MUSC

SALT & NUTRIENT MANAGEMENT PLAN

FOR THE UPPER SANTA ANA RIVER WATERSHED GROUNDWATER BASINS April 11, 2022 – BMPTF





A Successful SNMP Enhances Water Supply Reliability

Water Supply Strategies Addressing changing and uncertain conditions— Mitigating Risks

- Climate change
- Prolonged droughts
- Demand increase •

Opportunities

- Drought resiliency strategies
- Lessen dependence on imported water
- Stormwater capture/recharge
- **Recycled** water •



The San Bernardino **Basin Area (SBBA)** High quality GW supply critical to several agencies

Recycled Water Policy SNMP required as part of the Recycled Water Policy (RWP)

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Phase 1 -- Water Quality Characterization Ambient Water Quality Analysis Nitrogen Loss Coefficients for the SBB

Phase 2 -- Project Planning and Impact Analysis

Phase 3 -- Salt and Nutrient Management Plan

Phase 1					20	21						2022					
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr /	May	Jun	
	Task 1 objectiv	Develop es for the	provisiona SBB GMZ	al water qu	uality												
	Task 2 SBB GN	Estimate ⁄/Z	ambient v	water qua	lity in the												
			Task 3 in wate quantif assimil	l Evaluat er quality a y availabl ative capa	te trends and e acity												
			Task 4 signific & nitrat	. Identify ant water te	/ potential quality im	areas of pairment	for TDS										
	DRAFT TM-1: Water Quality Characterization							Final TM-1: Water Quality Characterization									
									ŀ	f Requir	ed						
Task 5 Develo nitrogen-loss c	p site-speo oefficients	for SBB								Field wo	rk to sup	port N-Lo	ss Study				
Determine effi	cacy of Site	S						=									
 Develop a Nitr by Regional B 	ogen-Loss oard	Workplan	for Approv	val		Nitro	ogen L	oss						TM: Nitr	rogen		
						,									LOSS		

Workplan

Phase 2						20	22						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
		Task 6 and qua recharge	Summari lity of imp ed in the S	ummarize the volume / of imported water in the SBB									
Task 7 Summarize the volumeand quality of stormwater capturedby active recharge projects in theSBB													
TM-1: Recharged Water Characterization													
						Mode	eling Tas	ks					
			Task 8 water pro	Characte ojects	erize proba	ble impac	ts to grou	ndwater q	uality from	n recycled			
TM-2: Recycled Water Evaluation													
Task 9. Characterize the probable cumulative and collective impacts to groundwater quality										/e			
Task 10. Characterize source loading for groundwaters impaire by TDS or nitrate.									paired	-			
								TN	1-3: Gr	oundv	vater		
								Q	uality	Evalue	ation [–]		

Phase 1.

AWQ Analysis Update







Objective Setting Period (1954-1973)



Data Required to Calculate AWQ

- Water Quality Point Statistics
- Water Quality Contours and Raster Grid
- Groundwater Elevation Contours and Raster Grid
- Grid Extract Table Data

Source: Wildermuth Environmental, Inc. 2000. TIN/TDS Phase 2A

Objective Setting Period (1954-1973)



Bunker Hill Pressure Zone

- Includes both Bunker Hill-A and Bunker Hill-B GMZs
- Two Layer Aquifer System (Layer 1 and Layer 2)
- The layered portions of the BHP are combined with the unlayered portions

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Source: Wildermuth Environmental, Inc. 2000. TIN/TDS Phase 2A

Proof of Concept Objective Setting Period Ambient Water Quality Computation

	Nitrate TDS)S	
Management Zone	Original Historical Ambient (1954-1973) ¹	Water Quality Objective ¹	Re- Computed Historical Ambient (1954- 1973) ²	Change in Historical Ambient (1954- 1973) ³	Original Historical Ambient (1954- 1973) ¹	Water Quality Objective ¹	Re- Computed Historical Ambient (1954- 1973) ²	Change in Historical Ambient (1954- 1973) ⁴
Bunker Hill-A	2.7	2.7	2.3	-0.4	313	310	310	0
Bunker Hill-B	7.3	7.3	5.9	-1.4	332	330	320	-10
Lytle	1.5	1.5	1.5	0	264	260	260	0

¹WEI, 2000. Technical memorandum: TIN/TDS Phase 2A, Tasks 1 through 5, TIN/TDS study of the Santa Ana Watershed. July 2000.

²This project.

³Assimaltive Capacity: Subtraction of Column 2 (Original Historical Ambient (1954-1973)) from Column 4 (Re-Computed Historical Ambient (1954-1973)) ⁴ Assimilative Capacity: Subtraction of Column 6 (Re-Computed Historical Ambient (1954-1973)) from Column 8 ((Re-Computed Historical Ambient (1954-1973))

Nitrate – AWQ Assimilative Capacity

		Nitrate as Nitrogen (mg/L)											
Management Zone	Water Quality Objective	Historical Ambient (1954-1973)	1997 Ambient (1978-1997)	2003 Ambient (1984-2003)	2006 Ambient (1987-2006)	2009 Ambient (1990-2009)	2012 Ambient (1993-2012)	2015 Ambient (1996-2015)	2018 Ambient (1999-2018)	Assimilative Capacity			
Bunker Hill-A	2.7	2.7	4.5	4.3	4.0	4.0	4.0	3.9	3.8	None (-1.1)			
Bunker Hill-B	7.3	7.3	5.5	5.8	5.4	5.4	5.6	5.8	5.8	1.5			
Lytle	1.5	1.5	2.8	2.7	2.7	2.6	2.5	2.4	2.4	None (-0.9)			
San Timoteo "max													
benefit"	5.0	2.7	2.9	?	?	0.8	2.3	2.0	1.5	3.5			
San Timoteo													
"antideg"	2.7	2.7	2.9	?	?	0.8	2.3	2.0	1.5	1.2			
Yucaipa "max													
benefit"	5.0	4.2	5.2	5.4	5.3	6.2	6.3	6.2	5.9	None (-0.9)			
Yucaipa "antideg"	4.2	4.2	5.2	5.8	5.3	6.2	6.3	6.2	5.9	None (-1.7)			

