of water used by the customer and the expected wastewater strength. Further, the ***residential and industrial cooling tower*** sewer user charge is computed based on the actual monthly metered

volume of water used by that customer during December, January, and February (billed in January, February, and March). During these months the actual usage is multiplied by the current sewer rate per 1,000 gallons. These three months of water usage establish the winter quarter average. All other months' sewer user charges are based on the winter quarter average consumption multiplied by the current sewer rate. In the event the actual monthly consumption is less than the winter quarter average consumption, the actual consumption is used. The user charge is intended to distribute the costs of operation, maintenance, and an equitable share of debt service of the sewer system to users in direct proportion to use.

Table 2
Wastewater Rates (effective January 1, 2013)
***(As of March 1, 2015 a $1 Capital Renewal Fee is included in the monthly fixed charge)**
Note: Rates are per 1000 gallons

Standard Classification	Flow	Bod	SS	Total	Monthly Fixed Chg*
Residential	$2.748	$1.418	$1.497	$5.663	$27.803
Auto Steam Clean	$2.748	$8.736	$9.981	$21.466	$27.803
Bakery Wholesale	$2.748	$7.597	$4.784	$15.129	$27.803
Bars without Dining	$2.748	$1.509	$1.600	$5.856	$27.803
Car Wash	$2.748	$0.144	$1.198	$4.090	$27.803
Department / Retail Stores	$2.748	$1.131	$1.198	$5.077	$27.803
Hospital / Convalescent	$2.748	$1.896	$0.803	$5.446	$27.803
Hotel / Motel with Dining	$2.748	$3.785	$4.796	$11.329	$27.803
Hotel / Motel without Dining	$2.748	$2.350	$0.955	$6.053	$27.803
Industrial Laundry	$2.748	$5.095	$5.426	$13.269	$27.803
Laundromat	$2.748	$1.131	$0.882	$4.761	$27.803
Commercial Laundry	$2.748	$3.413	$1.913	$8.074	$27.803
Market with Garbage Disposal	$2.748	$6.073	$6.393	$15.214	$27.803
Mortuaries	$2.748	$6.073	$6.393	$15.214	$27.803
Professional Office	$2.748	$0.984	$0.633	$4.365	$27.803
Repair Shop / Service Station	$2.748	$1.362	$2.229	$6.340	$27.803
Restaurant	$2.748	$8.344	$4.799	$15.891	$27.803
School / College	$2.748	$0.984	$0.791	$4.523	$27.803
Soft Water Service	$2.748	$0.026	$0.442	$3.217	$27.803
Government / Public Buildings	$2.748	$0.984	$0.633	$4.365	$27.803
Churches	$2.748	$0.984	$0.791	$4.523	$27.803
Apartments	$2.748	$1.509	$1.600	$5.856	$27.803
Mobile Home Parks	$2.748	$1.509	$1.600	$5.856	$27.803
Storage, Wholesale	$2.748	$1.131	$1.198	$5.077	$27.803
Industrial Manufacturing	$2.748	$1.509	$1.600	$5.856	$27.803
Jail	$2.748	$3.785	$4.796	$11.329	$27.803
Septage	$2.748	$41.054	$95.936	$139.737	$27.803

Wastewater Treatment Plants – Overview

After many years of planning and design, upgrades and expansions of the Hilltop Wastewater Treatment Plant (HTWWTP) and Downtown Wastewater Treatment Plant (DTWWTP) the Plants were completed in 2011 and 2012, respectively.

These upgrades did not come without a cost to the City and ultimately to the existing wastewater customers. The final cost to expand and upgrade the plants totaled $14.4 million for the DTWWTP and $33.7 million for the HTWWTP. Funding for these projects was secured by financing through WIFA.

In order to meet the loan covenants associated with the loans, such as loan coverage ratios, debt service reserve and repair and replacement reserve requirements, and annual debt service payments, it was necessary to increase wastewater rates. Since the construction phase of each of the upgraded treatment plants, wastewater rates have increased almost 200%.

As with any facility, whether it is new or old or upgraded, there is an ongoing operational expense incurred for the maintenance and repair of such facility. In addition to these expenses, as infrastructure ages there are replacement costs associated with the system. Although the treatment plants were upgraded within the past several years, not all infrastructure needs were nor could be addressed at that time. As an example, the sewer downtown outfall line needs replaced. It is old, above ground and is exposed to the elements. It is not easily accessible and thereby difficult to maintain. Although the line has been grandfathered in, the line does not meet current ADEQ requirements; when rehabilitation is needed, ADEQ will require significant changes. The line is located in a floodplain, and to date there have been no major issues with flooding. If this changes, given the age of the line and its supports, the line could not withstand a flood. This capital project is estimated to cost $8.775 million and is designated by staff to be a priority.

Financial Condition

In reviewing the financial condition of the Water and Wastewater Funds, this year it was important to not only review the unaudited past fiscal year 2014-2015 (FY15) financial condition for the Water and Wastewater Funds, but to also include an estimate for fiscal year 2015-16 (FY16) and a projection for 2016-17 (FY17) for the Wastewater Funds. All figures presented for FY15 are unaudited, and there may be adjustments after the audit is performed. Included is a discussion of Wastewater fund balances, the "net income" available for appropriation from FY15 through FY21. This will provide the Commission and Council a picture of not only what has financially occurred in the past, but what the projected financial position will be with proposed capital projects before considering any reductions to wastewater rates.

Wastewater

At the end of FY15, the Wastewater Fund had an unaudited available fund balance of $10,082,012. In addition, there are $1,070,254 required funds reserved for the Repair and Replacement Fund and $3,649,315 required funds reserved and restricted for the Debt Service Reserve Fund (Attachment A). Revenues received for FY15 totaled $8.8 million compared to $9 million in FY2013-14 (Attachment B). The decrease of approximately $200,000 was a result of less Sewer Investment Fees that were collected. Of the $8.8 million of revenue in FY15, $3.6 million was spent on debt service payments; $1.9 million was used for wastewater system operating costs; $664,000 for City engineering department, utility billing, and other administrative costs. The repair and replacement and debt service reserve requirements for the HTWWTP and DTWWTP are $778,547 for FY15[1]. The net balance of revenues minus expenditures leaves a net income for FY15 of $2,487,485 (Attachment B).

The unaudited beginning available fund balance for FY16 was $10,082,012 (ending fund balance for FY15). Revenues that are estimated to be received in FY16 are $8.8 million, at the same level as FY15. This is using 6 months of actual collections and 6 months of projections. Debt service expenditures remain the same, but operating costs are estimated at $2.6 million compared to $1.9 million in FY15. This is the result of capital expenditures increasing from $469,000 to $1.2 million. City engineering department, utility billing, and other administrative costs are estimated to be at $489,000. The net balance of revenues minus expenditures leaves a net income for FY16 of $2,028,557. By adding the net income for FY16 and subtracting out the annual repair and replacement and debt service reserve and the 180-day contingency reserve per City policy of $3 million, the ending available fund balance for FY16 is projected to be $8,332,022. (Attachment C). The repair and replacement reserve will then have a balance of $1,605,381, and the debt service reserve will have a balance of $3,892,735. It is important to mention that the City has submitted a request to WIFA asking the WIFA Board to lift the restriction on the debt service reserve. The WIFA Board will review this request at their April 20th meeting. If the request is approved, Council will use these funds to pay down the principal of the HTWWTP loan and use the annual debt service savings of over $350,000 to fund rate reductions.

The estimated beginning available fund balance for FY17 is $8,332,022 with an additional $3 million in contingency reserve. Revenues that are estimated to be received in FY17 are $8.9 million, a slight increase over FY16 revenues with conservative growth in customers. Debt service costs are the same as FY15 and FY16 and operating costs are estimated to be $2.2 million. City engineering department, utility billing, and other administrative costs are estimated to be at $500,000. The net balance of revenues minus expenditures leaves a net income for FY17 of $2,578,446. (Attachment C) By adding the net income for FY17 and subtracting out the annual repair and replacement reserve as well as the FY17 CIP projects of $2,382,806, the ending available fund balance for FY17 is $7,749,115. The repair and replacement reserve will then have a balance of $2,383,928.

[1] Starting in FY17, there is only a capital replacement reserve requirement, not a debt service reserve requirement for the HTWWTP and DTWWTP which remains at $778,547.

One important test that is required when the City incurs debt to build capital projects is what is called the "debt service ratio coverage." The difference between the wastewater operating revenues and the wastewater operating expenses must cover the highest annual debt service payment (principal and interest) over the life of the loan by 120% or 1.2 times. In performing that test, the debt service ratio coverage for FY15 is 1.81. For FY16 it is estimated to be 1.92, and FY17 is estimated to be at 1.81. Those ratios are well above the 1.2 debt service ratio coverage requirement.

The next step in this analysis is to project the impact of the proposed capital projects to the estimated funds available for 5 years, FY17 to FY21. The following is the amount of the proposed capital projects for the next 5 years. A list of these projects is presented on Attachment D.

FY17	FY18	FY19	FY20	FY21
$2,382,806	$2,770,500	$6,778,500	$2,995,000	$3,037,000

The assumptions made for FY18 through FY21 are that revenues and expenditures would increase as projected for FY17. This is a conservative approach but is the best information available at this time. With this approach, and not including any reclaimed water projects for the airport or golf course, the City would be able to fund the proposed CIP program through FY20 and the CIP for FY21 of $3 million would not be fully funded.

Water

The water utility system includes funds designated for water operations, including engineering, utility billing and administrative costs; capital renewal fees for repair and replacement of infrastructure; system connection fees used for capital projects; and restricted funds for the development of water resources.

In FY15, operating revenue plus transfers in received for the year totaled $8.5 million as compared to $9.2 million in FY14. The $700,000 revenue decrease is a result of approximately $340,000 less in water charges and $497,000 less in Mohave County Water Authority trust fees. The trust fees are based on the amount of water rights that are purchased each year by surrounding Colorado River cities and districts (Bullhead City, Lake Havasu City, Mohave Valley Irrigation Drainage and Mohave Water Conservation District) and vary from year to year. These shortfalls were offset by an increase in water meter connection fees resulting in an overall net decrease of $700,000. Of the $8.5 million of the FY15 revenue, $7.3 million was used for operating and capital costs; $668,000 was used for City administrative costs, and $61,000 was used for the ADOT land payment resulting in an ending net income of $1.2 million. (Attachment G)

Wastewater Rate Review - Options

Discussion of desired use of balances, appropriate level of user rates, economic and environmental impacts, and system expansion has been the focus of many City Council, Municipal Utilities Commission, staff and customer discussions. A common theme in all discussions is the desire to increase the number of wastewater customer connections. A

sewer expansion study identifying areas of greatest need and estimated number of connections is currently being conducted. In March of 2015, the Municipal Utilities Commission recommended and City Council approved dedication of $1 of the base charges to capital renewal funds. As of the end of FY15, the capital renewal fees collected were $42,000. In FY16, there is $120,000 estimated for capital renewal fees.

If rates and customer usage/discharge remain approximately the same over the next several years, the wastewater fund balance combined with the projected net operating income will provide sufficient inflows to fund most of the 5-year capital improvements plan. This does not include the reclaimed water projects for the airport and golf course. This takes into consideration the designation of $1 of the existing base charge to be used to pay for projects replacing, improving or expanding the wastewater system. The capital improvements plan totals $18 million which will be funded with existing cash balances and the remainder is planned to come from future net operating income. A list of 17 capital projects, including sewer extension lines may be viewed at the end of this report.

As was discussed last year, and presented in Attachment E, rather than fund the wastewater capital improvements plan, a wastewater rate reduction could be considered. Possible options include a: 1) reduction of 25% in residential base charges and user rates, 2) reduction of $2 in the base charges, 3) reduction of $1 in base rate and 5% in user rates, or 4) a $3.75 per month one-time annual credit allocated to users on a monthly basis. If Option 1 is implemented, the proposed capital improvement program could not be fully funded past FY18. In addition, eventually this option may not generate enough operating revenues to cover operating expenditures in the future. If Option 2, 3 or 4 is implemented, the CIP can be fully funded through FY19 (without reclaimed water for airport and golf course) but similar to Option 1, may eventually not generate enough operating revenues to cover operating expenditures. By FY20, the CIP program for all options could not be funded.

Water Rate Review

Discussion of desired use of balances, appropriate level of user rates, system expansion and economic development in the area, and the desire to secure future water resources has been the focus of many City Council, Municipal Utilities Commission, staff and customer discussions. A common theme in all discussions is the desire to ensure safe drinking water and sufficient water supply for future generations.

At the end of FY15, the Water Fund has approximately $19 million in available fund balance after taking out a $2.8 million contingency reserve per City's policy (180 days). In looking at the projected 6-year capital improvements plan (FY16-21, Attachment G), for the water system, it totals more than $23 million. After taking out 180 day contingency reserve of $2.8 million, only $19 million is available to fund the CIP. The remaining $4 million is unfunded at this time. In the past, the City has been able to accumulate net income inflows for several years and then complete eligible projects on a pay-as-you-go basis. However, the water base rate was reduced by $2 per month effective July 1, 2013 and as a result revenue derived from base rates decreased by $451,000 in FY 2014. This diminishes the amount of net income inflow for future capital projects as well as operations, and if the Municipal Utilities Commission considers an

additional water rate decrease, the decrease will impact the funding of future capital improvement projects.

Conclusion

In summary, construction of infrastructure with additional capacity to support growth, necessary replacement and repair of infrastructure, and ongoing operations and maintenance all require adequate financial resources within the water and wastewater enterprise funds. Established rate structures and sound financial condition of the City's utility systems are necessary to assure loan compliance, continual infrastructure improvements, and maintenance and operation of the utility systems in order to provide adequate, safe, and reliable utility services. The Municipal Utilities Commission serves as the recommending body to the City Council for any desired changes, amendments or recommendations.

ATTACHMENT A

CITY OF KINGMAN - WASTEWATER
Statement of Net Assets
As of June 30, 2015

	Wastewater Operating Fund	Wastewater Expansion Fund	Wastewater Cap. Renewal Fund	Total
ASSETS				
Current assets:				
Cash and investments	$3,947,061	$10,416,227	$33,038	$14,396,326
Accounts receivable	737,988		8,957	$746,945
Loan receivable				
Inventories	27,769			$27,769
Deposits				
Total current assets	4,712,818	10,416,227	41,995	15,171,040
Noncurrent assets:				
Restricted cash and investments		4,719,569		$4,719,569
Fixed assets land, infrastructure, etc.	65,596,882			$65,596,882
Accumulated depreciation	(11,187,238)			($11,187,238)
Total noncurrent assets	54,409,644	4,719,569		$59,129,213
Total assets	**59,122,462**	**15,135,796**	**41,995**	**74,300,253**
LIABILITIES				
Current liabilities:				
Accounts payable	110,708	198,487		309,195
Accrued payroll & benefits	58,151			58,151
Payback agreements collected for others	2,113			2,113
Loans Payable		2,287,672		2,287,672
Obligations under capital leases	54,553			54,553
Deferred revenue				0
Total current liabilities	225,525	2,486,159	0	2,711,684
Noncurrent liabilities:				
Non-current portion of long-term obligations	109,282	36,551,072		36,660,354
Total noncurrent liabilities	109,282	36,551,072	0	36,660,354
Total liabilities	**334,807**	**39,037,231**	**0**	**39,372,038**
NET ASSETS				
Invested in capital assets	54,409,644	(33,340,573)		21,069,071
Restricted - debt reserve Hilltop WWTP		2,675,635		2,675,635
Restricted - debt reserve Downtown WWTP		973,680		973,680
Restricted - replacement reserve Hilltop WWTP		1,070,254		1,070,254
Restricted - reserve working capital				0
Unrestricted	4,378,011		41,995	4,420,006
Total net assets	**$58,787,655**	**($28,621,004)**	**$41,995**	**$30,208,646**
Total net assets and liabilites	**$59,122,462**	**$10,416,227**	**$41,995**	**$69,580,684**
Budget Basis Fund Balance				**10,082,012**

ATTACHMENT B

CITY OF KINGMAN - WASTEWATER
Statement of Revenues, Expenses and Changes in Fund Net Assets
As of June 30, 2015

	Wastewater Operating Fund	Wastewater Expansion Fund	Wastewater Cap Renewal Fund	Wastewater Fund Total FY15	Wastewater Fund Total FY14
Operating revenues					
Charges for services:					
Sewer base fees	$3,063,565			$3,063,565	$3,052,241
Sewer user fees	5,240,505			5,240,505	5,309,113
Development investment fees		390,219		390,219	574,836
Sewer Capital Renewal Fees			41,995	41,995	400
Other	550			550	
Total operating revenues	**8,304,620**	**390,219**	**41,995**	**8,736,834**	**8,936,590**
Operating expenses				8,346,065	
Personnel expenses					
Wastewater operations	641,566			641,566	815,464
Total personnel expenses	641,566	0	0	641,566	815,464
Supplies & services					
R & M, supplies & services	229,357			229,357	204,029
Bad debt	24,591			24,591	31,341
Chemicals	72,158			72,158	77,420
Sampling and permits	90,127			90,127	127,042
Electricity & gas	325,003			325,003	347,622
Total supplies & services	741,236	0	0	741,236	787,454
Internal services					
Fleet, facilities, IT, insurance	97,524			97,524	94,970
Total internal services	97,524	0	0	97,524	94,970
Capital expenses					
Improvements, equip & machinery	147,777	320,930		468,707	55,496
Total capital purchases	147,777	320,930	0	468,707	55,496
Total operating expenses	**1,628,103**	**320,930**	**0**	**1,949,033**	**1,753,384**
Operating income (loss)	**6,676,517**	**69,289**	**41,995**	**6,787,801**	**7,183,206**
Transfers and other					
Investment income	12,610	29,112		41,722	49,813
Miscellaneous	6,797	10,178		16,975	8,791
Transfers for Admin, PW & Engineer	(638,847)			(638,847)	(651,845)
Internal Fund Transfers	(5,660,392)	5,635,392		(25,000)	155,195
ADOT land payment	(61,106)			(61,106)	(61,106)
WIFA Debt payments		(3,634,060)		(3,634,060)	(3,634,060)
Net transfers and other	(6,340,938)	2,040,622	0	(4,300,316)	(4,133,212)
Net operating income (loss)	**$335,579**	**$2,109,911**	**$41,995**	**$2,487,485**	**$3,049,994**

ATTACHMENT C

CITY OF KINGMAN - WASTEWATER
FY2015-2016 and FY2016-2017 Revenue and Operating Expenses Forecast

	Projected FY2015-2016	Projected FY2016-2017
Operating revenues		
Charges for services:		
Sewer base fees	3,092,128	$8,494,099
Sewer user fees	5,334,770	600
Development investment fees	250,000	275,000
Sewer Capital Renewal Fees	116,337	118,507
Other	600	
Total operating revenues	**8,793,835**	**8,888,206**
Operating expenses		
Personnel expenses	557,084	900,000
Supplies & services	729,754	856,500
Internal services	97,604	100,000
Capital improvements, equipment & machinery	1,240,000	300,000
Total operating expenses	**2,624,442**	**2,156,500**
Operating income (loss)	**6,169,393**	**6,731,706**
Transfers and other		
Investment income	40,000	40,000
Miscellaneous	3,842	2,000
Transfers for Admin, PW & Engineer	(489,418)	(500,000)
ADOT land payment	(61,200)	(61,200)
WIFA Debt payments	(3,634,060)	(3,634,060)
Net transfers and other	(4,140,836)	(4,153,260)
Net operating income (loss)	**2,028,557**	**$2,578,446**

LOAN COVENANT COVERAGE CALCULATION

Wastewater Operating Net Income	6,963,817	6,573,706
Less: Debt Payments	(3,634,060)	(3,634,060)
Coverage sufficiency/(deficiency)	3,329,757	2,939,646
Estimated Coverage Ratio	**1.92**	**1.81**

ATTACHMENT D

CITY OF KINGMAN
CAPITAL IMPROVEMENTS PROGRAM

ALL PROJECTS

PROJECT DESCRIPTION	2016	2017	2018	2019	2020	2021	TOTAL
PUBLIC WORKS - SEWER							
Andy Devine Ave. Sewer Extension			600,000	600,000			1,200,000
Berk-Beverly Sewer Extension	0	585,806					585,806
Broadway Ave. Sewer Extension	0	0		500,000			500,000
Chestnut Sewer Line Relocation Phase I	0	110,000					110,000
Chestnut Sewer Line Relocation Phase II			60,000				60,000
Downtown Sewer Outfall Line	0		875,000	4,000,000	1,950,000	1,950,000	8,775,000
Goldroad Avenue Sewer Replacement			52,000				52,000
I-40 Sewer Line Boring	0	224,000	255,000				479,000
Mohave Channel Trunk Sewer	0	450,000					450,000
Reclaimed Water Airport							0
Reclaimed Water Golfcourse							0
Reclaimed Water Injection		88,000	483,500	483,500			1,055,000
Sewer Extension Capital Projects	300,000	300,000	100,000	100,000	100,000	100,000	1,000,000
Sewer Line Replacement/Realignment	150,000	150,000	150,000	150,000	150,000	150,000	900,000
Sewer Master Plan Update	100,000						100,000
Sewer Slip Lining/Repair	50,000	200,000	50,000	200,000	50,000	200,000	750,000
Sewer GIS Mapping		130,000					130,000
South Kingman Sewer		0	0	600,000	600,000	550,000	1,750,000
Wastewater Infiltration Projects		145,000	145,000	145,000	145,000	87,000	667,000
TOTAL PUBLIC WORKS - SEWER	600,000	2,382,806	2,770,500	6,778,500	2,995,000	3,037,000	18,563,806

ATTACHMENT E

CITY OF KINGMAN - WASTEWATER

Wastewater Rate Reduction Options and Projected Impact on Net Revenues and Expenses

Using Projected FY2016-2017 Revenues and Operating Expenses

	Projected FY17	Option 1	Option 2	Option 3	Option 4
		Reduction of 25% in Residential Base Charges and User Rates	Reduction of $2 to Base Charges	Reduction of $1 to Base Charges and a 5% Decrease to User Rates	One-Time Credit to be Allocated to All Users (9,718 customers @ $3.75/mo/user)
Operating revenues					
Charges for services:					
Sewer base and user fees	$8,494,099	$8,494,099	$8,494,099	$8,494,099	$8,494,099
Other	600	600	600	600	600
Development Investment Fees	275,000	275,000	275,000	275,000	275,000
Capital Renewal Fees	118,507	118,507	118,507	118,507	118,507
Less: Est. decrease from sewer rates		(1,278,120)	(237,014)	(386,281)	(437,295)
Total operating revenue	**8,888,206**	**7,610,086**	**8,651,192**	**8,501,926**	**8,450,911**
Operating expenses					
Personnel expenses	900,000	900,000	900,000	900,000	900,000
Supplies & services	856,500	856,500	856,500	856,500	856,500
Internal services	100,000	100,000	100,000	100,000	100,000
Total operating expenses	**1,856,500**	**1,856,500**	**1,856,500**	**1,856,500**	**1,856,500**
Operating income (loss)	**7,031,706**	**5,753,586**	**6,794,692**	**6,645,426**	**6,594,411**
Transfers and other1					
Investment income	40,000	40,000	40,000	40,000	40,000
Miscellaneous	2,000	2,000	2,000	2,000	2,000
Transfers for Admin, PW & Engineer	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)
Operating Capital	(300,000)	(300,000)	(300,000)	(300,000)	(300,000)
ADOT land payment	(61,200)	(61,200)	(61,200)	(61,200)	(61,200)
WIFA Debt payments	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)
Net transfers and other	(4,453,260)	(4,453,260)	(4,453,260)	(4,453,260)	(4,453,260)
Net operating income (loss)	**$2,578,446**	**$1,300,326**	**$2,341,432**	**$2,192,166**	**$2,141,151**
Wastewater Operating Net Income	6,573,706	5,295,586	6,336,692	6,187,426	6,136,411
Less Debt payments	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)	(3,634,060)
Coverage sufficiency/(deficiency)	2,939,646	1,661,526	2,702,632	2,553,366	2,502,351
Estimated coverage ratio	**1.81**	**1.46**	**1.74**	**1.70**	**1.69**
FUND BALANCE ANALYSIS WITH OPTIONS:					
Estimated Beg. Fund Balance 7-1-16	8,332,022	8,332,022	8,332,022	8,332,022	8,332,022
Addition (Reduction) to Fund Balance	2,578,446	1,300,326	2,341,432	2,192,166	2,141,151
2017 CIP Program	(2,382,806)	(2,382,806)	(2,382,806)	(2,382,806)	(2,382,806)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-17	**7,749,115**	**6,470,995**	**7,512,101**	**7,362,835**	**7,311,820**
Fund Balance	7,749,115	6,470,995	7,512,101	7,362,835	7,311,820
Addition (Reduction) to Fund Balance	2,578,446	1,300,326	2,341,432	2,192,166	2,141,151
2018 CIP Program	(2,770,500)	(2,770,500)	(2,770,500)	(2,770,500)	(2,770,500)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-18	**6,778,515**	**4,222,274**	**6,304,486**	**6,005,953**	**5,903,925**
Fund Balance	6,778,515	4,222,274	6,304,486	6,005,953	5,903,925
Addition (Reduction) to Fund Balance	2,578,446	1,300,326	2,341,432	2,192,166	2,141,151
2019 CIP Program	(6,778,500)	(6,778,500)	(6,778,500)	(6,778,500)	(6,778,500)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-19	**1,799,914**	**(2,034,447)**	**1,088,871**	**641,072**	**488,029**
Fund Balance	1,799,914	(2,034,447)	1,088,871	641,072	488,029
Addition (Reduction) to Fund Balance	2,578,446	1,300,326	2,341,432	2,192,166	2,141,151
2020 CIP Program	(2,995,000)	(2,995,000)	(2,995,000)	(2,995,000)	(2,995,000)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-20	**604,813**	**(4,507,669)**	**(343,244)**	**(940,310)**	**(1,144,367)**
Fund Balance	604,813	(4,507,669)	(343,244)	(940,310)	(1,144,367)
Addition (Reduction) to Fund Balance	2,578,446	1,300,326	2,341,432	2,192,166	2,141,151
2021 CIP Program	(3,037,000)	(3,037,000)	(3,037,000)	(3,037,000)	(3,037,000)
Replacement Extension Provision	(778,547)	(778,547)	(778,547)	(778,547)	(778,547)
Estimated Ending Fund Balance 6-30-21	**(632,287)**	**(7,022,890)**	**(1,817,359)**	**(2,563,691)**	**(2,818,762)**

