DRAFT

MAJOR AMENDMENT
2021 RIO GRANDE REGIONAL WATER PLAN (REGION M)

Delta Region Water Management Supply, Hidalgo County Drainage District 1

B&V PROJECT NO. 413244

PREPARED FOR

Rio Grande Regional Water Planning Group

16 AUGUST 2022

BLACK & VEATCH

List of Abbreviations

acft	Acre-Feet
acft/yr	Acre-Feet per Year
HCDD1	Hidalgo County Drainage District 1
ID	Irrigation District
mgd	Million Gallons per Day
RGRWPG	Rio Grande Regional Water Plan
RWP	Regional Water Plan
RWPA	Regional Water Planning Area
RWPG	Regional Water Planning Group
SWIFT	State Water Implementation Fund for Texas
SWP	State Water Plan
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
UCM	Uniform Costing Model
WAM	Water Availability Model
WMS	Water Management Strategy
WMSP	Water Management Strategy Project
WWP	Wholesale Water Provider
WUG	Water User Group

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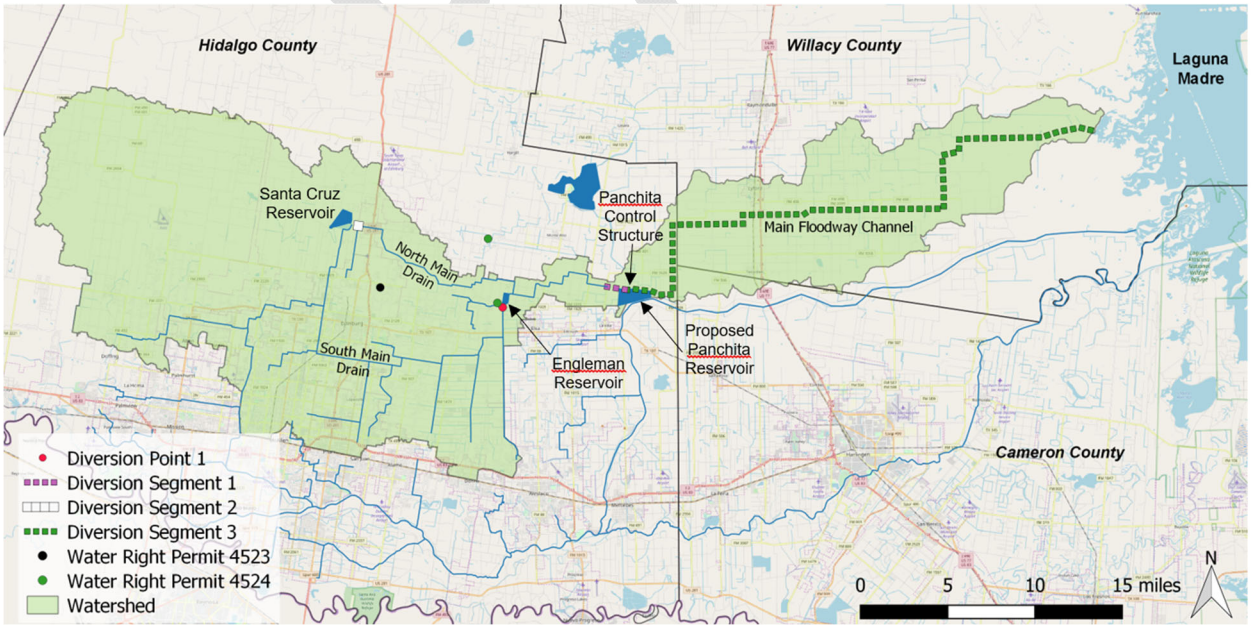
F. Additional Implementation Survey Responses (To Be Included Once Received)

INTRODUCTION

At the April 6, 2022 and July 6, 2022 Region M meetings, the Rio Grande Regional Water Planning Group (RWPG) heard the request from Hidalgo County Drainage District 1 (HCDD1) to consider pursuing an amendment to the 2021 Rio Grande Regional Water Plan (RGRWP) and agreed to begin the process of amending the 2021 RGRWP to include the Delta Region Water Management Supply as a Water Management Strategy. A version of this strategy had been included in the 2016 RGRWP as a recommended strategy but had not been included in the 2021 RGRWP. As the HCDD1 would like to apply for State Water Implementation Fund for Texas (SWIFT) funding from TWDB in order to begin design and construction efforts before the next State Water Plan is adopted, an amendment to the 2021 RGRWP is necessary. This is because a project must be included in the State Water Plan and Regional Water Plan as a recommended strategy in order to qualify for the funding.

HCDD1 has proposed construction of three reservoirs in northeastern Hidalgo County to capture tailwaters and precipitation runoff for beneficial use. The existing and proposed Engleman Reservoirs (77 acres), the proposed Santa Cruz Reservoir (418 acres) and the proposed Delta "Panchita" Reservoir (25 acres) are all in the Delta Watershed, which is distinct from other portions of the Nueces Rio Grande Watershed, and impact no downstream water rights. These reservoirs will allow for better control and management of flows in the drainage network and will allow for the drainage district to treat and distribute a portion of the flows for sale to potential customers. The proposed Engleman Reservoir would be constructed using a ring dike around a 12-foot depth reservoir, next to the existing Engleman Reservoir. The Santa Cruz Reservoir requires construction of a ring dike around a 14-foot depth reservoir adjacent to Lake Edinburg. The existing Panchita control structure and associated weir would be raised for the Delta "Panchita" Reservoir, which is proposed to be 12-feet deep.



MODIFICATIONS AND ADDITIONS TO THE 2021 RIO GRANDE REGIONAL WATER PLAN

The following are changes proposed to the various chapters of the 2021 RGRWP in order to include the Delta Region Water Management Supply as a Water Management Strategy, sponsored by the Hidalgo County Drainage District 1. **Insertions** are shown as underlined, **deletions** in ~~strikethrough~~.

EXECUTIVE SUMMARY

A.ES.1 MODIFICATION TO SECTION ES.4.1., PAGE ES-23

ES.4.1 Water Infrastructure and Distribution Systems, Assumptions and Methodology

Water infrastructure distribution systems addresses both municipal improvements, ~~and~~ ID improvements, and improvements by other water providers that reduce losses or enable increased or new supplies.

A.ES.2 ADDITION OF NEW SECTION ES.4.1.3., PAGE ES-24

ES.4.1.3 Other Water Provider Improvements

Hidalgo County Drainage District 1 (HCDD1) is considered an "Other Water Provider" because it is neither a municipal WUG nor an irrigation district. As an amendment to the 2021 RGRWP, HCDD1 requested to add the Delta Region Water Management Supply Strategy, which includes three off-channel reservoirs and three water treatment plants. HCDD1 is not currently a Wholesale Water Provider (WWP), but has seen an opportunity to capture and treat storm water runoff and return flows for sale to water users in the area.

CHAPTER 5

A.5.1 MODIFICATION TO TABLE 5.1-1, PAGE 5.1-2

Table 5.1-1 List of Potentially Feasible WMSs

POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES	FOR DETAILED EVALUATION, SEE SECTION:
Water Infrastructure and Distribution Systems	5.2.1
• Irrigation District Improvements / Conservation	5.2.1.1
• Municipal Infrastructure Improvements	5.2.1.2
▪ Distribution and Transmission	
▪ Storage	
▪ Surface Water Treatment	
▪ Other Water Provider Improvements	5.2.1.2a
Wastewater Reuse	5.2.2
• Non-Potable Reuse	
• Potable Reuse	

Desalination • Local Brackish Groundwater Development and Treatment • Seawater Desalination	5.2.3
Fresh Groundwater	5.2.4
Advanced Municipal Water Conservation	5.2.5
Municipal Drought Management	5.2.6
Implementation of Best Management Practices for Industrial Users	5.2.7
Conversion/Purchase of Surface Water Rights	5.2.8
On-Farm Irrigation Conservation	5.2.9
Biological Control of *Arundo donax*	5.2.10
Aquifer Storage and Recovery	5.2.11

A.5.2 ADDITION OF NEW SECTION 5.2.1.2A, PAGE 5.2-10

5.2.1.2a Other Water Provider Improvements

Hidalgo County Drainage District 1 (HCDD1) is considered an "Other Water Provider" because it is neither a municipal WUG nor an irrigation district. As an amendment to the 2021 RGRWP, HCDD1 requested to add the Delta Region Water Management Supply Strategy, which includes three off-channel reservoirs and three water treatment plants. HCDD1 is not currently a Wholesale Water Provider (WWP), but has seen an opportunity to capture and treat storm water runoff and return flows for sale to water users in the area.

Storage/Surface Water Treatment/Transmission
Recommended WMS

1. Hidalgo County Drainage District 1 (HCDD1) – Delta Region Water Management Supply.

A.5.3 ADDITION OF NEW PARAGRAPH AND TABLE AT END OF SECTION 5.2.1.3, PAGE 5.2-15

A summary of the identified and quantified environmental impacts for recommended other water provider improvements is presented in Table 5.2-5a.

Table 5.2-5a Environmental Impacts of Other Water Provider Improvements Strategies

ENTITY	WMS NAME	YIELD*	A	B	C	D	E	F	G	H	I	J
Storage/Surface Water Treatment/Transmission												
Recommended												
HCDD1	Delta Region Water Management Supply	5,600	557	613	468	0	1	557	37	0	5	1
*First decade of implementation yield (acft/yr).												

A.5.4 MODIFICATION TO FIGURE 5.3-9 AND TABLE 5.3-140, PAGE 5.3-91

5.3.2.2 Water User Groups and Water User Groups/Wholesale Water Providers

Hidalgo County WUGs and WUGS/WWPs that have recommended strategies with associated capital costs and locations are represented in Figure 5.3-9. A list of these WMSs and their map numbers is given in Table 5.3-140.