Updated Assimilative Capacity -- Nitrate

Bunker Hill-A 2.3 – 3.8 = None (-1.5) mg/L

Bunker Hill-B 5.9 – 5.8 = 0.1 mg/L

TDS – AWQ Assimilative Capacity

				Тс	otal Dissolve	d Solids (mg/	L)			
Management Zone	Water	Historical Ambient	1997 Ambient	2003 Ambiont	2006 Ambient	2009 Ambient	2012 Ambient	2015 Ambient	2018 Ambient	Assimilative
	Obiective	(1954-1973)	(1978-1997)	(1984-2003)	(1987-2006)	(1990-2009)	(1993-2012)	(1996-2015)	(1999-2018)	Capacity
Bunker Hill-A	310	313	350	320	330	340	340	330	330	None (-20)
Bunker Hill-B	330	332	260	280	280	270	280	290	280	50
Lytle	260	264	240	230	230	240	240	240	240	20
San Timoteo "max										
benefit"	400	303	300	?	?	420	410	420	420	None (-20)
San Timoteo										
"antideg"	300	303	300	?	?	420	410	420	420	None (-120)
Yucaipa "max										
benefit"	370	319	330	310	310	320	320	320	320	50
Yucaipa "antideg"	320	319	330	310	310	320	320	320	320	0

Updated Assimilative Capacity -- TDS

Bunker Hill-A 310 – 330 = None (-20) mg/L

Bunker Hill-B 320 – 280 = 40 mg/L



Recent AWQ (1999-2018) SBB Management Zone Nitrate



Recent AWQ (1999-2018) SBB Management Zone TDS





Recent AWQ (1999-2018) SBB Management Zone – Updated aquifer properties Nitrate



Recent AWQ Period(1999-2018) SBB Management Zone – Updated aquifer properties TDS



Summary of AWQ Analysis for TDS

Phase					AWQ ²		Update	d Aquifer Prop	erties ²
Groundwater Management Zone	Water Quality Objective	2018 Ambient (1999-2018)	Assimilative Capacity	Historical Ambient (1954-1973)	2018 Ambient (1999-2018)	Assimilative Capacity	Historical Ambient (1954-1973)	2018 Ambient (1999-2018)	Assimilative Capacity
Bunker Hill-A	310	330	None (-20)	320	330	None (-10)	300	330	None (-30)
Bunker Hill-B	330	280	50	300	280	20	320	290	30
Lytle	260	240	20	260	240	20	240	220	20
SBB				310	310	0	300	290	10

¹WEI, 2000. Technical memorandum: TIN/TDS Phase 2A, Tasks 1 through 5, TIN/TDS study of the Santa Ana Watershed. July 2000. ²This project.

Summary of AWQ Analysis for Nitrate

	Phase 2A ¹				AWQ ²		Updated Aquifer Properties ²			
Groundwater Management Zone	Water Quality Objective	2018 Ambient (1999-2018)	Assimilative Capacity	Historical Ambient (1954-1973)	2018 Ambient (1999-2018)	Assimilative Capacity	Historical Ambient (1954-1973)	2018 Ambient (1999-2018)	Assimilative Capacity	
Bunker Hill-A	2.7	3.8	None (-1.1)	2.3	3.8	None (-1.5)	2.0	3.4	None (-1.4)	
Bunker Hill-B	7.3	5.8	1.5	5.9	5.8	0.1	5.8	5.9	None (-0.1)	
Lytle	1.5	2.4	None (-0.9)	1.5	2.4	None (-0.9)	1.3	2.1	None (-0.8)	
SBB				4.4	5	None (-0.6)	4.2	4.7	None (-0.5)	

¹WEI, 2000. Technical memorandum: TIN/TDS Phase 2A, Tasks 1 through 5, TIN/TDS study of the Santa Ana Watershed. July 2000. ²This project.

Summary of AWQ Analysis for SBB GMZ

Ambient Water Quality for the San Bernardino Groundwater Management Zone (mg/L)

Constituent	Historical Ambient (1954-1973)	Current Ambient (1999-2018)	Assimilative Capacity	
Nitrate	4.4	5.0	None (-0.6)	
TDS	320	310	10	Ambient Water Quality for the San Bernardino
				Groundwater Management Zone

Updated Aquifer Characteristics (mg/L)

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Constituent	Historical Ambient (1954-1973)	Current Ambient (1999-2018)	Assimilative Capacity
Nitrate	4.2	4.7	None (-0.5)
TDS	300	290	10

Summary of AWQ Analysis for SBB GMZ

- Updating the Aquifer Properties does not substantially change the AWQ determinations
- Combining Bunker Hill-A, Bunker Hill-B, and Lytle GMZs does not create additional assimilative capacity for TDS or Nitrate
- Phase 2: Project Planning and Impact Analysis Results will inform the decision to combine GMZs or continue with individual GMZs

Questions?