ATTACHMENT F

CITY OF KINGMAN - WATER
Statement of Net Assets
As of June 30, 2015

	Water Operating Fund	Water Cap Renewal Fund	Water Expansion Fund	Colorado Rvr Water Auth Fund	Total
ASSETS					
Current assets:					
Cash and investments	$5,956,429	$7,007,466	$7,453,078	$2,200,798	$22,617,771
Restricted assets-customer deposits	-				-
Accounts receivable	766,350	73,834			840,184
Inventories	162,873				162,873
Deposits	9,208				9,208
Total current assets	6,894,860	7,081,300	7,453,078	2,200,798	23,630,036
Noncurrent assets:					
Fixed assets land, infrastructure, etc.	54,695,491				54,695,491
Accumulated depreciation	(31,921,453)				(31,921,453)
Total noncurrent assets	22,774,038	-	-	-	22,774,038
Total assets	**$ 29,668,898**	**$ 7,081,300**	**$ 7,453,078**	**$ 2,200,798**	**$ 46,404,074**
LIABILITIES					
Current liabilities:					
Accounts payable	161,533	234,596	4,364		400,493
Accrued payroll & benefits	327,589				327,589
Deposits held for others	417,241				417,241
Donations - Restricted	135				135
Deferred revenue			709,052		709,052
Obligations under capital lease	54,553				54,553
Total current liabilities	961,051	234,596	713,416	-	1,909,063
Noncurrent liabilities:					
Non-current portion of long-term obligations	109,282				109,282
Total noncurrent liabilities	109,282	-	-	-	109,282
Total liabilities	**1,070,333**	**234,596**	**713,416**	**-**	**2,018,345**
NET ASSETS					
Reserved for Fixed Assets and Working Capital	23,136,250				23,136,250
Unrestricted	5,462,315	6,846,704	6,739,662	2,200,798	21,249,479
Total net assets	**$28,598,565**	**$6,846,704**	**$6,739,662**	**$ 2,200,798**	**$ 44,385,729**
Total liabilites and net assets	**$29,668,898**	**$7,081,300**	**$7,453,078**	**$2,200,798**	**$ 46,404,074**

ATTACHMENT G

CITY OF KINGMAN - WATER
Statement of Revenues, Expenses and Changes in Fund Net Assets
As of June 30, 2015

	Water Operating Fund	Water Cap Renewal Fund	Water Expansion Fund	Colorado Rvr Water Auth Fund	Water Fund Total FY15	Water Fund Total FY14
Operating revenues						
Charges for services:						
Metered water service	$ 6,194,420	$ -	$ -	$ -	$ 6,194,420	$ 6,534,553
Service charges	257,165				257,165	260,647
Capital renewal fees		840,833			840,833	831,688
Meter connection fees			688,098		688,098	543,444
Trust fees				267,003	267,003	764,765
Other	43,492		3,247		46,739	35,755
Total operating revenues	**6,495,077**	**840,833**	**691,345**	**267,003**	**8,294,258**	**8,970,852**
Operating expenses						264,765
Personnel expenses						
Water operations	2,888,103				2,888,103	2,846,638
Total personnel expenses	2,888,103	-	-	-	2,888,103	2,846,638
Supplies & services						
R & M, supplies & services	585,618				585,618	593,936
Bad debt	33,558	3,103			36,661	41,180
Chemicals	6,834				6,834	11,617
Merchant card fees	104,362				104,362	85,999
Sampling	58,871				58,871	35,622
Electricity, natural gas & gasoline	1,316,541				1,316,541	1,337,231
Total supplies & services	2,105,784	3,103	-	-	2,108,887	2,105,585
Internal services						
Fleet, facilities, IT, insurance	677,926				677,926	644,758
Total internal services	677,926	-	-	-	677,926	644,758
Capital expenses						
Improvements, equip & machinery	431,409	634,008	543,108		1,608,525	561,621
Total capital purchases	431,409	634,008	543,108	-	1,608,525	561,621
Total operating expenses	**6,103,222**	**637,111**	**543,108**	**-**	**7,283,441**	**6,158,602**
Operating income (loss)	**391,855**	**203,722**	**148,237**	**267,003**	**1,010,817**	**2,812,250**
Transfers and other						
Investment income	17,716	19,820	21,387	6,231	65,154	90,053
Interest expense	-					
ADOT land purchase	(61,106)				(61,106)	(61,106)
Transfer for Admin, PW & Engineer	(842,995)	1,000,000			157,005	163,463
Net transfers and other	(886,385)	1,019,820	21,387	6,231	161,053	192,410
Net operating income (loss)	**($494,530)**	**$1,223,542**	**$169,624**	**$273,234**	**$1,171,870**	**$3,004,660**

ATTACHMENT H

CITY OF KINGMAN

CAPITAL IMPROVEMENTS PROGRAM

ALL PROJECTS

PROJECT DESCRIPTION	2016	2017	2018	2019	2020	2021	TOTAL
PUBLIC WORKS - WATER							
24" D.I. Transmission Main Kino-Main Tanks Phase I			167,500	1,250,000			1,417,500
24" D.I. Transmission Main Kino-Main Tanks Phase II					1,125,000		1,125,000
Automated Meter Reading (AMR)		3,500,000	2,500,000	2,500,000	1,500,000		10,000,000
City Well 10 Pump & Motor				500,000			500,000
Distribution Lines	800,000	800,000	300,000	300,000	300,000	300,000	2,800,000
East Bench 16" Transmission Phase II	1,805,000	100,000					1,905,000
Grace Neal 12" Water Line				850,000			850,000
New Storage Tank-College Tank Farm			0		1375000		1,375,000
New Water Well/Tank Site				0	50,000		50,000
Pumping Equipment	100,000	100,000	200,000	100,000	200,000	100,000	800,000
Rattlesnake Pump & Motor	100,000	530,000					630,000
Storage Tank Restoration	285,000	50,000	200,000	50,000	200,000	50,000	835,000
Surge Tanks	185,000	100,000	65,000	65,000	65,000	65,000	545,000
Water Master Plan Update	50,000	250,000					300,000
Water GIS Mapping		130,000					130,000
TOTAL PUBLIC WORKS - WATER	3,325,000	5,560,000	3,432,500	5,615,000	4,815,000	515,000	23,262,500

AGENDA ITEM

3-A

CITY OF KINGMAN
MUNICIPAL UTILITY COMMISSION
COMMUNICATION

TO: Chairman and Commission Members

FROM: Engineering Services

MEETING DATE: March 24, 2016

AGENDA SUBJECT: Request for variance to waive the requirement to extend sewer across the frontage of 569 Anson Smith Road, ENG16-0009

SUMMARY: Staff has received a request for a variance to the Utility Regulations regarding extension of sewer mains. The property in question is a corner lot located at the intersection of Anson Smith Road and N. Harvard Street with an address of 569 Anson Smith Road and a parcel number of 305-14-010D. The property owners, Gene and Jennifer Chambers, have submitted a letter requesting (1) to waive the requirement to extend sewer in N. Harvard Street, and (2) to extend sewer across only a portion of the Anson Smith frontage.

The subject property is approximately 1.14 acres in size and has a single family home built in 1967, which utilizes a septic disposal system. It is understood that the septic system has failed. There is an existing manhole at the intersection of Harvard Street and Anson Smith Road, which will serve as the point of sewer connection.

Section 7.2 A (2) of the Utility Regulations requires that the sewer extension be made across the frontage of both Anson Smith Road and N. Harvard Street. In 2014, the City reviewed a similar request for a property at Airfield Avenue and Apache Drive (ENG14-026). Ultimately, City Council required the 2014 applicant to extend a sewer main across one full frontage.

Staff recommends requiring a sewer extension across the full property frontage of Anson Smith Road – a total distance of approximately 240 feet.

ATTACHMENTS: MUC Application
Request for Variance Letter of March 4, 2016
Maps
Utility Regulations Section 7.2 A (2)

CITY OF KINGMAN
ENGINEERING DEPARTMENT

MUNICIPAL UTILITY COMMISSION
UTILITY SERVICE APPLICATION FOR REVIEW

310 N. 4th Street Kingman, AZ 86401 Ph: (928) 753-8122 Fax: (928) 753-8118

Date: 3/3/16

Applicant Information:

Name: GENE A & JENNIFER CHAMBERS Company Name:

Phone: (928) 757-7240 Fax:

Address: PO Box 6342 City, State, Zip:

Email: genejen@hotmail.com

Agent Information (if applicable):

Name: Company Name:

Phone: Fax:

Address: City, State, Zip:

Email:

Application For:

☐ Water Service to Unsubdivided Parcel ($250 application fee)

☐ Water Service to Subdivision ($250 application fee)

☒ Other (please explain or attach additional sheets as needed): SEWER CONNECTION

Site/Project Information:

Mohave County Tax Parcel Number: 305-14-010D

Property Address : 569 ANSON SMITH RD

Proposed Facility or Use for Water Request:

Applicant Signature: Jennifer Chambers

CITY OF KINGMAN ENGINEERING DEPARTMENT USE ONLY

Date Received: 3-4-16 Received By: mgs Date Admin Complete: 3-4-16

COK Project Number: ENG16-0009 Fee Paid:

Check Number: Charge Card Type: Receipt Number:

City of Kingman

310 Nth 4th St

Kingman Az. 86401

Request for Variance – Sewer Installation

We, the owners of property in the City of Kingman Parcel #305-14-010D

Address 569 W. Anson Smith Rd. Kingman Az. 86409 hereby request a variance

To NOT have to install a sewer line on N. Harvard St. (3200 block) Kingman Az 86409.

We request a permit to install a sewer line on W. Anson Smith Rd. (500 block) only

In order to service the above referenced property as far as the residence, not to the property line.

Signed Gene A. Chambers

Gene A. Chambers

Signed Jennifer Chambers

Jennifer Chambers

CITY OF KINGMAN
ENGINEERING

MAR 0 4 2015

RECV'D _____

N
W
E
S
N HARVARD ST
HODGES RD
N FAIRFAX ST
SYCAMORE AVE
KENWOOD AVE
N MANOR DR
ASTOR AVE
WESTERN AVE
ASTOR AVE
N HARVARD ST
Subject Property
SHELDON AVE
PALA MESA DR
TIERRA DEL SOL
ANSON SMITH RD
CALUMET AVE
VISTA GRANDE DR
WILSHIRE AVE
N FIFTH ST
BEVERLY AVE
N RALPH AVE
Project ENG16-0009
569 Anson Smith Road
Gene and Jennifer Chambers

N
W
E
S
3355 N HARVARD ST
305-14-001B
ASTOR AVE
626 SYCAMORE AVE 000000000
305-16-031
3335 N HARVARD ST KINGMAN 86401
305-14-010F
Subject Property
N HARVARD ST
305-16-028
21N 17W
305-14-010E
305-14-010A
12
305-14-010D
569 ANSON SMITH RD 000000000
3270 N HARVARD ST KINGMAN 864090000
Requested Sewer Extension +/- 120 Feet
ANSON SMITH RD
Recommended Sewer Extension +/- 240 Feet
305-14-013C
305-51-070
305-51-069
305-51-068
305-51-067
305-51-066
305-51-065
VISTA GRANDE DR
8" PVC
305-51-132B

3A

7.2 LOCATION

A. Generally

1. All extensions to the City of Kingman water and sewer system shall begin at the nearest point determined to be adequate by the Water and Wastewater Superintendents. Generally water system extensions shall not be connected to transmission mains. If connection is allowed a valve shall be inserted in the transmission main adjacent to proposed tee if necessary to satisfy applicable valve spacing requirements for distribution systems. [Ord.1756, 6/18/13]

2. A public water or sewer extension shall be required to extend across the total frontage of the property to be served. In instances where, due to topography, location, or surroundings, the engineering design shows that the water or sewer line can not be extended further to serve additional properties, the City Engineer may allow the developer to end the line without crossing the total frontage.

   a. The line must be constructed to provide for any extensions to property that can be developed.

   b. In the case of a sewer line, a cleanout shall be provided at the end of the extension. [Ord. 7l4, 8/0l/88]

   c. In the case of a water line, the line shall be looped to the system or provided with a fire hydrant in the discretion of the Water Superintendent. [Ord. 7l4, 8/0l/88; Ord.1756, 6/18/13]

   d. Any developer who is dissatisfied with a decision under this paragraph may appeal to Council.

   e. The requirement to extend a water or sewer line across the total frontage of the property to be served does not apply at the Kingman Airport Industrial Park. [Ord 759, 8/07/89]

B. Public water or sewer extensions shall be installed in dedicated public rights-of-way. Extensions may be constructed in open easements upon approval of the Water or Wastewater Superintendent. [Ord. 701, 4/04/88; Ord.1756, 6/18/13]

]

7.3 DESIGN

A. Minimum Size

AGENDA ITEM

3-B

CITY OF KINGMAN
MUNICIPAL UTILITY COMMISSION
COMMUNICATION

TO: Chairman and Commission Members

FROM: Engineering Services

MEETING DATE: March 24, 2016

AGENDA SUBJECT: Request for variance to waive the requirement to extend sewer to a new subdivision, ENG16-0008

SUMMARY: Staff has received a request from Angle Homes for a variance to the Utility Regulations regarding the extension of sewer mains to a proposed subdivision. The subdivision is located west of Sage Street between Louise Avenue and Pasadena Avenue. It includes three properties (311-20-032, 311-20-033, 311-20-036) totaling approximately 34 acres.

The proposal is to create 29 one-acre size lots. Mr. Angle is requesting that the subdivision have individual septic systems due to the following reasons: lot size, sewer depth and cost considerations. The closest available sewer main is over a half mile to the north in Airfield Avenue.

The Sewer Service Policy of the Utility Regulations states the following:

> *It is the City's policy that, unless specifically excepted, all new subdivisions within the City Water Service Boundary shall provide for the discharge of domestic and other liquid waste in the municipal sewerage system. It is intended that no new subdivisions inside or outside the City limits will be granted water service unless they are served by a central sewage collection system. All developers shall be required to extend to and through their project a sewage collection system of a size sufficient to dispose of these wastes to the public system. When deemed appropriate and necessary, the developer shall extend the main trunk and/or collector lines to the upstream extremities of the project so as to provide reasonable access for potential upstream users to the City system. [Ord 1708, 6/7/11]*

Staff recommends that the proposed subdivision connect to the City sewer system as required by the Utility Regulations.

ATTACHMENTS: MUC Application
Letter from Angle Homes dated March 3, 2016
Letter to Angle Homes dated March 17, 2016
Maps
Utility Regulations Sewer Service Policy

CITY OF KINGMAN

ENGINEERING DEPARTMENT

MUNICIPAL UTILITY COMMISSION
UTILITY SERVICE APPLICATION FOR REVIEW

310 N. 4th Street Kingman, AZ 86401 Ph: (928) 753-8122 Fax: (928) 753-8118

Date: 02/09/2016

Applicant Information:

Name: Mohave Land Holdings
Company Name:
Phone: (928) 718-1550
Fax:
Address: 2331 E Hualapai Mountain Rd. Suite A
City, State, Zip:
Email: info@anglehomes.com

Agent Information (if applicable):

Name: Doug Angle / Bob Albrecht
Company Name: Mohave Land Holdings
Phone: (928) 715-7682 / (208) 866-2958
Fax: (928) 718-1556
Address: 2331 E Hualapai Mountain Rd. Suite A
City, State, Zip: Kingman Arizona 86401
Email: doug@anglehomes.com / bob.angledevelopr

Application For:

- [ ] Water Service to Unsubdivided Parcel ($250 application fee)
- [ ] Water Service to Subdivision ($250 application fee)
- [x] Other (please explain or attach additional sheets as needed): See attached Sheet

Site/Project Information:

Mohave County Tax Parcel Number: 311-20-032 / 311-20-033 / 311-20-036

Property Address :

Proposed Facility or Use for Water Request:

Applicant Signature:

CITY OF KINGMAN ENGINEERING DEPARTMENT USE ONLY

Date Received: 3·3·16 Received By: mgStewart Date Admin Complete: 3-3-16

COK Project Number: ENG16-0008 Fee Paid:

Check Number: Charge Card Type: Receipt Number:

ANGLE HOMES

2331 E Hualapai Mountain Rd, Suite A, Kingman, AZ 86401 | P: 928-718-1550 | F: 928-718-1556 | info@anglehomes.com

March 3, 2016

Municipal Utility Commission
City of Kingman
310 N.4th Street
Kingman, Az. 86401

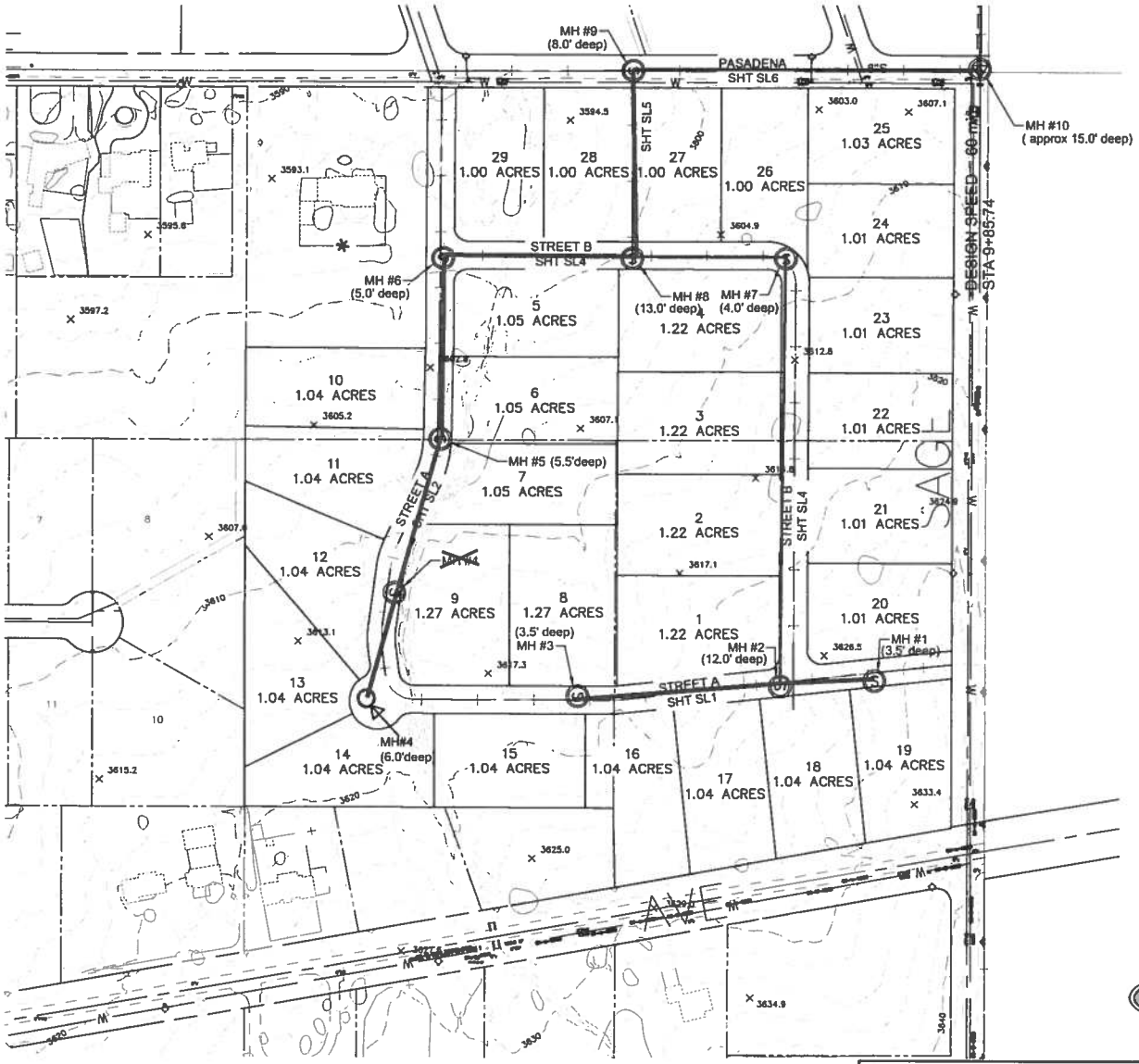
Re: Wastewater Service for 33 acres bounded by
Pasadena Avenue, N. Sage Street, Louise Avenue - See attached lot layout

We are working on a one acre subdivision on 33 acres that will contain approximately 29 one acre lots. We are requesting approval to install individual septic systems for the following reasons:

1. All lots are 1 acre and the state does not require sewer for one acre lot subdivisions.
2. The sewer would be up to 15 feet deep coming up Sage, the right of way (20 feet) is too narrow for equipment, trench slopes and the stockpiling of spoils during construction. It is also difficult to get an easement from the State of Arizona to increase your work area.
3. Within the subdivision the sewer lines would also have to be 12 foot and 13 foot deep to accept flow from all the lots.
4. It would be very costly to put sewer into this area with the available options.

Sincerely

Doug Angle
Angle Land Development



MOHAVE ENGINEERING ASSOCIATES, INC.
2513 GORDON DR, KINGMAN, AZ
POB 6547, 86402
INFO@MEAIAZ.COM
P:928.753.2627

SHEET TITLE: CONCEPTUAL LOT LAYOUT #2

MOHAVE ENGINEERING ASSOCIATES INC.	PLOT DATE: 1/26/2016 5:08 PM	PLOTTED BY: CHAD HENDRICKSON	PROJECT NAME: ANGLE HOMES	SUBMITTAL: CONCEPTUAL PLAN	DESIGNED BY: P.P.	DRAWN BY: C.T.H.	CHECKED BY: P.P.	PROJECT NUMBER: 15-178	SHEET NUMBER: LL2

G:\DROPBOX (MEA)\MEA PROJECT FILES\2015\15-178\CONCEPTUAL PLAN\LOT LAYOUTS\15-178 CP LOT LAYOUTS.DWG

City of Kingman
310 NORTH FOURTH STREET • KINGMAN • ARIZONA • 86401 • 928 • 753-5561
www.ci.kingman.az.us

March 17, 2016

Doug Angle
Angle Homes
2331 E. Hualapai Mountain Road, Suite A
Kingman, AZ 86401

RE: Request For Sewer Variance for New Subdivision
Mohave County Tax Parcels 311-20-032, -033, -036
City File ENG16-0008

Dear Mr. Angle:

I am in receipt of your March 3, 2016 letter requesting a variance for extending sewer to a new subdivision. The Municipal Utility Commission will review this request on March 24, 2016 at 5:30pm in the City Council chambers.

You have provided several reasons for not extending sewer to the three subject properties, which you propose to subdivide into 29 one-acre lots. I wanted to confirm the City's position on this matter and provide some additional clarifications.

