Meeting Agenda

Carlsbad Desalination Project – NPDES Permit Development Update

Date and Time

Tuesday, March 28, 2017 9:00am-12:00pm

Location

California Regional Water Quality Control Board, San Diego Region Library – Third Floor 2375 Northside Drive, Suite 100 San Diego, CA 92108

Teleconference

Phone number: 1-888-808-6929 Access code: 2535683

Global Meet weblink:

https://stateofcaswrcbweb.centurylinkccc.com/CenturylinkWeb/DASAII-Staff22

Meeting participants

Entity	Staff
Poseidon, LLC	Peter MacLaggan Josie McKinley Craig Johns (by phone) Kelly Huffman (by phone) Michael Welch Tim Hogan Michelle Powelson Pat Crain Eric Miller
San Diego County Water Authority	Robert Yamada Toby Roy Jeremy Crutchfield
San Diego Water Board	David Barker Brandi Outwin-Beals Ben Neill Dan Connally (USEPA contractor, by phone)
State Water Board	Claire Waggoner (by phone) Kim Tenggardjaja (by phone) Daniel Ellis (by phone Renan Jauregui (by phone) Phil Wyels (by phone) Marleigh Wood (by phone) Catherine Hagan

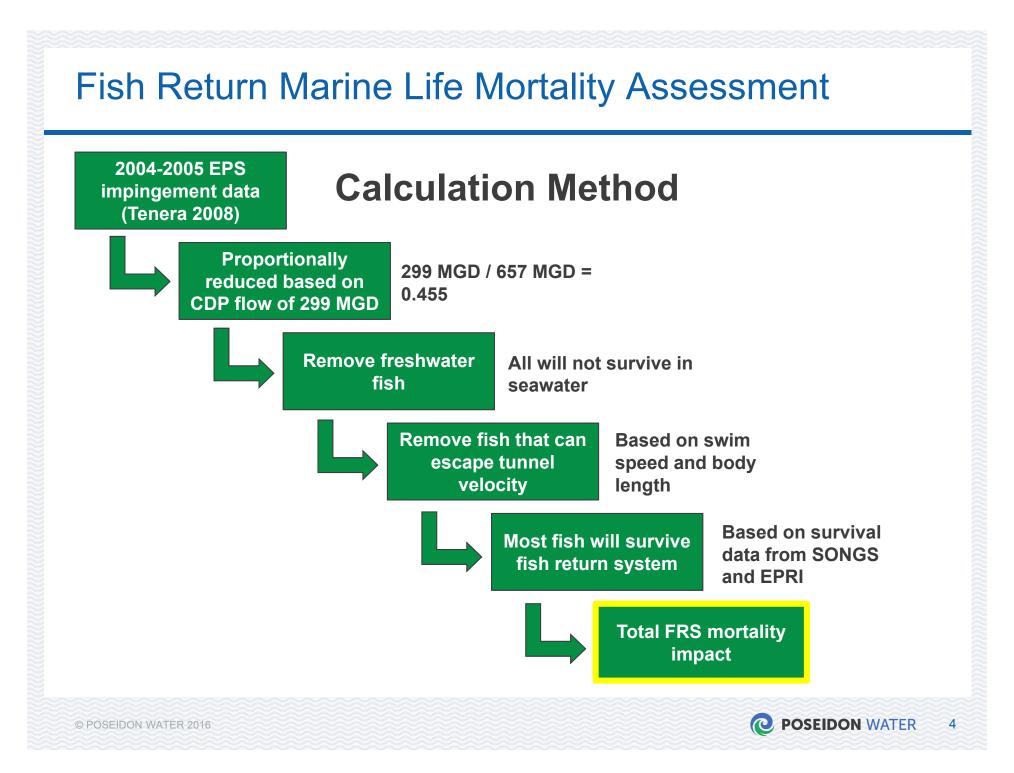
- 1. Introductions
- 2. Intake Structures Alternatives 15-20
- 3. Marine Life Mortality Report and Mitigation Calculations (Appendix ZZ)
- 4. Fish Return System
- 5. Schedule Update
 - Deliverables from Poseidon
 - Permit Development
- 6. Additional Discussion Next meeting is tentatively scheduled for Tuesday April 25.

CARLSBAD DESALINATION PROJECT PERMIT RENEWAL MEETING MARCH 28, 2017

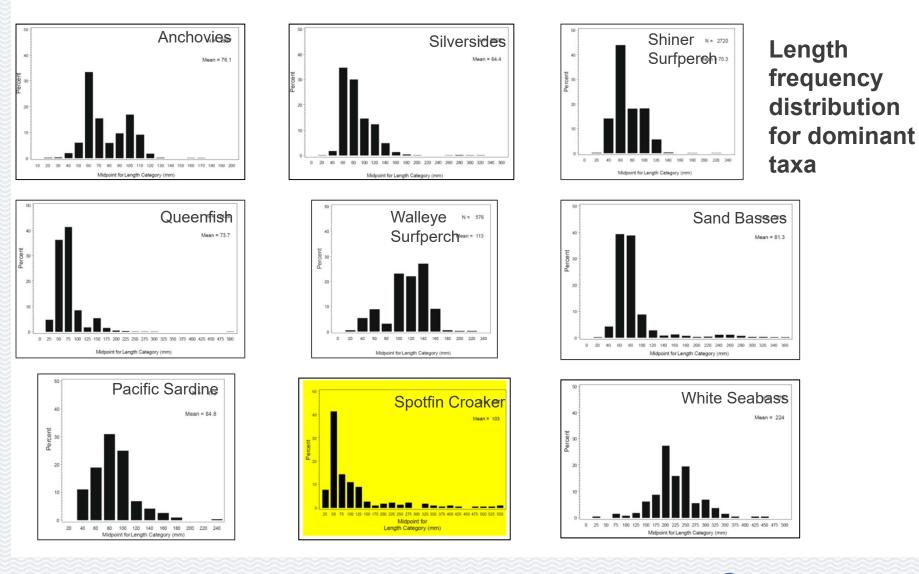
Discussion Topics

- 1. Response to State Water Board's request for an evaluation of additional intake alternatives
- 2. Marine Life Mortality
- 3. Mitigation Calculations
- 4. Fish Return Forms and Anti-degradation Analysis

FISH RETURN MORTALITY ASSESSMENT INTAKE ALTERNATIVES 1, 15 -20



Incremental Increase in Fish Escape

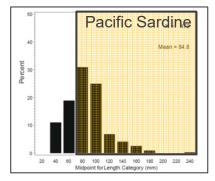


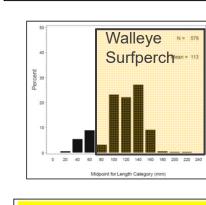
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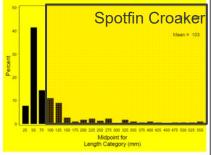