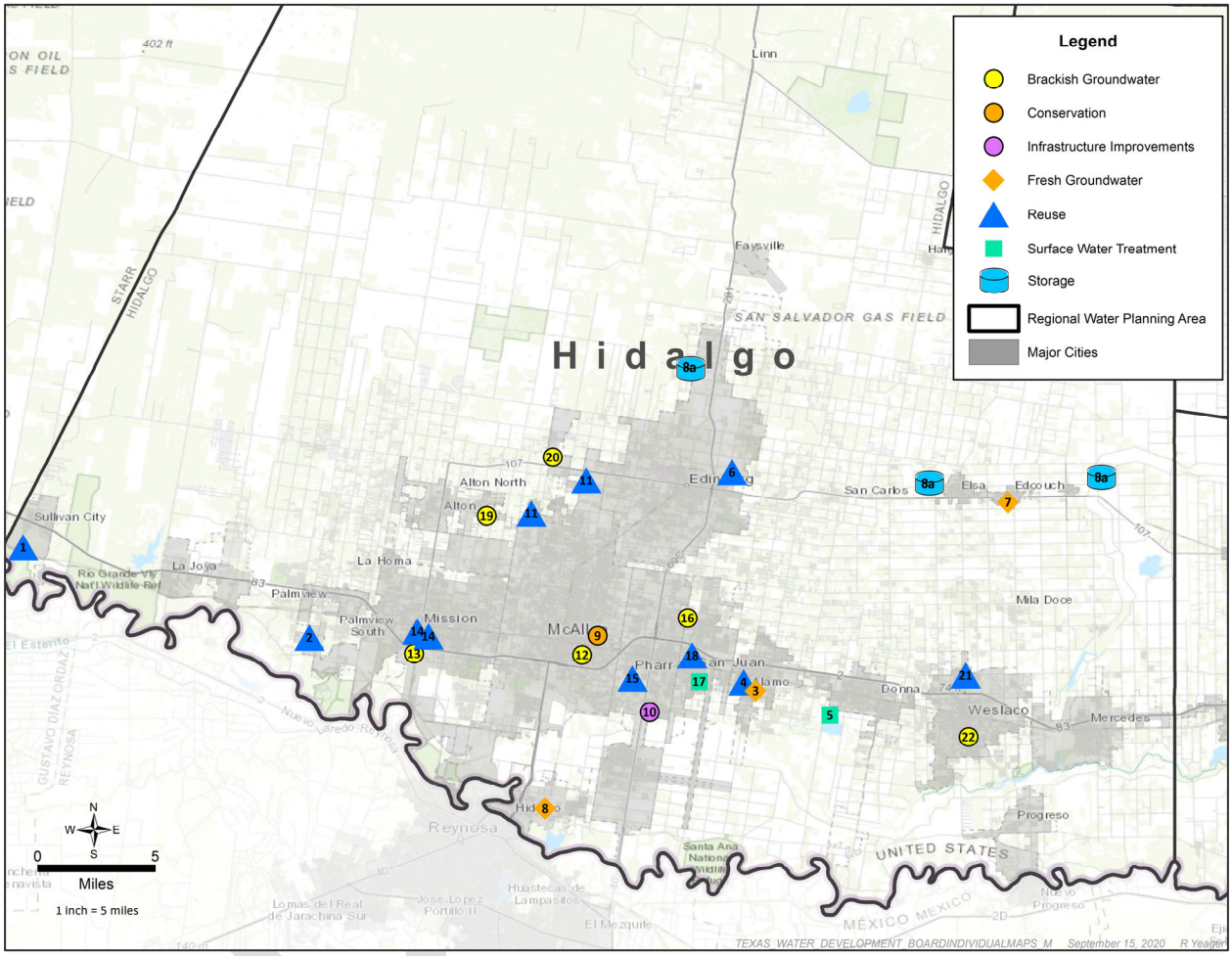


Figure 5.3-9 Hidalgo County Recommended WMS

Table 5.3-140 Map Legend: Hidalgo County Recommended Water Management Strategies

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
1	Agua SUD	West WWTP Potable Reuse	Reuse
2	Agua SUD	East WWTP Potable Reuse	Reuse
3	Alamo	Fresh Groundwater Well	Fresh Groundwater
4	Alamo	New Brackish Groundwater Treatment	Brackish Groundwater

MAP NUMBER	ENTITY	WMS NAME	WMS CATEGORY
5	Donna	WTP Expansion	Surface Water Treatment
6	Edcouch	New Groundwater Supply	Fresh Groundwater
7	Edinburg	Non-Potable Reuse Water for Cooling and Landscaping	Reuse
8	Hidalgo	Expand Existing Groundwater Wells	Fresh Groundwater
8a	Hidalgo County Drainage District 1	Delta Region Water Management Supply	Storage
9	McAllen	AMI Project	Conservation
10	McAllen	Raw Water Line Project	Infrastructure Improvements
11	McAllen	North WWTP Potable Reuse	Reuse
12	McAllen	Brackish Groundwater Desalination Plant	Brackish Groundwater
13	Mission	Brackish Groundwater Desalination Plant	Brackish Groundwater
14	Mission	Direct Potable Reuse	Reuse
15	Pharr	Potable Reuse and Raw Water Reservoir	Reuse
16	San Juan	Brackish Groundwater Well	Brackish Groundwater
17	San Juan	WTP No. 1 Upgrade, Expansion, and BGD	Surface Water Treatment
18	San Juan	Potable Reuse	Reuse
19	Sharyland WSC	WTP No. 2 Brackish Groundwater Desalination	Brackish Groundwater
20	Sharyland WSC	WTP No. 3 Brackish Groundwater Desalination	Brackish Groundwater
21	Weslaco	North WWTP Potable Reuse	Reuse
22	Weslaco	Groundwater Development and Blending	Brackish Groundwater

A.5.5 ADDITION OF NEW PARAGRAPHS IN MIDDLE OF SECTION 5.3.2.2, PAGE 5.3-114, PRIOR TO HIDALGO COUNTY MUNICIPAL UTILITY DISTRICT NO. 1

Hidalgo County Drainage District 1

As a drainage district, Hidalgo County Drainage District 1 manages the Hidalgo County Master Drainage System to allow for the efficient exportation of drainage water; within Region M, it is classified as a WWP. As it does not incur a demand or provide water supply at this time, there are zero projected needs in every decade (Table 5.3-163a). The recommended WMS, the Delta Region Water Management Supply, is shown in Table 5.3-163b.

Table 5.3-163a Hidalgo County Drainage District 1 Existing Supply Balance (acft/yr)

HIDALGO	2020	2030	2040	2050	2060	2070
Supplies	0	0	0	0	0	0
Demand	0	0	0	0	0	0
Need(-)/Surplus(+)	**0**	**0**	**0**	**0**	**0**	**0**

Table 5.3-163b Hidalgo County Drainage District 1 WMS Supplies (acft/yr)

HIDALGO	2020	2030	2040	2050	2060	2070
Delta Region Water Management Supply	0	5,600	11,200	12,140	12,140	12,140
New Supplies from WMS	**0**	**5,600**	**11,200**	**12,140**	**12,140**	**12,140**
WWP Balance After WMS	**0**	**5,600**	**11,200**	**12,140**	**12,140**	**12,140**

Project Source

This strategy was requested by the Hidalgo County Drainage District 1 to the RWPG at the April 6, 2022 and July 6, 2022 Region M meetings. The Rio Grande Regional Water Planning Group (RWPG) agreed to amend the 2021 Rio Grande Regional Water Plan (RGRWP) to include the Delta Region Water Management Supply as a Water Management Strategy. A version of this strategy had been included in the 2016 RGRWP as a recommended strategy but was not included in the 2021 RGRWP.

Description

This strategy is to construct three reservoirs in northeastern Hidalgo County to capture tailwaters and precipitation runoff for beneficial use. Each proposed reservoir in this strategy is separated into a different Water Management Strategy Project (WMSP): the Delta "Panchita" Reservoir (235 acft capacity, online 2030), the Santa Cruz Reservoir (4,621 acft capacity, online 2040), and the Engleman Reservoir (280 acft capacity, online 2050). These reservoirs will allow for better control and management of flows in the drainage network and will allow for the drainage district to treat and distribute a portion of the flows for sale to potential customers.

Available Supply

The reservoirs are all in the Delta Watershed, which is distinct from other portions of the Nueces Rio Grande Watershed and have impact no downstream water rights. Recently established environmental flow requirements for the Nueces Rio Grande basin do not place any limitations on the drainageways that will be impacted by this strategy.

Aqua Strategies, Inc. performed the Water Availability Modeling (WAM) analysis to determine the firm yield of each reservoir. The most updated version of the TCEQ NRG Full Authorization WAM was provided by TCEQ staff Kathy Alexander on July 13, 2022, and was last updated on November 21, 2019.

To assess the reservoirs' firm yields using the most updated version of the TCEQ NRG Full Authorization WAM, edits were required to include project off-channel reservoirs and return flows available for diversion by HCDD1 permit 13195. The firm yields were analyzed both with and without return flows included.

With return flows, the individual reservoir firm yield is 28,800 acft/yr for the Delta "Panchita" Reservoir, 8,100 acft/yr for the Santa Cruz Reservoir, and 940 acft/yr for the Engleman Reservoir. However, project yield is limited by water treatment plant capacity for two of the three reservoirs. The Delta "Panchita" Reservoir will provide 5,600 acft/yr when it comes online in 2030. The Santa Cruz Reservoir will provide 5,600 acft/yr when it comes online in 2040. The Engleman Reservoir will provide 940 acft/yr when it comes online in 2050.

Engineering and Costing

Costs for each project within this strategy were developed using the TWDB Uniform Costing Model (UCM) and include land acquisition, the reservoir, a pump station, transmission pipeline (distance estimated for costing purposes as an end user has not been identified at this time), and advanced water treatment facility with micro-filtration and reverse osmosis. It is assumed that the construction period for this strategy is 2 years for each reservoir. Table 5.3-163c outlines the project requirements and cost estimate developed in UCM for the Delta "Panchita" Reservoir, Table 5.3-163d outlines the project requirements and cost estimate developed in UCM for the Santa Cruz Reservoir, and Table 5.3-163e outlines the project requirements and cost estimate developed in UCM for the Engleman Reservoir. The costs shown are in September 2018 dollars, as required by the TWDB for the 2021 RWPs.

