LLM/BSC Watershed Protection Plan

Steering Committee Meeting March 17, 2021

<u>Agenda</u>

- Welcome and Introductions
- Modeling Efforts
- Watershed Delineation
- LLMBSC Data Collection
- FY2022-319 Proposals
- Adjourn

Welcome & Introductions

Modeling Efforts



11 Sep

12 Sep

13 Sep

14 Sep

08 Sep

07 Sep

09 Sep

10 Sep

You can also download this data in standard CSV format or Excel CSV with UTC times. All plots are in your browser's timezon

Cybercollaboratory

REON/RGV Implementation Component Interactions



River & Estuary Observation Network

Operational Components



Spatially Explicit Load Enrichment **Calculation Tool** (SELECT)

Identify Potential Bacteria Loadings by Watershed

Load Duration Curves (LDCs)

- Flow Conditions where Loads are Exceeded
- **Define Potential Load** Reductions



5 mi





Walnut Creek Minimum Maximum Util potential 2. converse Walnut Creek Cattle 2.30e+9 3.36e+14 Deer 1.05e+6 8.97e+10 5.45e+013 5.45e+013 Feral hogs 0 5.78e+12 5.45e+013 5.45e+013 5.45e+013 OWTSs 9.69e+6 5.41e+11 5.96e+013 3.86e+013 3.86e+013 WWTFs 0 1.05e+9 3.86e+013 3.86e+013 4.86e+013 Deer 3.68e+10 7.37e+10 7.36e+013 3.86e+013 3.86e+013 Mud Creek Feral hogs 2.22e+12 3.98e+12 1.82e+013 3.31e+013 5.11e+014 Deer 3.68e+10 7.37e+10 7.8e+013 3.31e+013 3.11e+013 3.31e+013 5.12e+013 3.31e+013 5.12e+013 3.31e+013 5.12e+013 3.31e+013 5.12e+013 3.31e+013 5.12e+014 1.82e+014	Watershed	Potential <i>E. coli</i> sources	Daily potential	<i>E. coli</i> load (CFU/day)	- Total potential <i>E. coli</i> load CFU/day
Walnut Creek Cattle 2.30e+9 3.36e+14 Walnut Creek Deer 1.05e+6 8.97e+10 5.45e+013			Minimum	Maximum	
Walnut Creek Deer 1.05e+6 8.97e+10 2.30e+009 - 5.4e+013 Feral hogs 0 5.78e+12 5.48e+013 - 1.47e+014 2.48e+013 - 1.47e+014 Poultry operations 0 6.37e+13 5.48e+013 - 1.47e+014 2.71e+014 - 3.41e+014 WTSs 9.69e+6 5.41e+11 3.68e+013 - 4.85e+013 3.68e+013 - 4.85e+013 WTFs 0 1.05e+9 4.86e+013 - 7.35e+013 7.36e+013 - 7.35e+013 Deer 3.68e+10 7.37e+10 Pin Oak Creek 9.37e+12 Poultry operations 0 9.37e+12 3.31e+013 - 6.11e+013 3.31e+013 - 6.11e+013 OWTSs 6.15e+6 2.53e+12 Mud Creek 1.32e+014 - 1.51e+014 1.32e+014 - 1.51e+014 WW 1 1 3.31e+014 - 6.11e+013 6.52e+012 - 6.51e+012 6.52e+014 - 2.59e+014 WW 2 2.25e+10 4.63e+11 1.38e+014 - 2.59e+014 1.38e+014 - 2.59e+014 Spring Creek Deer 1.37e+10 2.99e+10 6.52e+012 - 6.51e+012 6.52e+012 - 6.51e+012 6.52e+012 - 2.64e+013 - 6.81e+013 2.64e+013 - 6.81e+013 2.		Cattle	2.30e+9	3.36e+14	Walnut Creek
Walnut Creek Feral hogs 0 5.78e+12 5.78e+12 Poultry operations 0 6.37e+13 1.48e+014 - 2.70e+014 OWTSs 9.69e+6 5.41e+11 1.48e+014 - 2.70e+014 WWTFs 0 1.05e+9 3.68e+013 1.37e+014 WWTFs 0 1.05e+9 3.68e+013 3.68e+013 4.86e+013		Deer	1.05e+6	8.97e+10	2.30e+009 - 5.44e+013
Walnut Creek Poultry operations 0 6.37e+13 2.71e+014-3.41e+014 OWTSs 9.69e+6 5.41e+11 3.68e+013 3.68e+013 WWTFs 0 1.05e+9 3.68e+013 4.85e+013 Deer 3.68e+10 7.37e+10 7.36e+013-7.59e+013 7.36e+013-7.59e+013 Poultry operations 0 9.37e+12 3.98e+12 2.31e+013-3.30e+013 Poultry operations 0 9.37e+12 3.31e+013-3.30e+013 3.31e+013-3.30e+013 OWTSs 6.15e+6 2.53e+12 Mud Creek 1.82e+013-1.11e+014 Mud Creek WW* 1 1 1.36e+014-2.30e+013 3.31e+013-3.30e+013 3.31e+013-3.30e+013 OWTSs 6.15e+6 2.53e+12 Mud Creek 1.32e+014-1.1e+014 Mud Creek WW* 1 1 9e+9 3 <e+10< td=""> 1.32e+014-2.59e+014 1.35e+014-2.59e+014 Spring Creek Feral hogs 7.73e+11 2.08e+12 Campbells Creek 4.93e+012-6.51e+012 6.52e+012-2.63e+013 2.64e+013-6.45e+013 6.64e+013 6.64e+013 6.6</e+10<>		Feral hogs	0	5.78e+12	5.45e+013 - 1.47e+014 1.48e+014 - 2.70e+014