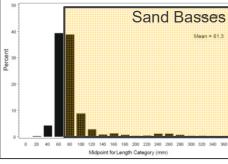
Incremental Increase in Fish Escape Anchovies Shiner N= 2720 Silversides Surfperch⁷⁰³ Mean = 84.4 Mean = 76. Fish that can Per escape 20 2.6 ft/sec Midpoint for Length Category (mm) Midpoint for Length Category (mm) Midpoint for Length Category (mm) Queenfish Walleye N= 57 Sand Basses Surfpercher = 11 Mean = 73.7 Mean = 81.3 Percent 20

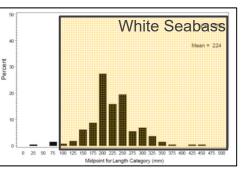






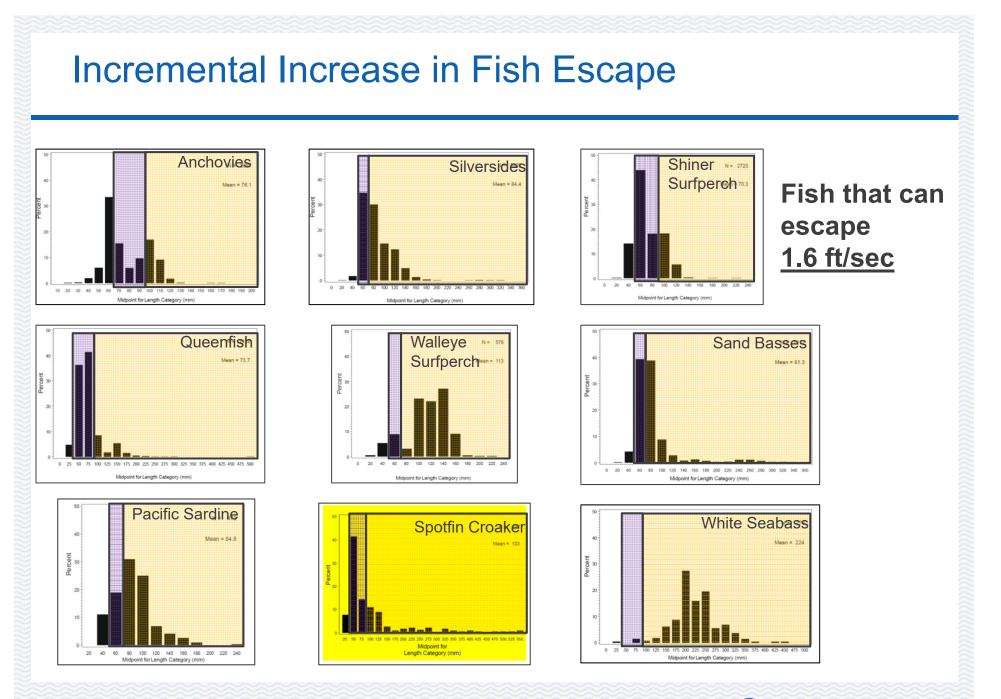






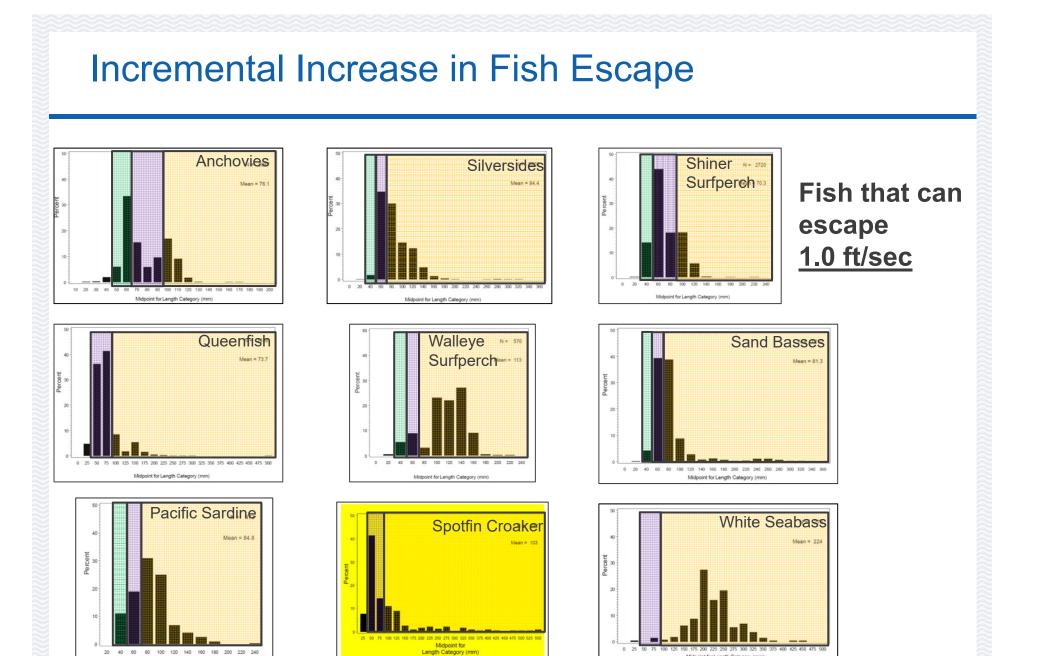
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Midpoint for Length Category (mm)

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Midpoint for Length Category (mm)

Comparison of Alternative Intake Velocity and Environmental Benefits

Alternative	Description	Velocity at Bar Rack at MLLW (ft/sec)	Mean Velocity in Tunnels at MLLW (ft/sec)	Mortality Estimate (Ibs/day)	Incremental Mortality Reduction (Ibs/day)
1	 Original Proposal 	1.06	2.63	0.85	NA
15	Alternative 1 plus: • Convert discharge tunnel to intake	1.06	1.54	0.78	0.07
16	Alternative 1 plus: • Widen bar rack	0.53	2.63	0.85	0
17	Alternative 1 plus:Convert discharge tunnel to intakeWiden bar rack	0.53	1.54	0.78	0.07
18	 Alternative 1 plus: Convert discharge tunnel to intake Widen bar rack New 20-ft wide open intake channel 	0.53	• 0.85	• 0.75	0.10
19	 Alternative 1 plus: Convert discharge tunnel to intake Raise intake/discharge tunnel roof to flow as open channel 	1.06	• 1.01	• 0.75	0.10
20	Alternative 1 plus:Convert discharge tunnel to intakeDual flow screens	1.06	• 1.54	• 0.78	0.07