Implementation Issues

The main implementation issue for the three reservoirs and future water treatment plants would be funding for the projects. State and federal permits must be obtained before construction can begin, potentially including a Section 404, Clean Water Act Permit. Additionally, the project may need to comply with the National Environmental Policy Act if federal funding is involved and with the Endangered Species Act if any threatened and endangered species are impacted. However, the project has received a non-jurisdictional determination from the U.S. Army Corps of Engineers. In addition, a study, "Environmental Flows Recommendations Report" was prepared by Rio Grande, Rio Grande Estuary, and Lower Laguna Madre Basin and Bay Expert Science Team indicating a reduction in freshwater entering the Laguna Madre would benefit the natural aquatic plant life by maintaining the salinity.

The Delta Region Water Management Supply Strategy currently has Memorandums of Understanding with two Irrigation Districts, Engleman and Delta Lake. The largest potential impact on cultural resources associated with this option comes from pipeline construction and operation. Therefore, pipelines should follow existing and shared rights-of-way whenever possible to minimize the area of disturbance.

Table 5.3-163c Hidalgo County Drainage District 1 – Delta "Panchita" Reservoir Project Requirements and Costs

COST ESTIMATE SUMMARY	
HIDALGO COUNTY DRAINAGE DISTRICT 1 – DELTA "PANCHITA" RESERVOIR	
Item	Estimated Costs for Facilities
CAPITAL COST	
Reservoir (Conservation Pool 235 acft, 25 acres)	$3,676,000
Primary Pump Station (5.3 MGD)	$1,274,000
Transmission Pipeline (18-in dia., 3.8 miles)	$3,052,000
Advanced Water Treatment Facility (5 MGD)	$35,385,000
TOTAL COST OF FACILITIES	**$43,387,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$15,033,000
Environmental & Archaeology Studies and Mitigation	$95,000
Land Acquisition and Surveying (78 acres - land already acquired for WTP and Res)	$167,000
Interest During Construction (3% for 2 years with a 0.5% ROI)	$3,229,000
TOTAL COST OF PROJECT	**$61,911,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,987,000
Reservoir Debt Service (3.5 percent, 40 years)	$245,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$31,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$32,000
Dam and Reservoir (1.5% of Cost of Facilities)	$55,000
Advanced Water Treatment Facility	$4,610,000
Pumping Energy Costs (1,060,332 kW-hr @ 0.08 $/kW-hr)	$85,000
TOTAL O&M	$4,813,000
TOTAL ANNUAL COST	**$9,045,000**
Available Project Yield (acft/yr)	**5,600**
Annual Cost of Water ($ per acft)	**$1,615.18**
Annual Cost of Water After Debt Service ($ per acft)	**$859.46**
Annual Cost of Water ($ per 1,000 gallons)	**$4.96**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.64**

Table 5.3-163d Hidalgo County Drainage District 1 – Santa Cruz Reservoir Project Requirements and Costs

COST ESTIMATE SUMMARY	
HIDALGO COUNTY DRAINAGE DISTRICT 1 – SANTA CRUZ RESERVOIR	
Item	Estimated Costs for Facilities
CAPITAL COST	
Off-Channel Storage/Ring Dike (Conservation Pool 4,621 acft, 418 acres)	$13,838,000
Primary Pump Station (5.3 MGD)	$1,661,000
Transmission Pipeline (18-in dia., 6.0 miles)	$5,038,000
Advanced Water Treatment Facility (5 MGD)	$35,385,000
TOTAL COST OF FACILITIES	**$55,922,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$19,321,000
Environmental & Archaeology Studies and Mitigation	$1,546,000
Land Acquisition and Surveying (498 acres)	$1,682,000
Interest During Construction (3% for 2 years with a 0.5% ROI)	$4,317,000
TOTAL COST OF PROJECT	**$82,788,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$4,233,000
Reservoir Debt Service (3.5 percent, 40 years)	$1,059,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$50,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$42,000
Dam and Reservoir (1.5% of Cost of Facilities)	$208,000
Advanced Water Treatment Facility	$4,610,000
Pumping Energy Costs (1,468,787 kW-hr @ 0.08 $/kW-hr)	$118,000
TOTAL O&M	$5,028,000
TOTAL ANNUAL COST	**$10,320,000**
Available Project Yield (acft/yr)	**5,600**
Annual Cost of Water ($ per acft)	**$1,842.86**
Annual Cost of Water After Debt Service ($ per acft)	**$897.86**
Annual Cost of Water ($ per 1,000 gallons)	**$5.65**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$2.76**

Table 5.3-163e Hidalgo County Drainage District 1 – Engleman Reservoir Project Requirements and Costs

COST ESTIMATE SUMMARY	
HIDALGO COUNTY DRAINAGE DISTRICT 1 – ENGLEMAN RESERVOIR	
Item	Estimated Costs for Facilities
CAPITAL COST	
Off-Channel Storage/Ring Dike (Conservation Pool 280 acft, 25 acres)	$3,844,000
Primary Pump Station (0.9 MGD)	$889,000
Transmission Pipeline (10-in dia., 4.0 miles)	$1,650,000
Advanced Water Treatment Facility (1 MGD)	$9,918,000
TOTAL COST OF FACILITIES	**$16,301,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$5,623,000
Environmental & Archaeology Studies and Mitigation	$200,000
Land Acquisition and Surveying (79 acres)	$277,000
Interest During Construction (3% for 2 years with a 0.5% ROI)	$1,233,000
TOTAL COST OF PROJECT	**$23,634,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,265,000
Reservoir Debt Service (3.5 percent, 40 years)	$265,000
O&M	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$17,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$22,000
Dam and Reservoir (1.5% of Cost of Facilities)	$58,000
Advanced Water Treatment Facility	$1,186,000
Pumping Energy Costs (117,998 kW-hr @ 0.08 $/kW-hr)	$9,000
TOTAL O&M	$1,292,000
TOTAL ANNUAL COST	**$2,822,000**
Available Project Yield (acft/yr)	**940**
Annual Cost of Water ($ per acft)	**$3,002.13**
Annual Cost of Water After Debt Service ($ per acft)	**$1,374.47**
Annual Cost of Water ($ per 1,000 gallons)	**$9.21**
Annual Cost of Water After Debt Service ($ per 1,000 gallons)	**$4.22**

CHAPTER 8

A.8.1 MODIFICATION TO SECTION 8.2.4, PAGE 8-6

8.2.4 Hidalgo County Drainage District Delta ~~Watershed Project~~Region Water Management Supply

The drainage district has proposed construction of ~~two~~ three reservoirs in northeastern Hidalgo County to capture tailwaters and precipitation runoff for beneficial use, discussed in detail in Chapter 5. The existing and proposed Engleman Reservoirs (77 acres), the proposed Santa Cruz~~/Lake Edinburg~~ reservoir (~~425~~ 418 acres) and the proposed Delta ~~Region~~ "Panchita" Reservoir (~~350~~ 25 acres) are ~~both~~ all in the Delta Watershed, which is distinct from other portions of the Nueces Rio Grande Watershed, and impact no downstream water rights. Recently established environmental flow requirements for the Nueces Rio Grande basin do not place any limitations on the drainageways that will be impacted by this strategy. These reservoirs will allow for better control and management of flows in the drainage network, and will allow for the drainage district to treat and distribute a portion of the flows for sale to potential customers ~~irrigation and as a raw water source for municipal treatment and distribution~~. The proposed Engleman Reservoir would be constructed using a ring dike around a 12-foot depth reservoir, next to the existing Engleman Reservoir. The ~~Edinburg~~ Santa Cruz reservoir requires construction of a ring dike around a ~~10~~ 14-foot depth reservoir adjacent to Lake Edinburg. The existing Panchita control structure and associated weir would be raised for the Delta "Panchita" Reservoir, which is ~~also~~ proposed to be ~~10~~12-feet deep.

A.8.2 MODIFICATION TO SECTION 8.2.6, PAGE 8-7

8.2.6 Recommendations

The Brownsville-Matamoros Weir and Reservoir has been considered a recommended alternative on the basis of cost, yield, and permitting concerns. The Laredo Low Water Weir may have considerable value as a flood control mechanism but does not meet the requirements to be recommended in the plan because it does not provide an increase in supply. The Banco Morales Reservoir and the United Off-Channel Reservoir have all been recommended by the RWPG. The Delta ~~Watershed Project~~Region Water Management Supply reservoirs have been recommended by the RWPG under the September 2022 Amendment to the 2021 Rio Grande Regional Water Plan~~are being reevaluated for next cycle~~.

None of these sites are recommended as unique reservoir sites.

CHAPTER 10

A.10.1 ADDITION OF SECTION 10.1.3, PAGE 10-5

10.1.3 Amendment to the 2021 Region M Plan

An Amendment to the 2021 RGRWP was requested by the Hidalgo County Drainage District 1 in order to add the Delta Region Water Management Supply Strategy to the 2021 RGRWP. A public hearing was held on August 23, 2022, with the public notice of the hearing being emailed to the RWPG members and posted on the Secretary of State and Region M websites on July 22, 2022. Following the public hearing, 30 days were allowed to receive public comments. After the 30-day public comment period, comments were incorporated into the amendment materials. A public meeting was held on September 29, 2022, where the Rio Grande RWPG adopted the Amendment to the 2021 RGRWP. The amendment was then submitted to the TWDB on September 30, 2022, for adoption into the 2022 State Water Plan.