Your letter requests the installation of individual septic systems for the following reasons:

1. All lots are 1 acre and the state does not require sewer for one acre lot subdivisions.

2. The sewer would be up to 15 feet deep coming up Sage, the right of way (20 feet} is too narrow for equipment, trench slopes and the stockpiling of spoils during construction. It is also difficult to get an easement from the State of Arizona to increase your work area.

3. Within the subdivision the sewer lines would also have to be 12 foot and 13 foot deep to accept flow from all the lots.

4. It would be very costly to put sewer into this area with the available options.

My response to your reasons follows below:

1. I believe the "one acre" rule that you are referencing is from Arizona Administrative Code (AAC) R18-5-404 and R18-9-A309 8(c)(i). The City is entitled to adopt and create its own sewer ordinances under Arizona Revised Statute (ARS) Title 9 and AAC R18-9-A309 5(a)(ii). As you know, the City's current policy requires all new subdivisions to connect to the sanitary sewer system. Therefore, we do not believe that the "one acre" rule applies within the City of Kingman service boundary.

2. If the Sage alignment creates a problem with depth (which may not be an issue for the City), then why not consider other alignments such as N. Central Street, Yavapai Drive or Apache Drive? A Central-Berry-Yavapai alignment will add length to the scope but will likely allow for the shallowest extension.

3. I am not sure that sewers 12 to 13 feet deep are a major problem for the City, and I do not understand why sewer lines within the entire subdivision would be required to be so deep. A "deep" sewer line in Pasadena should be able to collect sewage flows from the remaining subdivision at reasonably normal 5-6 foot depths. In fact, the plan that was attached to your MUC application verifies this statement.

4. I understand that economics are certainly a consideration for every development. There is nothing in the City rules that provides for consideration of a variance with respect to extending sewers. The only rule in the AAC is R18-9-A309 5(b)(ii) but, again, this rule is not applicable within the City service area, and in my opinion would only otherwise apply to individual home owners.

City staff recommends that new subdivisions connect to the sanitary sewer system as required by the Sewer Service Policy in the Kingman Utility Regulations.

Please let me know if you have any questions on this matter.

Sincerely,

Gregory T. Henry, P.E.
City Engineer

Enc. AAC R18-5-404 & R18-9-A309

R18-9-A309. General Provisions for On-site Wastewater Treatment Facilities

A. General requirements and prohibitions.

1. No person shall discharge sewage or wastewater that contains sewage from an on-site wastewater treatment facility except under an Aquifer Protection Permit issued by the Director.
2. A person shall not install, allow to be installed, or maintain a connection between any part of an on-site wastewater treatment facility and a drinking water system or supply so that sewage or wastewater contaminates the drinking water.
3. A person shall not bypass or release sewage or partially treated sewage that has not completed the treatment process from an on-site wastewater treatment facility.
4. A person shall not use a cesspool for sewage disposal.
5. A person constructing a new on-site wastewater treatment facility or replacing the treatment works or disposal works of an existing on-site wastewater treatment facility shall connect to a sewage collection system if:
   a. One of the following applies:
      i. A provision of a Nitrogen Management Area designation under R18-9-A317(C) requires connection;
      ii. A county, municipal, or sanitary district ordinance requires connection; or
      iii. The on-site wastewater treatment facility is located within an area identified for connection to a sewage collection system by a Certified Area-wide Water Quality Management Plan adopted under 18 A.A.C. 5 or a master plan adopted by a majority of the elected officials of a board or council for a county, municipality, or sanitary district; or
   b. A sewer service line extension is available at the property boundary and both of the following apply:
      i. The service connection fee is not more than $6000 for a dwelling or $10 times the daily design flow in gallons for a source other than a dwelling, and
      ii. The cost of constructing the building sewer from the wastewater source to the service connection is not more than $3000 for a dwelling or $5 times the daily design flow in gallons for a source other than a dwelling.
6. The Department shall prohibit installation of an on-site wastewater treatment facility if the installation will create an unsanitary condition or environmental nuisance or cause or contribute to a violation of an Aquifer Water Quality Standard.
7. A person shall operate the permitted on-site wastewater treatment facility so that:
   a. Flows to the facility consist of typical sewage and do not include any motor oil, gasoline, paint, varnish, solvent, pesticide, fertilizer, or other material not generally associated with toilet flushing, food preparation, laundry, or personal hygiene;
   b. Flows to the facility from commercial operations do not contain hazardous wastes as defined under A.R.S. § 49-921(5) or hazardous substances;
   c. If the sewage contains a component of nonresidential flow such as food preparation, laundry service, or other source, the sewage is adequately pretreated by an interceptor that complies with R18-9-A315 or another device authorized by a general permit or approved by the Department under R18-9-A312(G);
   d. Except as provided in subsection (A)(7)(c), a sewage flow that does not meet the numerical levels for typical sewage is adequately pretreated to meet the numerical levels before entry into an on-site wastewater treatment facility authorized by this Article;
   e. Flow to the facility does not exceed the design flow specified in the Discharge Authorization;
   f. The facility does not create an unsanitary condition or environmental nuisance, or cause or contribute to a violation of either a Aquifer Water Quality Standard or a Surface Water Quality Standard; and
   g. Activities at the site do not adversely affect the operation of the facility.
8. A person shall control the discharge of total nitrogen from an on-site wastewater treatment facility as follows:
   a. For an on-site wastewater treatment facility operating under the 1.09 General Permit or proposed for construction in a Notice of Intent to Discharge under a Type 4 General Permit and the facility is located within a Nitrogen Management Area, the provisions of R18-9-A317(D) apply;
   b. For an on-site wastewater treatment facility proposed for construction in a Notice of Intent to Discharge under R18-9-E323, the provisions of R18-9-E323(A)(4) apply;
   c. For a subdivision proposed under 18 A.A.C. 5, Article 4, for which on-site wastewater treatment facilities are used for sewage disposal, the permittee shall demonstrate in the geological report required in R18-5-408(E)(1) that total nitrogen loading from the on-site wastewater treatment facilities to groundwater is controlled by providing one of the following:
      i. For a subdivision platted for a single family dwelling on each lot, calculations that demonstrate that the number of lots within the subdivision does not exceed the number of acres contained within the boundaries of the subdivision;
      ii. For a subdivision platted for dwellings that do not meet the criteria specified in subsection (A)(8)(c)(i), calculations that demonstrate that the nitrogen loading over the total area of the subdivision is not more than 0.088 pounds (39.9 grams) of total nitrogen per day per acre calculated at a horizontal plane immediately beneath the active treatment of the disposal fields, based on a total nitrogen contribution to raw sewage of 0.0333 pounds (15.0 grams) of total nitrogen per day per person; or
      iii. An analysis by another means of demonstration showing that the nitrogen loading to the aquifer due to on-site wastewater treatment facilities within the subdivision does not cause or contribute to a violation of the Aquifer Water Quality Standard for nitrate at the applicable point of compliance.
9. Repairs.
   a. A Notice of Intent to Discharge is not required for routine work that maintains a facility.
   b. The following work is not considered routine work and a Notice of Intent to Discharge is required:
      i. Converting a facility from operation only under gravity to one requiring a pump or other powered equipment for treatment or disposal;
      ii. Modifying or replacing a facility operating under the 1.09 General Permit with a different

Historical Note
Correction in subsection (E) citation to A.R.S. should have read § 32-2101. Amended effective June 21, 1978 (Supp. 78-3). Former Section R9-8-1011 renumbered without change as Section R18-5-401 (Supp. 89-2).

R18-5-402. Approval of plans required

A. No subdivision or portion thereof shall be sold, offered for sale, leased or rented by any corporation, company or person, or offered to the public in any manner, and no permanent building shall be erected thereon until plans and specifications for the water supply, sewage disposal and method of garbage disposal to be provided in or to serve such subdivision shall have been submitted to and approved by the Department.

B. The plans of any proposed water supply and sewage disposal system shall be submitted in quadruplicate on a plat of the subdivision as recorded, or as will be recorded, in the office of the county recorder.

Historical Note
Former Section R9-8-1012 renumbered without change as Section R18-5-402 (Supp. 89-2).

R18-5-403. Application for approval

A. An application for approval, prepared in duplicate on forms furnished by the Department, shall be filed at the time the plans are submitted for approval. The form shall be completely filled out unless indicated otherwise.

B. The distance to the nearest public water supply main and to a sewer main of a municipal or community system shall be given.

Historical Note
Former Section R9-8-1013 renumbered without change as Section R18-5-403 (Supp. 89-2).

R18-5-404. Size of lots

The minimum size lot approved by the Department will be governed largely by the area necessary for the safe accommodation of individual wells and/or sewage disposal systems. Where both the water supply and sewage disposal system must be developed on the same lot, the minimum size shall be at least one acre, excluding streets, alleys and other rights-of-way. Where water from a central system is provided for residential uses, the lot shall be sufficient to accommodate the sewage disposal system and provide for at least 100 percent expansion of the system based on a four-bedroom house within the bounds of the property allowing a minimum of five feet distance to the property lines. Where lots are zoned for commercial uses, the lot shall be sufficient to accommodate the sewage disposal system and provide for at least 100 percent expansion of the system within the bounds of the property allowing a minimum of five feet distance to the property lines.

Historical Note
Former Section R9-8-1014 renumbered without change as Section R18-5-404 (Supp. 89-2).

R18-5-405. Responsibility of subdivider

Where plans for a subdivision include a public water supply system, or public sewerage system, it shall be the responsibility of the subdivider to provide the facilities to each lot in the subdivision prior to human occupancy. The installation of such facilities shall be in accordance with plans, or any revisions thereof, approved by the Department.

Historical Note
Former Section R9-8-1015 renumbered without change as Section R18-5-405 (Supp. 89-2).

R18-5-406. Public water systems

A. Where water from an approved public water system is proposed for use in a subdivision, the inside diameter, length, and location of all proposed and existing water mains and valves necessary to serve each and every lot shall be shown on the subdivision plat. If the existing main to which a connection will be made is not immediately adjacent to the property, the direction and distance shall be indicated on the plat by an arrow or other suitable means.

B. A letter shall be obtained and submitted with the application for approval of the subdivision from responsible officials of the water system indicating that an agreement has been reached to supply water to each individual lot in the subdivision.

C. Where the owner of a subdivision, or other interested person, firm, company or corporation, proposes to develop a source or sources of supply and to construct a distribution system to furnish water to the subdivision, either free or for charge, complete details of the proposed water system including plans and specifications shall be furnished. Department approval of the supply and proposed system shall first be obtained before an approval for the sale of lots will be granted. The installation of such facilities shall be in accordance with the plans, and any revisions thereof, approved by the Department.

D. Proposed water supply and distribution systems shall comply with A.A.C. Title 18, Chapter 4, Article 2, except those distribution lines which are a common element of a condominium shall be exempt from A.A.C. R18-4-234.

E. Where water from an approved public water system is proposed for use in a subdivision, the Department shall issue a Certificate of Approval for Sanitary Facilities for a Subdivision only if the applicant has complied with subsections (A) and (B) of this Section and the public water system is either:
1. in compliance with the provisions of A.A.C. Title 18, Chapter 4, Article 2; or
2. making satisfactory progress toward compliance with the provisions of A.A.C. Title 18, Chapter 4, Article 2 under a schedule approved by the Department.

F. The Department shall revoke the Certificate of Approval for Sanitary Facilities for a Subdivision and notify the Department of Real Estate of such action if the public water system in use by the subdivision is creating an environmental nuisance pursuant to A.R.S. § 49-141 and is neither:
1. is compliance with the provisions of A.A.C. Title 18, Chapter 4, Article 2; nor
2. making satisfactory progress toward compliance with the provisions of A.A.C. Title 18, Chapter 4, Article 2 under a schedule approved by the Department.

Historical Note
Amended effective June 21, 1978 (Supp. 78-3). Former Section R9-8-1021 renumbered without change as Section R18-5-406 (Supp. 89-2). Amended effective July 25, 1990 (Supp. 90-3).

R18-5-407. Public sewerage systems

A. Where a public sewerage system is already in existence, or if sewers are proposed and have been approved by the Department, it shall be necessary to show lines indicating the approximate location and size of the sewers on the subdivision plat.

B. Where the proposed sewers will connect to an existing public sewerage system, a letter from officials of the system shall be required stating that acceptable plans have been submitted and that the subdivider has been granted permission to connect to and become a part of the public sewerage system.

C. Proposed sewage disposal facilities shall comply with A.A.C. Title 18, Chapter 9, Article 8, except those drain lines which

Possible Sewer Extension
Possible Sewer Extension
Subject Property
N COX ST
N ALPHA S
N EVANS S
311-03-094A
N STEWART ST
N MELODY S
N TANNER S
N BROOK S
N RAINBOW ST
N JEROME S
N PRESCOTT ST
AIRFIELD AVE
N CLARK S
N LOMALAI
N DIAMOND ST
N JEWEL S
N YUMA ST
N APACHE S
N CIMPRESS ST
N SAGE ST
311-28-006A
YAVAPAI CIR
311-20-027
311-22-049
311-22-025
BERRY AVE
311-22-024
311-22-023
311-22-002B
311-22-003
ROSS AVE
BROUDY DR
DARREN DR
PASADENA AVE
QUAIL RIDGE CIR
311-20-082
311-20-037
311-20-036
FRANKLIN DR
FRANKLIN CT
BROUDY DR
ELLERMAN DR
EASTERN ST
GOLD CANYON CT
311-20-032
311-20-033
SIMMS AVE
311-20-074
LOUISE AVE
311-20-060
311-20-071
311-20-010
HARROD WAY
N
W
E
S
3B

Subject Properties +/- 34 Acres
PASADENA AVE
N CENTRAL ST
QUAIL RIDGE CIR
ELLERMAN DR
GOLD CANYON CT
SIMMS AVE
LOUISE AVE
N YAVAPAI DR
N APACHE DR
N SAGE ST
311-20-036
311-20-032
311-20-033
311-20-037
311-20-077
311-20-038
311-20-069
311-20-070
311-20-072
311-20-073
311-20-010
311-32-004
N
S
E
W

e. if a new water pressure zone is required, a description of the storage and pumping facilities proposed to accomplish this

In determining whether or not the City should provide water service to a new subdivision, an unsubdivided parcel or to any parcel lying outside of the City Municipal Water Service Area Boundary, or to extend the Water Service Area, the City Council shall take into account the following:

f. the distance the proposed new water service will be from the Water Service Area Boundary

g. whether or not the area proposed to be served by water will require the creation of a new pressure zone

h. the proposed development plan, density, and development standards

i. whether or not the proposed development is in conflict with any development plans inside the Water Service Area Boundary and/or any City Infill Development Program

j. whether or not the area to be served is within the City limits or should be annexed into the City

k. the impact on the proposed development would have on the existing water production, transmission, storage, and distribution systems

l. the relationship the proposed water extension has with the City of Kingman, Arizona, Water Master Plan Report, prepared by John Carollo Engineers, June 1988 [Ord 742, 03/20/1989]

SEWER SERVICE POLICY

It is the City's policy that, unless specifically excepted, all new subdivisions within the City Water Service Boundary shall provide for the discharge of domestic and other liquid waste in the municipal sewerage system. It is intended that no new subdivisions inside or outside the City limits will be granted water service unless they are served by a central sewage collection system. All developers shall be required to extend to and through their project a sewage collection system of a size sufficient to dispose of these wastes to the public system. When deemed appropriate and necessary, the developer shall extend the main trunk and/or collector lines to the upstream extremities of the project so as to provide reasonable access for potential upstream users to the City system. [Ord 1708, 6/7/11]

SANITARY SERVICE POLICY

It is the City's policy to provide residential and commercial sanitation services to all areas within the City limits. Residential pickup is scheduled for twice a week collection. Commercial collection is provided on an as needed schedule to accommodate the requirements of the individual users.

Containers are furnished by the City as part of this service. A trash collection service is also available from the Sanitation Department. This service is provided on an unscheduled basis. Citizens requiring the service need only call the City and arrange for a special pickup.

Contractors and builders should arrange with private haulers to have construction materials hauled from construction sites.

AGENDA ITEM

3-C

CITY OF KINGMAN
MUNICIPAL UTILITY COMMISSION
COMMUNICATION

TO: Chairman and Commission Members

FROM: Engineering Services

MEETING DATE: March 24, 2016

AGENDA SUBJECT: Presentation of Sewer Master Plan Study, ENG14-112

SUMMARY: On January 6, 2015, the City hired Sunrise Engineering to prepare a Sewer Master Plan Report and Infiltration Study. The planning area for the study includes the entire City Water Boundary. The plan examines the existing sewer system and provides recommendations on areas that have sewer pipe capacity concerns, as well as recommendations on the future expansion of the sewer system. In addition, the study examines areas of inflow and infiltration into the downtown sewer system and provides recommendations on projects to eliminate such inflow and infiltration (I&I).

The main body of the report is attached as are a few of the maps (Full size maps will be made available at the meeting). The figures and appendices have been removed due to the large file size. The full report is available on the City of Kingman website at the link below. City staff will provide a brief overview of the report and its recommendations to the Utility Commission. The Consultant will provide a presentation at the April 5 City Council meeting.

ATTACHMENTS: Sewer Master Report (text only)
Existing Sewer Connections Map
Downtown I&I Map
Future Hilltop Recommendations Map

FULL REPORT
WEB LINK: http://www.cityofkingman.gov/Departments/Engineering/DesignStudiesandReports.aspx

3C

DRAFT

Wastewater Master Plan Update & Inflow / Infiltration Study

Final Report - January 2016

CITY OF KINGMAN
FOUNDED 1882

SUNRISE ENGINEERING

3C

WASTEWATER MASTER PLAN UPDATE & INFLOW / INFILTRATION STUDY

FOR

JANUARY 2016

Prepared for:
City of Kingman
310 North 4th Street
Kingman, Arizona 86401
928.753.8329
Attn. Gregory T. Henry, P.E.

Prepared by:
Sunrise Engineering, Inc.
2152 South Vineyard, Suite 123
Mesa, Arizona 85210
480.768.8600

Project Team Leads:
Gregory D. Potter, P.E.
Project Principal

Randy M. Perham, P.E., CFM
Project Manager/Sewer Modeler

Christina Christian, E.I.T.
Assistant Project Manger

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1.0 INTRODUCTION

1.1 SCOPE OF WORK

The purpose of this Wastewater Master Plan Update and Inflow/Infiltration Study is to provide the City of Kingman (City) with an evaluation of the interceptor wastewater collection system for both the Downtown and Hilltop Service Areas. The most recent wastewater master plan and interceptor model for the Hilltop Service Area was developed in 2003 and the most recent report for Downtown was prepared in 2011. While both reports are being utilized, they do not sufficiently meet the current planning needs. The City's General Plan has been updated, as such, land usage has changed, and there have been changes and expansions to the City's collection system. The interceptor modeling and analysis performed under this project reflects the sewer network as currently constructed, includes the impact of land use updates, and includes an inflow/infiltration study for the Downtown. It is intended that this report will function as a planning tool to determine deficiencies with existing facilities, as well as sizing of future facilities and provide a comprehensive analysis of the City's entire network.

The scope of work for the project consisted of 6 major tasks including:

- Data Collection & Supplemental Manhole Survey
- Sewer Interceptor Model Data Input
- Existing (2016) Sewer Interceptor Modeling & Analysis – Hilltop Service Area
- Existing (2016) Sewer Interceptor Modeling & Analysis – Downtown Service Area
- Inflow/Infiltration Study – Downtown Service Area
- Future Sewer Interceptor Modeling & Analysis – Hilltop Service Area

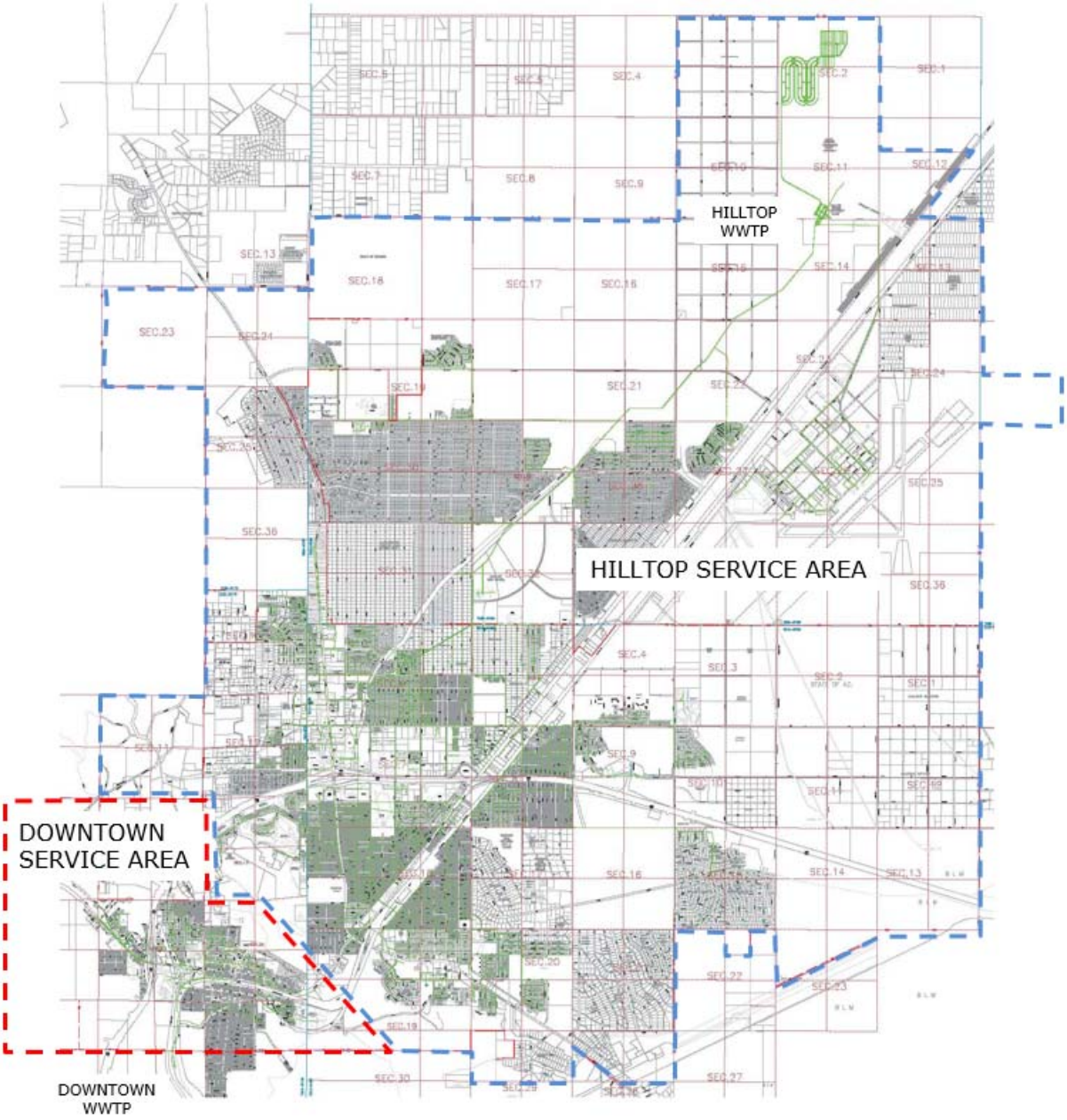
This Wastewater Master Plan Update provided modeling and analysis for wastewater service within the entire City boundary and a substantial portion of the General Plan 2030 boundary. The study boundaries were selected by the City and closely mimic the current Water Service Boundary. Further analysis and master-planning will be required for those areas outside of the study boundary.

1.2 PROJECT PLANNING AREA

The City of Kingman is located in Mohave County in Northwestern Arizona along historic Route 66. The City is approximately 150 miles west of Flagstaff and 100 miles southeast of Las Vegas. Nearby communities include Bullhead City and Laughlin 35 miles to the west and Lake Havasu City 60 miles to the southwest. The project study boundary is within a portion of the City of Kingman 2030 planning boundary and is shown on the map in **Figure 1.2.1 – Project Study Boundary**. This boundary was established by the City to accommodate projected short and long term planning needs.

The majority of the area within the study boundary falls within the Hilltop Service Area. The remainder of the study area falls within the Downtown Service Area which is located in the southwestern portion of the City roughly bound by Sunrise Ave to the North, Western Ave to the East, and the study boundary to the South and West.