MARINE LIFE MORTALITY REPORT

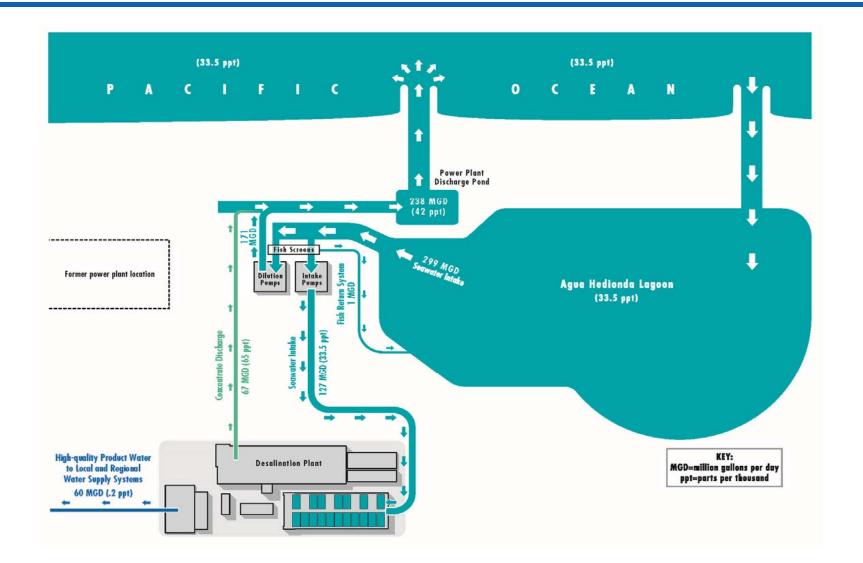


Marine Life Mortality Report

- Intake Mortality
 - CDP Process Water
 - Entrainment
- Discharge Mortality
 - Flow Augmentation
 - Entrainment
 - Osmotic Stress
 - Multiport Diffuser
 - Entrainment
 - Osmotic Stress
 - Comparison of Discharge Alternatives
 - Flow Augmentation vs. Multiport Diffuser
- Fish Return Mortality
- Permanent Construction Impacts
- Summary of Marine Life Mortality Report for Proposed Project



Proposed Intake and Discharge Facilities



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CDP Process Water – Entrainment Mortality

	CDP Process Water	Fish Return	Total	1 mm Screen Credit (1%)	Net Total	Supporting Documentation
Flow (MGD)	127	0.42	127.42			
Area of Production Foregone Total (Acres)	36.00	0.12	36.12	-0.36	35.76	Appendix K Appendix P

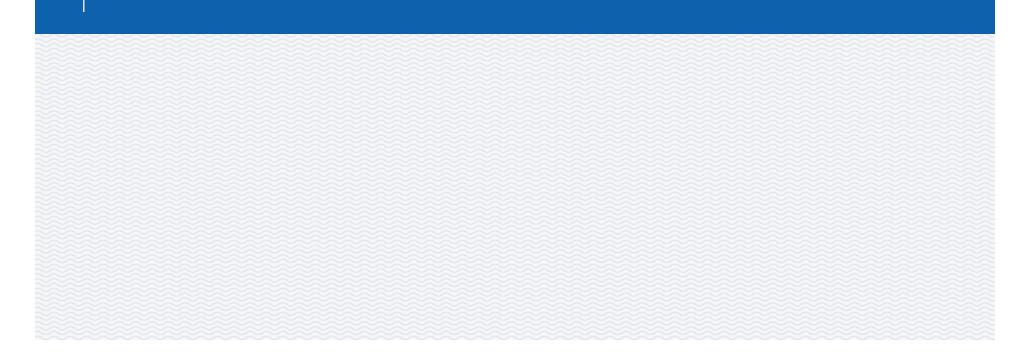
Discharge Mortality

- The Discharger is proposing to use flow augmentation as an alternative brine discharge technology.
- Section III.M.2.d.(2)(c) of the Ocean Plan Amendment provides that alternative brine discharge technologies may be used if:

[A]n owner or operator can demonstrate to the regional water board that the technology provides a comparable level of intake and mortality of all forms of marine life as wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable. The owner or operator must evaluate all of the individual and cumulative effects of the proposed alternative discharge method on the intake and mortality of all forms of marine life, including (where applicable): intake-related entrainment, osmotic stress, turbulence that occurs during water conveyance and mixing, and shearing stress at the point of discharge.

 Wastewater dilution is not available, so the analysis that follows provides a comparison of the marine life mortality of the proposed flow augmentation system to that of the diffuser.

FLOW AUGMENTATION DISCHARGE MORTALITY



Flow Augmentation – Entrainment Mortality

	Flow Augmentation System	Fish Return	Total	1 mm Screen Credit (1%)	Net Total	ROWD Supporting Documentation
Flow (MGD)	171	0.58	171.58			
Entrainment Mortality APF (Acres)	48.00	0.16	48.16	-0.48	47.68	Appendix K Appendix P

Flow Augmentation Brine Mixing Zone (BMZ)



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Flow Augmentation Osmotic Stress in BMZ Benthic Habitat

- Due to the negative buoyancy, the brine discharge flows offshore along the bottom of the BMZ under the force of gravity.
- Parts of the benthic habitat within the BMZ may be exposed to salinity in excess of 35.5 parts per thousand (ppt) for extended periods of time.
- The discharge mortality assessment conservatively assumes that 100% of the benthic area within the BMZ is exposed to toxic conditions.
- Based on this assumption, the impacted area within the BMZ is 18.51 acres.

Flow Augmentation Shear and Osmotic Stress in BMZ Water Column

- The brine discharge flows offshore under the force of gravity.
- Organisms drifting through the BMZ would not be exposed to excessive shear or turbulence.
- Parts of the water column within the BMZ can be exposed to salinity in excess of 35.5 parts per thousand (ppt).
- Modified WET testing was conducted to determine the potential salinity-induced adverse effects on organisms traveling through all three phases of the brine dilution process (ROWD Appendix I).
- The brine dilution toxicity study focused on the species that are most sensitive to elevated salinity.
- These species experienced no significant toxic effects after being exposed to elevated salinity conditions similar to those that would exist during transit through: (1) the discharge tunnel; (2) discharge pond; (3) discharge channel; (4) BMZ; and (5) from the edge of BMZ to the location offshore where discharge salinity would be match the surrounding seawater.
- Organisms drifting through the BMZ would experience lower salinity concentrations and lower exposure times than the study design, so it is reasonable to conclude that these organisms would not be exposed to adverse salinity effects while drifting through the BMZ.