CHAPTER 11

A.11.1 MODIFICATION TO TABLE 11-1, PAGE 11-10

Table 11-1 2021 Potentially Feasible WMSs

POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES	FOR DETAILED EVALUATION, SEE SECTION:
Water Infrastructure and Distribution Systems • Irrigation District Improvements / Conservation • Municipal Infrastructure Improvements ▪ Distribution and Transmission ▪ Storage ▪ Surface Water Treatment • Other Water Provider Improvements	5.2.1 5.2.1.1 5.2.1.2 5.2.1.2a
Wastewater Reuse • Non-Potable Reuse • Potable Reuse	5.2.2
Desalination • Local Brackish Groundwater Development and Treatment • Seawater Desalination	5.2.3
Fresh Groundwater	5.2.4
Advanced Municipal Water Conservation	5.2.5
Municipal Drought Management	5.2.6
Implementation of Best Management Practices for Industrial Users	5.2.7
Conversion/Purchase of Surface Water Rights	5.2.8

On-Farm Irrigation Conservation	5.2.9
Biological Control of *Arundo donax*	5.2.10
Aquifer Storage and Recovery	5.2.11

A.11.2 MODIFICATION TO SECTION 11.4, LAST PARAGRAPH ON PAGE 11-10

Table 11-2 compares the number of each type of WMS Project that was recommended in the 2016 RWP and the 2021 RWP. The 2016 LRGVRWP included 195 recommended WMSPs and 54 alternative WMSPs; whereas the 2021 LRGVRWP recommends ~~132~~ 135 WMSPs and 21 alternative WMSPs. The total volume of recommended strategies in the 2021 Plan for the year 2070 is ~~508,462~~520,602 acft/yr, with alternative strategies were projected to be 231,241 acft/yr. The 2016 LRGVRWP new supplies were projected to be 668,705 acft/yr and alternative strategies were projected to be 383,144 acft/yr.

A.11.3 MODIFICATION TO TABLE 11-2, PAGE 11-11

Table 11-2 Comparison of Recommended WMS Projects from 2021 and 2016 RWPs

CATEGORY	NUMBER OF RECOMMENDED WMS PROJECTS		NUMBER OF ALTERNATIVE WMS PROJECTS	
	2021 RWP	2016 RWP	2021 RWP	2016 RWP
Acquisition of Water Rights	46	29	-	-
Aquifer Storage and Recovery	-	-	1	-
Brackish Groundwater	2	10	-	17
Fresh Groundwater	18	18	5	4
ID Improvements	24	28	-	-
Municipal Conservation	1	61	-	-
Municipal Infrastructure Improvements	13	15	7	11
Reuse	-	1	-	-
Seawater Desalination	20	24	5	16
Storage*	~~6~~ 9	2	2	5
Surface Water Treatment	1	4	1	1

*Three WMS projects were added to the 2021 Rio Grande Regional Water Plan (RGRWP) as part of an Amendment to the 2021 RGRWP in September 2022.

A.11.4 ADDITION OF NEW PARAGRAPH AT END OF SECTION 11.4.1, PAGE 11-12

An implementation survey was conducted for the 2021 Region M RWP, which describes the progress toward implementing projects listed in the 2016 RWP. Appendix H includes survey results and project information that were received by sponsors.

As part of an amendment to the 2021 RGRWP in September 2022, the Delta Region Water Management Supply Strategy was added that included three water management strategy projects consisting of new off-channel reservoirs and water treatment plants. The project sponsor is Hidalgo County Drainage District 1. A feasibility study has been performed for all three reservoirs, along with some conceptual design.

A.11.5 ADDITION OF NEW PARAGRAPH IN MIDDLE OF SECTION 11.6, PAGE 11-13

11.6 ASSESSMENT OF PROGRESS TOWARD REGIONALIZATION

In accordance with 31 TAC §357.45(b), planning groups must "assess the progress of the RWPA in encouraging cooperation between WUGs for the purpose of achieving economies of scale and otherwise incentivizing WMSs that benefit the entire RWPA." This rule is new for this cycle of planning, and because it became effective shortly before Plan adoption (on June 28, 2020), the TWDB provided guidance that RWPGs may provide a general assessment of the progress toward regionalization, as opposed to the more prescriptive requirements identified in the adopted rule.

Several WMSs since the 2016 RWP have focused on cooperative agreements among WUGs and WWPs. For example, the North Cameron Regional WTP Wellfield Expansion (both in the 2016 and the 2021 RWPs) has been a focus to increase supplies to both the NAWSC and ERHWSC systems. Another major example is the ID Conservation WMS, which focuses on improving ID distribution systems to reduce losses and remove infrastructure bottlenecks. Continued improvement to any ID increases efficiency and enables more water to convey through the complex systems in the Lower Rio Grande Valley. Outside of WMSs, SRWA has also conducted successful regional groundwater connection studies.

The Delta Region Water Management Supply Strategy, added to the 2021 RGRWP through the Amendment process in September 2022, includes multiple off-channel reservoirs and water treatment plants across Hidalgo County that will capture and treat storm runoff and return flows to create a new water supply for water users in the Hidalgo County area.

For many years, the Rio Grande RWPA has encouraged cooperation and collaboration among WUGs for the purposes of achieving economies of scales. For example, the Southmost Regional Water Authority utilizes economy of scale to service various independent systems. These WUGs include Brownsville PUB, Valley MUD, Brownsville Navigation District (i.e. Manufacturing, Cameron in the RWP), Los Fresnos, and Indian Lake (i.e. County-Other, Cameron in the RWP).

This assessment demonstrates that many entities within the Rio Grande RWPA coordinate and collaborate in order to achieve regionalization. Based on the array of collaborative projects and

partnerships, the RGRWPA has been successful in encouraging cooperation among WUGs for the purpose of achieving economies of scale or otherwise incentivizing WMSs that benefit the entire RWPA. The Rio Grande RWPG is committed to encouraging continued cooperation among WUGs and is always looking for ways to achieve economies of scale for the benefit of the region and the state.

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ATTACHMENT A

Water Management Strategy Environmental Impact Legend and Description

The following section 5.2.1.3 from the 2021 RGRWP details the legend and description for Table 5.2-5a for Water Management Strategy Environmental Impact analysis.

5.2.1.3 Environmental Impacts

Potential environment impacts for water infrastructure and distribution systems strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5.2-4.

A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant type and capacity.
- It is assumed that ID conservation projects have no permanently impacted acreage.

B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

For ID conservation, impacted acreage was calculated with the following assumptions:

- The acreage impacted for pipelines and canal linings is equivalent to the ROW easements required; it is assumed 50-feet for ROW unless otherwise known.
- Unless otherwise known, the length of pipeline and canal lining projects is assumed using the calculated average value of 411 AF-conserved/mile of improvement.
- General improvements (canal gate replacements, SCADA, and other improvements) have an assumed 50-feet ROW and 50-feet project construction length.

C. Inundation Acreage

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

D. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was

overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

E. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at http://www.fws.gov/wetlands/Data/Mapper.html.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

F. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

G. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (http://tpwd.texas.gov/gis/rtest/).

H. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

I. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the

environmental flow standards as established by 30 TAC §298. The reliability of on/off-channel reservoirs is also projected to be high (reliability score = 5).

J. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

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ATTACHMENT B

ASI Delta Project Firm Yield Analysis

AquaStrategies
Water Planning, Science & Engineering

Memorandum

TO: Kristina Leal, PE, CFM
Halff Associates

CC: Jaime Burke, PE
Black & Veatch

FROM: Frank Schalla, PE
Tim Osting, PE, D.WRE, CFM

DATE: August 15, 2022

RE: HCDD1 Delta Regional Water Management Project TCEQ WAM Analysis for Amendment for Regional Water Plan Group M

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1 Introduction

The Hidalgo County Drainage District 1 (HCDD1) seeks to amend the 2021 Rio Grande Region M Regional Water Plan to include the HCDD1 Delta Regional Water Management Project (herein Delta Project) as a recommended water management strategy. For this project to be accepted as a recommended water management strategy by the Rio Grande Regional Water Planning Group (Region M) and to be eligible for SWIFT funding, the Delta Project's firm yield must be documented according to regional water planning requirements.

1.1 Overview of Water Use Permit

Source water for the Delta Project is permitted by Texas Commission on Environmental Quality (TCEQ) Water Use Permit No. 13195. The HCDD1 was granted Water Use Permit No. 13195 from TCEQ on November 8, 2016. This water use permit grants HCDD1 the authorization to construct and maintain the Panchita off-channel reservoir, divert and use up to 62,712 acre-feet of water per year (AFY) across four locations in the Nueces Rio Grande Basin, and has a priority date of November 20, 2015. The permit also authorizes storing these diverted waters in Santa Cruz Irrigation Reservoir and Engelman Irrigation Reservoir, which are dependent upon agreements with the corresponding Irrigation Districts. A breakdown of the water use permit's authorized diversion amounts, diversion locations, and maximum diversion rates are summarized in Table 1 and shown in Figure 1.

The maximum combined annual diversion amount is limited to 62,712 AFY and a maximum combined diversion rate of 659.9 cfs. These permitted diversions can be used for domestic, municipal, mining, agricultural, industrial, hydroelectric power generation, recreation, flood control, and water quality purposes in Hidalgo and Willacy Counties within the Nueces-Rio Grande Coastal Basin.

The permit also authorizes using the bed and banks of the Main Floodwater Channel, North Main Drain, and the South Main Drain to convey and subsequently divert any discharged return flows. The right to divert these return flows is conditioned on the availability of the discharges.

Table 1. Summary information for water use permit number 13195.

Diversion Location	Waterbody	Corresponding Off-Channel Reservoir [1]	Authorized Diversion Amount, AFY	Maximum Diversion Rate, cfs
Diversion Point 1	South Main Drain	Engleman Irrigation Reservoir	12,288	54.7
Diversion Segment 1	Main Floodwater Channel	Panchita Reservoir (proposed)	44,940	198.8
Diversion Segment 2	North Main Drain	Santa Cruz Irrigation Reservoir	29,148	129 / 396 [2]
Diversion Segment 3	Main Floodwater Channel	-	62,712	277.3

[1] Diversion point 1 and the diversion segments divert from the corresponding waterbody and, if applicable, into a corresponding off-channel reservoir.
[2] 129 cfs for water supply purposes, 396 cfs for water quality purposes

1.2 Other Water Use Permits in the Project Watershed

Within the Delta Project watershed there are two active surface water use permits, which are summarized in Table 2 and whose locations are shown in Figure 1. Both permits allow for storage in an off-channel reservoir and are senior to HCDD1 water user permit 13195.