OWTSs 9.69e+6 5.41e+11 Spring Creek WWTFs 0 1.05e+9 3.68e+013 4.86e+013 4.86e+013 Cattle 1.30e+14 2.55e+14 7.36e+013 4.86e+013 7.36e+013 Deer 3.68e+10 7.37e+10 Pin Oak Creek Pin Oak Creek Pin Oak Creek Poultry operations 0 9.37e+12 3.31e+013 3.31e+013 2.30e+013 WW 1 1 1.32e+013 3.011 2.31e+013 3.31e+013 2.31e+013 2.	Walnut Creek	Poultry operations	0	6.37e+13	2.71e+014 - 3.41e+014
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Deer 3.68e+10 7.37e+10 Pin Oak Creek Feral hogs 2.22e+12 3.98e+12 1.82e+013 - 2.30e+013 2.31e+013 - 3.30e+013 Poultry operations 0 9.37e+12 3.31e+013 - 6.11e+013 2.31e+013 - 3.30e+013 OWTSs 6.15e+6 2.53e+12 Mud Creek 1 6.12e+013 - 1.11e+014 WW 1 1 1 1 1 1.33e+014 - 1.51e+014 Ca 3.e+1 1 1 1.33e+014 - 1.51e+014 1.33e+014 - 1.52e+014 - 1.52e+014 Losek Feral hogs 7.73e+11 2.08e+12 Campbells Creek 1.34e+014 Spring Creek Gettle 3.58e+13 7.40e+13 2.64e+013 - 6.51e+012 6.52e+012 - 2.63e+013 Deer 1.37e+10 2.99e+10 6.41e+013 - 6.40e+013 <		Cattle	1.30e+14	2.55e+14	7.36e+013 - 7.59e+013
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Spring Creek Cattle 3.58e+13 7.40e+13 2.64e+013 - 6.40e+013 Deer 1.37e+10 2.99e+10 6.41e+013 - 6.81e+013 Feral hogs 9.70e+11 1.79e+12 Walnut Creek Sub-watersheds OWTSs 6.07e+10 2.67e+11 Mud Creek Sub-watersheds Cattle 4.80e+12 6.64e+13 Pin Oak Creek Sub-watersheds Deer 1.81e+9 2.70e+10 Little Brazos Watershed Boundary Campbells Creek Feral hogs 1.31e+11 2.05e+12 OWTSs 4.25e+9 1.72e+12 0		OWTSs	2.25e+10	4.63e+11	4.93e+012 - 6.51e+012
Spring Creek Deer 1.37e+10 2.99e+10 6.41e+013 - 6.81e+013 Feral hogs 9.70e+11 1.79e+12 Walnut Creek Sub-watersheds OWTSs 6.07e+10 2.67e+11 Mud Creek Sub-watersheds Cattle 4.80e+12 6.64e+13 Spring Creek Sub-watersheds Deer 1.81e+9 2.70e+10 Cattle Brazos Watershed Boundary Feral hogs 1.31e+11 2.05e+12 0 1.25 2.5 5 7.5 10 OWTSs 4 25e+9 1.72e+12 1.72e+12 1.72e+12 1.72e+12 1.72e+12	Spring Creek	Cattle	3.58e+13	7.40e+13	6.52e+012 - 2.63e+013 2.64e+013 - 6.40e+013
Spring Creek Feral hogs 9.70e+11 1.79e+12 Walnut Creek Sub-watersheds OWTSs 6.07e+10 2.67e+11 Mud Creek Sub-watersheds OWTSs 6.07e+10 2.67e+11 Pin Oak Creek Sub-watersheds Cattle 4.80e+12 6.64e+13 Spring Creek Sub-watersheds Deer 1.81e+9 2.70e+10 Little Brazos Watershed Boundary Feral hogs 1.31e+11 2.05e+12 0 1.25 2.5 5 7.5 10 OWTSs 4.25e+9 1.72e+12 1.72e+12 1.25 2.5 5 7.5 10		Deer	1.37e+10	2.99e+10	6.41e+013 - 6.81e+013
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Cattle 4.80e+12 6.64e+13 Deer 1.81e+9 2.70e+10 Feral hogs 1.31e+11 2.05e+12 OWTSs 4.25e+9 1.72e+12		OWTSs	6.07e+10	2.67e+11	Pin Oak Creek Sub-watersheds
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Campbells Creek Feral hogs 1.31e+11 2.05e+12 0 1.25 2.5 5 7.5 10 OW/TSs 4 25e+9 1 72e+12 Miles		Deer	1.81e+9	2.70e+10	Campbells Creek Sub-watersheds
OWTSs 4.25e+9 1.72e+12		Feral hogs	1.31e+11	2.05e+12	0.10505 5 75 10
		OWTSs	4.25e+9	1.72e+12	0 1.25 2.5 5 7.5 10