Flow Augmentation Toxicity Test Results

Scenario #	Scenario	Test	Species		Mean No	rmal Devel	opment
<i>#</i>	Description	date	Tested	Sample	Phase 1	Phase 2	Phase 3
1	P1: 44 ppt for 2.8 minutes; P2: 39 min.; P3: 30 min.	2/6/15	Abalone Development	Control Brine Exposure	83.8 76.7*	77.7 79.1	80.5 78.8
1	P1: 44 ppt for 2.8 min.; P2: 39 min.; P3: 30 min.	2/17/15	Urchin Development	Control Brine Exposure	93.7 91.3	92.0 90.3	89.3 91.3
2	P1: 42 ppt for 2.2 min.; P2: 36 min.; P3: 30 min.	1/30/15	Abalone Development	Control Brine Exposure	94.0 95.7	93.7 92.7	94.3 91.7
3	P1: 40 ppt for 1.7 min.; P2: 34 min.; P3: 30 min.	1/22/15	Abalone Development	Control Brine Exposure	66.0 68.5	61.0 67.0	67.3 60.3

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Flow Augmentation - Combined Discharge Mortality

Impacted Area	Flow Augmentation	Fish Return	Total Impacted Area (Acres)	1 mm Screen Credit (1%)	Net Impacted Area (Acres)	Supporting Documentation
Flow Subject to 100% Mortality (MGD)	171	0.58				
Entrainment Mortality APF (Acres)	48.00	0.16	48.16	-0.48	47.68	Appendix K Appendix P
BMZ - Adverse Salinity Effects Benthic Habitat (Acres)	NA	NA	18.51	0	18.51	Appendix I Appendix BB Appendix QQ Appendix XX
Total Impacted Area (Acres)			66.67		66.19	

MULTIPORT DIFFUSER DISCHARGE MORTALITY



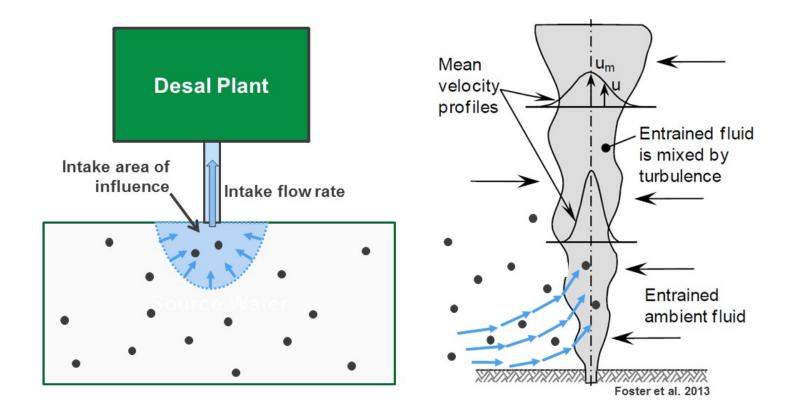
Multiport Diffuser – Shear Stress Mortality

- The multiport diffuser alternative contemplates that the CDP will discharge approximately 60 MGD of brine through a 72" outfall pipeline extending approximately 4,000 feet offshore to four duck-bill diffuser ports would eject the brine into the water column at a high velocity to promote rapid mixing.
- In order to comply with the Ocean Plan Amendment requirement that the brine is diluted to a salinity of no greater than 2 ppt over natural background salinity, 945 MGD of the surrounding seawater needs to be entrained in the discharge.
- The Staff Report/SED direction for calculation of shear-related mortality:

[U]ntil additional data is available, we assume that larvae in 23 percent of the total entrained volume of diffuser dilution water are killed by exposure to lethal turbulence.

- 23 percent of the total entrained volume of diffuser dilution water is 217 MGD.
- Entrainment estimate calculated using the methodology set forth in Ocean Plan Amendment Appendix E.

Multiport Diffuser – Calculation of Shear Stress Mortality



Conceptual schematics of how ambient flow and passive marine life are drawn into 1) a desalination intake and 2) a desalination discharge diffuser. Blue arrows indicate ambient water flow and black dots represent passive marine organisms.

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Multiport Diffuser – Shear Stress Mortality

	Multiport Diffuser	Supporting Documentation
Flow Exposed to 100% Shear Mortality (MGD)	217	SED §8.6.2.2.1
Shear Stress Mortality APF (Acres)	48.00	Appendix K Appendix P Appendix WW

Multiport Diffuser Osmotic Stress in the BMZ

Benthic Habitat

- Parts of the benthic habitat in the BMZ may be exposed to salinity in excess of 35.5 ppt.
- Consistent with the approach taken in the analysis of the flow augmentation system, the discharge mortality assessment for the multiport diffuser conservatively assumes that 100% of the benthic area within the BMZ is exposed to toxic conditions.
- The BMZ extends 100 meters (328 ft.) out from each of the four discharge points with an impacted area inside the BMZ of 14.4 acres.

Water Column

- The organisms drifting through the BMZ associated with the multiport diffuser may be exposed to somewhat higher salinity concentrations than in the BMZ with flow augmentation system;
- However, overall exposure time would be shorter due to the rapid entrainment and mixing that occurs within the turbulent plume created by high velocity discharge from the multiport diffuser.
- The impact assessment assumes there would be no adverse salinity effects on organisms drifting through the BMZ associated with the multiport diffuser.

COMPARISON OF DISCHARGE MORTALITY FLOW AUGMENTATION AND MULTIPORT DIFFUSER

Comparison of Discharge Mortality – Flow Augmentation and Multiport Diffuser

	Flow Augmentation	Multiport Diffuser
Flow Subject to 100% Mortality (MGD)	171	217
Entrainment Shear Mortality APF (Acres)	47.68	67.00
BMZ - Adverse Salinity Effects Benthic Habitat (Acres)	18.51	14.4
Total Impacted Area (Acres)	66.19	81.40

FISH RETURN SYSTEM MORTALITY



Fish Return System Mortality

Fish Return Mortality

- The methodology described in slide 4 estimated the fish return system mortality to be 0.85 for Alternative 1, and 0.78 lbs/day for Alternative 15.
- Order R9-2009-0038 estimated the CDP stand-alone operations would result in 10.36 lbs/day of impingement mortality, which would be offset by 11.3 acres of estuarine habitat restoration.
- A proportional reduction of the 11.3 acres yields the impacted area associated with the fish return system:

Alternative 1 - 0.85 lbs/d/10.36 lbs/d x 11.3 acres = 0.93 acres

Alternative 15 - 0.78 lbs/d/10.36 lbs/d x 11.3 acres = 0.85 acres

Permanent Construction Impacts

- The discharge end of the fish return system will be in Agua Hedionda Lagoon.
- The entire area within Agua Hedionda Lagoon that would be permanently impacted by the fish return system is less than 0.1 acres.