Figure 1.2.1



1.3 BACKGROUND INFORMATION

Growth and development in Kingman has necessitated the expansion of the City's interceptor system. Over the years, different analyses, master plans and sewer interceptor models have been developed to service the planning areas defined by the City. Most recently, the main tools utilized for sizing and routing of these expansions have been the *Trunk Sewer Master Plan*, May 2003, by Burgess & Niple for the Hilltop Service Area and the *Sewer Master Plan for Kingman Commercial Center*, January 2011, by Shephard-Wesnitzer for the Downtown Service Area. However, both of these reports are limited in their scope and do not address all of the current planning needs. For instance, the *Trunk Sewer Master Plan* analyzes a smaller planning boundary and focuses on the deficiencies of existing trunk mains for both existing and buildout conditions. In addition, the City's General Plan has changed since the completion of this report, which has a direct impact on the flow loading of the City's interceptor system. Secondly, the *Sewer Master Plan for Kingman Commercial Center* doesn't include an interceptor model, focuses only on a portion of the Downtown Service Area, and doesn't address inflow/infiltration (I&I) concerns.

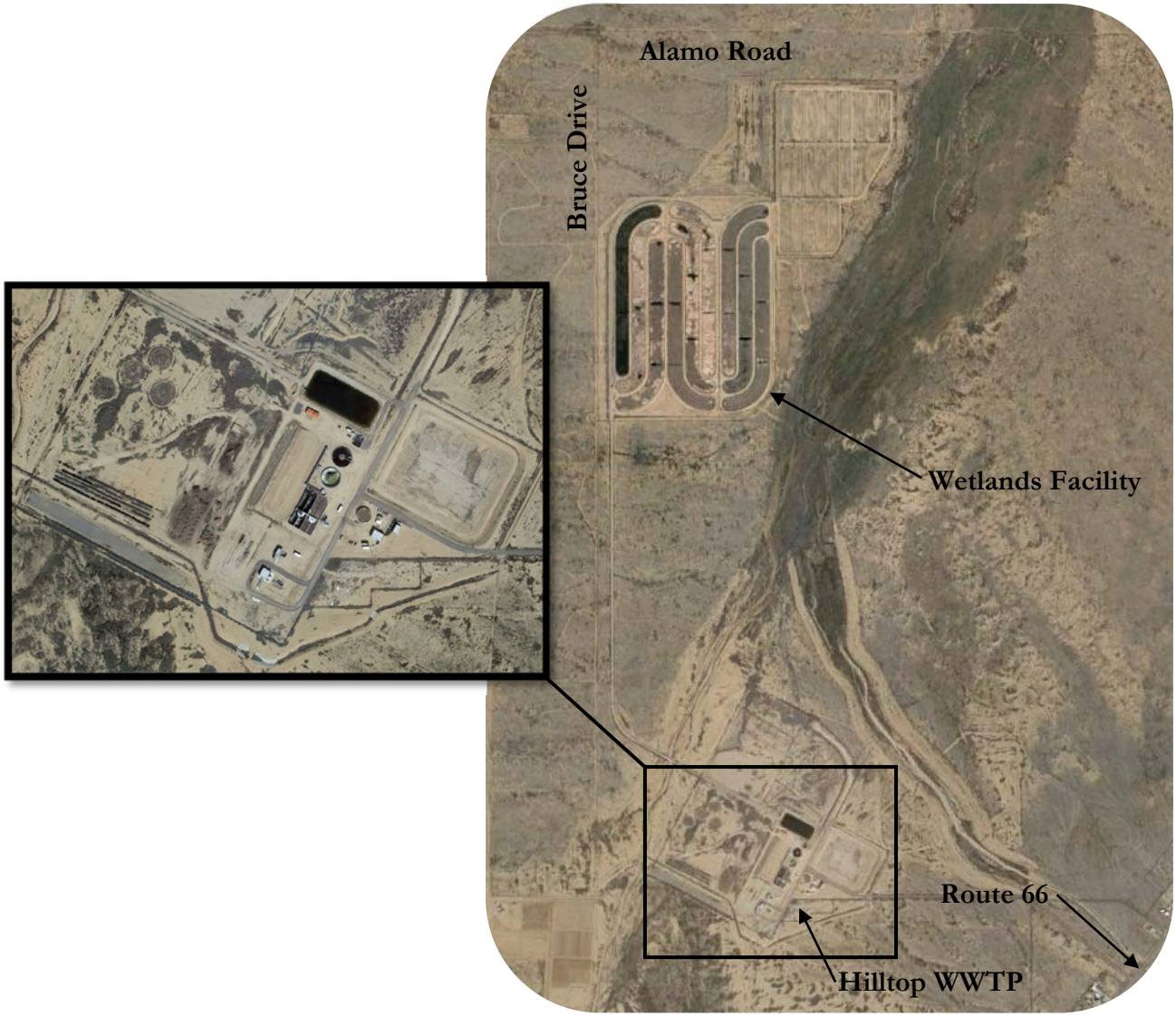
There are three main reasons for a Wastewater Master Plan Update and Inflow/Infiltration Study. The first reason is to provide an analysis of City's interceptor sewer system based on the latest General Plan and the changes that have occurred since the previous reports were written. The second purpose is to provide a comprehensive modeling tool for the entire planning boundary. The City may utilize these models to easily modify sizing due to updated land use, topography, or flow loading and perform additional analyses for future development and service area expansions. Lastly, this report investigates sources of I&I causing significant storm surge (wet weather peaking) at the Downtown Wastewater Treatment Plant (WWTP).

1.4 OUTFALL CAPACITIES

The topography of the Hilltop Service Area generally slopes in a southeasterly direction at approximately 1.5% to 3.5% north of the Mohave Wash and in a northwesterly direction at approximately 1.3% to 3.0% south of the Mohave Wash. The Mohave Wash flows diagonally from southwest to northeast across the Project Study Boundary and is roughly parallel to Arizona Highway 66. The City's two major outfall interceptors run adjacent to the Mohave Wash. As expected from the topography, all of the City's trunk mains feed into the two main outfall interceptors which eventually convey flow to the ultimate outfall at the Hilltop Wastewater Treatment Plant. The Hilltop WWTP is owned and operated by the City of Kingman and has a current capacity of 5.1 MGD. The City of Kingman will likely expand this facility beyond the current capacity to 10.1 MGD to meet future demand.

Figure 1.4.1 – Hilltop WWTP shows the aerial view of the Hilltop Wastewater Treatment Plant located at the northeast corner of Project Study Boundary and north of Route 66.

Figure 1.4.1



The topography of the Downtown Service Area is highly variable, characterized by rocky hills, canyons, and washes. Slopes vary but generally run in a southwesterly direction east of the Johnson Wash and southeasterly direction west of the Johnson Wash. The Johnson Wash flows from north to south in between Route 66 and the Old Trails Road. All of the Downtown trunk mains feed into the main outfall interceptor, an above ground, ductile iron sewer main running along the edge of the Johnson Wash. This line eventually conveys flow to the ultimate outfall at the Downtown Wastewater Treatment Plant. The Downtown WWTP is also owned and operated by the City of Kingman and has a current capacity of 0.62 MGD.

Figure 1.4.2 – Downtown WWTP shows the aerial view of the Downtown Wastewater Treatment Plant located at the southwest corner of Project Study Boundary.

Figure 1.4.2

1.5 PREVIOUS STUDIES

The analysis shown in this report primarily used background data from two previous wastewater collection system reports, three wastewater treatment plant reports, and the latest General Plan. The reports, ordered by date, are as follows:

Trunk Sewer Master Plan, May 2003, *Burgess & Niple*: This study provided an analysis of the City's existing sewer system for the Hilltop Service Area. More specifically it analyzed six major trunk mains (Airway West, Fairgrounds, Harrison Street, East Trunk, Kino, and Airport) under existing loading conditions and build out conditions. The proposed sewer interceptor improvements for future loading are parallel lines along the existing trunk mains. This report did not size any future interceptors outside of the parallel trunk mains proposed in the recommendations. This report did include a sewer model and flow monitoring. The vertical data (manhole rims and invert elevations) was useful in verifying and supplementing the as-built data used to build the Hilltop interceptor model for this project.

Request for Amendment to 208 Area-Wide Water Quality Management Plan, August 2007, *Brown and Caldwell*: This study provided an analysis of the City's planned upgrades and expansions to the Hilltop WWTP in compliance with the Mohave County regional Water Quality Management Plan.

Hilltop Wastewater Treatment Plant Aquifer Protection Program (APP) Permit Amendment Application (and supporting documentation), August 2007, *Brown and Caldwell*: This included the Arizona Department of Environmental Quality (ADEQ) APP Amendment form, as well as, all necessary attachments to amend the City's current APP (P-100611). The purpose of the amendment is to allow for the expansion and upgrade of the Hilltop WWTP. The report discusses all aspects of the expansion which would increase the plants flow capacity and allow them to produce higher quality effluent for discharge and reuse.

Downtown Wastewater Treatment Plant Upgrade and Expansion Preliminary Design Report (PDR), November 2009, *Brown and Caldwell*: This study provided a preliminary analysis and options for replacing the Downtown WWTP aerated lagoons system with a different treatment process. The replacement of the aerated lagoon system was triggered by the inability to meet ADEQ effluent standards.

Sewer Master Plan for Kingman Commercial Center (and surrounding areas), January 2011, *Shephard – Wesnitzer*: This study provided an analysis of a portion of the Downtown Service Area called the Kingman Commercial Center and the surrounding area. The report provided recommendations for alternative routing for the failing outfall interceptor for this area and for relocating sewer lines that crossed into private property.

City of Kingman General Plan Update 2030, March 2014, *City of Kingman:* This study provides a comprehensive reference for guiding future growth and development within the City limits and planning boundary. The report includes land use descriptions and a summary of recent upgrades to the City's WWTPs.

1.6 MODELING SOFTWARE

The modeling software employed in this analysis was H_2OMAP Sewer Pro Suite version 10.5, by *Innovyze*. H_2OMAP Sewer is a powerful, stand-alone GIS-based computer program for use in the planning, design, analysis, and expansion of sanitary, storm and combined sewer collection systems. The program can be effectively used to model both dry-weather and wet-weather flows and determine the most cost-effective and reliable method of wastewater collection. The software allows the user to seamlessly view, manipulate, and exchange GIS data sets with relative ease. This feature is particularly beneficial because all hydraulic and geometric data sets generated from the project modeling can be fully integrated into the City's future GIS database. The City may utilize the stand-alone H_2OMAP Sewer or convert to the GIS based InfoSewer, also by *Innovyze*, which runs within ArcGIS.

Both H_2OMAP Sewer and InfoSewer allow various shapefiles and images to be brought into the modeling environment for reference purposes or data storage. For example, parcel shapefiles can be utilized to store a specified allocation manhole. In other words, every parcel in the City could store the unique manhole ID to which it contributes flow. This same file could store land use data or utilize an overlaid land use shapefile and, using H_2OMAP Sewer's Load Allocator module, allocate sewer flow and population loads to a specific manhole. This is a powerful tool for the City staff to utilize when land usage and/or load factors change and thereby keep the interceptor model up to date with changing conditions.

2.0 DATA COLLECTION

Every attempt was made to ensure that model input data was current and representative of the actual physical system. This included analyzing a sewer infrastructure network map provided by City and comparing it against supplemental survey data, as well as sewer record drawings and available technical reports.

2.1 CITY DATA COLLECTION

The first project task involved coordination with the City's engineering department to retrieve any pertinent sewer data for inclusion in the model. This data consisted of a digital CAD drawing showing all of the City's sewer infrastructure which included pipe sizing, material data, and as-built reference numbers. Other appurtenant files which supported the completion of the collection system mapping and model setup were also provided. The files collected included the following:

- Aerial Imagery
- Sewer As-built Record Drawings
- Previous Interceptor Model
- Parcel Information (City and County)
- Mohave County Topography (contours)
- AutoCAD Infrastructure Drawing
  - Manholes (dwg)
  - Gravity Pipes (dwg)
  - Force Mains (dwg)
- Land Use Data
  - City Zoning Map (dwg)
  - General Plan 2020 Map (dwg)
  - General Plan 2030 Map (pdf)
- Sewer Flow Data
  - Significant Industrial Users
  - Jail and Hospital Flows
  - Subdivision Design Flows
  - WWTP Influent Flow

In general, the data provided appeared to be consistent with the horizontal datum NAD 27 (North American Datum of 1927) and the vertical datum NGVD 29 (National Geodetic Vertical Datum of 1929). The major exception to this was the CAD drawing which was on the horizontal datum NAD 83, AZ State Plane Zone West, US Survey Feet, with ground correction. Other exceptions include a few record sewer as-built drawings on unidentified datum; most likely utilizing localized coordinates. Per the City's request, all data was converted to the horizontal datum AZ83CIF (Arizona State Plan Coordinates, NAD83, West Zone, International Feet) and the vertical datum NAVD 88, prior to being entered into model.

The CAD drawing was useful for providing a relatively accurate horizontal layout of the sewer interceptors. However, all vertical data (manhole rims and pipe inverts) had to be gathered from the as-builts and reports and manually entered. This vertical data was added as object data onto the manholes and pipes within AutoCAD Civil 3D and then exported out as shapefiles. A shapefile can easily be imported into H_2OMAP Sewer and all object data can be mapped to the correct hydraulic field within the model. Considerable time was taken to ensure that elevations were accurate throughout the interceptor model. As part of that effort, whenever missing or questionable data was observed, field-survey data was obtained (See **Section 2.2**) to verify or correct elevations at various points in the network.

2.2 INTERCEPTOR MANHOLE SURVEY

The City requested that any deficiencies in the as-builts or reports (i.e. missing/questionable vertical and horizontal data) be supplemented with survey to refine the model input data. A field survey of approximately 100 sewer interceptor manholes was conducted as part of the data collection effort. Surveyors collected the following data for each manhole: horizontal location (northing & easting), rim elevation, depth to pipe inverts, and compass direction of inverts. This data was then input into the model. Manhole rim elevations at other locations in the interceptor network were spot checked using the latest aerial topography from Mohave County and the City. This review indicated general consistency between the aerial topography and the as-built data. The addition of field survey data, along with as-built maps and technical reports allowed for the completion of the interceptor models. The approximate location of all of the surveyed manholes are shown in **Table 2.2.1** (Hilltop) and **Table 2.2.2** (Downtown):

Table 2.2.1

Manhole ID	Location (Hilltop Service Area)	Manhole ID	Location (Hilltop Service Area)
76	Monroe St & Karen Ave	674	Motor & Fairgrounds Ave
78	Jackson St & Karen Ave	675	Hope & Fairgrounds Ave
79*	Jackson St & Karen Ave	738	Hope Ave & Main St
80	Van Buren St & Karen Ave	832*	Hope Ave & Main St
81	Van Buren St & Karen Ave	833	Hope & Fairgrounds Ave
712	Historic Rte 66 & Hall St	953*	Motor & Fairgrounds Ave
713	Historic Rte 66 & Hall St	148	Del Mar Ave & Legacy Dr
651	Sunset & Fairgrounds Blvd	407	Coronado Ave & N Irving St
718	Sunset Blvd & Main St	433	Will Rogers Way & N Glen Rd
954	Sunset Blvd & Main St	434	Will Rogers Way & N Glen Rd
1000	Sunset Blvd & Kingman Ave	435	Jimmy Stewart Dr & N Glen Rd
1002	Sunset Blvd & Kingman Ave	450	Kino Ave & Mohave Wash
657	Wikieup & Fairgrounds Ave	451	Kino Ave & Mohave Wash
658	Mullen & Fairgrounds Ave	708	Kino Ave & Bond St
659*	Mullen & Fairgrounds Ave	709	Kino Ave & Bond St
724	Wikieup Ave & Main St	134*	Airway Ave & Harrison St
725*	Mullen Ave & Main St	136	Airway Ave & Harrison St
831*	Airway Ave & N Rainbow Dr	137	Airway Ave & Harrison St
868*	Airway Ave & N Rainbow Dr	879	Airway Ave & N Pinal St
870*	Airway Ave & N Rainbow Dr	880	Airway Ave & Coolidge St
894	Airway Ave & N Rainbow Dr	882	Airway Ave & Roosevelt St
957*	Airway Ave & N Rainbow Dr	884	Airway Ave & Rutherford St
535	Kino Ave & N Bank St	885*	Airway Ave & Rutherford St
956	Kino Ave & N Bank St	592	Airway Ave & Castle Rock Rd
556*	Heather Ave	593	Airway Ave & Castle Rock Rd
557*	Heather Ave	594	Airway Ave & Santa Rosa Dr
558*	Heather Ave	595	Airway Ave & Santa Rosa Dr
561*	Airway Ave & Castle Rock Rd	598	Quarter Cir Ave & Rawhide Dr
154	Gordon Dr & N Bank St	599	Quarter Cir Ave & Rawhide Dr

155	Gordon Dr & N Bank St
229	Gordon Dr & N Bank St
230	Gordon Dr & N Bank St
404	Gordon Dr & N Bank St
178	Thompson & Mohave Wash
256	Thompson & Mohave Wash

600	Quarter Cir Ave & Rawhide Dr
601*	Quarter Cir Ave & Rawhide Dr
602*	Quarter Cir Ave & Rawhide Dr
161	N of Kingman HS Ball Fields
163	N of Kingman HS Ball Fields
238	N of Kingman HS Ball Fields
240	N of Kingman HS Ball Fields

*Horizontal Data Only.

Table 2.2.2

Manhole ID	Location (Downtown Service Area)
45	W Beale St & Fort Beale Dr
11	W Beale St & I-40
15	W Beale St & Johnson Wash
16	W Beale St & Johnson Wash
17	W Beale St & Johnson Wash
61	W Oak St & Parkview Ave
62*	W Oak St & Parkview Ave
20*	W Beale St & Parkview Ave
22*	SW of LWHS Ball Fields
70*	W Oak St & Parkview Ave
71*	W Oak St & Grandview Ave
72*	W Oak St & Grandview Ave
25*	Locomotive Park
87	N of LWHS Ball Fields
88	S of LWHS Ball Fields

Manhole ID	Location (Downtown Service Area)
28	SW of Powerhouse Museum
96	Historic Rte 66 & N 1st St
97	Historic Rte 66 & N 1st St
99*	Historic Rte 66 & N 1st St
100	S of Powerhouse Museum
101*	Historic Rte 66 & N 10th St
102	Historic Rte 66 & N 10th St
124	Park & S 6th St
125*	Park & S 6th St
128	Hubbs & S 4th St
131	Goldroad & S 4th St
134	Goldroad & S 2nd St
135*	Goldroad & S 2nd St
144*	Golconda Ave & S 2nd St

*Horizontal Data Only.

Through analyzing the survey data, as-builts, and reports, multiple flow split locations were identified in the interceptor model for the Hilltop Service Area. No flow splits were identified for the Downtown Service Area model. The approximate location of all of the flow split manholes are shown in **Table 2.2.3**:

Table 2.2.3

Manhole ID	Flow Split Location (Hilltop Service Area)
88	Harrod Ave & Van Buren St
116	Van Marter Dr & Harrison St
119	Detroit Ave & Harrison St
137	Airway Ave & N Willow Rd
144	Del Mar Ave & N Willow Rd

Manhole ID	Flow Split Location (Hilltop Service Area)
720	Simms Ave & Main St
770	Detroit & Western Ave
831	Airway Ave & N Rainbow Dr
858	Walapai Ave & Railroad St

2.3 CITY OF KINGMAN LAND USE

Two sources were used to define land use for the Interceptor Sewer Models; the current City of Kingman Official Zoning Map and the General Plan 2030 Map (See Appendix B).

For developed parcels within the existing city limits, land use was primarily based on the City's Zoning Map. However, in some residential areas, the density (DU/Acre) within existing subdivisions was found to be different than the density defined by the current zoning. The modeling was adjusted to more accurately reflect the true density during flow calibrations (See Appendix D, 2016 Flow Data, Calibration).

Undeveloped parcels within the existing city limits could have been defined by either the current Zoning Map or the General Plan 2030 Map. In general, variations in land use between the two maps were minimal and the current zoning densities are consistent with the range of densities described in the General Plan 2030 Report. The City decided to utilize the General Plan 2030 for undeveloped lots within City limits because, in some instances, the General Plan uses were denser than current zoning. Undeveloped parcels outside of the existing city limits but within the planning boundary were solely defined by the General Plan 2030 Map.

Defining land usage within the study boundary was a critical component in developing the loading factors for the model. Loading factors allow you to apply a sewer flow rate per unit area, usually gallons per day per acre (GPD/Acre) or cubic feet per second per acre (CFS/Acre). For residential areas the load factor can be derived from a known density (DU/Acre) for a given land use, a known occupancy (persons/DU), and a known capita flow rate (GPD/person).

2.4 VACANT AND OCCUPIED LAND PARCELS

In order to make a clear distinction between occupied parcels and vacant land, the 2016 Connections Map was developed (See **Exhibit 2.4.1**). The occupied land parcels have been divided into two groups; Existing and Septic. The Existing group includes developed parcels that are currently connected to the City's sewer infrastructure network. The Septic group was determined to be those parcels where a dwelling unit was present but adjacent sewer facilities were not. The vacant land parcels have been divided into three groups; Existing Committed, Vacant (Future Connections), and Vacant (Restrictive Slope). Committed parcels include undeveloped land that the City either already has infrastructure in place to serve or plans to develop infrastructure to serve in the near future. Vacant (Future Connections) parcels include undeveloped land that will eventually connect to the City's sanitary network but no infrastructure is currently constructed. Vacant (Restrictive Slope) parcels include undeveloped land that are unlikely to be constructed on due to steep grades and, therefore, unlikely to connect to the City's sanitary network. It is possible that some scattered development may occur in these restrictive slope areas in the future. If this occurs, interceptor modeling should be adjusted to account for the additional flow.

While most parcels could easily be delineated into their respective group based on physical observations (e.g. existing buildings), the Existing Committed parcels required additional coordination with the City staff. The City was responsible for defining which parcels should fall under this category. In general, most of these parcels fell within partially built subdivisions that already had a recorded plat. An existing platted subdivision would have filed a Notice of Intent to Discharge (Sewage Collection System) with the Arizona Department of Environmental Quality (ADEQ) or the City and would likely have already received will-serve letters from the City.

Multiple files were provided from the City's engineering department including a map showing the physical locations of the parcels to be included in the Existing Committed group. Each of the parcels was also listed in a spreadsheet that had projected design flows and an associated lot count (each corresponding to the provided map). These specific sewer loads were used in lieu of the allocated loads for the committed parcels in the model. Design flows are generally greater than flows defined by the current land-use, i.e. more conservative estimates of future flows. Some of the design flows provided by the City included developments that were already constructed. These design flows were removed from the specific sewer loads for the committed parcels.

Developing the Connections Map and defining the land-use groups was also necessary for defining the four main model scenarios for the project:

1. Existing (2016) Scenario - Hilltop – Includes Existing and Existing Committed parcels.
2. Future Scenario - Hilltop – Includes everything in the 2016 Existing Scenario, Septic and Vacant (Future Connections), i.e. all areas within the project study boundary limits other than areas with restrictive slopes.
3. Existing (2016) Scenario - Downtown – Includes Existing and Existing Committed parcels.
4. I&I Scenario - Downtown – Includes everything in the 2016 Existing Scenario and simulated wet weather flow loading.

These model scenarios will allow City staff to determine what improvements need to be made to service current customers and determine what infrastructure must precede development on undeveloped parcels to be served. This will allow the City to designate CIP projects and funds for appropriate solutions.

Note: There are a few large parcels that have an existing facility constructed on them (e.g. golf course, airport runway, etc.) but are not contributing sewage flows. Consequently there are a few parcels that are shown as Existing on the 2016 Connections Map that aren't truly connected. This has been taken into consideration when modeling the 2016 Existing Scenarios. Each of these facilities is a permanent structure and therefore will not contribute flows under future loading conditions.

2.5 HISTORIC SEWAGE FLOWS

Existing and projected flow rates within the sewer model have a direct correlation to the land use definitions for the service area. Once the land use for all parcels within both the current City boundary and the study boundary were identified, a loading chart was developed for each of these land uses. This chart shows the land usage type and ultimately the unit load (GPD/Acre) that was used for each parcel type and acreage within the model. The development of load factors is more thoroughly discussed in **Section 3.0 Design Criteria**. As may be surmised, loading factors vary widely between the different residential, commercial, and industrial land uses. Load factors for the same land use type may also vary depending on whether they are being applied to an existing conditions model scenario or a proposed conditions model scenario. That is, proposed loading charts are typically more conservative, i.e. larger load factors, and conform to ADEQ requirements for design flows.

The module which runs within the H_2OMAP Sewer software and utilizes load factors and parcel acreage to develop sewer flows (and contributing populations) is known as the Load Allocator. Consequently, all sewer loads developed in the model using this tool are known as Allocated Loads. This was the primary method used to develop sewage flows for each of the three model scenarios. There were also loads that were entered manually for each of the scenarios which are referred to as Known Loads. The Known Loads for the 2016 Scenario consisted of known, permitted, or metered flow rates from the heavy users, including those categorized as a Significant Industrial User (SIU) or a Categorical Industrial User (CIU). In the Future Scenario, known loading was entered for large parcels that required a loading greater than that which was defined by the land use designation. For example, one of the vacant parcels being loaded into the Future Scenario was designated as Park/Open Space per the General Plan 2030 but was likely to be developed into Community Commercial.