Table 2. Summary of other existing surface water permits in the project watershed.

Certificate of Adjudication No.	Priority Date	Entity Name	Diversion Amount, AFY	Maximum Diversion Rate, cfs	Off-channel Impoundment Capacity, AF
22-4523	12/10/1973	Hidalgo County Irrigation District 1	0	-	500
22-4524	7/10/1928	Engleman Irrigation District	254.5 [1]	12 [1]	250 [1], 300

[1] Authorized off-channel reservoir, diversion amount and maximum diversion rate are associated with locations outside of the project watershed

1.3 Existing Recommended Strategies in the 2021 Region M Regional Water Plan

Review of the 2021 Region M Regional Water plan finds no recommended water management strategies that would be impacted by the Delta Project. Section 1.2 discusses the existing surface water permits in the project watershed, which are senior to the HCDD1 water use permit 13195 and upstream of HCDD1 diversion locations. No 2021 Region M water management strategies are recommended that would coincide with the Delta Project or Delta Project watershed; therefore, the Delta Project permitted diversions or off-channel storage would have no impact on any other recommended strategies.

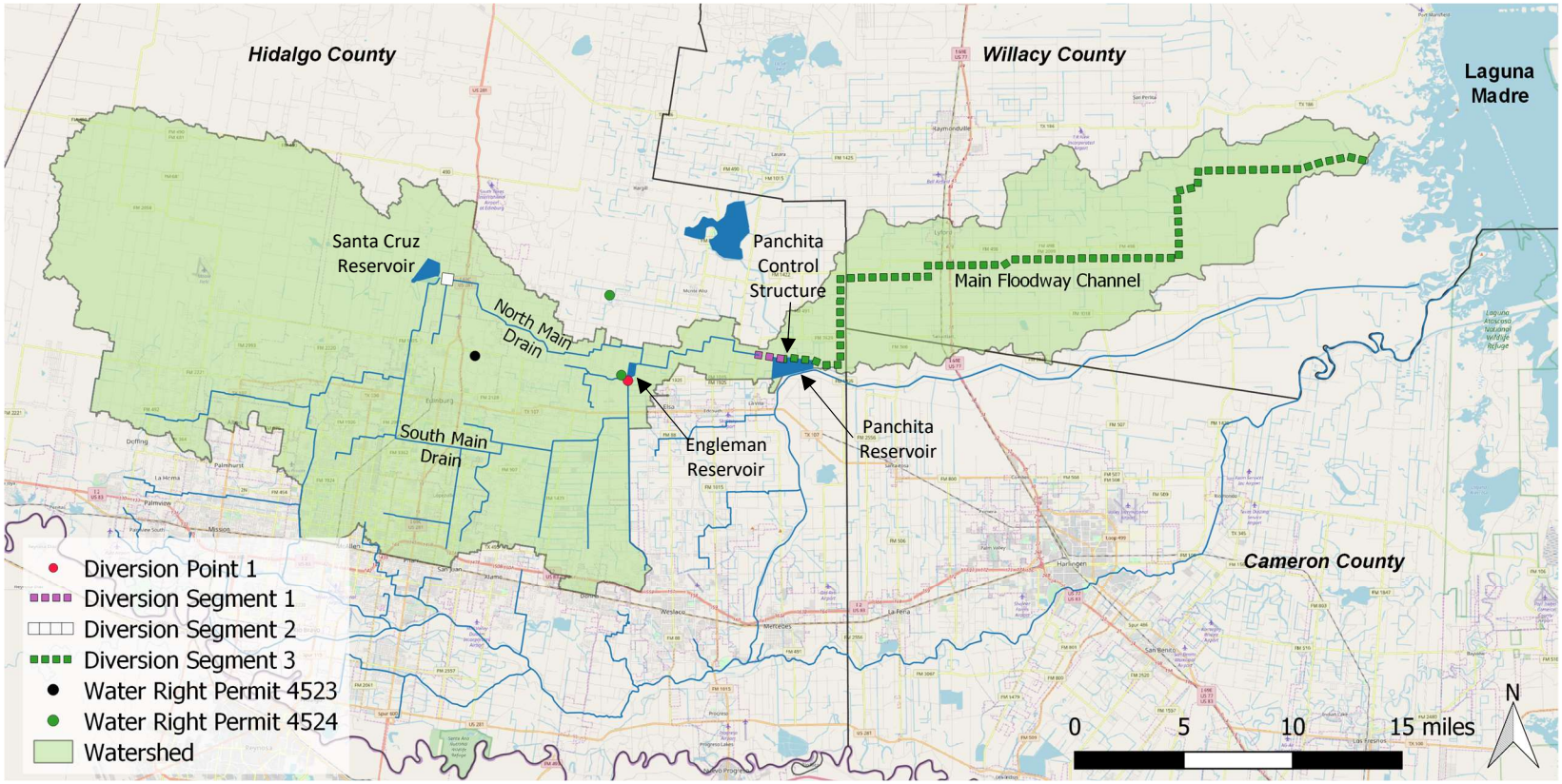

Figure 1. Overview of the Delta Project watershed, water use permit 13195 components, reservoirs, and other water use permits within the Delta Project watershed.

2 TCEQ Water Availability Model

As required by Texas Water Development Board (TWDB) Regional Water Planning guidelines, the Delta Project's firm yield must be evaluated using the Texas Commission on Environmental Quality (TCEQ) Nueces Rio Grande Coastal Basin full authorization (Run 3) water availability model (WAM). The TCEQ full authorization WAM scenario simulates the entire Nueces Rio Grande Coastal Basin (NRG) on a monthly timestep and examines water availability as if all existing water permit holders are requesting their full authorized permitted amounts, without return flow discharges. Reservoirs are included in the WAM and simulate authorized diversions, impoundment capacities, maximum pumping rates, and net evaporation, which is evaporation minus direct reservoir precipitation. During periods when there is not enough water to satisfy all permitted demands, the model allocates water to senior water permits first, in order of their priority dates. The TCEQ NRG WAM's analysis period is from 1948 through 1998.

The most updated version of the TCEQ NRG Full Authorization WAM was provided by TCEQ staff Kathy Alexander on July 13, 2022, and was last updated on November 21, 2019. This version includes HCDD1 water use permit 13195, including its four respective diversion locations. This WAM version does not include any of HCDD1 permit's authorized off-channel reservoirs.

3 TCEQ WAM Edits

To assess the Delta Project firm yield using the most updated version of the TCEQ NRG Full Authorization WAM, edits were required to include project off-channel reservoirs and return flows available for diversion by HCDD1 permit 13195. Edits are described below, included in Appendix A, and the corresponding TCEQ WAM digital files are included in the amendment package.

While there are four HCDD1 water use permit diversion locations (see Table 1), diversion segment three, located along the main floodway channel downstream of the Panchita diversion structure, was not utilized within the WAM. The Delta Project will utilize diversion point 1, and diversion segments 1 and 2 for diversions, which correspond to each project off-channel reservoir.

3.1 Addition of project reservoirs

The proposed Delta Project's water management strategy includes utilizing water use permit 13195 to divert water into the three corresponding off-channel reservoirs for subsequent beneficial use. The three off-channel reservoirs, Panchita, Santa Cruz and Engleman, will be operated as a single system to maximize the overall Delta Project's firm yield. Since diversions into these reservoirs are authorized under the HCDD1 water use permit, the reservoirs were added into the most updated version of the TCEQ NRG full authorization WAM.

Existing net evaporation data are already included in the WAM for the corresponding diversion points and reservoir locations. The elevation-area-volume relationships for these three reservoirs were referenced from a previous 2019 Delta Region Water Management Project Feasibility Study prepared for HCDD1. The 2019 study used available 2-meter LiDAR-derived elevation data or site plan data to estimate the elevation-area-volume relationship. The normal operating level, at which the reservoir capacity was calculated, is based on a two-foot freeboard assumption below the top of berm elevation. A summary table of area and volume capacity at the normal operating level is listed in Table 3. Table 4

through Table 6 list the elevation-volume-area relationships used in the WAM for each reservoir. All reservoir modeled capacities are less than the estimated capacities reported in the TCEQ water rights application for permit 13195.

The volume-area relationships were input into the WAM as SV and SA records for each respective reservoir. WS records were also input into the WAM to represent each reservoir individually, its corresponding capacity at its normal operating elevation, and were linked to each corresponding WR record. To ensure each off-channel reservoir did not deplete from its respective waterbody more than its authorized maximum diversion rate or annual authorized diversion amount, the corresponding SO record was edited to set monthly and annual depletion limits. The depletion limits apply to the water right diversions made directly from the water source (WR Record), and any amount of water used to refill reservoir storage capacity due to reservoir diversions or evaporation.

Table 3. Capacity, surface area and normal operating elevation for the Delta Project off-channel reservoirs.

Off-Channel Reservoir	Normal Operating Elevation, ft	Capacity at the Normal Operating Elevation, acre-feet	Surface Area at the Normal Operating Elevation, acre
Panchita	52.0	187.9	23.1
Santa Cruz	88.6	3,790	417.7
Engleman	76.0	713.5	74.4

Table 4. Elevation-volume-area relationship used in the WAM for Panchita Reservoir.

Water Surface Elevation, ft	Volume, acre-feet	Surface Area, acres
52.0	187.9	23.1
51.0	165.0	22.7
50.0	142.5	22.3
49.0	120.5	21.8
48.0	98.9	21.4
47.0	77.8	20.9
46.0	57.1	20.5
45.0	36.9	20.0
44.0	17.1	19.5
43.0	3.1	7.9
42.5	0.5	2.8
42.0	0.0	0.0

Table 5. Elevation-volume-area relationship used in the WAM for Santa Cruz Reservoir.

Water Surface Elevation, ft	Volume, acre-feet	Surface Area, acres
88.6	3,790.0	413.4
88.0	3,542.0	412.3
86.0	2,721.0	409.0
84.0	1,908.0	401.1
83.0	1,513.0	386.5
82.0	1,137.0	365.5

81.0	784.0	339.4
80.0	466.0	295.1
79.0	226.0	196.2
78.0	59.0	131.0
77.0	1.0	5.6
76.3	0.0	0.0

Table 6. Elevation-volume-area relationship used in the WAM for Engleman Reservoir.