Watershed Delineation



Figure 1: Location of the Brownsville Ship Channel

Methodology



Figure 2: Watershed Delineation

Data Reconditioning



Figure 4: LIDAR elevation data



DEM High : 102.67 Low : -1.46



Figure 3: LIDAR elevation data recondition



Figure 4: LIDAR elevation data recondition



LLMBSC Existing Data

Water Quality and Flow Data

Site	Predominant Land Use	Status
CCDD1 Ditch No. 2 at the intersection with Old Port Isabel Rd. downstream of Bayview East lateral	Agriculture	Data Collection started summer 2019.
Ditch No. 1 at the Brownsville Public Works offices	Urban medium density	Data Collection started summer 2019
Old Main Drain 2 at the Brownsville Landfill	Agriculture and Urban	Data Collection started summer 2019

LLMBSC Monitoring station



Continuous RTHS Measurements

- 1. River and Estuary Observatory Network (REON)-http://rths.us
- 2. Real Time Hydrologic Station
 - a. Stations online in Feb (Prior to Q1 sampling event)
 - b. Continuous data at 5 minute resolution





Real-Time Hydrologic System

REON maintains a system of water quality sensors in riverine and estuarine systems.

You can pick a site off the map, choose a site by name, choose a variable, compare two sites, or view all site photos. You can double-click to zoom once, mouse wheel to zoom, use the +/- on the top left, or hold shift and draw a box to zoom to the box.



Data Collection











Public Works (22120) RTHS Results



Monitoring Results (22120)

	Brownsville Public Works (22120)			
Date	Feb-2020	Sep-2020	Mar-2021	Average
Flow (m³/s)	0.25	0.298	0.41	0.3
Gage Height (ft)	1.2	1.1	0.26	0.9
Water Temp (°C)	25.5	28.05	19.4	24.3
SpC (uS/cm)	6,808	5,637	7,253	6,566
D.O. (mg/L)	5.68	9.41	13.57	9.6
рН	7.5	7.961	8.52	8.0
<i>E. coli</i> (MPN/100mL)	1120	1299.7	1986.3	1468.7
TKN (mg/L)	0.67	0.736	1.03	0.8
NO ₂ +NO ₃ (mg/L)	12	8.14	6.39	8.8
Total-P (mg/L)	2.9	2.16	1.94	2.3

CCDD 1- Ditch #2 (22118) RTHS Results



Monitoring Results (22118)

	Came	ron County DD	1- Ditch #2	(22118)
Date	Feb-2020	Sep-2020	Mar-2021	Average
Flow (m³/s)	0.9	0.362	0.0013	0.4
Gage Height (ft)	0.84	1.5	0.65	1.1
Water Temp (°C)	17	26.901	15.5	19.8
SpC (uS/cm)	12,128	15,088	11,522	12912.8
D.O. (mg/L)	7.72	16.489	7.265	10.5
рН	8.2	8.353	8.33	8.3
<i>E. coli</i> (MPN/100mL)	648	1046.2	547.5	747.2
TKN (mg/L)	2.2	1.66	1.62	1.8
$NO_2 + NO_3 (mg/L)$	5.8	<0.68	1.43	3.6
Total-P (mg/L)	1.8	0.851	1.16	1.3

Brownsville Landfill (22121) RTHS Results



Monitoring Results

	City of Brownsville Landfill (22121)			
Date	Feb-2020	Sep-2020	Mar-2021	Average
Flow (m³/s)	0.2	-0.228	0.05	0.1
Gage Height (ft)	0.28	2.1	1.1	1.2
Water Temp (°C)	18.2	25.6	16.259	20.0
SpC (uS/cm)	6,026	2,236	6,152	4804.5
D.O. (mg/L)	8.22	7.438	7.06	7.6
рН	8.0	8.063	7.99	8.0
<i>E. coli</i> (MPN/100mL)	980	>2419.6	>2419.6	1939.7
TKN (mg/L)	64	1.05	2.02	1.2
$NO_2 + NO_3 (mg/L)$	1.1	<0.68	2.34	1.7
Total-P (mg/L)	0.12	0.292	0.144	0.2