After initial model loading (Allocated and Known), flow monitoring results were used to calibrate the Existing Scenarios to more accurately represent the field measurements observed. This was a critical step in the modeling process as the existing conditions provide the base for which all other scenarios are built upon. The City provided metered sewage flows for both the Hilltop and Downtown WWTP. In addition, as part of the scope of this project, 15 other critical locations within the interceptor network were also monitored (See **Exhibit 2.5.1** Flow Monitoring Map). On average, three to four weeks of continuous monitoring time was provided for each site. Flow monitoring results were used to iterate different load variations. While loading was not adjusted to match the monitoring data exactly, adjustments were made to the load chart in order to make the model as representative of the existing system, as possible. This was accomplished by calibrating the load factor input data: daily flow per capita (gallons/capita/day), occupancy (people/DU), and density (DU/Acre).

As a result of the flow monitoring, it was revealed that the zoning density (DU/Acre) was not accurate for several land uses. The density was adjusted to more accurately reflect densities of these land uses in the existing system. After calibration, modeled flows in the existing conditions model remain more conservative than the monitoring data. This was expected as calibrating load factors down to match metered flows exactly would require developing load factors for each land use that weren't justifiable.

Further calibration of the model should be conducted when the City has in place a more extensive monitoring program. Adding more flow monitoring sites could improve the accuracy of the modeling and monitoring flows throughout the year would allow the City to capture flow variations due to population increases from seasonal visitors and wet weather conditions. Interceptors that will see the greatest fluctuation due to "seasonal flow" are those adjacent to high density retirement communities or any residential developments with concentrated groups of seasonal visitors. As part of an expanded monitoring program, the City should be able to start tracking and quantifying these changes. For this study, all parcels with existing homes and sewer connections were loaded into the model, therefore seasonal visitors were accounted for in the existing service area.

2.6 RAINFALL DATA

In order to determine the how the sewer system operated during wet weather conditions, the City requested that flow monitoring data be collected during the monsoon season. Flow monitors operated at various locations throughout the City between 6-29-15 and 9-11-15. Rainfall data was then collected for this same period of time in order to correlate peak flows observed during monitoring with the various storms that took place. The primary source for rainfall data was the Mohave County ALERT website. The County maintains a number of rain gauge stations in around the City of Kingman. Five of the County's gauges which fell within the project study boundary were used for this project. In addition, one rain gauge maintained by the City, located at the Downtown Fire Station, was also used. The names of rain gauge stations utilized for this project are:

- Holy Moses Wash
- Fire Station 1 (City of Kingman)
- Mohave Wash @ Airway Ave
- Kingman
- Diagonal Wash
- Upper Devlin Wash

The location of the six rain gauge sites along with a summary of the rainfall data collected can be found on **Exhibit 2.6.1** Rain Gauge Map. In total, 17 separate storm events were observed during the flow monitoring period. This data was used to distinguish which peak flows observed during flow monitoring were caused by storm events. Additional flows caused by wet weather conditions is called storm surge and typically creates a wet weather peak in the system.

Note: The rain gauges maintained by the County only create a rainfall data log when 0.04 inches of rain is observed. In other words, very low intensity rain events won't register any rainfall on data logger. For this project, the larger storms were of more interest to the study than the low intensity events.

3.0 DESIGN CRITERIA

3.1 ADEQ REQUIREMENTS

This report utilized the Arizona Department of Environmental Quality (ADEQ) minimum sewer collection system design guidelines in the Arizona Administrative Code (AAC) Title 18, Chapter 9, Article 3, Part E. Type 4 General Permits (Last amended on Nov. 12, 2005) as the basis for the design criteria. See **Appendix A - ADEQ Minimum Standards** for AAC codes and minimum sewer system design constraints relating to sewer collection systems including Table 1, Unit Design Flows.

Per ADEQ standards (R18-9-E301.4.01), all proposed sewer interceptors were designed and all existing interceptors were checked against the following criteria:

- Slopes that ensure a minimum velocity of 2 feet per second (ft/s) and a maximum velocity of 10 ft/s when flowing full, using a Manning's roughness coefficient of 0.013.
- Base design flow shall be 80 gal/capita/day.
- Maximum manhole spacing is dependent on interceptor sizing and shall not exceed that which is prescribed by ADEQ for a given pipe diameter.
- Maintain minimum cover of 3 feet over all proposed sewer pipes.
- Ratio of flow depth to the pipe diameter (d/D) shall not exceed 0.75 in peak dry weather conditions
- Population-based Peaking Factors (applied to cumulative loading for all pipes)

3.2 CITY OF KINGMAN REQUIREMENTS

In addition to ADEQ requirements, this report is guided by design standards established by the City of Kingman. These requirements were directly outlined by the City Engineer for this project. The design criteria that governed the analysis, modeling and master planning for the project are as follows:

1. For the purposes of this project, modeling shall only be conducted for sewer interceptors ("trunk lines"). An interceptor is defined, in general, as any sanitary sewer pipe, within the City's system, 10 inches in diameter or greater. However, some 8-inch and 6-inch diameter pipes were included in the model analysis because they were determined to be part of an outfall line for a given sewer shed and thereby functioning as an interceptor.

2. The City believes, based on the observed flows and the proliferation of water-saving technologies, 80 gal/capita/day is sufficient for planning purposes. This design flow was used for sizing proposed interceptors in all residential areas within the City's planning area and for determining equivalent populations for commercial and industrial flows.

3. The City Engineer directed that loading rates (gallons/day/acre) for parcels that are zoned commercial, business, or industrial be consistent with the loading rates of similarly sized communities in Arizona.

4. In general proposed interceptor sewers will be located within or adjacent to the right-of-way of existing or future section line roads.

5. All rim elevations for proposed manholes shall match the best available topographic data; City contours, Mohave County contours, or USGS maps.

6. Mohave Wash crossings should be avoided wherever possible.

7. Railroad/Arizona Highway 66 crossing locations should be minimized.

8. The master planning shall conform to the current City Design Standards unless otherwise directed by the City Engineer.

9. Under future loading conditions, parallel interceptors are preferred to upsizing (i.e. removing & replacing) the existing interceptors.

10. The master plan should not include interim sizing. All sizing should be based on future flow conditions to avoid the costs of replacing a newly constructed line or necessitating a parallel line. However, the development of a flushing plan may be required in the interim between construction of the interceptor and build out of the sewer shed

11. Average household size shall be based on the most current census data (2010) – 2.46 persons/household.

12. The sewer model shall be set up as two separate interceptor models; one for the Downtown Service Area and one for the Hilltop Service Area.

13. SIUs with known flow rates, such as hospitals and jails, shall be manually loaded into the model based on metered data.

14. The project datum and coordinates shall be based on NAD83, Arizona West, International Feet (AZ83WIF) for horizontal and NAVD88 for vertical.

15. The City has requested that the sewer customer address database be utilized in verifying septic vs existing connections.

16. All recommendations for proposed interceptors shall take into consideration the current design plans for sewer infrastructure on the City's CIP list (e.g. Mohave Channel Sewer Line).

17. All undeveloped parcels within platted subdivisions classified as "Committed" by the City shall be included in the Existing (2016) Scenario and recommendations shall be adjusted accordingly.

18. Loading of undeveloped parcels within the City boundary shall be based on the General Plan 2030 instead of the City of Kingman Official Zoning Map.

19. Any industrial sites that are vacated or are currently not in operation shall be removed from the Existing (2016) Scenario.

3.3 RESIDENTIAL FLOW RATES

A majority of connections within the existing system (and the future system) fall under a residential land use. Under the City's current zoning there are a range of different residential uses including:

- R-1-6 (Single Family Housing, 6,000 SF Lot Minimum)
- R-1-6PDD (Planned Development District, 6,000 SF Lot Minimum)
- R-1-8 (Single Family Housing, 8,000 SF Lot Minimum)
- R-1-10 (Single Family Housing, 10,000 SF Lot Minimum)
- R-1-10PDD (Planned Development District, 10,000 SF Lot Minimum)
- R-1-20 (Single Family Housing, 20,000 SF Lot Minimum)
- R-1-40 (Single Family Housing, 40,000 SF Lot Minimum)
- R-2 (Multiple Family Housing, Low Density)
- R-2PDD (Planned Development District, Multiple Family Housing)
- R-3 (Multiple Family Housing, Medium Density)
- R-4 (Multiple Family Housing, High Density)
- R-MH-6 (Manufactured Home, 6,000 SF Lot Minimum)
- R-MH-20 (Manufactured Home, 20,000 SF Lot Minimum)
- R-MH-40 (Manufactured Home, 40,000 SF Lot Minimum)
- R-R (Rural Residential)

For each of the residential uses described, a unique loading factor (cfs/acre) was developed in order to calculate the anticipated flow rates for parcels that fell within that land use. Beyond the City limits, land use is solely defined by the General Plan 2030. The General Plan residential uses encompass a much broader range of densities and uses within each category. Unique loading factors were developed for these, as well.

Load factors areas are initially established using the maximum density (DU/Acre) allowed per the zoning, the average household occupancy (2.46 people/DU), and the design flow (80 gal/capita/day). This method gives very conservative values for determining sewer flows for residential land uses. It was determined early on in the project that load factors developed using this method needed to be adjusted based on more current data and the flow monitoring results.

According to ADEQ requirements, collection system design flows must be calculated based on 80 gal/capita/day (excluding peaking factors), but allow for "lower unit flow values in the served

area due to significant use of low-flow fixtures, hydrographs of actual flows, or other factors." A comparison of the monitored sewage flow rates with the design flow rate required by ADEQ was investigated to determine if a "lower unit flow value" was justified. According to the flow monitoring results, an average sewer flow contribution of 70 gal/capita/day was justified for the Hilltop Service Area but not for the Downtown Service Area.

Given the recent flow monitoring data, the Existing (2016) Scenario - Hilltop load factors were based on a lower unit flow value of 70 gal/capita/day. Load factors for the Future Scenario - Hilltop used the ADEQ minimum standard of 80 gal/capita/day. Based on water saving technology that will likely result in lower flows per capita in the future, using a loading factor of 80 gal/day/person is reasonable for future planning. The Downtown showed slightly higher per capita usage than the Hilltop Service Area and therefore both the Existing (2016) Scenario – Downtown and the I&I Scenario – Downtown utilized a unit flow value of 80 gal/capita/day.

For the analysis of existing facilities and the design of new facilities, 2.46 people per dwelling unit was used based on the average household size for residents of Kingman. This is consistent with the most current census data (2010) and the flow monitoring results. It should be noted, however, that not all of the loading factors for residential usage utilized 2.46 people/DU. This occupancy was viewed as a base for "typical" residential units. A multi-family residential usage, for example, may have justified a slightly lesser occupancy, while a single-family rural (i.e. low-density) warranted the use of a higher occupancy.

While developing load factors for the Existing (2016) Scenarios, it was necessary to reduce the density for several residential uses based on the flow monitoring results. In many municipalities, zoning densities are not always representative of true density. Kingman is not an exception to this, and it became necessary during calibration to reduce densities for both the Hilltop and Downtown Service Areas. For the Future Scenario no density reductions were necessary. For planning purposes, it is better to utilize more conservative load factors.

The Loading Tables for the four model scenarios can be found in Appendix E – 2016 Flow Data and Appendix F – Future Flow Data. The Loading Tables include both the initial loading and final (calibrated) loading. These load factors were entered into the model to develop the Allocated Loads for both existing and future residential development. Known Loads from residential land uses were manually entered into the model for the Existing (2016) and Future Scenarios. Known Loads consisted of design flow rates that had been calculated for residential developments.

3.4 COMMERCIAL FLOW RATES

Commercial load factors in this report are based upon those utilized by comparable municipal entities in Arizona, in particular those of the Town of Gilbert, the Town of Queen Creek, and the City of Casa Grande. The unit loads used to estimate sewage flows from commercial developments were established using the load factors (in gallons per day per acre) of these municipalities. The commercial flow rates utilized in their Wastewater Master Plans are representative of the City of Kingman's existing development. **Figure 3.4.1 - Commercial Flow Rate Comparison** correlates City of Kingman Zoning & General Plan commercial land uses and unit loads to the land uses and flows of these municipalities.

Load factors applied to the interceptor model for the various commercial zones are shown in the Loading Tables (Appendix E & F). The City's commercial zones include:

- C-1 (Neighborhood Convenience)
- C-2 (Community Business)
- C-2PDD (Community Business, Planned Development District)
- C-2-HMR (Hualapai Mountain Road Design Overlay)
- HMMC-PDD (Hualapai Mountain Medical Center, Planned Development District)
- C-3 (Service Business)
- C-3PDD (Service Business, Planned Development District)

Load factors applied to the interceptor model for the various commercial uses defined by the General Plan 2030 are also shown in the Loading Tables (Appendix E & F). The commercial uses defined by the General Plan include:

- Neighborhood Commercial
- Community Commercial
- Regional Commercial
- Highway Service Commercial

These load factors were entered into the model to develop the Allocated Loads for both existing and future commercial land use. Again, load factors were adjusted for the Existing (2016) Scenarios during the model calibration. Future Scenario load factors were not adjusted. Known Loads from commercial land uses are typically manually entered into the model for the Existing and Future Scenarios. However, for this project only the Allocated Loads were utilized for commercial areas.

3.5 INDUSTRIAL FLOW RATES

Compared to residential and commercial users, industrial land use areas contribute the least amount of sewer flow within the system. There are three different industrial uses under the City's current zoning including I-1 (Light Industry), I-1PDD (Light Industry, Planned Development District) and I-2 (Heavy Industry). As with other land uses described, a unique loading factor (GPD/Acre) was developed in order to calculate the anticipated flow rates for parcels within that

land use. The General Plan industrial uses fall under 2 categories; Light Industrial and Manufacturing Industrial. Loading factors developed for the General Plan areas were similar for those defined by the current zoning. However, for the Existing (2016) Scenario – Hilltop, the General Plan loading factors were greatly reduced during calibration. The reason for this was that industrial flows coming from the Airport Industrial Park were uncharacteristically low, according to the flow monitoring results. Although, depending on the type of industrial user, wastewater flow contribution can vary significantly.

Load factors were initially established at 900 gallons per day per acre for Light Industrial users and 1,200 gallons per day per acre for Heavy/Manufacturing Industrial users. These factors were applied to the model for the Existing (2016) Scenarios and for the Future Scenario.

In addition to the load factors developed for Allocated Loads, metered flow rates from industrial connections, provided by the City, were manually entered into the model. Known Loads from significant industrial users (SIUs) were used in both the Hilltop and Downtown interceptor models and include flows from the following:

- Mohave County Jail
- Mohave County Juvenile Detention
- Kingman Regional Medical Center (Main Hospital)
- Kingman Regional Medical Center (Hualapai Mountain Campus)

Peaking factors from these users was not provided, therefore average base flow from the industrial users was entered into the model and peaked according to a known occupancy or an equivalent population. Note that all flow loading for SIUs was based on the flow monitoring results provided by the City for the respective users and not necessarily the permitted capacities. Known Loads were manually entered for both Existing and Future Scenarios.

The Flow Data appendices for each scenario (Appendix E & F) give the estimated industrial user flow rates based on land usage and all known industrial flows. They represent all industrial flows applied to the hydraulic model of the City's sewer interceptor system.

Note: Load factors were also developed for those land uses not categorized as either Residential, Commercial, or Industrial per the City's Official Zoning Map or the General Plan 2030 Map. These land uses include:

- O (Recreational Open Space) - Zoning
- Public/Quasi-Public – General Plan 2030
- Parks/Open Space – General Plan 2030

Load factors for these areas varied greatly. For instance Public land has the potential for significant flow contribution while Parks may contribute no flow at all.

3.6 PEAKING FACTORS

Dry Weather Peaking Factors were applied to all flows within the model based upon the total population upstream of the calculation point. ADEQ recommended peaking factors per R18-9-E301 (See **Appendix A - ADEQ Minimum Standards**, Dry Weather Peaking Factor Table) were entered into the model via a table showing peaking factor versus population. For populations greater than 1,000 the peaking factor must be calculated based upon given equations. These equations were also entered into the model.

The H_2OMAP Sewer Pro model applies peaking factors to flows by first adding the population of the upstream manholes. Next it applies the appropriate peaking factor from the loaded table based on the cumulative population total. This allows the model to develop a unique peaking factor based on the upstream population at each manhole node. The peaking factor is applied to the total non-peaked flow to that point.

Population calculations were used for calculating peaking factors only. Actual City population projections were not estimated for this project. Where applicable, residential peaking factor populations were calculated using a value of 2.46 people per dwelling unit for existing and future conditions. For commercial and industrial land uses, peaking factors were developed from equivalent populations, which were simulated by taking the flow rate of the land area (GPD/Acre) and dividing by historic usage rate per person of 70 GPD/capita (80 GPD/capita for the future conditions).

Proposed pipes in the system were then designed such that the d/D (ratio of flow depth in the pipe to the diameter of the pipe) did not exceed 0.75 when the peaked dry weather flow was applied. Existing pipes in the system were also checked to see if they exceed 0.75 d/D.

3.7 INFLOW AND INFILTRATION

R18-9-C305.2.05 General Permit: Capacity, Management, Operation and Maintenance of a Sewage Collection System requires that the City demonstrate "how to maintain sufficient capacity to convey the base flows and peak wet weather flow of a 10-year, 24-hour storm event for all parts of the collection system owned or managed by the permittee (City) or under the permittee's operational control"

In order to comply with R18-9-C305.2.05, the City included a comprehensive inflow and infiltration (I&I) study of the Downtown Service Area as part of this project (see **Section 5 - Inflow and Infiltration**). In the past the City has observed significant flow increases at the Downtown WWTP during heavy rainfall events. Based on these observation and the relative age of the infrastructure, it was concluded that Downtown was the most susceptible area under wet weather conditions. The study determined the magnitude and location of the wet weather surcharging on the existing sewer network and includes recommendations for mitigation efforts by the City to reduce I&I throughout the system.

The historic inflow and infiltration rate during a 10-yr, 24 hr event, estimated from the I&I study was incorporated into the model as a surcharge load in order to demonstrate the collection system's capacity to convey this flow. According to ADEQ standards (R18-9-E301.4.01), peak wet weather flow may be determined by adding to the peak dry weather flow "a wet weather infiltration and inflow rate based on either a percentage of peak dry weather flow or a gallons per acre rate of flow." The results of the study showed a percent (%) increase in flow during the 10yr, 24hr storm event due to infiltration and inflow. In the model, the flow increase may be added to the dry weather peak flows**,** by applying a global multiplier to peak dry weather flows or manually distributing the known storm surge flow rate from the WWTP amongst the loading manholes in the interceptor network.

While determination of inflow and infiltration (I&I) flows was part of the Downtown analysis, it was beyond the scope of work for this study for the Hilltop Service Area. Instead all future pipes in the Hilltop area were designed to adhere to a depth to diameter ratio (d/D) no greater than 0.75 during peak dry weather conditions. In addition, these future pipes will reduce existing peak dry weather flows and wet weather surcharging to the existing system as there will now be additional piping in the system for flows to be conveyed. The City may conduct a comprehensive I&I Study for the Hilltop area in the future. This would necessitate increased flow monitoring efforts at multiple locations in the system prior to and during the rainy season to track increased flows due to I&I. Significant storm events could potentially cause adverse surcharging in pipes that are currently flowing at or near full flow capacity in the peak dry weather conditions. It should be noted that newly constructed sewer is typically less prone to I&I flow, therefore it is unlikely that any of the recommended sizing for proposed interceptors in this report will need to be modified once peak wet weather flow is determined. Depending on the findings of the future I&I study, recommendations for upsizing existing facilities may need to be expanded or a plan developed to remediate I&I sources in the Hilltop Service Area.

4.0 2014 INTERCEPTOR MODELING

The goal of the 2016 interceptor modeling is to create a hydraulic simulation of the City's wastewater collection system as it currently exists. The models were created using information provided by the City (CAD drawings, mapping, record drawings, influent flows, etc.), field survey of interceptor manholes, and wastewater flow measurement. The results of this modeling are intended to show how the current (2016) interceptor system performs under current loading conditions.

4.1 PHYSICAL MODEL

In order to develop the interceptor model the first step was to create the physical elements. The input data for the model mathematically simulates the physical characteristics of the interceptor system. The input data used for the simulation is as follows:

- **Manhole Information**
  Location (Northing & Easting)
  Rim Elevation
  Invert Elevation
  Pipe Connectivity
- **Pipe Information**
  Pipe Size (Diameter)
  Pipe Length
  Pipe Slope (From Inverts & Pipe Length)
  Pipe Roughness (Manning's n=0.013)

As previously stated, the input data was gathered through meetings and coordination with the City, record drawings, and field survey of manholes within the interceptor system. The results of this physical modeling are best depicted in maps of the existing systems which are shown in **Exhibit 4.1.1 - 2016 System Map – Hilltop** and **Exhibit 4.1.2 – 2016 System Map – Downtown.**

The existing models include the latest improvements to the network including one interceptor that is currently in the design phase called the Mohave Channel Sewer Line. Installation of this sewer pipe will likely begin within one year and will serve portions of Walleck Ranch and Mohave Country Club Estates Unit 3. The 12 inch interceptor, which runs along the north bank of the Mohave Wash, was sized by the City for build-out of the contributing area (i.e. existing and future flows).

There are a number of flow splits at various locations throughout the City's system (see **Table 2.2.3** in **Section 2.2 Interceptor Manhole Survey**). H_2OMAP Sewer is capable of splitting the sewer flows automatically based on invert elevations and downstream pipe slope. However, in some cases it becomes necessary to input a flow split criteria at a given manhole structure, e.g. when pipes switch from open-channel (free surface) and switch to pressurized flow. The manual flow split can be based on a simple percentage of incoming flow (other methods are also available). For the 2016 Scenario, there are six manual flow splits, all in the Hilltop Service Area. These were added to refine the model based on the flow monitoring results.

4.2 SEWERSHED DEFINITIONS

After the physical model was created, sewersheds were defined for areas that contribute to each interceptor from the existing service area. This was completed using the latest available topography, aerial photography, as-builts and other available data. Aerial photographs were used to determine if homes were built within the platted subdivisions, or commercial and industrial developments in non-residential areas. Empty parcels within partially developed subdivisions were not considered to contribute flow to the system. Subdivisions that were platted but construction had not begun were not considered to contribute flow to the system. Developed areas that are not connected to the sewer system (i.e. lots with septic systems) were not shown as contributing. Maps of the defined sewer sheds within the system are shown in **Exhibit 4.2.1 - 2016 Sewershed Map – Hilltop** and **Exhibit 4.2.2 – Sewershed Map –Downtown**.

Sewersheds include all land within a given area of the project planning boundary that ultimately outfalls at a certain location on the sewer network. The **2016 Sewershed Maps** only highlight those areas within the "ultimate sewer shed" that are currently contributing. In other words, the boundary of an existing sewer shed may expand in future model scenario if the contributing area is not currently built out.

A sewer infrastructure drawing, provided by the City, which incorporated every sewer pipe in the collection system (not just interceptors), was used to determine the exact sewer shed delineations. This map of the entire sewer collection system is available online through the County's GIS website.

4.3 SEWER CONNECTIONS & FLOW CALCULATIONS

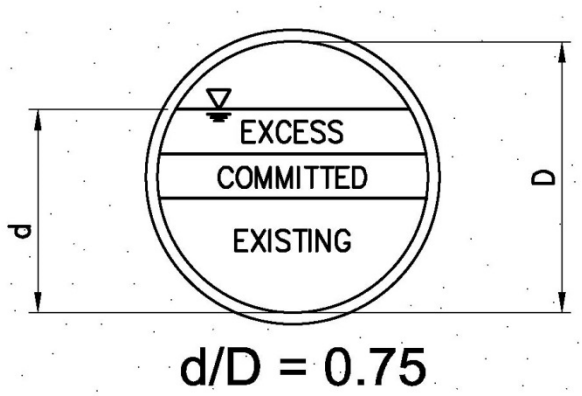
The number of sewer connections in each sewershed was calculated using aerial imagery, a list of active sewer customers provided by the City, and parcel shapefiles. Each parcel within a sewershed is assigned an existing downstream manhole on the interceptor network where it ultimately contributes sewer flow. Sewersheds were further broken down into sub-basins made up of all the parcels that contribute flow to a specific manhole. All the flows from individual sub-basins make up the total sewer shed outfall flow. The sub-basins are not shown on **Exhibit 4.2.1 or 4.2.2**; however, they may be viewed in the H_2OMAP Sewer interceptor model. The software allows you to store the outfall manhole data associated with each parcel within the parcel shapefile itself. Total acreage for each sewer shed is found in **Appendix H - 2016 Sewer Shed Legends**.

