SAN JACINTO RIVER AUTHORITY RAW WATER SUPPLY MASTER PLAN
DETAILED STRATEGY EVALUATION TECHNICAL MEMORANDUM

Project Name:	Return Flows in Montgomery County Service Area
Project Type:	Reuse
Potential Supply Quantity (Rounded):	Up to 26,300 acre-feet/year (23 mgd)
Development Timeline:	5 years
Project Capital Cost:	$0 - $34,059,000 (August 2017)
Unit Water Cost (Rounded):	$0 - $313 per acre-feet (during loan period) $0 - $111 per acre-feet (after loan period)

FREESE AND NICHOLS, INC.
TEXAS REGISTERED
ENGINEERING FIRM
F-2144

STRATEGY DESCRIPTION

The San Jacinto River Authority (SJRA) is a wholesale water provider for various municipal, industrial, and irrigation retail customers in the San Jacinto River Basin. In Montgomery County, Lake Conroe is SJRA's primary source of supply. Montgomery County is currently in the process of converting excess groundwater demand to surface water and other sources. This process is being carried out by the Large Volume Groundwater Users (LVGUs) in the county and can be accomplished by individual LVGUs or collectively in a joint Groundwater Reduction Plan (GRP). SJRA represents the largest surface water provider, providing a means of conversion within the county to several LVGUs in its joint GRP. Current supplies from Lake Conroe are adequate for initial phases of conversion but future growth will require the introduction of additional options such as groundwater and treated wastewater alternatives.

Return flows are one of the various sources of supply that SJRA is considering as a potential future source. Throughout the San Jacinto River Basin, organized development is steadily overtaking the traditional, rural pattern that has historically been present in much of the area. Over time, homes with individual wells and on-site sewage systems are being replaced with homes served by master-planned water and wastewater service from centralized utility systems. It is these latter types of development that produce opportunity for the development of return flows from wastewater treatment facilities.

Below is a description of the methodology used to compute the return flows, as presented in Task 1102. The populations contributing to return flows were taken from the 2016 Region H Regional Water Plan (RWP) and the Regional Groundwater Update Project (RGUP) developed by Harris-Galveston Subsidence District (HGSD), Fort Bend Subsidence District (FBSD), and Lone Star Groundwater Conservation District (LSGCD), where possible. These sources were also used in the development of the 2016 Region H Regional Water Plan (RWP). A detailed analysis of population density in utilities known to have a comprehensive wastewater system was conducted. The population densities for various utilities were determined and the lowest of these densities were used as a threshold for other population-bearing units; those with a density less than this threshold will be assumed to use on-site treatment and will be assumed to not generate return flows until they reach a density that surpasses the threshold. Based on the review of per-capita demands from the RGUP and Region H, the per-capita demands developed during the development of the 2016 RWP without the application of conservation were used to develop estimates of return flows.

The return flow estimates were generated based on a return flow factor of 40% of the annual water demand. In addition, the return flows in the basin that are already permitted under existing water rights were excluded from consideration.

STRATEGY ANALYSES

The project analyses for Return Flows strategy for the Montgomery County service area include evaluations of the potential supply to be created, environmental factors involved in the project, permitting and development considerations, and an analysis of potential project cost.

Supply Development

Separate return flows strategies are being developed for the Montgomery County service area and the Highlands service area. Therefore, the sub-basins contributing return flows to each one of the service areas were identified and were separated based on the service area to which they are contributing return flows. It is possible that the choice to develop certain return flows strategies may impact the potential to develop strategies downstream in the Highlands service area.

Exhibit 1, attached to this technical memorandum, includes a map of the sub-basins contributing to the Montgomery County service area. Some or all of the return flows generated in the Montgomery County service area could potentially be diverted downstream in Lake Houston to serve the Highlands service area. However, for purposes of this analysis, it was assumed that the return flows generated above Lake Conroe and in the area indicated as the Lake Creek sub-basin of the San Jacinto River will be captured and permitted as part of the Montgomery County service area strategy. Similarly, return flows generated from sub-basins below these two sub-basins were considered to be part of the Highlands service area strategy.