Water Surface Elevation, ft	Volume, acre-feet	Surface Area, acres
76.0	713.5	74.4
75.0	639.4	73.8
74.0	565.9	73.3
73.0	492.9	72.8
72.0	420.3	72.3
71.0	348.2	71.8
70.0	276.6	71.3
69.0	205.6	70.7
68.0	135.3	69.9
67.0	66.0	67.7
66.1	6.4	64.6
66.0	0.0	0.0

3.2 Addition of municipal and industrial based return flows

The 2021 TWDB approved hydrologic variance memorandum approves alternative water supply assumptions for determining existing and future surface water availability. Water discharged from a wastewater treatment plant (WWTP) can be utilized in evaluating indirect reuse water management strategies through modifications to the TCEQ NRG Full Authorization WAM. The TWDB memorandum approves using site-specific information in determining the amount of discharge water available as return flows. Since the HCDD1 water use permit 13195 approves the diversion of any discharged return flows, they were included in assessing the Delta Project firm yield. In addition to municipal WWTP discharge permits, two power generating station discharge permits' discharges were also considered available for diversion by the Delta Project water use permit.

Ten years of monthly discharge data for each municipal and power utility discharge permit in the project watershed were accessed through the US Environmental Protection Agency Enforcement and Compliance History Online (EPA Echo) website (https://echo.epa.gov/). Discharge permits located downstream of the Delta Project diversion locations were excluded. TPDES discharge permit TX0132055 (La Joya WWTP) discharges above the Delta Project diversion locations but was excluded due to the small annual discharge volumes. Table 7 lists the discharge permits upstream of the Delta Project diversion locations and the average annual discharge volumes from 2012 through 2021.

To estimate a conservative annual discharge amount for use as return flows in the TCEQ WAM, the minimum annual discharge amount from 2012 through 2021 was calculated and then further reduced to estimate 2040 return flow conditions. A further reduction was applied because of the McAllen North WWTP Potable Reuse Pipeline, which is a recommended water management strategy in the 2021 Region

M Plan that approximates 3,880 AFY of potable reuse will be produced starting in 2030. This amount of reuse was reduced from the McAllen minimum annual discharge amount from 2012 through 2021. For the other municipal dischargers the minimum annual discharge amount from 2012 through 2021 was reduced by 5% to estimate 2040 return flow amounts. Final municipal and industrial discharge volumes input into the TCEQ WAM are listed on the "Reduced 10-Year Annual Minimum Discharge" row in Table 7. A combined 16.48 cfs (11,931 AFY) of return flows from municipal and industrial discharge permits are included as Delta Project accessible return flows within the TCEQ WAM.

Table 7. Municipal and industrial discharge permits annual average discharge amounts that are upstream of the Delta Project water use permit diversion locations. Discharge permit numbers and assigned TCEQ WAM control point locations are also listed.

Entity Name / Year	Average Annual Discharge, cfs								Combined Total
	North Alamo WSC [1]	North Alamo WSC [1]	North Alamo WSC	North Alamo WSC [2]	Calpine Hidalgo Energy Center	Magic Valley Generating Station	City of McAllen	City of Edinburg	
TPDES Permit Number	TX0128350	TX0128643	TX0132497	TX0134902	TX0119423	TX0116751	TX0093106	TX0024112	-
TCEQ WAM Control Point Location	B52010	B52010	B52010	B52010	B50010	B50010	B50010	B52010	-
2012	0.90	0.46	0.87	-	1.01	1.23	8.25	10.84	23.56
2013	1.02	0.45	0.87	-	1.25	1.20	8.46	10.52	23.76
2014	0.81	0.42	0.79	-	1.09	1.27	9.19	11.71	25.30
2015	0.73	0.42	0.89	-	1.26	1.31	10.63	13.46	28.70
2016	0.96	0.42	0.82	-	1.26	1.09	10.32	11.91	26.77
2017	0.96	0.47	0.74	-	1.22	1.20	10.10	11.48	26.17
2018	1.16	0.48	0.93	0.23	1.22	1.05	10.38	12.86	28.29
2019	1.06	0.43	1.10	0.19	1.28	1.05	10.39	12.34	27.82
2020	1.17	0.42	1.20	0.28	1.22	0.95	10.91	14.23	30.40
2021	1.20	0.39	1.16	0.29	1.25	0.74	11.38	15.86	32.26
10-Year Minimum Annual Discharge	0.73	0.39	0.74	0.19	1.01	0.74	8.25	10.52	22.57
Reduced 10-Year Minimum Annual Discharge	0.69	0.37	0.70	0.18	0.96	0.70	2.89	9.99	16.48

[1] North Alamo WCS permit discharges are from reverse osmosis plants
[2] Discharge data are not available prior to 2018 for permit no. TX0134902

The reduced 10-year annual minimum municipal and industrial return flow amounts from Table 7 were input in the TCEQ WAM as individual CI Records, and assigned to the nearest upstream control point, if available. Discharge permits that were associated with a single entity (i.e. North Alamo Water Supply Corp) or were near each other (i.e. Calpine Hidalgo Energy Center and Magic Valley Generating Station) were combined as single CI Records in the WAM. No discernable monthly demand distribution was identified from the monthly discharge data, so a constant daily discharge volume was assumed across each month and year.

3.3 Addition of irrigation based return flows

Similar to the estimate of municipal and industrial discharge data in Section 3.2, irrigation based return flows were also estimated for diversion by HCDD1 permit 13195 and inclusion in the TCEQ WAM. There are twelve irrigation districts within the Delta Project watershed, which are shown and listed in Figure 2. Each irrigation district's monthly water diversions for irrigation purposes from 2010 through October of 2019 were provided by TCEQ. Since most irrigation district boundaries are inside and outside of the Delta Project watershed, the irrigation diversion data for each respective district were reduced by the percent of area within the Delta Project watershed.

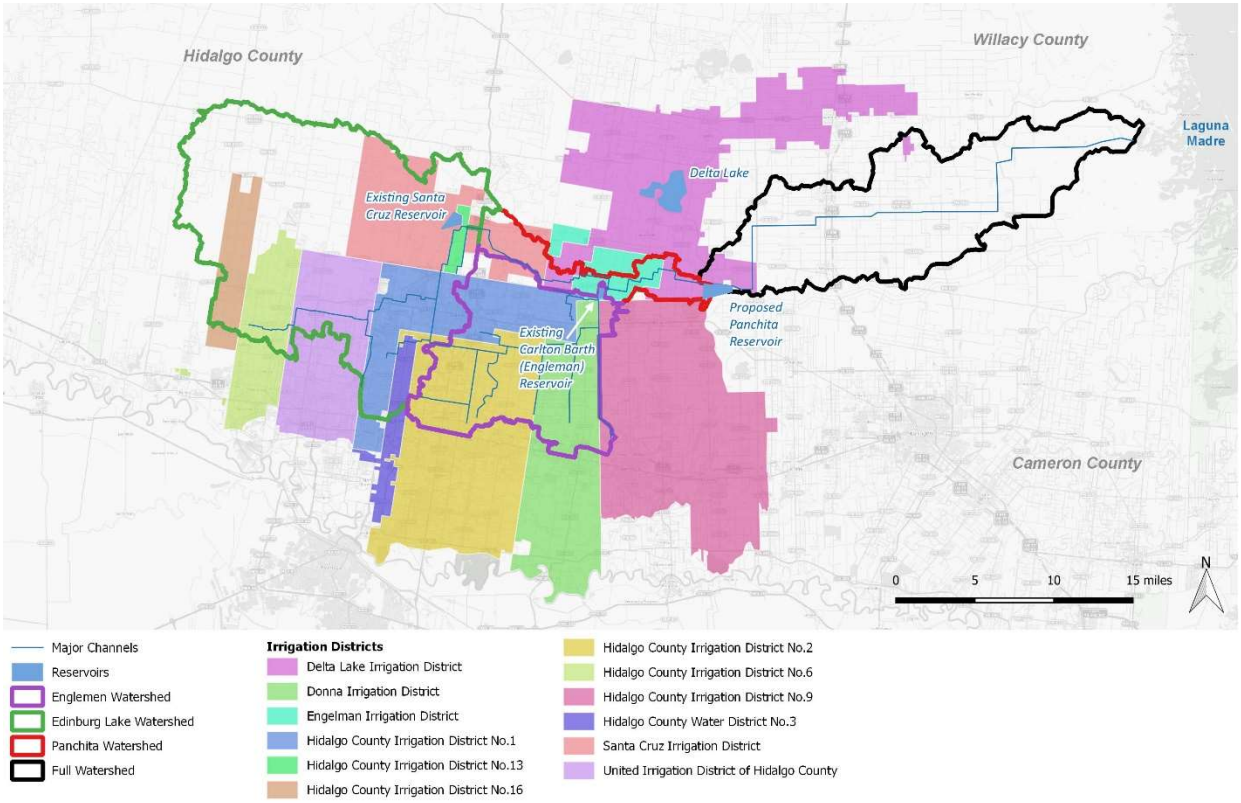

Figure 2. Irrigation districts in the Delta Project watershed.

Diversion data were then reduced to account for losses from the point of diversion to where return flows enter the drainage network. First, to account for irrigation network channel losses a 25% reduction was applied. Secondly, to account for absorption and evaporation due to field irrigation a 90% reduction was applied. And finally, to estimate the reduction in irrigation based return flows from now to the year 2040, an additional 30% reduction was applied. In total, irrigation diversions were reduced by 94.75% from the point of diversion to return flows entering drainage channels in the project watershed. This reduction percent is higher than the reduction amount used in the HCDD1 water permit 13195 application. TCEQ approved naturalized flows for the Delta Project watershed, which were developed as part of the HCDD1 water permit 13195 application, used a percent reduction amount of 92.5% from point of diversion to return flows entering drainage channel.