The sewer flow calculations in the model simulate the current (2016) flows within the interceptor system. Each manhole in the system was allocated specific parcels that are associated with a land use defined by the Zoning or the General Plan 2030. In order to simulate flows, each manhole was "loaded" with a flow rate using the Load Allocator. Loads were calculated by multiplying the allocated parcels acreage by the unit load (cfs/acre) for the parcel's land use. This simulated the average daily flow (ADF) from each developed parcel within the system. Later, peaking factors were applied in accordance with **Section 3.6**, to obtain the ultimate peak flow (design flow). Known Loads from SIUs were also entered into the model manually but were stored separately from the Allocated Loads in the model database.

Per the City's request, Known Loads from committed parcels were also entered into the model. All committed loads were entered as additional flow after the calibration of the model with existing loading only. Committed parcels are residential developments that will likely connect to the system in the immediate future. All committed parcels are located within the Hilltop Service Area. These flows were stored separately in the model database from the Allocated Loads and Known Loads for existing connections. The outfall manhole data associated with each committed parcel was also stored within a separate committed parcel shapefile. This shapefile, although not used for this project, will allow the City to use the Load Allocator for these areas. The City may decide, at a later date, to utilize Allocated Loads instead of Known Loads for the committed parcels.

The purpose of adding the committed loading onto the Existing (2016) Scenario was to determine the true excess capacity (or deficiencies) of the system if all committed parcels were to be built-out within the project planning boundary (See **Figure 4.3.1**). The City believed it was in the best interest of the public to analyze the available capacity of the existing interceptors under these loading conditions. Available or excess capacity is defined as the additional flow that may be added to existing flows while maintaining a d/D of 0.75 in peaked dry weather conditions. Without loading the committed developments, the apparent excess capacity in a given interceptor may have been misrepresented because, in reality, that capacity was already reserved.

Figure 4.3.1



The respective flow loads within the Manhole Hydraulic Model Data Table (within the model database) are as follows:

- LOAD 1 – Allocated Loads based on the existing (2016) connections
- LOAD 2 – Known Loads based on given flow rates from SIUs (2016)
- LOAD 3 – Allocated Loads based on the committed connections
- LOAD 4 – Known Loads based on given flow rates for committed connections

Table 4.3.1 – 2016 Load Data – Hilltop

Model Load Data	ADF (MGD)
LOAD 1	2.17
LOAD 2	0.10
LOAD 3	0.00
LOAD 4	0.50

Table 4.3.2 – 2016 Load Data - Downtown

Model Load Data	ADF (MGD)
LOAD 1	0.46
LOAD 2	0.04
LOAD 3	0.00
LOAD 4	0.00

All land within the project planning boundary was divided into five main categories (**Section 2.4**), Existing, Existing Committed, Septic, Vacant (Future Connections), and Vacant (Restrictive Slope). Septic, Vacant (Future Connections), and Vacant (Restrictive Slope) parcel areas are not considered to be contributing to the system within the Existing (2016) Scenario model. Septic parcels, i.e. existing lots that are currently being serviced by individual on-site treatment systems, will eventually be connected to the City's sewer system but are not simulated until the Future Scenario.

The total flow output per land use type (Allocated Loads) and metered flow data from SIUs (Known Loads) applied to the model is shown in **Appendix E - 2016 Flow Data**. The total given flow data from committed developments (Known Loads) applied to the model is also shown in **Appendix E.**

4.4 MODEL CALIBRATION

Creating the existing conditions scenarios was a critical step in the modeling process, as all other scenarios (I&I and Future) build upon the 2016 Scenarios. As such, great care was taken to calibrate the model and ensure that modeled flows were as representative of actual flows as possible. Calibration efforts included:

1. Comparison of modeled flow rates (ADF and peak flows) against flow monitoring results.
2. Investigation of zoned density versus actual density and adjusting the loading factors accordingly.
3. Other load factor adjustments were made based on occupancy data (person per dwelling unit) and capita flow rates (gallons per person per day). For instance, daily flow per capita was reduced to 70 gallons/capita/day and occupancy for various residential uses wer also adjusted.
4. Investigation of flow split locations throughout the interceptor network and applying manual flow splits as necessary to match existing conditions.

To review all of the adjustments that were made to the model loading factors, compare the Initial versus the Calibrated Loading Tables in **Appendix E**. When calibrating an interceptor sewer model it becomes problematic to match flow monitoring results exactly at each flow monitoring

location throughout the system. Instead a close, preferably more conservative, representation of existing system flows is attained. Such was the case when calibrating the Hilltop and Downtown interceptor models.

4.5 INTERCEPTOR MODELING RESULTS

Once the physical model described in **Section 4.1** was loaded with the sewer flows described in **Section 4.3** to create the completed interceptor sewer models, simulations were run with peaking factors (**Section 3.5)** for the Existing (2016) Scenarios.

In general, the 2016 interceptor modeling showed that the existing interceptor system is adequate to convey the existing Average Daily Flow, and Dry Weather Peaked Flow. However, there is one area of concern at this time for the Hilltop interceptor system. The Dry Weather Peaked Flows cause surcharging over full flow capacity at the intersection of Jagerson and N Bank Street. The locations of this sections of pipe is clearly shown in red on **Exhibit 4.5.1 – 2016 d/D Map – Hilltop.**

The model also revealed sections of pipe that exceed 0.75 d/D under dry weather peaked conditions at various locations on the main outfall interceptor for the Downtown system. The locations of these sections are clearly shown in red on **Exhibit 4.5.2**. **2016 d/D Map – Downtown**.

The total flow at the outfall from the models is compared with the actual total outfall flows recorded by the City at the WWTPs in **Table 4.5.1 – 2016 Outfall Flows – Hilltop** and **Table 4.5.2 – 2016 Outfall Flows – Downtown**.

Table 4.5.1 – 2016 Outfall Flows – Hilltop*

Location/Source	ADF, MGD	Peak, MGD
Hilltop WWTP/Sewer Model	2.27	3.90
Hilltop WWTP/Flow Monitoring	1.56	2.91

* Excludes committed flows.

Table 4.5.2 – 2016 Outfall Flows – Downtown

Location/Source	ADF, MGD	Peak, MGD
Downtown WWTP/Sewer Model	0.50	0.96
Downtown WWTP/Flow Monitoring	0.26	1.01

Appendix E – 2016 Flow Data shows the calibration data comparing the model flows with the actual flows at each of the flow monitoring sites.

4.6 2016 RECOMMENDATIONS

The 2016 interceptor modeling showed that most of the existing interceptor system is adequate to convey the existing and committed flows experienced by the system for Average Daily Flow and Dry Weather Peaked Flow. Only one improvement is recommended at this time for the Hilltop interceptor system.

Hilltop Service Area

To relieve the surcharging on the Jagerson Avenue interceptor, a portion of the 10 inch interceptor should be upsized to a 12 inch pipe (Project 1). The majority of the Jagerson Avenue interceptor can convey the existing dry weather peaked flows at 0.75 d/D, however, from the intersection with N Bank Street and 250 feet to the east, sewer flow exceeds the full flow capacity of the pipe. It should be noted that under the future load conditions (see **Section 6.5 Future Recommendations**) a parallel interceptor will be required along Jagerson Avenue from N Bank Street to the Mohave Wash. Rather than spend money replacing the 250 feet of interceptor for existing loading conditions, the City may wait and apply those funds for a larger CIP project recommended under future loading conditions. In the interim the City can monitor this location which, although it is exceeding full flow capacity, is experiencing only minor surcharging.

There are no other improvements recommended for the Hilltop system. Several locations are approaching the 0.75 d/D capacity. These locations should be monitored during wet weather conditions to determine the magnitude of the storm surge on a case by case basis. **Exhibit 4.6.1 - 2014 Recommendations Map** shows the pipes that will require replacement due to lack of capacity. **Figure 4.6.1 - 2014 Recommendations Cost Estimate** shows the cost estimates of the removal and replacement of the recommended improvements. Pipe segment lengths shown on the estimate are approximate, true lengths will be determined in final design.

Downtown Service Area

There are no improvements recommended for the Downtown system under existing dry weather peaked flows. However, under existing peak wet weather conditions the interceptor network and the Downtown WWTP experience significant storm surge. **Section 5.0 Inflow and Infiltration** investigates the magnitude and potential sources of I&I in the system. All recommended improvements for the Downtown Hilltop Service Area focus on the mitigation of I&I sources rather than sizing larger interceptors for the system.

5.0 INFLOW & INFILTRATION

As mentioned in **Section 3.7**, in order to comply with R18-9-C305.2.05, the City requested a comprehensive inflow and infiltration (I&I) study of the Downtown Service Area. Based on observed flow increases at the Downtown WWTP during rainfall events and on the condition of the infrastructure, this area was determined to be the most critical for I&I. The purpose of the study is to determine the magnitude and location of the wet weather surcharging on the existing sewer network and develop recommendations for reducing I&I throughout the system.

5.1 FLOW MONITORING & RAIN GAUGE RESULTS

In order to model the effects of I&I on the Downtown Service Area, storm surge data from actual rain events needed to be collected. This was accomplished by monitoring flows at multiple locations in the system (including the WWTP) prior to and during a storm. **Exhibit 2.5.2 – Flow Monitoring Map** shows the location of the flow monitoring sites, as well as, a summary table of the data collected. **Appendix D** gives a more complete chart showing the observed flows for the entire monitoring period for each site. Rainfall data was also collected from various rain gauge sites located within the project vicinity. **Exhibit 2.6.1 – Rain Gauge Map** shows the location and names of all of the rain gauge sites, as well as, dates and measurements for each storm event. **Appendix C** gives a complete breakdown of all the data logged for rainfall during the analysis. The main purpose for tracking rainfall data in the City was to determine the effects of various sized storm events on the flow capacity of the interceptor network. Every peak flow event recorded during flow monitoring both at the WWTP and at the flow monitoring sites was compared to the rainfall data. This involved determining the location, time, duration and magnitude of each of the storms that hit during a peak flow period. If a significant storm event occurred directly before a "spike" was registered at a flow monitoring site, causation was usually inferred; especially if the storm event took place in the vicinity of the monitoring site. Using this method was useful in distinguishing the wet weather peak flows from the dry weather peak flows. The combination of rainfall and flow monitoring data was utilized in determining the inflow and infiltration rate during the design storm.

The design storm for an I&I analysis should be based on the 10 year-24 hour storm event per ADEQ standards. However, the City did not experience a 10yr-24hr storm during the flow monitoring period. Instead, a representative storm was selected to approximate the effects of the design storm on the interceptor network. The storm that was selected on occurred on 8-13-15. This rainfall event caused the greatest wet weathering peaking observed during flow monitoring both at the WWTP and at a majority of the flow monitoring sites. While the overall rainfall depth and duration was less than the 10yr-24hr storm, the event experienced intensities greater than the average intensity of the 10yr-24hr event. According to the NOAA Atlas 14 isopluvial for Kingman, the 10yr-24hr rainfall depth is roughly 2.8 inches. This translates to an average intensity of 0.12 in/hr. The max intensity recorded for the selected event was 0.8 in/hr. The storm occurred approximately between 1:20 PM and 6:40 PM and the Downtown WWTP recorded the greatest peak flow that was observed during the flow monitoring period at 6:21 PM

Note: A 10yr-24hr event will experience max intensities greater than average intensity of 0.12 in/hr. The storm may or may not experience max intensities greater than 0.8 in/hr. However, given that the storm event on 8-13-15 registered intensities greater than the average intensity of 10yr-24hr event and caused the largest flow peak at the WWTP, it was selected as the design storm for the analysis. This represented the best available data to base storm surge calculations upon. Also, instantaneous peaks from slug loads recorded at the plant were not considered true peaked flow events for the system.

Utilizing the flow monitoring data results, it was determined that the storm surge on the system from the design storm was 1.67 cfs (1.08 MGD). Flow monitoring data collected at the plant during the storm was compared to flow monitoring data for the same time period for the day before event, the day after the event, and a dry weather day for the same day of the week. The storm surge was the difference between the peaked wet weather flow recorded at the WWTP and the peak dry weather flow recorded during the same time period at the WWTP.

5.2 MODELING RESULTS

The inflow and infiltration rate during the design storm, estimated from the analysis described in **Section 5.1**, was incorporated into the model as a surcharge load in order to demonstrate the collection system's capacity to convey this flow. The wet weather flows were added to the dry weather peaked flows by manually distributing the known storm surge flow rate from the WWTP amongst the loading manholes in the interceptor network

Based on the flow monitoring results, several areas within Downtown contributed very minimal storm surge. As such, the manholes in these areas were not loaded with additional storm flow. Instead the calculated storm surge for the design storm was distributed among the manholes along interceptors known to contribute I&I flows. The respective flow loads within the Manhole Hydraulic Model Data Table (within the model database) for the I&I Scenario are as follows:

- LOAD 1 – Allocated Loads based on the existing (2016) connections
- LOAD 2 – Known Loads based on given flow rates from SIUs (2016)
- LOAD 3 – Not used
- LOAD 4 – Known Loads based on estimated I&I flow rates

Table 5.2.1 – I&I Load Data

Model Load Data	ADF (MGD)
LOAD 1	0.46
LOAD 2	0.04
LOAD 3	0.00
LOAD 4	1.08

The contributing areas include all land within the project planning boundary designated as Existing, and Existing Committed. Septic, Vacant (Future Connections), and Vacant (Restrictive Slope) parcel areas are not considered to be contributing to the system within the I&I Scenario model.

The total flow output per land use type (Allocated Loads) and metered flow data from SIUs (Known Loads) applied to the model remains unchanged from the Existing (2016) Scenario. I&I flows were added as an additional surcharge flow to the model. Once the physical model was loaded, simulations were run with peaking factors (**Section 3.5)** for the I&I Scenario.

The I&I interceptor modeling indicates that the existing interceptor system is not adequate to convey the Wet Weather Peaked Flow. Multiple locations in the existing interceptor system have insufficient capacity and therefore are unable to handle the projected flows. The model revealed sections of pipe that exceed 0.75 d/D and some minor surcharging under peaked conditions, i.e. the hydraulic grade lines of the pipes flowing full are right at the top of pipe or just above it (less than 2'). The locations of these sections are shown in red on **Exhibit 5.2.1 – 2016 I&I d/D Map** so that the problem areas can be easily visualized.

The Wet Weather Peaked Flows cause significant surcharging over full flow capacity for the following:

- A majority of the 8 inch interceptor running north to south along the Johnson Wash and terminating at the Downtown WWTP. This is the main outfall interceptor for the Downtown Service Area (MH 36 to MH 44).
- Approximately 600 feet of 8 inch interceptor running east to west between the Old Trails Road and Goldroad Avenue. This is the most westerly portion of the interceptor, close to the main Downtown outfall interceptor (MH 142 to MH 155).

The total flow at the Downtown WWTP outfall from the I&I Scenario model is shown in Table 5.2.2 – I&I Outfall Flows. This table includes outfall flow contributions from both the I&I Scenario and the Existing (2016) Scenario.

Table 5.2.2 – I&I Outfall Flows

Location/Source	Scenario	ADF, MGD	ADF, Cumulative	Instantaneous Peak, MGD	Peak, Cumulative
Downtown WWTP/Sewer Model	2016	0.50	0.50	0.96	0.96
Downtown WWTP/Sewer Model	I&I	1.08	1.58	1.08	2.04

5.3 FIELD INVESTIGATION

As part of the I&I study, an extensive field investigation was conducted to identify the main sources of inflow and infiltration within the Downtown Service Area. Typical I&I sources include the following:

Inflow

- Vented or Damaged Manhole frame and cover
- Cross Connections from storm drain facilities
- Roof Drain Connections to the sanitary sewer

Infiltration

- Groundwater Seepage into cracked/damaged sewer pipes
- Groundwater Seepage into cracked/damaged sewer manholes

The field investigation was broken into two phases. Phase one involved a visual inspection of the majority of the manholes in the system along interceptor and non-interceptor sewers. While walking or driving the sewer alignments, infiltration sources and potential storm drain connections were also identified. Any storm drain facilities (catch basin, scupper, etc.) adjacent to a manhole or sanitary sewer pipe were noted during this investigation. Sewer pipe located directly in or adjacent to a wash or exposed drainage channel was also identified for infiltration potential. Sewers located below a pervious surface (gravel, dirt, turf, etc.) were also identified; however, potential for infiltration at these locations is minimal. The type and condition of each manhole varied greatly throughout the system. Also, based on the relative location of the facility to a drainage path, the potential risk for inflow to the system also varied. General categories were developed to describe the characteristics of the manholes that were inspected. The categories, ranked in order of potential inflow risk, are:

- Highly Susceptible – Varied risk factors: visually damaged manhole frame/cover, located in a drainage path, manhole adjacent to a storm drain facility, etc. These manholes did not fit into any other category identified during the field visit but still represented high risk to the system for inflow.

- Vented, in drainage – Multiple holes in the manhole cover and located within a drainage path.

- Partially Vented, in drainage – 3 or less holes in the manhole cover and located within a drainage path.

- Non-Water Tight, in drainage – Any visible gap between the frame and cover and located within a drainage path.

- Solid Rim, in drainage – No visible gap between frame and cover and located within a drainage path.

- Vented – Multiple holes in the manhole cover
- Partially Vented – 3 or less holes in the manhole cover
- Non-Water Tight – Any visible gap between the frame and cover
- Solid Rim – No visible gap between frame and cover
- Not Found, Inaccessible – Manhole was not located during the investigation

Pictures were taken of most of the manholes inspected during the field investigation Examples of each category may be found in **Appendix L**. **Exhibit 5.3.1 – I&I Map** shows the location of every manhole in the Downtown system and color coding to identify risk potential based on the above descriptions.

The second phase focused solely on potential roof drain connections within the historic Downtown business/residential district. The bounds of this district are approximately Andy Devine Avenue (Historic Route 66) to the south, 1st Street to the West, Chestnut Street to the north and 10th Street to the east. This area was identified by the City for having the most potential for this type of inflow. Potential for roof drain connections outside of this area was very low. This task involved an inspection of the buildings that fell within the area of concern. In most cases, access from public sidewalks and alleys was sufficient to inspect the entire exterior of a building. Local residents and business owners were also accommodating in allowing access to their properties. However, in some cases, limited accessibility to the property impeded visibility to the entire building. **Exhibit 5.3.2 – Drain Connections Map** shows the location of sites identified during this investigation and color codes each property according to risk potential. Sites where a likely outfall for the roof drain was identified are coded green. If an outfall was discovered but connectivity with the roof drain line was inconclusive, the site was coded yellow. If no outfall was discovered and the location of the roof drain termination was underground, the site was considered high risk for a potential roof drain connection and coded red. Each site was also given a number. These numbers correspond to pictures and descriptions in **Appendix M**. Some of the facilities identified in this analysis were not roof drains but another potential source of inflow to the system.

5.4 INFLOW & INFILTRATION RECOMMENDATIONS

The modeling results from the I&I Scenario showed that portions of the existing interceptor system in the Downtown Service Area were not adequate to convey the Wet Weather Peaked Flow without causing significant surcharging. The City's goal is to reduce I&I flows in this area to a manageable level. As such, all recommendations for the I&I scenario are for remediation on the existing infrastructure, rather than upsizing existing pipe sizes or running parallel sewer lines. A map showing the recommendations based on the I&I modeling and field investigation is shown in **Exhibit 5.4.1 – 2016 Recommendations Map - Downtown**. Only one critical improvement project is recommended at this time (Project 2) but it encompasses the entire Downtown Service area. This project involves remediation of all 46 manholes in the system which have the highest

inflow potential. These 46 manholes fall within the top 3 risk categories discussed in **Section 5.3** and are shown on **Exhibit 5.3.1**.

Figure 5.4.1 – I&I Recommendations Cost Estimates show the cost of remediating the high risk manholes. The intent behind these estimates is to provide the City with a range of options for addressing inflow at these locations. **Table 5.4.1** also lists the remediation options and associated costs. It is recommended that the most economical option that effectively reduces or eliminates inflow risk should be selected. The City will likely utilize a combination of these options to reduce inflow to their system.

Table 5.4.1 – I&I Remediation Options

Remediation Description	Unit	Unit Price
Manhole Inserts	EA	$80.00
Manhole Cover	EA	$460.00
Replace Manhole Frame and Cover	EA	$1,838.00
Curtain or Probe Grouting	EA	$1,200.00
Manhole Lining	EA	$8,000.00
Manhole Removal & Replacement	EA	$14,500.00

It is also recommended that the City allocate time for staff to visit each of the properties identified on the **Exhibit 5.3.2 Drain Connections Map** to verify the outfall location of the roof drains. If an outfall cannot be located, the City should partner with the property owner in re-routing the drains to outfall to the historic drainage path. The City should also allocate time for the facilities maintenance staff to utilize the CCTV inspection cameras at their disposal to investigate the interceptor system for storm drain cross connections at the locations indicated on **Exhibit 5.3.1 – I&I Map**.

Other improvements are not recommended at this time, however, the City may choose to budget for future remediation of manholes that fall within the lower risk categories (e.g. Non-Water Tight, In Drainage). Infiltration remediation is not recommended at this time until inflow concerns are addressed. However, a line item has been included in the cost estimate for CIPP (cured-in-place pipe) remediation of the sewer interceptors if the City chooses to address infiltration in the future. The unit price is based on the ultraviolet light curing method for CIPP.

6.0 FUTURE SERVICE AREA MODELING

The goal of the interceptor modeling for the Future Scenario – Hilltop is to create a hydraulic simulation of the City's wastewater collection system assuming all development within the study area is completed. The results of the modeling are intended to show how the City's interceptor system (current and projected) performs and provide a planning tool for future loading conditions. This model was created using information from the previous model scenarios, plus available topography in future development areas.

6.1 PHYSICAL MODEL

The Future Scenario model expands upon the Existing (2016) Scenario physical model, extending the City's interceptor sewers, adding new interceptors to areas not currently serviced by the system, and adding parallel facilities along overtaxed existing interceptors. These new pipes and manholes were schematically located (horizontally and vertically) using existing mapping and topographic information. Model input included the proposed pipe sizes, manhole rim elevations, pipe lengths, and inverts. Pipe slopes are based on invert input information and ADEQ minimum slopes required to maintain a cleaning velocity of two feet per second. Initial input data was modified, as necessary, during the iterative modeling process to determine appropriate sizing and slopes of proposed interceptors.

Additional flow splits that were created in the Future Scenario from adding parallel facilities are automatically calculated based on the pipe invert elevations whenever possible. New manual flow splits become necessary in some locations to maximize the capacity of the system. Some examples of this were the manual flow splits created along the Mohave Wash Outfall interceptors. Multiple flow splits were created along the existing Mohave Wash Outfall interceptors to push flow north into the new proposed parallel interceptor (Project 5).

It should also be noted that the original outfall for the Eagle View Subdivision and Prairie Heights Subdivision was the Jagerson Avenue interceptor. In this scenario flows that were originally heading south from these developments were intercepted and redirected west into the new proposed 15" and 12" interceptor in Grace Neal Boulevard (Project 6).

See **Exhibit 6.1.1 - Future System Map** for the Future Scenario proposed pipe extensions and additions.

6.2 SEWERSHED DEFINITIONS

Sewershed areas were expanded to include all land within the project planning boundary. The contributing areas for the interceptor extensions discussed in **Section 6.1** were defined using the latest available topography, aerial photography, as-builts, and other available data. **Exhibit 6.2.1 – Future Sewershed Map** shows a map of the defined sewer sheds within the Future Scenario system.

6.3 SEWER CONNECTIONS & FLOW CALCULATIONS

The number of sewer connections in each sewer shed was calculated using the parcel shapefiles and City's land use data. The designated land use for each parcel was defined by the General Plan 2030 Map for all undeveloped land within the project planning boundary. The land use was then used to estimate the number of connections. **Exhibit 6.2.1 - Future Sewershed Map** shows the future areas contributing flow to the system. Total acreage per sewershed is found in **Appendix H- Sewershed Legends – Hilltop**.

The sewer flow calculations are the portion of the modeling that simulates the projected flows that are anticipated within the interceptor system once the future land is fully developed according to the designated land use. In addition to the loadings for the existing scenario, each manhole in the system was allocated specific parcels, not yet represented in previous scenarios, associated with a land use defined by the General Plan 2030. Flows were simulated in a manner similar to the previous scenarios; each manhole was allocated future parcels and "loaded" with a flow rate using the Load Allocator. This simulated the average daily flow (ADF) from existing, committed, and future parcels within the system. Later, peaking factors were applied in accordance with **Section 3.6**, to obtain the ultimate peak flow (design flow). As in the 2016 Scenario, the outfall manhole data associated with each parcel was stored within a separate future parcel shapefile.