Two sub-basins were identified as potential sources contributing return flows to the Montgomery County service area: Lake Conroe and Lake Creek. The overall volumes of return flows generated for these sub-basins are reported in *Table 1* below.

Table 1. Summary of Return Flows generated in the Montgomery County Service Area

Service Area	Return Flows (Acre-Feet per Year) [1]					
	2020	2030	2040	2050	2060	2070
Lake Conroe	4,777	6,150	7,483	8,990	11,651	14,315
Lake Creek	6,466	8,382	10,282	12,522	15,357	17,718
TOTAL	**11,243**	**14,532**	**17,765**	**21,512**	**27,008**	**32,033**

[1] Return flow estimates in this table do not include deductions for existing authorization or channel losses.

Any return flows already permitted under the existing authorizations were subtracted from these return flows. *Table 2* includes a list of existing authorizations considered in this evaluation. The return flows to be deducted were determined based on the geographical extents of the existing authorizations and the manner in which they drain to potential diversion points. In addition to this, conveyance losses for the travel time from the sub-basins to the diversion points were also subtracted from the return flows listed in *Table 1* during the evaluation of supply options seen below. A channel loss factor of 5% was assumed and used for estimating these conveyance losses.

Table 2. Summary of the Currently Authorized/Negotiated Return Flows within the Montgomery County Service Area

Deduction	Return Flows (Acre-Feet per Year) [1]					
	2020	2030	2040	2050	2060	2070
Lake Conroe	540	556	572	584	595	620
Montgomery County MUDs 8 and 9 [2]	*85*	*90*	*101*	*113*	*125*	*150*
City of Huntsville [2]	*455*	*466*	*470*	*470*	*470*	*470*
Lake Creek	5,669	6,749	8,045	9,068	10,164	11,292
City of Conroe [2]	*5,577*	*6,657*	*7,953*	*8,975*	*10,072*	*11,200*
City of Panorama Village	*92*	*92*	*92*	*92*	*92*	*92*
TOTAL	**6,209**	**7,305**	**8,617**	**9,651**	**10,759**	**11,912**

[1] Return flow estimates in this table do not include deductions for existing authorization or channel losses.
[2] Include flows that may be developed by SJRA.

The options considered below will use the return flows identified in *Table 1* along with the reductions indicated in *Table 2* in order to present potential scenarios in which flows may be developed for supply purposes. The options considered will develop water from the flows that are currently being identified through agreement and presented in *Table 2* but also utilize resources that are not currently under consideration as presented in *Table 1*, less the volumes in negotiation/under approval in *Table 2*. This will mean that some supplies will be more readily obtainable because their permitting and contractual agreements are already materializing at the present.

Return Flow Strategy Options

Whether it is to develop the return flows in the Lake Conroe sub-basin or the Lake Creek sub-basin, SJRA must determine the volume of return flows available in each sub-basin in the Montgomery County service area, identify the entities that are generating those return flows, determine the pending applications for return flows to keep track of, establish agreements/contracts with entities generating return flows, and apply for TCEQ permits for the return flows. SJRA has the following potential project alternatives.

1) Existing Supplies contributing to Lake Conroe. These are the pending agreements that SJRA currently holds that require additional steps to perfect as an available supply.

2) Other Sources contributing to Lake Conroe. These sources can be GRP participants or non-GRP participants or other entities contributing return flows to the Lake Conroe sub-basin.

3) Determine all water users (GRP participants and non-GRP participants) currently contributing return flows to Lake Creek sub-basin and determine if an agreement can be set with those participants for acquiring the return flow permit. Some of these supplies are already in the process of being developed through permitting of the City of Conroe's return flows.