Summary of the Results

	PW (22120)	CCDD#1 (22118)	Landfill (22121)	Screening Level
RTHS Water Depth (cm)	36.6 - 53.3	28.3 - 56.6	7.4 – 47.4	
Flow (m³/s)	0.3	0.4	0.1	
Gage Height (ft)	0.9	1.1	1.2	
Water Temp (°C)	24.3	19.8	20.0	35
SpC (uS/cm)	6,566	12,912	4,804	
D.O. (mg/L)	9.6	10.5	7.6	4 - 5
рН	8.0	8.3	8.0	6 - 9.5
<i>E. coli</i> (MPN/100mL)	1,468.7	747.2	1939.7	126 (Geomean)
TKN (mg/L)	0.8	1.8	1.2	
NO ₂ +NO ₃ (mg/L)	8.8	3.6	1.7	0.17
Total-P (mg/L)	2.3	1.3	0.2	0.21

Subbasins



https://data.tnris.org/collection/6131ecdd-aa26-433e-9a24-97ac1afda7de

Land Cover



Subbasins

- Open Water
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock/Sand/Clay)
- Grassland/Herbaceous

Open Water

Shrub/Scrub

Grassland/Herbaceous

Emergent Herbaceous Wetlands



South Bay





Open Water

Shrub/Scrub

Cultivated Crops

Woody Wetlands

53%

Developed, Low Intensity

Developed, Medium Intensity

Barren Land (Rock/Sand/Clay)

Emergent Herbaceous Wetlands

Grassland/Herbaceous

Port Isabel

4%

5%

3%

1%

3%

1%

1%

11%



Subbasins



Port of Brownsville



Developed, Open Space

Deciduous Forest

Open Water

Deciduous Forest

Cultivated Crops

Woody Wetlands

Grassland/Herbaceous

Mixed Forest Shrub/Scrub

Developed, Open Space

Shrub/Scrub

Developed, Low Intensity

Lower Laguna Madre

7%

3%

2%

7%

2%







22%

Nonpoint Source



Phase I : Grant Status

- Monitoring QAPP (Approved July 2019)
- RTHS (Real-Time Hydrological System) (Installed August 2019)
- Modeling and Geospatial QAPP (In progress)
- 2nd Sampling Event (Sept 2020)
- Coastal Habitat WG (02/03/2021)
- Urban/Infrastructure WG (02/10/2021)
- AG WG (02/24/2021)
- 3rd Sampling Event (March 2021)

FY2022-319 Proposals

<u>1- Lower Laguna Madre-Hydrodynamic Water Quality</u> <u>Study</u>

- a) Circulations patterns in LLM are poorly understood in this impaired water body, thus difficult to characterize the sources of impairments
- b) Propose to integrated real-time current monitoring program (Possible HF Radar to characterize the circulation patterns)

2- North and Central-Lower Rio Grande Valley-Phase II

- a) Continuation of Phase I which involves Characterization of the Northern and Central Lower RG Valley Watersheds base on existing data
- b) Currently available data is insufficient to characterizing
- c) Will provide additional monitoring to determine the water quality status of the North and Central Water sheds, may be extended to characterize the tidal reaches

3- Llano Grande Lake Dredging Feasibility Study

- a) Dredging was identified in ACWPP as a potential implementation to improve AC water quality. A feasibility study was suggested as a first phase of its implementation.
- b) Dredging would potentially increase ground water flows to Llano Grande and hence increase fresh water flow to Arroyo Colorado
- c) Proposal in 2020 was not evaluated by TCEQ because project title included the word dredging and dredging is outside the scope of TCEQ 319 program. Suggest dusting proposal off and remove/limit mention of dredging. (next year Llano Grande Implementation- Feasibility Study)

4- Arroyo Colorado-Tidal: Implementation of Watershed Monitoring and Modeling Estuarine Hydrodynamics

- a) AC-WPP classified the estuarine hydrodynamics of the AC as poorly characterized
- b) AC is impaired
- c) Thus is NPS polluted loads to the LLM are poorly understood.
- d) Proposal called for characterizing the tidal forces and flux in river through a combination of continuous monitoring of stage height with ADCP to measure tidal velocities in the river. Additional flow measurements and over complete tidal cycles would enable generation of velocity-indexed discharge rating curves.
- e) Modeling would be employed to assess the impact of estuarine hydrodynamics on Water Quality.

5- LRGV LID Implementation-Harlingen City Hall and Cameron County San Benito Annex

a) Goal to reduce NPS loads to the AC through the implementation of Bioretention cells such as rain gardens, bioswales, and biopfilters

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