Known Loads from future developments are typically entered into the model manually for individual developments projected to contribute significant flows to the system. The flows are then stored separately from the Allocated Loads in the model database. For this project, however, all of the future loading was done with the Load Allocator and no future Known Loads were added to the model.

The respective flow loads within the Manhole Hydraulic Model Data Table (within the model database) are as follows:

- LOAD 1 – Allocated Loads based on the existing (2016) connections
- LOAD 2 – Known Loads based on given flow rates from SIUs (2016)
- LOAD 3 – Allocated Loads based on the committed connections
- LOAD 4 – Known Loads based on given flow rates for committed connections
- LOAD 5 – Allocated Loads based on the future connections
- LOAD 6 – Known Loads based on given flow rates for future connections

Table 6.3.1 – Future Load Data

Model Load Data	ADF (MGD)
LOAD 1	2.17
LOAD 2	0.10
LOAD 3	0.00
LOAD 4	0.50
LOAD 5	19.22
LOAD 6	0.00

The Future Scenario includes all land within the project boundary designated as Existing, Existing Committed, Septic and Vacant (Future Connections). The assumption is that septic areas will ultimately connect to the centralized sewer network once individual septic systems near the end of their design life. Vacant (Restrictive Slope) parcel areas are not considered to be contributing to the system within the Future Scenario model.

The total flow output per land use type (Allocated Loads) and given flow data from Future Developments (Known Loads) applied to the model is shown in **Appendix F - Future Flow Data**. The flows entered in the 2016 modeling for the Future Service Area remains unchanged, the future flows were added as additional flow to the model. The generated flows were added throughout the model based on anticipated location of connection to the future interceptor system.

6.4 INTERCEPTOR MODELING RESULTS

Once the physical model described in **Section 6.1** was loaded with the sewer flows described in **Section 6.3** to create a completed interceptor sewer model, simulations were run with peaking factors (**Section 3.5)** for this Future Scenario.

The future interceptor modeling showed that the existing interceptor system is not adequate to convey the future Average Daily Flow, nor Dry Weather Peaked Flow. Multiple locations in the interceptor system are under capacity and therefore unable to handle the projected flows The model revealed sections of pipe that exceed 0.75 d/D and sections with minor surcharging under peaked conditions, i.e. the hydraulic grade lines of the pipes flowing full are right at the top of pipe or just above it (less than 2'). It also revealed sections of pipe experiencing significant surcharging (2' or greater).

The Dry Weather Peaked Flows caused significant surcharging over full flow capacity for the following:

- 10-inch Jagerson Avenue interceptor west of the Mohave Wash (MH 321 to MH 263)
- 14 and 15-inch Shangrila Drive, Kino Ave and Arizona Street interceptor south of the Mohave Wash (MH 521 to MH 525 and MH 530 to MH 228)
- 15 and 18-inch Mohave Wash Outfall interceptor from the Hilltop WWTP south to Bank Street and Gordon Drive (MH 154 to 217)
- 6-inch Fairgrounds Avenue interceptor north of AZ Highway 66 (MH 657 to MH 661)
- 8-inch Marlene Avenue and Van Buren Street interceptor north of Hualapai Mountain Road (MH 73 to MH 83)
- 8, 10 and 15-inch Stockton Hill Road, Hillcrest Drive, Glen Road, Kino Avenue and Willow Road interceptor south and west of the Walleck Ranch Subdivision (MH 418 to MH 429 and MH 433 to MH 444)
- 12-inch Washington Street and Eastern Street interceptor south of AZ Highway 66 and across Interstate 40 to Kenwood Avenue (MH 492 to MH 504 and MH 507 to MH 517)

Wherever significant surcharging was observed a parallel interceptor was added to the system to provide relieve to that section of pipe. This was part of the iterative process to build the Future system model. All new interceptors added to the model were appropriately sized to carry Average Daily Flow and Dry Weather Peaked Flow. After adding the parallel facilities to relieve significant surcharging, problem areas on Future Scenario model consist only of minor surcharging issues on existing lines.

The total flow at the Hilltop WWTP outfall from the Future Scenario model is shown in **Table 6.4.1 – Future Outfall Flows**, which includes flow contributions from the Future Scenario (Known and Allocated), as well as, flows from the Existing (2016) Scenario

Table 6.4.1 – Future Outfall Flows

Location/Source	Scenario	ADF, MGD	ADF, Cumulative	Peak, MGD	Peak, Cumulative
Hilltop WWTP/Sewer Model	2016	2.77	2.77	4.68	4.68
Hilltop WWTP/Sewer Model	Future	19.22	21.99	29.33	34.01

The total outfall flows from the interceptor modeling for the Future Scenario are higher than outfall flows projected in previous sewer master plan reports. This was expected due to changed conditions since the last model update. The first reason for the difference in flow is related to the completion of a new General Plan and the resulting changes in land use. And the second reason is an expanded service area boundary.

6.5 FUTURE RECOMMENDATIONS

The modeling results were used to determine the master-planned pipe sizes and locations for future flow conditions within the existing system and expanded Future Service Area. Multiple expansions to the interceptor system have been proposed to serve future development in these areas. All interceptors were sized to accommodate future peaked dry weather flow at 0.75 d/D. The expansions include extensions to existing interceptors, as well as, construction of new major interceptors. The new lines include the following:

- 8, 12, 15 and 18-inch interceptor along Grace Neal Boulevard between Stockton Hill Road and the Mohave Wash (Project 6)
- 12, 15 and 18-inch interceptor running along the north half of Sec 36 T22N-R16W (south of the airport), across AZ Highway 66 and along Thompson Avenue and Rose Drive to the Mohave Wash (Project 7)
- 8, 12, 21 and 24-inch interceptor along Amigo Road/Gordon Drive, across AZ Highway 66 and along Diagonal Way and Castle Rock Road (Project 8)
- 8 and 12-inch interceptor along Seneca Street, across Interstate 40 and Castle Rock Road, and north along AZ Highway 66 to Diagonal Way (Project 9)
- 12 and 15-inch interceptor along Mohave Drive (aka Rancho Santa Fe Parkway), across Interstate 40 to Gordon Drive (Project 10)
- 8 and 12-inch interceptor along Stockton Hill Road, College Drive, Sierra Road and Devlin Avenue to Powell Avenue (Project 11)

- 8-inch interceptor east of Stockton Hill Road, along John L Avenue to Powell Avenue to the Mohave Wash (Project 12)
- 8-inch interceptor southwest of Sec 24 T22N-R17W, west to Stockton Hill Road (Project 13)
- 8-inch interceptor along Stockton Hill Road, northwest of Sec 24 T22N-R17W to Grace Neal Boulevard (Project 14)
- 8-inch interceptor along Cherum Road from Fountain Hills Road to Grace Neal Boulevard (Project 15)
- 8-inch interceptor along Illinois, east of Sec 18 T22N-R16W, from Grace Neal Boulevard to south of Calle Allende (Project 16)
- 8-inch interceptor along Bank Street, west of Sec 17 T22N-R16W, from Grace Neal Boulevard to south of Calle Allende (Project 17)
- 8-inch interceptor between Sec 17 and Sec 16 T22N-R16W, from Grace Neal Boulevard to south of Calle Allende (Project 18)
- 10-inch interceptor along north Avenida Verde, east of Sec 16 T22N-R16W, from Grace Neal Boulevard to south of Calle Allende (Project 19)
- 12 and 15-inch interceptor east and south of the Hilltop WWTP, across AZ Highway 66 and Grossman Road to Charles Drive, south to Grounds Ranch Road (Project 20)
- 8 and 12-inch interceptor along Northern Avenue and Norrie Drive to Thompson Avenue (Project 21)
- 12-inch interceptor along the east side of AZ Highway 66 to Thompson Avenue (Project 22)
- 12-inch interceptor along Castle Rock Road between Gordon Drive and Northern Avenue (Project 23)
- 8-inch interceptor along Prospector Street, south of Gordon Drive and north of Airway Avenue (Project 24)
- 8-inch extension along Airway Avenue from Prospector Street to north of Mohave Drive (Project 25)
- 8-inch extension along Santa Rosa Drive and Diamond Joe Road from the Hualapai Mountain Campus to the east of Wagon Wheel Drive (Project 26)
- 8-inch interceptor along Santa Rosa Drive across Interstate 40 from the Hualapai Mountain Campus to south of Interstate 40 (Project 27)
- 8-inch extension along Interstate 40 between Prospector Street and Mohave Drive (Project 28)*
- 8-inch interceptor along Southern Avenue between Cherokee Street and Seneca Street (Project 29)
- 8 and 12-inch interceptor along El Paso Road between Mohave Drive and east of Durango Drive (Project 30)
- 8-inch interceptor along Siesta between Mohave Drive and east of Durango Drive (Project 31)
- 12-inch interceptor along Interstate 40 between Mohave Drive and Durango Drive (Project 32)*
- 8-inch extension along Northern Avenue between Sierra Road and the Mohave Wash (Project 35)

- 8-inch extension along Sierra Vista Avenue between Sierra Road and the Mohave Wash (Project 36)
- 8-inch interceptor along Gordon Drive between Sierra Road and the Mohave Wash (Project 37)
- 8 and 12-inch interceptor along Riata Valley Road between 4th Street and north along Western Avenue to Kino Avenue (Project 39)

*See Alternative Alignments discussion in **Section 7.0**

As expected, future interceptor modeling showed that portions of the existing interceptor system were inadequate to convey the future Average Daily Flow and Dry Weather Peaked Flow. There are seven critical improvements recommended where existing pipes may be undersized for the future conditions.

- To relieve the surcharging on the 10-inch Jagerson Avenue interceptor west of the Mohave Wash, will require the construction of an 8-inch parallel line (Project 3).
- The 14 and 15-inch Shangrila Drive, Kino Ave and Arizona Street interceptor south of the Mohave Wash will require the construction of a 12-inch parallel line (Project 4).
- 15 and 18-inch Mohave Wash Outfall interceptor from the Hilltop WWTP south to Bank Street and Gordon Drive will require the construction of a 42, 36, 30, 18, 12 and 8-inch parallel line (Project 5).
- The 6-inch Fairgrounds Avenue interceptor north of AZ Highway 66 will require the construction of an 8-inch parallel line (Project 33).
- The 8-inch Marlene Avenue and Van Buren Street interceptor north of Hualapai Mountain Road will require the construction of an 8-inch parallel line (Project 34).
- 8, 10 and 15-inch Stockton Hill Road, Hillcrest Drive, Glen Road, Kino Avenue and Willow Road interceptor south and west of the Walleck Ranch Subdivision will require the construction of an 8, 12 and 15-inch parallel line (Project 38).
- The 12-inch Washington Street and Eastern Street interceptor south of AZ Highway 66 and across Interstate 40 to Kenwood Avenue will require the construction of an 8 and 12-inch parallel line (Project 40).

Sizing has been made to accommodate flows from the Future Scenario, along with flows from the Existing (2016) Scenario. A map showing the proposed pipes and future system deficiencies with recommended solutions is shown in **Exhibit 6.5.1 – Future Recommendations Map**.

Other improvements are not recommended for minor surcharging, i.e. when the hydraulic grade line is less than 2 feet above the top of pipe and the interceptors are sufficiently deep. Instead, these locations should be monitored during wet weather conditions, to determine the magnitude of the storm surge on the interceptor, on a case by case basis.

Figure 6.5.1 – Future Recommendations Cost Estimate shows the cost of the proposed master planned improvements. Pipe lengths shown on the estimate are approximate, true lengths will be determined in final design. Individual cost estimates for each project may be found in **Appendix G**.

7.0 SUMMARY & CONCLUSIONS

In summary, the interceptor system model and master planning provide the City of Kingman with a tool to better manage their wastewater system and prepare for future development. The model also provides the City with additional collection system analysis and management capabilities. A summary of some relevant capabilities are as follows:

- Future Pipe Sizing
- Flow Depths
- Travel Time Analysis
- Flow Capacity Evaluations
- Alternative Pipe Routings
- CMOM Program Planning
- Dynamic Profiling
- Real Time Simulations
- Odor Control Analysis
- Source Tracing

For a full listing of modeling capabilities now available to the City please visit http://www.innovyze.com/products/infosewer/.

Recommendations: The following is a summary of all master plan recommendations with their associated cost:

- Project 1 – $106,000 – Remove and Replace – Jagerson Ave. (10-inch with 12-inch)
- Project 2 – $4,400 to $800,400 – I&I Remediation (46 Critical Manholes)
- Project 3 – $2,059,000 – Parallel Line – Jagerson Ave. (8-inch)
- Project 4 – $1,625,000 – Parallel Line – Shangrila Dr. and Kino Ave. (12-inch)
- Project 5 – $12,122,000 – Parallel Line – Mohave Wash Outfall interceptor (8 to 42-inch)
- Project 6 – $6,000,000 – New Interceptor – Grace Neal Blvd. (8 to 18-inch)
- Project 7 – $8,891,000 – New Interceptor – Sec 36 T22N-R16W (12 to 18-inch)
- Project 8 – $9,971,000 – New Interceptor – Amigo Rd./Gordon Dr. (8 to 24-inch)
- Project 9 – $7,685,000 – New Interceptor – Seneca St. to Diagonal Way (8 to 12-inch)
- Project 10 – $5,707,000 – New Interceptor – Mohave Dr. to Gordon Dr. (12 to 15-inch)
- Project 11 – $5,653,000 – New Interceptor – Stockton Hill Rd. (8 to 12-inch)
- Project 12 – $3,848,000 – New Interceptor – John L Ave. to Powell Ave. (8-inch)
- Project 13 – $911,000 – New Interceptor – Sec 24 T22N-R17W (8-inch)
- Project 14 – $1,540,000 – New Interceptor – Stockton Hill Rd. (8- inch)
- Project 15 – $1,148,000 – New Interceptor – Cherum Rd. (8- inch)
- Project 16 – $1,757,000 – New Interceptor – East of Sec 18 T22N-R16W (8-inch)
- Project 17 – $1,759,000 – New Interceptor – West of Sec 17 T22N-R16W (8-inch)
- Project 18 – $1,772,000 – New Interceptor – Sec 17 and Sec 16 T22N-R16W (8-inch)
- Project 19 – $1,829,000 – New Interceptor – North Avenida Verde (10-inch)
- Project 20 – $5,679,000 – New Interceptor – East of the Hilltop WWTP (12 to 15-inch)
- Project 21 – $1,504,000 – New Interceptor – Northern Ave. (8 to 12-inch)
- Project 22 – $980,000 – New Interceptor – AZ Hwy. 66 to Thompson Ave. (12-inch)
- Project 23 – $1,509,000 – New Interceptor – Castle Rock Rd. (12-inch)
- Project 24 – $1,070,000 – New Interceptor – Prospector St. (8-inch)

- Project 25 – $1,076,000 – Extension – Airway Ave. (8-inch)
- Project 26 – $1,492,000 – Extension – Santa Rosa Dr. and Diamond Joe Rd. (8-inch)
- Project 27 – $1,556,000 – New Interceptor – Santa Rosa Dr. across Interstate 40 (8-inch)
- Project 28 – $879,000 – Extension – Interstate 40 (8-inch)
- Project 29 – $1,420,000 – New Interceptor – Southern Ave. (8-inch)
- Project 30 – $2,561,000 – New Interceptor – El Paso Rd. (8 to 12-inch)
- Project 31 – $2,476,000 – New Interceptor – Siesta (8-inch)
- Project 32 – $1,570,000 – New Interceptor – Interstate 40 (12-inch)
- Project 33 – $168,000 – Parallel Line – Fairgrounds Ave. (8-inch)
- Project 34 – $856,000 – Parallel Line – Marlene Ave. and Van Buren St. (8-inch)
- Project 35 – $1,594,000 – Extension – Northern Ave. (8-inch)
- Project 36 – $1,571,000 – Extension – Sierra Vista Ave. (8-inch)
- Project 37 – $1,040,000 – New Interceptor – Gordon Dr. (8-inch)
- Project 38 – $1,348,000 – Parallel Line – Stockton Hill Rd. (8 to 15-inch)
- Project 39 – $1,391,000 – New Interceptor – Riata Valley Rd. (8 to 12-inch)
- Project 40 – $1,925,000 – Parallel Line – Washington St. and Eastern St. (8 to 12-inch)

In addition to the recommendations already covered, the following should be taken into consideration by the City:

Modeling Updates: This report recommends that the City perform regular updates to the model as development occurs and the collection/interceptor system is expanded. An up-to-date model of the system will provide the City with the best analysis and management tool. As the model changes the Master Plan can easily be updated to reflect those changes. The goal is that the Master Plan, and more so the models developed, will function as a living document that is updated or modified as conditions change.

Interim Sizing: Interim sizing for interceptors should be avoided wherever possible. However, due to budgetary constraints the City may choose to install a smaller diameter pipe than what is recommended in this report. The City should understand that any interim sized interceptor will likely be replaced in the future conditions or necessitate an additional parallel line along that corridor. It is highly recommended that any such alterations to the proposed pipe network be input under a new scenario, and such modifications be thoroughly analyzed and evaluated to determine the ramifications prior to implementation.

Plan for Projects in the City's CIP: The City should use the information shown in each of the scenarios and evaluate those projects identified which should be included in the City's Capital Improvement Program, and when they should be programmed for design and construction. Many of the projects for the Future service areas will be dependent on the pace at which development occurs in the un-serviced areas of the City. All proposed developments will impact the downstream capacity in the City's network to varying extents.

Plan for Flows to the WWTP: Currently, the City uses only a portion of their capacity in the Hilltop WWTP. However, this report demonstrates that as the City grows and develops, in the future, additional capacity will be required. Planning for this will be necessary to accommodate

the future service areas. It is recommended that the City begin the process of expanding the current treatment capacity, in accordance with AAC R18-9-A305, as increased flows from these future service areas begin to utilize the remaining capacity.

Scour Depth Analysis: While this report attempted to establish depths of proposed interceptors sufficiently below washes and other drainage or irrigation facilities, consideration of requirements to prevent or mitigate scour were not considered.

Aerial Topography: New aerial topography that becomes available, either through the City or Mohave County, should be utilized to update rim elevations for the proposed interceptors in the model. Aerial topographic data provided for this study did not encompass the entire planning boundary and was fairly outdated in some areas of the City.

Manhole Survey: A majority of the interceptor model was created using record as-built drawings of the sewer interceptors. As additional surveyed manhole data becomes available it should be used to verify the as-built information entered into the model.

General Plan Amendments: If changes are contemplated for the City's General Plan (i.e. higher density housing, higher wastewater industries, larger planning area etc.) the proposed change should be input into the model for two reasons. The first is to verify if the proposed change impacts the existing downstream interceptor system. The second is to verify the master planned sizing of proposed facilities shown in this report.

Additional Crossings: Multiple interceptors recommended for the Future Scenario involve crossing the highways, railroad tracks, or the Mohave Wash. Special design considerations will have to be considered for these locations, as well as, planning for the significant costs associated with these crossings. Although not shown in the model there are two additional sewer crossings/extensions that are recommended for the system. These sewer lines are non-interceptors but are necessary for providing adequate sewer service to part of the Hilltop Service Area. One of these is an 8-inch interceptor that crosses the Interstate 40 at Fairground Boulevard. The second is an 8-inch interceptor that crosses the Interstate 40 at Rutherford Street and is needed to serve parcels developing around Manzanita School. Both projects should be included in the City's CIP.

Alternative Alignments: The routing of new interceptors proposed in this report represents the best overall layout for serving all areas within the Study Boundary, while not overtaxing existing facilities, and adhering to the design criteria and feedback provided by the City. However, there are several locations were alternative routings were considered. The interceptor sewer model developed for this project allows the City to create additional scenarios in the model with alternative interceptor alignments as various needs arise in the system. One such area where alternative routing should be analyzed is Section 14, T21N-R16W, south of Interstate 40. The current projects recommended for serving this area (Project 10 and Project 32) route flows north across the Interstate towards the airport. An alternative to this alignment is routing flows to the west and connecting with the sewer proposed for Project 28. The interceptor sizing would need to be modified for Project 28 and the downstream capacity of the rest of the interceptor network would also have to be analyzed.

The City of Kingman Wastewater Master Plan Update and Inflow/Infiltration Study gives the City an unlimited planning tool for their wastewater collection system going forward. In the future, as more historic data becomes available, there will be opportunity to review this plan to ensure the assumptions made are still valid; thus insuring the City can continue to operate its collection system in the most efficient way possible.

8.0 REFERENCES

Arizona Administrative Code (AAC) Title 18, Chapter 9, Article 3, Part E. Type 4 General Permits

City of Kingman General Plan Update 2030, March 2014, *City of Kingman*

Downtown Wastewater Treatment Plant Upgrade and Expansion Preliminary Design Report (PDR), November 2009, *Brown and Caldwell*

Hilltop Wastewater Treatment Plant Aquifer Protection Program (APP) Permit Amendment Application (and supporting documentation), August 2007, *Brown and Caldwell*

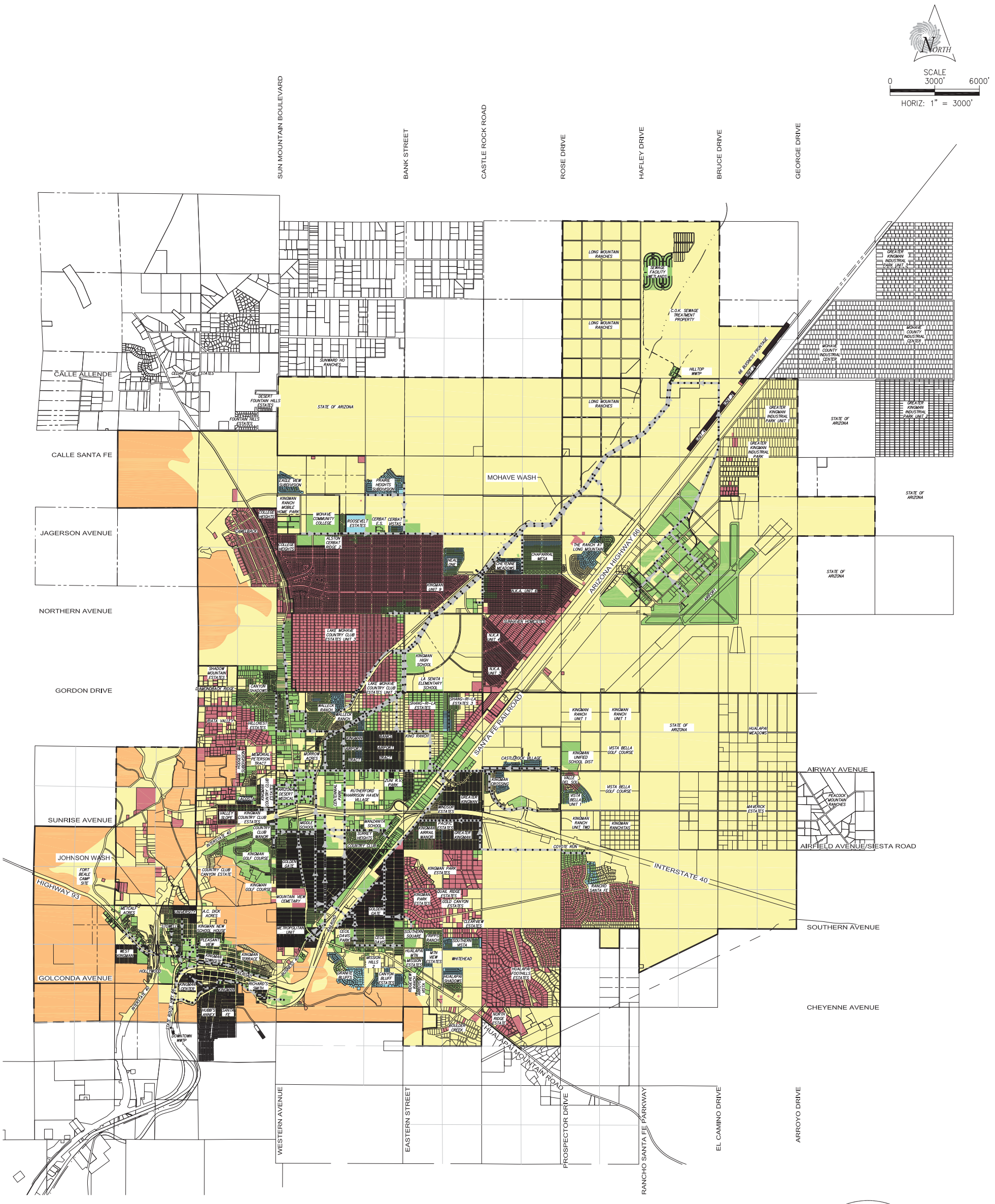
Request for Amendment to 208 Area-Wide Water Quality Management Plan, August 2007, *Brown and Caldwell*

Sewer Master Plan for Kingman Commercial Center (and surrounding areas), January 2011, *Shephard – Wesnitzer*

Trunk Sewer Master Plan, May 2003, *Burgess & Niple*

9.0 ACKNOWLEDGMENTS

The City of Kingman Engineering and Public Works Department made significant contributions to the completion of the Wastewater Master Plan Update. Individuals who provided feedback, assisted in data collection, and spent many hours attending project meetings, reviewing submittals and coordinating with the project team, include: Greg Henry, Phil Allred, Mike Prior, Frank Marbury and Keelan Yarbrough. Their efforts were invaluable during the course of the project.