Strategy Alternative Option 1 - SJRA has pending agreements with MUDs 8 and 9 for return flows originating from MUDs 8 and 9, and from MUDs 8 and 9 contract for reuse supplies with City of Huntsville. As per this agreement, 21% of the return flows generated from the MUDs 8 and 9 reuse contract will be available in Lake Conroe. In addition, the City of Huntsville will dedicate 21% of the supply discharged for MUDs 8 and 9 at their WWTPs for diversion downstream at Lake Conroe, less conveyance loss. About one-third of the volume available in Lake Conroe is available for SJRA to permit and the two-thirds is accounted for by the City of Houston. The one-third portion returned to the SJRA portion of Lake Conroe is readily available to SJRA and the remaining two-thirds accounted for the City of Houston portion may also be availed to SJRA but would require the negotiation of terms with the City of Houston that would parallel the existing agreement for SJRA to obtain contract supplies from the COH portion of Lake Conroe.

Based on this agreement, the volumes shown in *Table 3* below are potentially available to SJRA for future permits. In this case, SJRA already has an agreement in development with MUDs 8 and 9. If they choose to develop a project for these return flows, SJRA will have to apply to TCEQ for a bed and banks transfer of the return flow volumes specified in *Table 3,* and any additional steps necessary should they pursue the City of Houston portion of supplies. The return flows from these two agreements will be available for capture at Lake Conroe.

Table 3. Option 1: Return Flow Volumes Available for SJRA Agreement with MUDs 8 and 9 and City of Huntsville

Reuse Source	Return Flows (Acre-Feet per Year) [1]					
	2020	2030	2040	2050	2060	2070
MUDs 8 and 9 returns	81	90	101	113	125	150
SJRA Portion	*28*	*30*	*34*	*38*	*42*	*50*
City of Houston Portion	*57*	*60*	*68*	*75*	*83*	*100*
City of Huntsville Contract with MUDs 8 and 9 returns	455	466	470	470	470	470
SJRA Portion	*152*	*155*	*157*	*157*	*157*	*157*
City of Houston Portion	*303*	*311*	*313*	*313*	*313*	*313*
OPTION 1 TOTAL	**540**	**556**	**572**	**584**	**595**	**620**
SJRA Portion	***180***	***185***	***191***	***195***	***198***	***207***
City of Houston Portion	***360***	***371***	***381***	***389***	***397***	***414***

[1] Return flows adjusted for channel losses.

Strategy Alternative Option 2 – This strategy option includes the permitting of the return flows generated in the Lake Conroe sub-basin by the SJRA GRP and non-GRP participants and all other sources contributing flows to Lake Conroe. In this strategy alternative, it was assumed that SJRA would apply to TCEQ for a bed and banks permit to convey the return flows generated from the sub-basin through Lake Conroe to the point of diversion. Because the return flows are naturally flowing into Lake Conroe, there is no requirement for any additional infrastructure to capture these return flows. To that end, the only cost incurred in developing this strategy is the administrative and legal fees associated with the TCEQ permitting process. It should be noted that the return flows permitted in this strategy will represent an additional source of supply and not be considered as part of SJRA's existing permit authorization for Lake Conroe.

Table 4 includes the summation of return flow volumes from entities that rely on SJRA's surface water supplies and contribute return flows to the Lake Conroe sub-basin. Also included is a summation of return flows generated by other sources. Once SJRA has coordinated with the specific entities and agreements have been secured, SJRA can apply to TCEQ for permits. It should be noted that the return flow estimates for City of Huntsville and MUDs 8 and 9 were not included in this table as SJRA is currently under contract with these two entities for return flows. The return flow estimates available for SJRA from the contracts with the two entities are reported in *Table 3*.