COMBINED MARINE LIFE MORTALITY PROPOSED PROJECT (ALTERNATIVE 1 AND ALTERNATIVE 15)

Combined Marine Life Mortality Proposed Project (Alternative 1 and Alternative 15)

Impact	Impact Appagement Mathed	Impacted Area (Acres)		
Impact	Impact Assessment Method	Alternative 1	Alternative 15	
Intake	APF calculated per Appendix E of the Staff Report/SED to the Ocean Plan Amendment using a 95% confidence bound for an assumed 100% mortality of all forms of marine life entrained by 127 MGD CDP process water with an APF of 35.76 acres and 171 MGD flow augmentation with an APF of 47.68 acres after accounting for a 1% credit for 1 mm screening technology.	83.44	83.44	
	Potential mortality associated with the operation of the fish return system.	0.93	0.85	
Discharge	Area within the BMZ potentially exposed to a salinity in excess of 2 ppt over natural background salinity.	18.51	18.51	
Construction	Permanent footprint of the fish return within lagoon	0.10	0.10	
	Total Impacted Area	102.98	102.90	

MITIGATION CALCULATION



Mitigation Calculation Proposed Project (Alternative 1 and Alternative 15)

- The impacted area identified in the CDP Marine Life Mortality Report for the proposed project is 102.90 acres for Alternative 15 to 102.98 acres for Alternative 1.
- There are four types of habitats impacted by the CDP:
 - Estuarine habitat Alternative 1 62.73 acres and Alternative 15 62.72 acres;
 - Open water habitat Alternative 1 21.64 acres and Alternative 15 21.57 acres;
 - <u>Soft bottom habitat</u> for both Alternative 1 and Alternative 15 the impacted area is 18.20 acres;
 - <u>Rock jetty habitat</u> both Alternative 1 and Alternative 15 the impacted area is 0.31 acres.
- The Discharger is proposing to restore estuarine habitat to satisfy all of the CDP mitigation requirements.
- The mitigation calculation contemplates 1:1 in-kind mitigation for estuarine species and the rocky jetty habitat, and 1:10 mitigation for open ocean species and soft bottom habitat potentially impacted by the CDP.
- The mitigation calculation takes into account all of the impacted habitat.
- The total mitigation required for the proposed project prior to any adjustment for double counting of mitigation is 67.13 acres for Alternative 1 and 67.11 acres for Alternative 15.
- An adjustment is necessary to account for the soft bottom habitat within the flow augmentation BMZ that is within the same source water body as the open water area impacted by the intake. The mitigation for the open water habitat impacted by the intake fully mitigates for the soft bottom habitat in the BMZ.
- The net mitigation after adjustment is 65.31 acres for Alternative 1 and 65.29 acres for Alternative 15.

Mitigation Ratio

- The Discharger conducted an assessment of existing habitat value in the BMZ to determine the appropriate mitigation ratio based on the productivity of the existing BMZ habitat as compared to that of the restoration project (ROWD Appendix UU).
- This assessment found that the soft bottom habitat underlying the BMZ outside the discharge channel is sand.
- Within the discharge channel, the rocky jetties defining the channel represent higher productivity rocky habitat that warrants a 1:1 mitigation ratio.
- The sand bottom habitat within the BMZ has a relatively low infaunal diversity and abundance.
- Three key factors for measuring habitat productivity.
- For each of the parameters, (vegetation production, fish count, and fish productivity) the productivity of the estuarine habitat contemplated under the restoration project is significantly greater than that of the soft bottom area of the BMZ.
- This information conservatively supports a 1:10 mitigation ratio as appropriate for the soft-bottom sandy habitat impacted by the BMZ (i.e., 10 acres of impacted soft-bottom habitat would be fully mitigated by the restoration of one acre of estuarine habitat).

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Mitigation Ratio

Natural Resource	Mitigation Ratio ^b			
Vegetation (Net prod. g C/m²/y)	>10:1ª			
Fish (count/m²)	650:1 to 9,750:1			
Fish Productivity	6:1 to 12:1			
. Since there is no aquatic vegetation present in the BMZ, a true ratio cannot be calculated. However, given the high productivity of the estuarine habitat (1,680 g C/m²/y) compared to no aquatic vegetation in the BMZ, a ratio of 10:1 is extremely conservative.				
b. (ROWD Appendix UU)				

Mitigation Calculation (Alternative 1)

Type of Impact Measured	Impacted Area (Acres)	Impacted Habitat	Impacted Area By Habitat Type (Acres)	Mitigation Ratio	Required Mitigation (Acres)	Mitigation Area Habitat Type
		Estuarine	62.58	1:1	62.58	Estuarine
Intake	83.44	Open Water	20.86	1:10	2.09	Estuarine
		Estuarine	0.15	1:1	0.15	Estuarine
Fish Return	0.85	Open Water	0.78	1:10	0.08	Estuarine
Discharge	18.51	Soft Bottom	18.20	1:10	1.82	Estuarine
Discharge	10.51	Rock Jetties	0.31	1:1	0.31	Estuarine
Construction	0.10	Estuarine	0.10	1:1	0.10	Estuarine
Subtotal	102.90		102.98		67.13	
Adjustment to Eliminate Double Counting of BMZ Mitigation					-1.82	
Total	102.90		102.98		65.31	



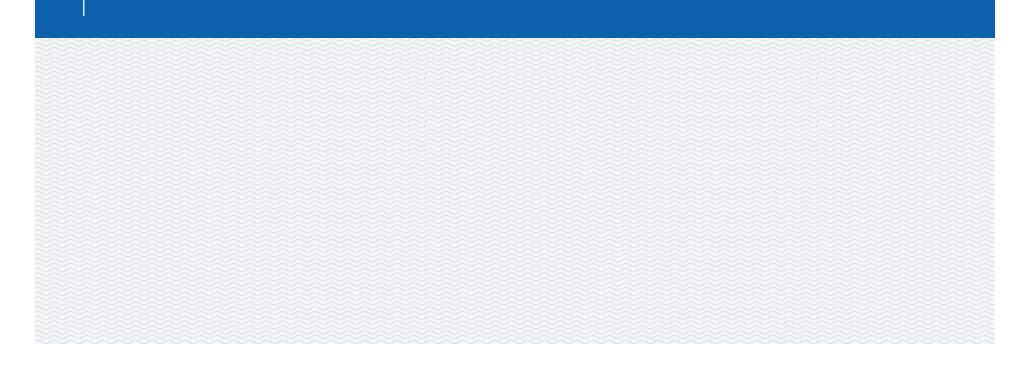
Mitigation Calculation (Alternative 15)

Type of Impact Measured	Impacted Area (Acres)	Impacted Habitat	Impacted Area By Habitat Type (Acres)	Mitigation Ratio	Required Mitigation (Acres)	Mitigation Area Habitat Type
		Estuarine	62.58	1:1	62.58	Estuarine
Intake	83.44	Open Water	20.86	1:10	2.09	Estuarine
		Estuarine	0.14	1:1	0.14	Estuarine
Fish Return	0.85	Open Water	0.71	1:10	0.07	Estuarine
Discharge	18.51	Soft Bottom	18.20	1:10	1.82	Estuarine
Discharge	10.01	Rock Jetties	0.31	1:1	0.31	Estuarine
Construction	0.10	Estuarine	0.10	1:1	0.10	Estuarine
Subtotal	102.90		102.90		67.11	
Adjustment to Eliminate Double Counting of BMZ Mitigation					-1.82	
Total	102.90		102.90		65.29	

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MITIGATION PROJECT AND SECURITY



Mitigation Project Timeline

- The Marine Life Mitigation Plan (MLMP) approved by the Regional Water Board provides that construction of the wetland restoration project must commence within six months of approval of the necessary permits.
- The Discharger expects the permitting of the restoration project to be complete in the first half of 2018, and that the mitigation project construction would be complete in 2020.
- The Discharger is responsible for monitoring, management, maintenance and remediation of the wetlands (MLMP Obligations) for a period of thirty years from the date the as-built plans are submitted to the Commission.
- Based on the current schedule, the MLMP Obligations will run from 2020 to 2050.