CITY OF KINGMAN
FOUNDED 1882

CITY OF KINGMAN

INTERCEPTOR SEWER MODELING
EXHIBIT 2.4.1
2016 CONNECTIONS MAP

CONNECTIONS AREA LEGEND

- EXISTING CONNECTIONS (SEE NOTE 2)
- EXISTING COMMITTED CONNECTIONS
- SEPTIC (ONSITE WASTEWATER TREATMENT)
- VACANT LAND (FUTURE CONNECTIONS)
- VACANT LAND (RESTRICTIVE SLOPE)

LEGEND

- CITY LIMITS
- STUDY LIMITS (WATER BOUNDARY)
- EXISTING SEWER 2016
- MANHOLE
- EXISTING CANAL
- EXISTING WASH
- FM — FORCE MAIN
- LS — LIFT STATION

NOTE
1. SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.
2. EXISTING CONNECTIONS INCLUDE AREAS WHERE PERMANENT FACILITIES (E.G. GOLF COURSE, AIRPORT RUNWAY, ETC) PROHIBIT THE DEVELOPMENT OF A FUTURE CONNECTION.

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NORTH

SCALE

0 500' 1000'

HORIZ: 1" = 500'

LEGEND

- EXISTING WASH
- SEWER LINE
- SEWER LINE, SUSCEPTIBLE TO INFILTRATION
- SEWER LINE, PERVIOUS SURFACE

MH	CO	INFLOW POTENTIAL
●	○	HIGHLY SUSCEPTIBLE – 26 TOTAL
●	○	VENTED, IN DRAINAGE – 6 TOTAL
●	○	PARTIALLY VENTED, IN DRAINAGE – 14 TOTAL
●	○	NON-WATER TIGHT, IN DRAINAGE – 89 TOTAL
●	○	SOLID RIM, IN DRAINAGE – 17 TOTAL
●	○	VENTED – 4 TOTAL
●	○	PARTIALLY VENTED – 11 TOTAL
●	○	NON-WATER TIGHT – 110 TOTAL
●	○	SOLID RIM – 29 TOTAL
●	○	NOT FOUND, INACCESSIBLE – 130 TOTAL
*		ADJACENT STORM DRAIN FACILITIES

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

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CITY OF KINGMAN

INTERCEPTOR SEWER MODELING

EXHIBIT 5.3.1

I & I MAP - DOWNTOWN

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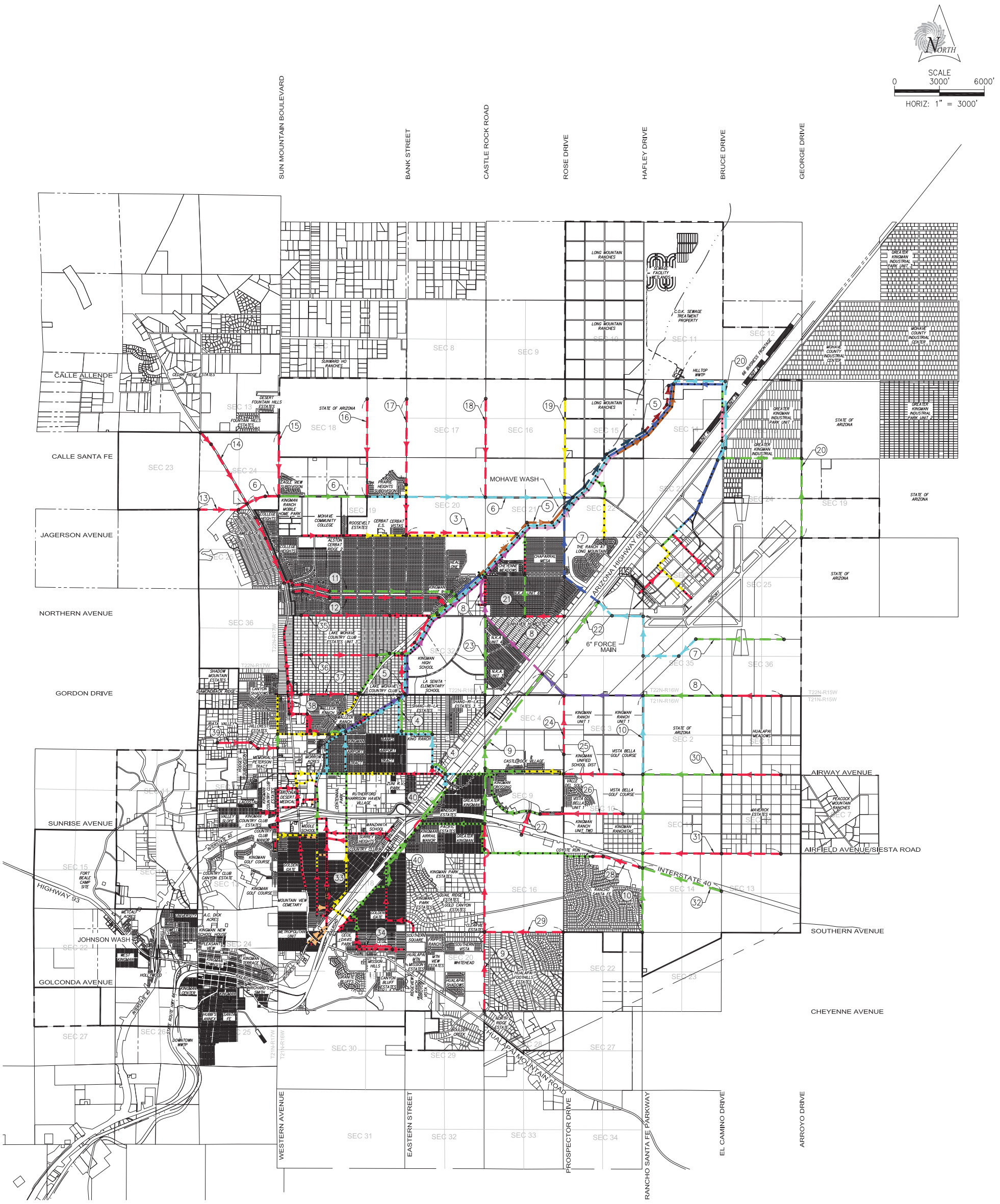

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF KINGMAN
INTERCEPTOR SEWER MODELING
EXHIBIT 6.5.1
FUTURE RECOMMENDATIONS MAP
HILLTOP

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AGENDA ITEM

3-D

CITY OF KINGMAN
MUNICIPAL UTILITY COMMISSION
COMMUNICATION

TO: Chairman and Commission Members

FROM: Engineering Services

MEETING DATE: March 24, 2016

AGENDA SUBJECT: Presentation of Reclaimed Water Study, ENG15-047

SUMMARY: On August 4, 2015, the City hired Sunrise Engineering to prepare a report on options for reusing effluent from the Hilltop Wastewater Treatment Facility (WWTF). The Hilltop WWTF is currently permitted to produce up to 1 million gallons per day of A+ reclaimed water, and up to 5.1 million gallons per day of B+ reclaimed water. The study specifically examines three options for A+ reuse as follows: (1) Groundwater Injection, (2) Airport Industrial Use and (3) City Golf Course and Parks Reuse. The Executive Summary from the report is attached. The full report is available on the City of Kingman website at the link below.

Option 1 (Groundwater Injection) involves drilling a well at the Hilltop WWTF and injecting A+ water into the aquifer, thereby replenishing the supply. Option 1 is the cheapest and simplest option to implement. Option 2 involves the installation of pumps and a reclaimed distribution system from the Hilltop Facility to the Kingman Airport. Option 2 is the most expensive option and would require charging rates higher than potable water, in order to fund the option. This option may be more feasible if a large user (1 million gallons per day) were to open in the Airport Park. Option 3 (Golf Course/Schools reuse) involves the installation of pumps and a reclaimed distribution system from the Hilltop Facility to the Golf Course. The reclaimed distribution line would be located to pass as many schools and parks as possible. Option 3 is the second most expensive option and would allow for the watering of multiple turf areas, which are currently irrigated with potable water.

City staff will provide a brief overview of the report and its recommendations to the Utility Commission. The Consultant will provide a presentation at the April 5 City Council meeting.

ATTACHMENTS: Reclaimed Water Report – Executive Summary

FULL REPORT
WEB LINK: http://www.cityofkingman.gov/Departments/Engineering/DesignStudiesandReports.aspx

3D

Reclaimed Water Reuse Study

Final Report - February 2016

CITY OF KINGMAN
FOUNDED 1882

SUNRISE ENGINEERING

3D

RECLAIMED WATER REUSE STUDY

FOR

FEBRUARY 2016

Prepared for:
City of Kingman
310 North 4th Street
Kingman, Arizona 86401
928.753.8329
Attn. Gregory T. Henry, P.E.

Prepared by:
Sunrise Engineering, Inc.
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Mesa, Arizona 85210
480.768.8600

Registered Professional Engineer (Civil)
CERTIFICATE NO.
60459
K. JUSTIN
VAN DE GRAAFF
Date Signed 2/25/16
ARIZONA U.S.A.
EXPIRES: 9/30/2018

Project Team Leads:
Justin Van De Graaff, P.E.
Project Engineer/ Project Manager

Greg Potter, P.E.
Project Principal

EXECUTIVE SUMMARY

The City of Kingman owns and operates their Hilltop Wastewater Treatment Facility (WWTF) north of the City of Kingman located at 5925 E Highway 66 in Kingman, Arizona. This facility has the capacity and is permitted through the Arizona Department of Environmental Quality (ADEQ) to treat and redistribute up to 1 MGD of Class A+ reclaimed water. Currently, however, the WWTF only treats the wastewater to a Class B+ condition and then discharges the effluent to the Mohave Wash and to wetlands northwest of the facility.

Per ADEQ, Class A+ reclaimed water is wastewater that has been treated to a high standard of cleanliness and is cleared for human contact. Class B+ reclaimed water is also wastewater that has been treated, but to a lesser standard of cleanliness although it is still safe for human contact.

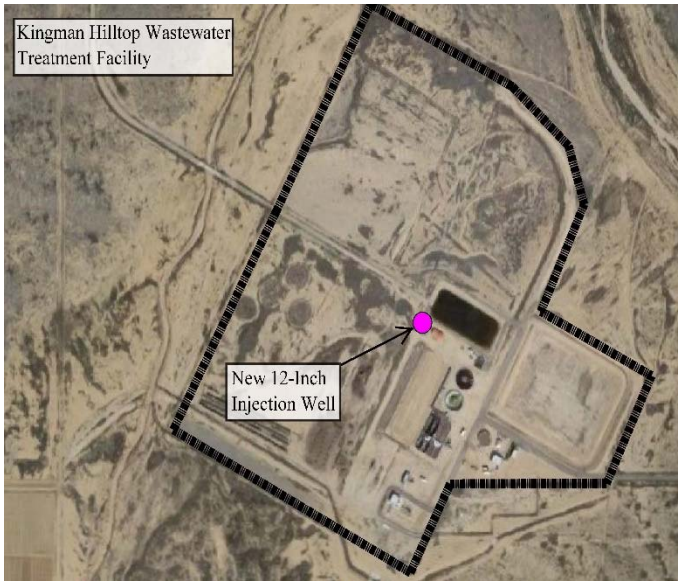
The City of Kingman would like to produce and utilize Class A+ reclaimed water and has contracted with Sunrise Engineering to perform a study of Options that would best serve Kingman's interests. These options include the following:

- Injection of the reclaimed water back into the Hualapai Valley Basin aquifer
- Distribution of the reclaimed water to the Kingman Airport Industrial Park
- Distribution of the reclaimed water to the Cerbat Cliffs Golf Course, Kingman schools and Kingman parks.

In order to determine which of the three above mentioned Options would best serve the City of Kingman, an analysis of these options was performed and is listed below.

Option 1 – Groundwater Injection:

This Option analyzed the benefits of injecting 1 MGD of Class A+ reclaimed water back into the Hualapai Valley Basin aquifer. An analysis of the Basin aquifer was performed and it was noted that groundwater levels in the Kingman and surrounding areas have been declining over time. Injection of Class A+ reclaimed water into the Basin aquifer would help to stabilize and/or raise groundwater levels.



Option 1 – Groundwater Injection

Injection Conceptual Design:
In order to achieve this injection a few options were considered. The City owns and operates a few drinking water wells within a three mile radius of the WWTF and these wells were analyzed to determine their injection capacities. It was determined that City Well #6 has enough capacity to inject the desired 1 MGD of reclaimed water and that City Well #1 only has the capacity to inject 264K GPD of reclaimed water. In order to reduce initial capital of installing a distribution

system to these wells, a third option for groundwater injection was analyzed and ultimately decided upon. This option includes drilling a new injection well at the WWTF and allowing the 1 MGD of reclaimed water to gravity flow into this new well.

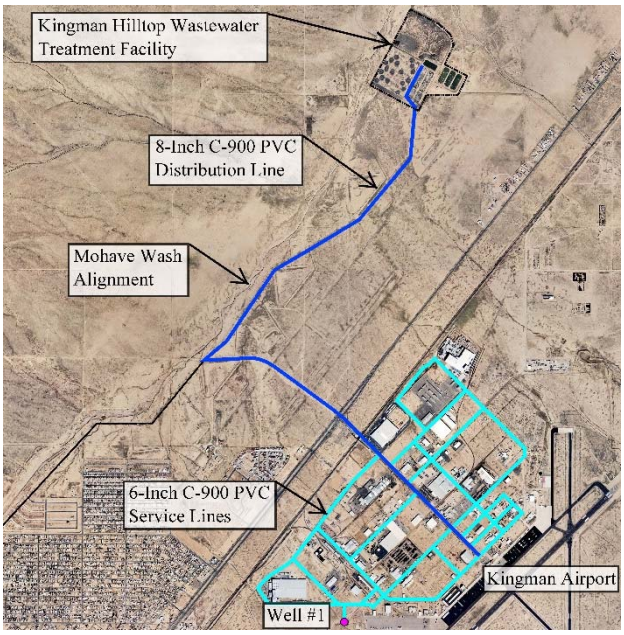
Permitting:
Permitting for Option 1 – Groundwater Injection would require that the City amend their current ADEQ Aquifer Protection Permit (APP) no. P-100611 to include groundwater injection as a form of discharge.

Capital and Long Term O&M Costs:
With the injection well being installed onsite, projected capital costs are approximately $1 Million and has minimal long term operations and maintenance (O&M) costs as there are no pumps, storage tanks or distribution line to maintain.

Option 2 – Airport Industrial Park Reuse:

This Option analyzed the feasibility of distributing Class A+ reclaimed water from the Hilltop Wastewater Treatment Facility to the property and business owners of the Kingman Municipal Airport Industrial Park.

Water Usage Study:
Current and historic water usage was analyzed to help project future reclaimed water usage demands for the next 20-years at the Airpark with an assumed 6% growth rate. Surprisingly, the projected reclaimed water peak demand was under 350K GPD with the average reclaimed water demand even lower.



Option 2 – Airport Industrial Park Reuse

Distribution Conceptual Design:
The design to distribute reclaimed water to the Airpark would include a booster station to pump reclaimed water from the City's tertiary treatment facility to a new steel water storage tank onsite, a pump station to pump the stored reclaimed water to the Airpark and an 8-inch C-900 PVC distribution line from the WWTF to the Airpark with 6-inch C-900 PVC service lines from the distribution line to the tenants at the Airpark.

This distribution line would follow the City's existing sewer easement along the Mohave Wash alignment north to the Grace Neal Parkway alignment and then run east boring under AZ Highway 66 and on to the Airpark. Option 2 would also include the option to recharge groundwater at the City's Well #1 near the Airpark. As mentioned above, this well has the capacity to inject up to 264K GPD.

Permitting:
The ADEQ permitting required for this Option would include a Type III user's permit which would allow for the City to act as the agent for the reuse of reclaimed water. This would allow the City to determine who could reuse reclaimed water and it would be the responsibility of the City to guarantee that the reclaimed water is being used appropriately and that end users are in compliance with all Arizona Administrative Code (AAC) requirements and regulations. Also, the City would need to amend their APP permit no. P-100611 to allow for reclaimed water to be discharged into the Basin aquifer.

Capital and Long Term O&M Costs:
Projected capital costs for this Option are the highest of all three Options coming in at just over $10.7 Million. Long term O&M costs are also high as there are pump stations, a storage tank and several miles of distribution lines to operate and maintain.

Rate Analysis:
A rate analysis was performed on this Option to determine by how much the reclaimed water base rates at the Airpark would need to be adjusted to in order to fund this project. Low water demand spread over a limited amount of users equated to a reclaimed water base rate increase of approximately $1,057 higher than the City's current water base rate.

Capital Savings:
Option 2 does, however, provide approximately $1.9 Million of capital savings by reducing the demands on the City's water system thereby freeing up water infrastructure.

Survey:
A survey for this Option was prepared and sent to the tenants of the Airpark to gauge interest in a reclaimed water system. To date, most of the responses have not been in favor of this system.

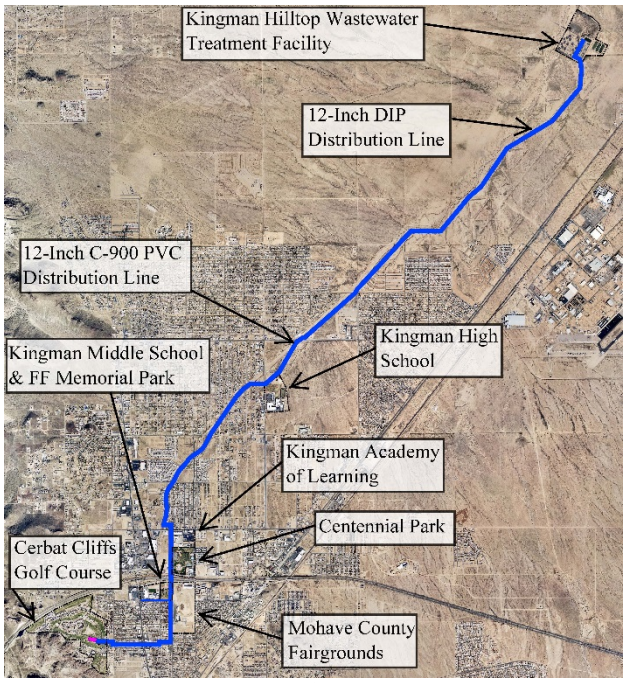
Option 3 – Golf Course, Schools and Parks Reuse:

This Option analyzed the feasibility of distributing Class A+ effluent from the Hilltop Wastewater Treatment Facility to Cerbat Cliffs Golf Course in Kingman with the possibility to have connections to the Kingman High School, Kingman Middle School, Kingman Academy of Learning, Firefighter's Memorial Park, Centennial Park and the Mohave County Fairgrounds.

Water Usage Study:
Historic irrigation water usage at the golf course, schools, parks and fairgrounds were analyzed to determine which entity had the highest demand. It was immediately determined that the golf course's irrigation water demand was almost 1 MGD in the summer months with the next highest water demand being the Kingman High School with a peak 2011 summer usage of approximately 292K GPD. Since the golf course's irrigation demands are three times higher than the next entity's irrigation water demands, it was decided that the conceptual design for Option 3 should include a distribution line from the WWTF to the golf course.

Distribution Conceptual Design:

A route was selected for this distribution line that follows the City's existing sewer easement along the Mohave Wash alignment from the WWTF into town, briefly exiting the Mohave Wash alignment to pass by the Kingman High School and then return to the Wash. At Airway Avenue, the distribution line would again exit the Mohave Wash alignment and head east to N Burbank Street. The distribution line would then turn south passing by the Kingman Academy of Learning, Centennial Park, boring under Interstate 40, and passing by Firefighter's Memorial Park, Kingman Middle School and the Mohave County Fairgrounds.



Option 3 – Golf Course, Schools and Parks Reuse

The distribution line would be a combination of 12-inch DIP for the higher pressured section near the WWTF and C-900 PVC for the lower pressured section near the golf course. This distribution line would be sized for future growth. Also, as part of the conceptual design for Option 3 there would be a booster station at the WWTF to pump the reclaimed water to the golf course.

The reclaimed water would then be stored at an available pond at the golf course with another booster station to pressurize the reclaimed water into their irrigation system. Possible service lines to the schools, parks and fairgrounds could be provided, however, all these entities except the Kingman High School would need to add additional booster stations onsite to pressurize their irrigation systems.

Permitting:

As with Option 2, this Option would only require a Type III user's permit which would allow for the City to act as the agent for the reuse of reclaimed water.

Capital and Long Term O&M Costs:

Projected capital costs for this Option were significantly higher than Option 1 but were not as high as Option 2. Projected capital costs for Option 3 came in just over $8.2 million. Long term O&M costs are also high as there are multiple pump stations to power and maintain and a long distribution line to maintain.

Rate Analysis:

To determine how much the City's current water rates would need to be adjusted to in order to fund this Option, a rate analysis was performed. Water base rates Citywide would need to increase approximately $3.16 to fund this Option.

Capital Savings:
This Option does however provide approximately $3.6 Million of capital savings by reducing the demands on the City's water system thereby freeing up water infrastructure.

Benefits Analysis:

A benefits analysis of all three Options was performed to weigh the pros and cons and help determine which of these Options best serves the City's interests. To equally compare all three Options, a list of unbiased selection criteria with assigned points possible was prepared. Criteria with a higher level of importance, such as capital costs and long term O&M were given higher points possible. A total of 200 points was possible for scoring.

Option 1 – Groundwater Injection:
This Option was the least costly of all three Options and therefore scored the highest in the capital cost criteria. It did not, however, provide any capital savings or provide any connections for future developments and therefore scored low in these criteria. This Option scored 120 points out of a possible 200 points and was ranked second of the three Options.

Option 2 – Airport Industrial Park Reuse:
This Option provides a high probability for positive community economic impact and is available for green funding and therefore scored high in these criteria. This Option was, however, the most expensive project in the study, had the highest long term O&M costs and would increase user rates the highest, therefore scoring low in these criteria. This Option scored 95 points out of a possible 200 points and was ranked last of the three Options.

Option 3 – Golf Course, Schools and Parks Reuse:
This Option provided the highest capital savings, provided a high probability for positive community economic impact and was eligible for green funding and therefore scored high in these criteria. It did not, however provide any groundwater recharging and although its capital costs and long term O&M costs were not as high as Option 2, they were significantly higher than Option 1's costs and therefore this Option scored low in these criteria. This Option scored 129 points out of a possible 200 points and was ranked first of the three Options.

Recommendations:

Option 1 Recommendation
If the City of Kingman would prefer a project with low capital costs, low long term O&M costs and an Option that provides groundwater recharging, Option 1 – Groundwater Injection is recommended.

This Option only provides groundwater injection and will be the easiest to construct. It also is the least expensive Option in this study and has the lowest O&M costs.

Option 3 Recommendation
If the City of Kingman would like to service multiple entities with reclaimed water, free up existing water infrastructure and has options for funding, Option 3 – Golf Course, Schools and Parks Reuse is recommended.

This option would use approximately 1 MGD of reclaimed water as irrigation water for the Cerbat Cliffs Golf Course with possible connections to the schools, parks and the fairgrounds. Its capital and O&M costs are higher than Option 1, but it will qualify for WIFA funding and will provide capital savings by reducing the demands on the City's water system thereby freeing up water infrastructure. Also, water base rates Citywide would only need to rise slightly in order to fully fund this Option.

Option 3 is the most flexible/scalable Option in the study. It would pass near the Airpark (approximately one mile away), multiple schools and parks, the fairgrounds and City wells that could be retrofitted for groundwater injection.

This Option would also positively impact the community economy as it has the possibility to attract new "green" businesses that want to use reclaimed water.