Table 4. Option 2: Summary of SJRA GRP Participants and Others Contributing Return Flows to the Lake Conroe Sub-Basin in Montgomery County Service Area

Reuse Source	Return Flows (Acre-Feet per Year) [1]					
	2020	2030	2040	2050	2060	2070
SJRA Surface Water	0	132	188	555	675	853
Other Sources	1,663	2,753	3,886	4,898	7,253	9,493
OPTION 2 TOTAL	**1,663**	**2,885**	**4,075**	**5,454**	**7,928**	**10,346**

[1] Return flows adjusted for channel losses

Strategy Alternative Option 3 – Another option is for SJRA to reach out to the GRP participants and non-GRP participants contributing return flows to the Lake Creek sub-basin. Significant amounts of return flows to the Lake Creek sub-basin originate from City of Conroe's wastewater discharges. These flows are currently in the process of being permitted through TCEQ by both Conroe and SJRA which will provide access to the groundwater and surface water-based return flows of these discharges, respectively. In addition to this there are other unpermitted return flows contributed by other groundwater users. *Table 5* includes a summary of the entities relying on SJRA surface water, and those that are relying on groundwater, that contribute return flows to the Lake Creek sub-basin. The most feasible course of action would be for SJRA to coordinate with the entities generating return flows starting with surface water users and other sources, in that order. Once agreements have been secured with the entities, SJRA will have to apply to TCEQ for a diversion permit to divert the return flows near the crossing of Interstate Highway 45 and the San Jacinto river and transfer the supplies to Lake Conroe by means of a new transmission system. It should be noted that this diversion point was selected as one potential location for planning purposes, and further study may refine this location to a more suitable site at a later time.

Since the return flows from the Lake Creek sub-basin are not naturally flowing into Lake Conroe, additional infrastructure is required to develop the supply from this strategy and use it to serve the Montgomery County service area demands. A maximum of approximately 4,199 acre-feet of supplies can be developed in this strategy. It was assumed that the return flows generated from the Lake Creek sub-basin will be captured at the intersection of the San Jacinto river and Interstate Highway 45 and transferred to the SJRA's water treatment plant near Lake Conroe by means of a transmission pipeline and pump station. In addition to the cost incurred in securing the TCEQ permit for diverting the supplies at the Interstate Highway 45 diversion point, this strategy option will include additional construction cost for the infrastructure development. The cost estimates for transferring the supplies to the treatment plant are discussed in the cost estimates section below.

Table 5. Option 3: List of Entities Contributing Return Flows to the Lake Creek Sub-Basin in Montgomery County Service Area

Reuse Source	Return Flows (Acre-Feet per Year) [1]					
	2020	2030	2040	2050	2060	2070
City of Conroe Permit	3,299	4,194	5,667	6,395	7,176	7,980
SJRA Surface Water	*3,299*	*4,194*	*5,667*	*6,395*	*7,176*	*7,980*
Unpermitted Flows	757	1,552	2,125	3,282	4,934	6,105
SJRA Surface Water	*0*	*692*	*1,012*	*1,224*	*2,121*	*2,568*
Other Sources	*757*	*860*	*1,113*	*2,058*	*2,813*	*3,537*
OPTION 3 TOTAL	**4,056**	**5,745**	**7,792**	**9,677**	**12,110**	**14,085**
SJRA Surface Water	***3,299***	***4,885***	***6,678***	***7,619***	***9,297***	***10,548***
Other Sources	***757***	***860***	***1,113***	***2,058***	***2,813***	***3,537***

[1] Return flows adjusted for channel losses

The return flows discussed in these options are available for and subject to the granting of a TCEQ permit by any party pursuing this opportunity. Therefore, the amount available may vary as additional permits are obtained by other entities. The current evaluation of these strategy options accounted for all the known existing authorizations. The future analyses of this strategy must take into consideration any additional return flow authorizations secured or applied for with TCEQ.

Another possibility for developing return flows would be to consider the development of a new water treatment plant at the southern boundary of the Montgomery County service area to treat all the return flows generated and captured in the service area. This option would include return flows originating from

sub-basins below the Lake Conroe and Upper West Fork sub-basins and therefore create additional return flow supply over that provided in Table 5. This option would require a TCEQ permit for diverting the return flows at a location closer to the southern boundary of the service area, a conveyance system (pipelines and pump station) to transfer the supplies to the new treatment plant, and the construction of the new treatment plant. If the return flows generated in the service area justified the investment in a conveyance and treatment system in the southern portion of the service area, this strategy would be a meaningful one. However, at this point in time, the return flow volumes in the service area are low in magnitude and this option was considered cost prohibitive and not feasible, and therefore not evaluated in detail. If any of the assumptions or variables considered in this study change in the future, thus making this option viable, this strategy will be considered for further evaluation at that point in time.