Mitigation Performance Security

- The Water Purchase Agreement (WPA) between the Discharger and the San Diego County Water Authority is scheduled to expire on December 23, 2045.
- If the WPA is not amended or extended, MLMP Obligations are expected to continue for approximately five years beyond the end of the term of the WPA.
- The Discharger proposes the following performance security to ensure the MLMP Obligations continue to be met after the WPA term expires:
 - One year prior to the end of the term of the WPA, the Discharger shall confirm the number of years remaining on the MLMP Obligations after the WPA is terminated and submit for review and approval by the Regional Water Board the expected cost of the MLMP Obligations for this period.
 - Prior to the end of the term of the WPA, the Discharger shall provide (or cause to be provided) the Regional Water Board a non-cancelable mitigation performance security in the amount of the expected cost of the MLMP Obligations for this period.
 - The performance security may take one of the forms below:
 - Cash;
 - Non-Cancelable Bond;
 - Irrevocable letter of credit; or
 - Renewable time certificate of deposit.



BIOLOGICAL PERFORMANCE STANDARD



Biological Performance Standard

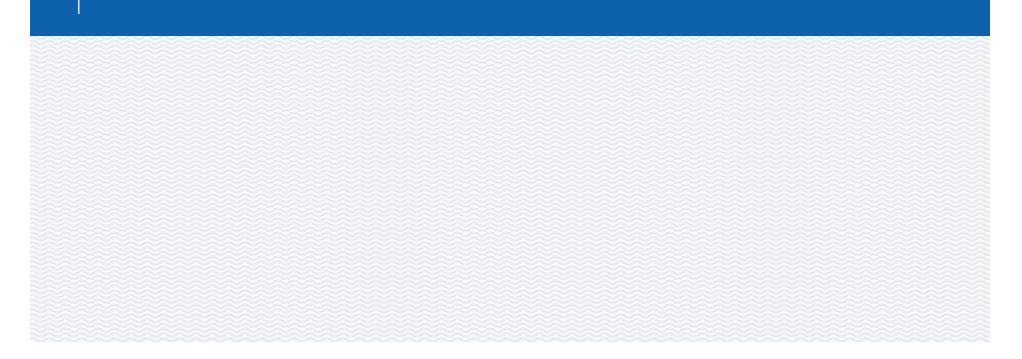
The ROWD includes a request that the renewed NPDES CA0109233 acknowledge that biological performance standards established in the March 27, 2009 Minimization Plan are no longer applicable:

- The BPS is no longer needed because subsequent to the adoption of Order R9-2009-0038, the Discharger agreed to increase the size of the MLMP from 55.4 acres to 66.4 acres.
- The provision of the additional 11 acres to ensures that the potential impingement impacts associated with the temporary stand-alone operation of the CDP are fully mitigated independent of the 55.4 acres of mitigation provided for entrainment impacts, thereby eliminating the need for the Biological Performance Standard.
- The destructive nature of the biological performance tests would result in adverse impacts to wetlands habitat and organisms.
 - The biological performance tests would impact fish populations and the salt march habitat of the restored site, potentially reducing the Discharger's ability to meet the MLMP performance standards.
 - The Science Advisory Panel voiced concerns that the depletion of fish populations and that hauling nets through the restored wetlands could trample vegetation, detracting from the Discharger's ability to demonstrate fish productivity and canopy development.

• These impacts are contradictory to the goals of the MLMP.