Since irrigation based return flows entering the drainage channels are diffused and not point source return flows like a discharge point, irrigation district return flows are grouped and listed by HCDD1 water permit diversion location, i.e., those return flows entering upstream of Santa Cruz reservoir, Engleman reservoir and Panchita reservoir. Table 8 lists these average annual irrigation based return flow amounts. A combined 9.40 cfs (6,805 AFY) of irrigation based return flows are included as Delta Project accessible return flows within the TCEQ WAM.

Table 8. Average annual irrigation based return flows, grouped by HCDD1 water permit 13195 diversion locations, i.e. Santa Cruz Reservoir, Engleman Reservoir, Panchita Reservoir.

HCDD1 Water Permit Diversion Location / Year	Average Annual Irrigation Return Flows, cfs			
	Santa Cruz Reservoir	Engleman Reservoir	Panchita Reservoir	Combined Total
2010	6.11	3.75	0.60	10.46
2011	13.23	7.61	2.02	22.86
2012	11.65	8.27	1.67	21.59
2013	9.73	6.47	1.27	17.47
2014	8.02	5.60	1.06	14.68
2015	5.32	3.55	0.53	9.40
2016	8.64	6.61	1.27	16.52
2017	9.84	7.20	1.50	18.54
2018	9.00	7.13	1.51	17.64
2019	9.57	7.09	1.28	17.94
10-Year Minimum Annual Return Flow [1]	5.32	3.55	0.53	9.40

[1] TCEQ diversion data were provided through October of 2019 when initially requested in 2019. Diversion data through 2021 were recently received but not processed.

The 10-year annual minimum irrigation based return flow amounts from Table 8 were input in the TCEQ WAM as individual CI Records, and assigned to the respective HCDD1 water permit diversion locations. A monthly irrigation demand distribution was estimated for irrigation based return flows by taking monthly averages of irrigation based diversion data. The monthly irrigation demand distribution is shown in Figure 3.

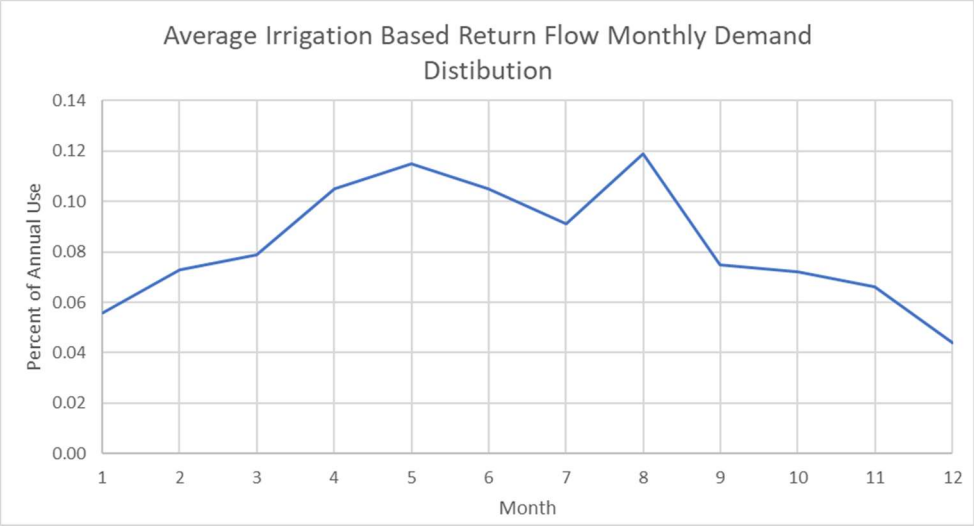

Figure 3. Monthly demand distribution for irrigation based return flows.

4 System Firm Yield Model Scenarios and Modeling Procedure

Since the project reservoirs will be operated as a single system, a number of reservoir operating procedure scenarios were developed to maximum the Delta Project's firm yield. The firm yield is the amount of water that can be diverted from a reservoir under a repeat of the worst drought of record. The firm yield is the amount of water that is considered fully reliable in all years, including the single lowest year in the historical record.

These procedures describe which project reservoir or reservoirs will have priority to divert water over another project reservoir. Diversion of water refers to water being diverted under the HCDD1 water use permit. The four operating procedure scenarios are described as follows:

1. **Fully utilized Santa Cruz and Engleman Reservoirs.** This operating procedure will assume Santa Cruz and Engleman Reservoirs will have senior priority and divert up to their full permitted amounts, while any potential remaining water not diverted would pass downstream and could be diverted by the Panchita Reservoir.
2. **Fully utilized Panchita Reservoir.** This operating procedure will assume the Panchita Reservoir will have senior priority and divert up to its full permitted amount, while any potential remaining water not diverted, or not reserved for use at Panchita Reservoir, could be diverted by the Santa Cruz and Engleman Reservoirs, which will have junior priority.
3. **Fully utilized Santa Cruz Reservoir.** This operating procedure will assume the Santa Cruz Reservoir will have senior priority and divert up to its full permitted amount, while any potential remaining water not diverted would pass downstream and could be diverted by Panchita Reservoir, which will have junior priority. The Engleman Reservoir will have junior priority to Panchita Reservoir.
4. **Fully utilized Engleman Reservoir.** This operating procedure will assume Engleman Reservoir will have senior priority and divert up to its full permitted amount, while any potential remaining water not diverted would pass downstream and could be diverted by Panchita Reservoir, which will have junior priority. The Santa Cruz Reservoir will have junior priority to Panchita Reservoir.

To implement these scenarios in the TCEQ NRG WAM, each project reservoir's priority date (associated with its WR Record) will be edited to reflect either a junior or senior date when compared to the other project reservoirs. Changes to the permit priority dates will not impact priority order with any other water permits in the project watershed.

The TCEQ WAM is capable of calculating an individual reservoir's firm yield through the FY Record. Due to the three reservoirs in the Delta Project, each reservoir's firm yield was individually calculated in sequence according to its assigned priority order. The multi-step modeling procedure used to calculate a combined Delta Project firm yield is described as follows:

1. The firm yield model runs were ordered according to the operating procedure's priority order. For example, the order for operating procedure scenario 3 is Santa Cruz Reservoir, Panchita Reservoir and Engleman Reservoir.
2. The WAM model is then used to calculate the firm yield for the most senior reservoir first. Since this reservoir is senior to the other project reservoirs its firm yield is not affected by their respective diversions.
3. The senior most reservoir's firm yield is input as the annual diversion amount for its corresponding WR Record. This ensures the reservoir's diversion amount is fully reliable and also allows any surplus water to be diverted by the remaining junior reservoirs.
4. The WAM model is used to calculate the firm yield for the second most senior reservoir.
5. The second most senior reservoir's firm yield is input as the annual diversion amount for its corresponding WR Record. Once again, this ensures the reservoir's diversion amount is fully reliable and also allows any surplus water to be diverted by the remaining junior reservoir.
6. The WAM model is used to calculate the firm yield for the most junior reservoir.
7. The Delta Project's firm yield is calculated as the sum of each individual reservoir's firm yields, as calculated in the above steps.

The final WAM run incorporates the yield for all three reservoirs and may be used to assess future strategies.

5 Delta Project Firm Yield Model Results

Table 9 lists the Delta Project's firm yield according to reservoir operating procedure. Each scenario's firm yield is reported with and without the ability to divert watershed return flows.

The highest Delta Project firm yield without being able to divert return flows, is 18,150 acre-feet per year. This corresponds to scenario 1, fully utilized Santa Cruz and Engleman reservoirs. The highest Delta Project firm yield with being able to divert return flows, is 38,025 acre-feet per year. This corresponds to scenario 3, fully utilized Santa Cruz reservoir.

All TCEQ NRG Full Authorization WAM input and output files, including firm yield results, are included as electronic files in the amendment package.

Table 9. Delta Project firm yield modeling results.

Operating Procedure Scenario Number	Operating Procedure Scenario Name	Off-Channel Reservoir	Individual Reservoir Firm Yield, acre-feet per year		Delta Project Combined Firm Yield, acre-feet per year	
			Without Return Flows	With Return Flows	Without Return Flows	With Return Flows
1	Fully Utilized Santa Cruz and Engleman	Santa Cruz Reservoir	12,260	20,310	18,150	36,430
		Engleman Reservoir	3,460	12,010		
		Panchita Reservoir	2,430	4,110		
2	Fully Utilized proposed Panchita	Santa Cruz Reservoir	7,830	8,100	18,025	37,840
		Engleman Reservoir	955	940		
		Panchita Reservoir	9,240	28,800		
3	Fully Utilized Santa Cruz	Santa Cruz Reservoir	12,265	20,315	18,085	38,025
		Engleman Reservoir	1,470	1,450		
		Panchita Reservoir	4,350	16,260		
4	Fully Utilized Engleman	Santa Cruz Reservoir	7,165	8,095	18,070	36,630
		Engleman Reservoir	3,460	12,010		
		Panchita Reservoir	7,445	16,525		

6 Appendix A - TCEQ WAM File Edits

The TCEQ WAM .dat file with edits made to include the off-channel Delta Project reservoirs within the HCDD1 water use permit's diversion components (WR Records). Additions are the WS Records (i.e. SANTAC, ENGLEM, PANCHA), adjustments to the SO Records, and adding SV and SA Records for reservoir volume-area relationships. Full TCEQ WAM files are included as an electronic attachment.

```
** WATER RIGHTS ON MAIN FLOODWATER CHANNEL
** HIDALGO COUNTY DRAINAGE DISTRICT NO. 1 (P13195)
** DIVERSION REACH NO. 2 (SANTA CRUZ IRRIGATION RESERVOIR)
WRB20010    29148       20151120                                    12213195102 12213195 HCDD1
WSSANTAC    3790
SO          7680    29148
** DIVERSION POINT NO. 1 (ENGLEMAN IRRIGATION RESERVOIR)
WRB22010    12288       20151120                                    12213195001 12213195 HCDD1
WSENGLEM    713.5
SO          3253    12288
** DIVERSION REACH NO. 1 (PANCHITA RESERVOIR)
WRB20000    44940       20151120                                    12213195101 12213195 HCDD1
WSPANCHA    187.9
SO          11830   44940
** DIVERSION REACH NO. 3
**WRB10010   62712       20151120                                   12213195103 12213195 HCDD1
**SO         16503
```

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** ASI/FES Delta project reservoir volume area relationships (SV/SA)
SVSANTAC      0.      0.     59.    226.    466.    784.   1137.   1513.   1908.   2721.   3542.   3790.
SA            0.     5.6    131.   196.2   295.1   339.4   365.5   386.5   401.1    409.   412.3   413.4
SVENGLEM      0.     6.4     66.   135.3   205.6   276.6   348.2   420.3   492.9   565.9   639.4   713.5
SA            0.    64.6    67.7    69.9    70.7    71.3    71.8    72.3    72.8    73.3    73.8    74.4
SVPANCHA      0.     0.5     3.1    17.1    36.9    57.1    77.8    98.9   120.5   142.5    165.   187.9
SA            0.     2.8     7.9    19.5     20.    20.5    20.9    21.4    21.8    22.3    22.7    23.1
```

Below are edits to the .dat file to include return flows upstream of the Delta Project water use permit diversion components. The return flows were added on individual CI Records as monthly amounts.