Environmental Considerations

Environmental considerations associated with reuse are largely associated with the reduction of instream flows. This consideration will be included as part of the permitting process for any indirect reuse project. More specific issues arise from the development of infrastructure intended to facilitate the use of reclaimed water. The following are some of the general environmental considerations associated with the transmission alignment identified for developing return flows strategy option 3 for the Montgomery County service area. A desktop-level survey was conducted to identify any environmental issues associated with the specific route. The details of the survey are summarized below.

1. The diversion of the effluent source supply would be expected to have some degree of impact in terms of reduction of instream flows downstream of the diversion point for any portion of the source supply originating from current levels of return flow. A more detailed analysis of environmental impacts and legal constraints would be considered during the permit application and review process. Any impacts would be anticipated to occur from reuse of effluent generated from current levels of discharge; diversion of the portion attributable to future growth would not be expected to cause additional impact. It should also be noted that the proposed diversions would occur upstream of the monitoring points for Senate Bill 3 environmental flow standards and could potentially be subject to associated restrictions.
2. Due the presence of streams, wetlands and ponds that could be deemed Waters of the United States (WOTUS) and jurisdictional to Section 404 of the Clean Water Act (CWA) throughout the alignment considered for alternative option 3, acquiring a permit(s) through the USACE would be required prior to beginning construction activities. Pending the level of potential WOTUS impacts, project activities could likely be covered by a Nationwide Permit. Nationwide Permits are typically obtained within 45 to 60 calendar days, but acquiring an Individual Permit typically requires a minimum of 180 days and a public comment period.
3. If no Federal funding or assistance would be used for construction of the proposed project, the need to complete the National Environmental Policy Act (NEPA) process would not be required. However, coordination with the USACE to obtain a CWA Section 404 permit, particularly an Individual Permit, could trigger the need to comply with the NEPA review process.
4. *Table 6* provides a synopsis of potential archaeological/historical resources present within the alternative alignment.
5. *Table 7* includes a summary of the desktop environmental constraints information pertaining to the transmission route considered for alternative Option 3 in this evaluation.

Table 6. Summary of Desktop Archaeological/Historical Constraints for the Transmission Route for Transferring Return Flows from Lake Creek Sub-Basin to Lake Conroe

Option	Archaeological Sites within 1-mile buffer	Cemetery	Historic Places Listed	Texas Historic Landmark
3	36	0	0	0

Table 7. Summary of Desktop Environmental Constraints for the Transmission Route for Transferring Return Flows from Lake Creek Sub-Basin to Lake Conroe

Option	Ponds/Pond Acreage (acre)	Stream and Canal Crossings/Length (miles)	Potential Wetlands	Total Wetland Acreage (Acres)	Prime Farmland Soil Tracts	Farmland Acreage (Acres)
3	1.0/0.14	10/5	20	29.02	9.0	167.5

All environmental constraints must be addressed during the permitting and detailed feasibility study phases of the project development. At this stage, the environmental considerations are merely provided as a guide for selecting the appropriate route for future evaluation.

Permitting and Development

SJRA will have to coordinate with TCEQ for a bed and banks permit to convey the return flows developed in all strategy alternative options. For Options 1 and 2, SJRA must apply for authorization to use the bed and banks of Lake Conroe and upstream tributaries to convey reuse supplies for subsequent diversion. For option 3, SJRA must apply for a permit to convey water through the bed and banks of Lake Creek and divert supplies at the Interstate Highway 45 intersection with the West Fork of San Jacinto River. Owing to the pre-existing contractual relations that SJRA has with its GRP participants, it may be procedurally easier to develop the return flows with GRP participants than it is to develop the projects with non-GRP participants.