FISH RETURN SYSTEM



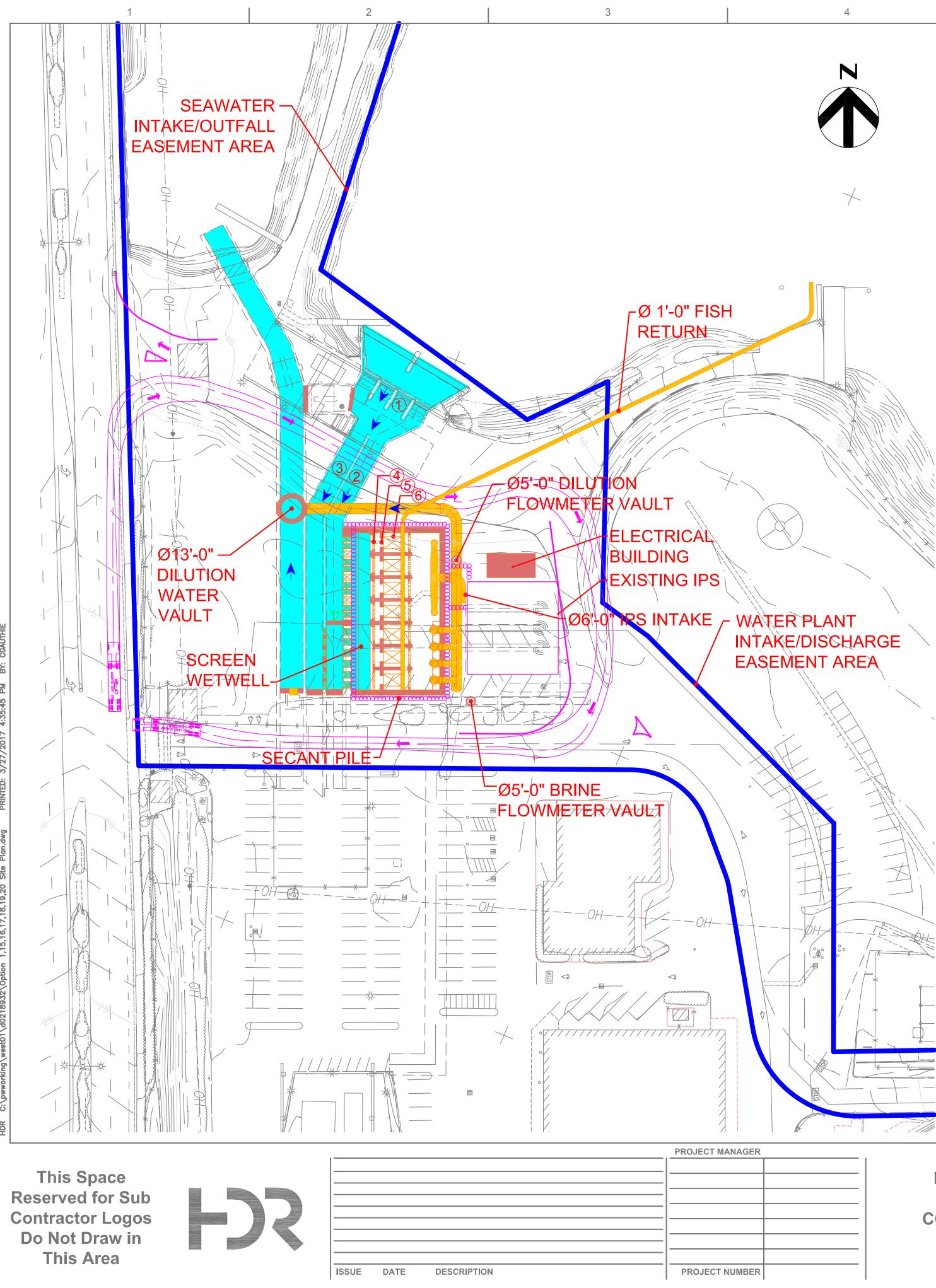
Lagoon Fish Return

Revised Permit Application Forms

- Revised Form 2D/Form 200 with new outfall designated "002"
- Supporting water quality table for fish return Outfall 002
- Fish return discharge location figure

Fish Return Antidegradation Analysis

- Potential exists for fish return discharge to contain higher concentrations of larger suspended particles greater than 1 mm (e.g., kelp, eel grass, etc.) than the ambient lagoon water
- No lowering of water quality for smaller suspended particles or any other water quality parameter
- Analysis concludes that implementation of the fish return alternative protects beneficial uses, complies with applicable water quality standards, and is consistent with maximum benefit to the state





	ALTERNATIVE EVALUATION
ITEM	COMM
ALTERNATIVE	1 (Original P
DESCRIPTION	Discharger's proposed project
KEY ELEMENTS	 Existing bar rack at 1.06 fps inlet velocity 2 east intake channels at 2.63 fps respective 7-1mm center flow screens. Existing west channel for combined dilut
CONSTRUCTION COST	\$ 34.7 Million *
PHASING	Phase 1-Screen Intake Structure
FOOTPRINT	Original Proposal
CONSTRUCTION DURATION	2.1 Years (24.7 Months) (107 Weeks)
OPERATION & MAINTENANCE	Original Proposal
COMPLEXITY	Original Proposal
PLANT SHUT DOWN IMPACT	42 days to connect 1st and 2nd tunnels to
PLANT SHUT DOWN COST(\$182,000/day)	\$ 7,644,000 [*]
FISH RETURN MARINE LIFE MORTALITY - JUVENILE AND ADULT FISH (LBS/D)	0.85
SITE INGRESS/EGRESS IMPACT	Fish return line construction Dilution line construction

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	ALTERNATIVE	1
No.	DESCRIPTION	VELOCI
1	EXIST. BAR RACK INTAKE	1.06 FPS
2	EXIST.INTAKE CHANNEL EAST	2.63 FPS
3	EXIST.INTAKE CHANNEL WEST	2.63 FPS
4	SCREEN UPSTREAM CHANNEL	0.33 FPS
5	SCREEN INFLUENT THROAT	0.73 FPS
6	THROUGH SCREEN VELOCITIES WITH 15% FOULING	0.44 FPS

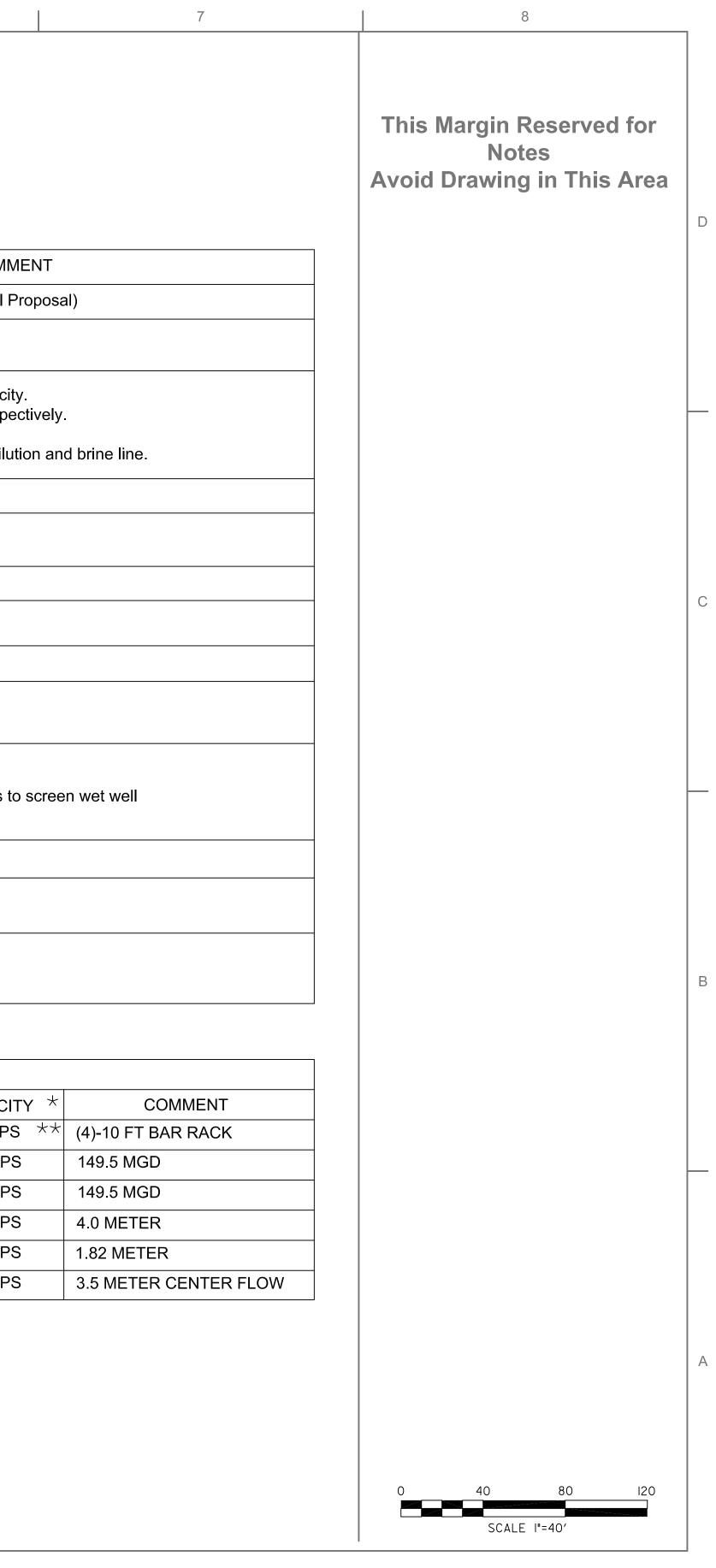
ALL VELOCITY SHOWN ARE AT MLLW UNLESS OTHERWISE NOTED.