```
** ASI added return flows for municipal, power companies, and irrigation
** North Alamo WSC, NPDES Facility IDs: TX0128350, TX0128643, TX0132497, TX0134902
CIB52010    119.3   107.7   119.3   115.4   119.3   115.4
CI          119.3   119.3   115.4   119.3   115.4   119.3
** City of Edinburg, NPDES Facility ID: TX0024112
CIB52010    614.3   554.8   614.3   594.4   614.3   594.4
CI          614.3   614.3   594.4   614.3   594.4   614.3
** Calpine Hidalgo Energy and Magic Valley Generating, NPDES Facility ID: TX0119423, TX0116751
CIB50010    102.1    92.2   102.1    98.8   102.1    98.8
CI          102.1   102.1    98.8   102.1    98.8   102.1
** City of McAllen, NPDES Facility ID: TX0093106
CIB50010    177.7   160.5   177.7   172.0   177.7   172.0
CI          177.7   177.7   172.0   177.7   172.0   177.7
** Irrigation Return flows contributing to CPB20010
CIB20010    215.7   281.2   304.3   404.4   442.9   404.4
CI          350.5   458.3   288.9   277.3   254.2   169.5
** Irrigation Return flows contributing to CPB22010
CIB22010    143.9   187.6   203.0   269.9   295.6   269.9
CI          233.9   305.8   192.8   185.0   169.6   113.1
** Irrigation Return flows contributing to CPB20000
CIB20000     21.5    28.0    30.3    40.3    44.1    40.3
CI           34.9    45.7    28.8    27.6    25.3    16.9
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ATTACHMENT C

Additional IFR Survey Responses

ADDITIONAL IFR SURVEY RESPONSE - CONTACT LIST

Entity Name	Entity Planning Region	Respondent Contact Name	Area Code	Phone	Extension	Email	Comment	Entity Rwp Id
AGUA SUD	M							2806
ALAMO	M							159
BAYVIEW IRRIGATION DISTRICT #11	M							6864
BROWNSVILLE	M							278
BROWNSVILLE IRRIGATION DISTRICT	M	Arturo Cabello Jr	956	831-8462		acbid06@sbcglobal.net		16
CAMERON COUNTY IRRIGATION DISTRICT #10	M							6876
CAMERON COUNTY IRRIGATION DISTRICT #2	M							18
CAMERON COUNTY IRRIGATION DISTRICT #6	M							6865
COUNTY-OTHER, CAMERON	M							397
COUNTY-OTHER, HIDALGO	M							474
COUNTY-OTHER, MAVERICK	M							528
COUNTY-OTHER, STARR	M							580
COUNTY-OTHER, WEBB	M							606
COUNTY-OTHER, ZAPATA	M							619
DELTA LAKE IRRIGATION DISTRICT	M	Troy Allen	956	262-2101		troy@deltalakeid.org		37
DONNA	M							666
DONNA IRRIGATION DISTRICT-HIDALGO COUNTY #1	M							39
EAGLE PASS	M	Jorge L. Flores	830	773-2351		jflores@epwaterworks.org	At this time, EPWWS does not have any plans for the projects below	42
EAST RIO HONDO WSC	M							679
EDCOUCH	M							685
EDINBURG	M							688
EL JARDIN WSC	M							2975
EL SAUZ WSC	M							12991
EL TANQUE WSC	M							12992
ELSA	M							702
ENGELMAN IRRIGATION DISTRICT	M							6872
HARLINGEN	M	Timothy E. Skoglund	956	430-6157		tskoglund@hwws.com; administration@hwws.com	Project for purchase of water rights. No construction or state funding involved	66
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	M							65
HIDALGO	M							843
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	Raul Sesin	956	292-7080	5801	raul.sesin@hcdd1.org	technical consultant: Kristina Leal, Halff Associates (956) 867-3400	12881
HIDALGO COUNTY IRRIGATION DISTRICT #1	M							68
HIDALGO COUNTY IRRIGATION DISTRICT #13	M							6874

ADDITIONAL IFR SURVEY RESPONSE

Sponsor Entity Name	Sponsor Entity Primary Region	Project Name	WMS Project Sponsor Region	IFR Element Name	IFR Element Value	Year Of Need	IFR Project Data Id	Entity Rwp Id	WMS Project Id	IFR Project Elements Id
HARLINGEN	M	URBANIZATION - HARLINGEN	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	0%			66	4150	3
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	M	HARLINGEN ID CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				65	2294	1
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	M	HARLINGEN ID CONSERVATION	M	CONSTRUCTION FUNDING				65	2294	2
HARLINGEN IRRIGATION DISTRICT-CAMERON COUNTY #1	M	HARLINGEN ID CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				65	2294	3
HIDALGO	M	HIDALGO - EXPAND EXISTING GROUNDWATER WELLS	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				843	1715	1
HIDALGO	M	HIDALGO - EXPAND EXISTING GROUNDWATER WELLS	M	CONSTRUCTION FUNDING				843	1715	2
HIDALGO	M	HIDALGO - EXPAND EXISTING GROUNDWATER WELLS	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				843	1715	3
HIDALGO	M	URBANIZATION - HIDALGO	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				843	2742	1
HIDALGO	M	URBANIZATION - HIDALGO	M	CONSTRUCTION FUNDING				843	2742	2
HIDALGO	M	URBANIZATION - HIDALGO	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				843	2742	3
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	DELTA "PANCHITA" RESERVOIR	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$15,295,000.00	2024		12881	TBD	1
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	DELTA "PANCHITA" RESERVOIR	M	CONSTRUCTION FUNDING	$46,616,000.00	2027		12881	TBD	2
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	DELTA "PANCHITA" RESERVOIR	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	75%	2028		12881	TBD	3
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	SANTA CRUZ RESERVOIR	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$22,549,000.00	2037		12881	TBD	1
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	SANTA CRUZ RESERVOIR	M	CONSTRUCTION FUNDING	$60,239,000.00	2040		12881	TBD	2
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	SANTA CRUZ RESERVOIR	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	75%	2041		12881	TBD	3
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	ENGLEMAN RESERVOIR	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING	$6,100,000.00	2047		12881	TBD	1
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	ENGLEMAN RESERVOIR	M	CONSTRUCTION FUNDING	$17,534,000.00	2050		12881	TBD	2
HIDALGO COUNTY DRAINAGE DISTRICT #1	M	ENGLEMAN RESERVOIR	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY	75%	2051		12881	TBD	3
HIDALGO COUNTY IRRIGATION DISTRICT #1	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				68	2325	1
HIDALGO COUNTY IRRIGATION DISTRICT #1	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M	CONSTRUCTION FUNDING				68	2325	2
HIDALGO COUNTY IRRIGATION DISTRICT #1	M	HIDALGO COUNTY ID NO. 1 CONSERVATION	M	PERCENT STATE PARTICIPATION IN OWNING EXCESS CAPACITY				68	2325	3
HIDALGO COUNTY IRRIGATION DISTRICT #13	M	HIDALGO COUNTY ID NO. 13 CONSERVATION	M	PLANNING, DESIGN, PERMITTING & ACQUISITION FUNDING				6874	2353	1

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ATTACHMENT D

Public Hearing Notice

RIO GRANDE
REGIONAL WATER PLANNING GROUP

Public Hearing Notice

Date: July 22, 2022

Subject: Notice of Public Hearing for a Major Amendment to the 2021 Rio Grande Regional Water Plan to add the Delta Project as a Water Management Strategy

A public hearing will be held to receive public comments on a Major Amendment to the 2021 Rio Grande Regional Water Plan that will add the Delta Project as a Water Management Strategy.

All meetings of the Rio Grande Regional Water Planning Group (RGRWPG) are open to the public and include opportunities for public comment.

Public Hearing
August 23, 2022
2:00 PM
301 W. Railroad, Building B
Weslaco, Texas 78596

You may attend in person or virtually via GoToMeeting by using this link: https://meet.goto.com/352656037 or you can also call in to hear the Public Hearing by dialing 408-650-3123, access code: 352-656-037.

Submit public comments via email at dmorales@lrgvdc.org.

The deadline to comment on the amendment is **September 23, 2022.**

If you are unable to attend the public hearing or email comments, but would like to comment on the amendment, please send written comments to:

Jim Darling, Chairman
Rio Grande Regional Water Planning Group
301 W. Railroad St.
Weslaco, TX 78596

To review the amendment in advance of the public hearing, please go to the RGRWPG's website after August 15, 2022: http://www.riograndewaterplan.org/.

If you have questions or would like additional information, please contact Debby Morales, LRGVDC Executive Assistant at 956-682-3481 ext.102 or dmorales@lrgvdc.org

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ATTACHMENT E

Agency and Public Comments with Responses (To Be Included After the Comment Period)

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ATTACHMENT F

Additional Implementation Survey Responses

(To Be Included Once Received)