Cost Analysis

There will be some cost incurred for implementing Options 1 and 2, and these costs may include permitting fees, legal fees, and contract fees with various entities. However, it is difficult to provide an estimate for these costs as each strategy cost will be different and varied on a case-to-case basis. Preliminary opinions of probable construction cost estimates were developed based on planning-level details considered for alternative Option 3. The cost estimates were developed using a similar approach used for the Region H regional planning strategy evaluation. The cost estimates were indexed to August 2017 dollars. *Table 8* includes the overall preliminary opinion of probable cost estimate for Option 3. It should be noted that these cost numbers are preliminary planning level cost estimates intended as a means to compare and evaluate alternatives, and are not intended for contracting or designing purposes. Detailed cost estimates should be developed during subsequent feasibility or design phases.

Table 8– Cost Estimate for Return Flows Alternative Option 3 - Transfer of Return Flows from Lake Creek Sub-Basin to SJRA Water Treatment Plant

OPINION OF PROBABLE CONSTRUCTION COST						September 14, 2017
ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL	
PROJECT COST SUMMARY						
1	CONSTRUCTION (CAPITAL) COST	1	LS	$23,651,700	$23,651,700	
2	ENGINEERING, FINANCIAL, AND LEGAL SERVICES AND CONTINGENCIES	1	LS	$7,611,840	$7,611,840	
3	LAND AND EASEMENTS	1	LS	$732,689	$732,689	
4	ENVIRONMENTAL - STUDIES AND MITIGATION	1	LS	$1,018,674	$1,018,674.24	
5	INTEREST DURING CONSTRUCTION	1	LS	$544,777	$544,777	
6	OTHER (LEGAL FEES)	1	LS	$0	$500,000	
	PROJECT COST				**$34,059,680**	

ITEM	DESCRIPTION	ANNUAL TOTAL					
ANNUAL COST SUMMARY		**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
1	DEBT SERVICE	$2,850,091	$2,850,091	$0	$0	$0	$0
2	OPERATION AND MAINTENANCE (O&M)	$386,416	$386,416	$386,416	$386,416	$386,416	$386,416
3	PUMPING ENERGY COSTS	$1,175,820	$1,175,820	$1,175,820	$1,175,820	$1,175,820	$1,175,820
4	PURCHASE COST OF WATER	$0	$0	$0	$0	$0	$0
	TOTAL ANNUAL COST	**$4,412,327**	**$4,412,327**	**$1,562,236**	**$1,562,236**	**$1,562,236**	**$1,562,236**

ITEM	DESCRIPTION	ANNUAL TOTAL					
ANNUAL COST SUMMARY		**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
1	ANNUAL COST	$4,412,327	$4,412,327	$1,562,236	$1,562,236	$1,562,236	$1,562,236
2	YIELD	14,085	14,085	14,085	14,085	14,085	14,085
3	UNIT COST	$313	$313	$111	$111	$111	$111
	TOTAL UNIT COST						**$178**

CONSTRUCTION COST SUMMARY					
1	PUMP STATIONS	1	LS	$9,826,600	$9,826,600
2	PIPELINES	1	LS	$11,858,429	$11,858,429
3	PIPELINE CROSSINGS	1	LS	$1,466,671	$1,466,671
4	DAMS AND RESERVOIRS	1	LS	$500,000	$500,000
	PROJECT COST				**$23,651,700**

OPERATION AND MINTENANCE (O&M) COST SUMMARY					
1	PUMP STATIONS	2.5	%	$9,826,600	$245,665
2	PIPELINES	1.0	%	$11,858,429	$118,584
3	PIPELINE CROSSINGS	1.0	%	$1,466,671	$14,667
4	DAMS AND RESERVOIRS	1.5	%	$500,000	$7,500
	ANNUAL OPERATION AND MAINTENANCE COST				**$386,416**

PUMP STATION CONSTRUCTION COSTS					
1	2000 HP Pump Station with Intake	1.0	LS	$9,826,600	$9,826,600
	PUMP STATIONS TOTAL COST				**$9,826,600**

PIPELINE CONSTRUCTION COSTS					
1	30'' Diameter Pipeline (Rural Soil) Lake Creek to Lake Conroe	83,975.0	LF	$141	$11,858,429
	PIPELINES TOTAL COST				**$11,858,429**

PIPELINE CROSSING CONSTRUCTION COST					
1	30'' Diameter Pipeline Crossing (Boring) SH 105	250.0	LF	$793	$198,199
2	30'' Diameter Pipeline Crossing (Boring) Spillway and ROW	800.0	LF	$793	$634,236
3	30'' Diameter Pipeline Crossing (Boring) I45 Intersection	800.0	LF	$793	$634,236
	PIPELINE CROSSINGS TOTAL COSTS				**$1,466,671**

DAMS AND RESERVOIRS CONSTRUCTION COST					
1	On-Channel Dam for Diversion	1.0	LS	$500,000	$500,000
	DAM AND RESERVOIR TOTAL COSTS				**$500,000**

WATER MANAGEMENT STRATEGY EVALUATION

Based on the analysis provided above, the Return Flows in Montgomery County Service Area strategy was evaluated across eleven different criteria for the purpose of quick comparison against alternative projects that may be incorporated into the Regional Water Plan. The results of this evaluation can be seen in *Table 9* below. Project criteria and scoring methodology are described in the technical memorandum, *Preliminary Strategy Identification and Evaluation (Task 1104)*. Higher scores relate to preferable characteristics.

Table 9 - Screening Criteria and Scores for Return Flows in Montgomery County Service Area Strategy

Criteria	Rating		
	Option 1 MUDs 8 and 9 and City of Huntsville	Option 2 Other Lake Conroe Flows	Option 3 Lake Creek Diversion
Cooperation	3	2	2
Cost	4	4	2
Diversification	3	3	3
Environmental	3	3	2
Funding	4	4	4
Land Acquisition	4	4	3
Legal	2	2	1
Location	4	4	2
Magnitude	1	2	2
Other Supplies	3	3	2
Public	3	3	2
Scalability	1	1	1
Schedule	4	3	3
Yield Risk	2	2	2
Weighted Score [1]	332	326	210

[1] Based on weighting methodology adopted in Preliminary Strategy Identification and Evaluation (Task 1104)

REFERENCES

Region H Water Planning Group. 2015. 2016 Regional Water Plan.

Madison
Grimes
Walker
San Jacinto
Polk
Liberty
Montgomery
Harris
Trinity River
LAKE LIVINGSTON
LAKE CONROE
LEWIS CREEK RESERVOIR
San Jacinto River

Legend

Drainage Sub Basins
- Lake Conroe
- Lake Creek

Rivers
Existing Reservoirs
Counties

N
W E
S

0 25,000 50,000
Feet

SJRA RAW WATER SUPPLY MASTER PLAN

Montgomery County Service Area

Sub-Basins Contributing Return Flows

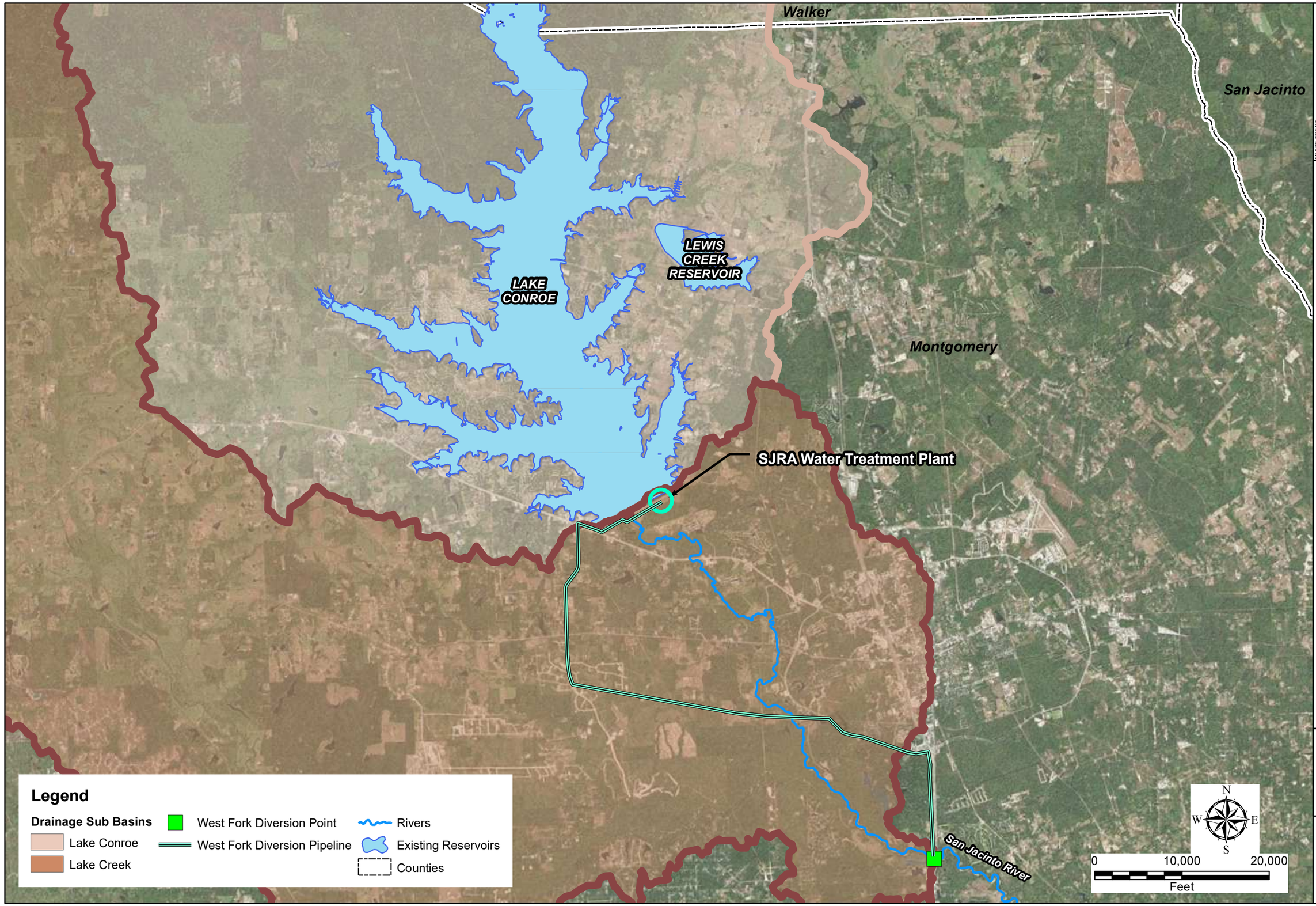
PA PROJECT NO.	SJR15816
DATE CREATED	9/7/2017
DATUM & COORDINATE SYSTEM	NAD83 State Plane (feet) Texas South Central
FILE NAME	Exhibit_1_MontgomerySA_ReturnFlows
PREPARED BY	DMS

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
P: (713) 600-6800
F: (713) 600-6801

EXHIBIT
1

Date Saved: 9/7/2017 12:26:46 PM

Path: H:\WR_PLANNING\Working\SJRA_RWSMP\Exhibit_1_MontgomerySA_ReturnFlows.mxd



SJRA RAW WATER SUPPLY MASTER PLAN

Montgomery County Service Area

Alternative Option 2 - Transfer Of Return Flows From West Fork to SJRA Water Treatment Plant

FNI PROJECT NO.	SJR16616
DATE CREATED	9/7/2017
DATUM & COORDINATE SYSTEM	NAD83 State Plane (feet) Texas South Central
FILENAME	Exhibit_2_ReturnFlow_Alternative2
PREPARED BY	DML

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
P: (713) 600-6800
F: (713) 600-6801

EXHIBIT

2