** VELOCITY THROUGH BAR RACK.

PRELIMANRY **NOT FOR** CONSTRUCTION OR RECORDING

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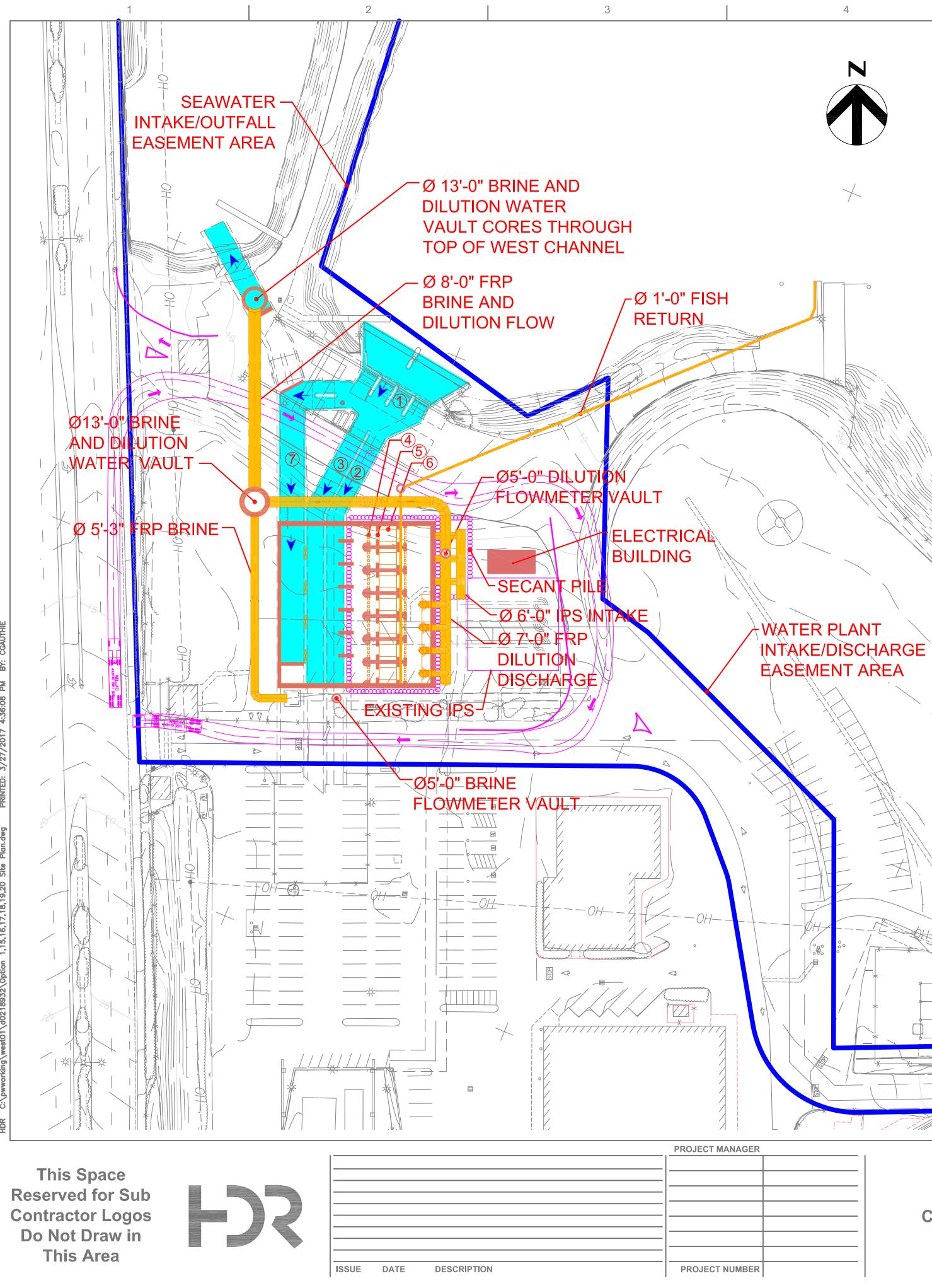






ALTERNATIVE-1

FILENAME FILENAME SCALE SCALE





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		ALTERNATIVE EVALU	JATION			D
	ITEM		COMMENT			
	ALTERNATIVE		15			
	DESCRIPTION	Discharger's proposed project wit	h discharge channel	repurposed as an intake.		
	KEY ELEMENTS	 Existing bar rack at 1.06 fps inle 3 intake channels at 1.54, 1.54 a 7-1mm center flow screens. Additional brine discharge and c 	and 1.60 fps inlet velo			
	CONSTRUCTION COST	\$ 38.3 Million [*] (Incremental increa	ase from Alt 1 is \$ 3.6	6 Million)		
	PHASING	Phase 1A-Screen intake structure Phase 1B-Dilution and brine line)			
	FOOTPRINT	Same as original proposal				
	CONSTRUCTION DURATION	2.2 Years (26.1 Months) (113 wee	eks) (Incremental inc	rease from Alt 1 is 6 weeks)		C
	OPERATION & MAINTENANCE	Same as original proposal				
	COMPLEXITY	3rd inlet tunnel New combined dilution and brine	discharge			
	PLANT SHUT DOWN IMPACT	42 days to connect 1st and 2nd tu 28 days for blocking existing chan 14 days for pipeline connection. Total of 84 days	unnels to screen wet			
PLAN	NT SHUT DOWN COST(\$182,000/day)	\$ 15,288,000 [*] (INCREMENTAL II	NCREASE FROM AI	_T 1 is \$ 7,644,000)		
	H RETURN MARINE LIFE MORTALITY - VENILE AND ADULT FISH (LBS/D)	0.78				
	SITE INGRESS/EGRESS IMPACT	Fish return line construction Dilution line construction Combined dilution and brine line o	construction			В
k	2017 Dollar Value					
		ALTERNATIVE 15				
No.	DESCRIPTION		VELOCITY *	COMMENT		
1	EXIST. BAR RACK INTAKE		1.06 FPS **	(4)-10 FT BAR RACK		
2	EXIST.INTAKE CHANNEL EAST		1.54 FPS	87.5 MGD		\vdash
3	EXIST.INTAKE CHANNEL WEST		1.54 FPS	87.5 MGD		
(4)	SCREEN UPSTREAM CHANNEL		0.33 FPS	4.0 METER		
5	SCREEN INFLUENT THROAT THROUGH SCREEN VELOCITIES W		0.73 FPS	1.82 METER 3.5 METER CENTER FLOW		
6 (7)	EXIST.DISCH. CHANNEL REPURPOS		0.44 FPS 1.60 FPS	124 MGD		
<u> </u>						
	ALL VELOCITY SHOWN ARE AT MLLV VELOCITY THROUGH BAR RACK.	V UNLESS OTHERWISE NOTED.				A
**						
					0 40 80 I20 SCALE I"=40'	

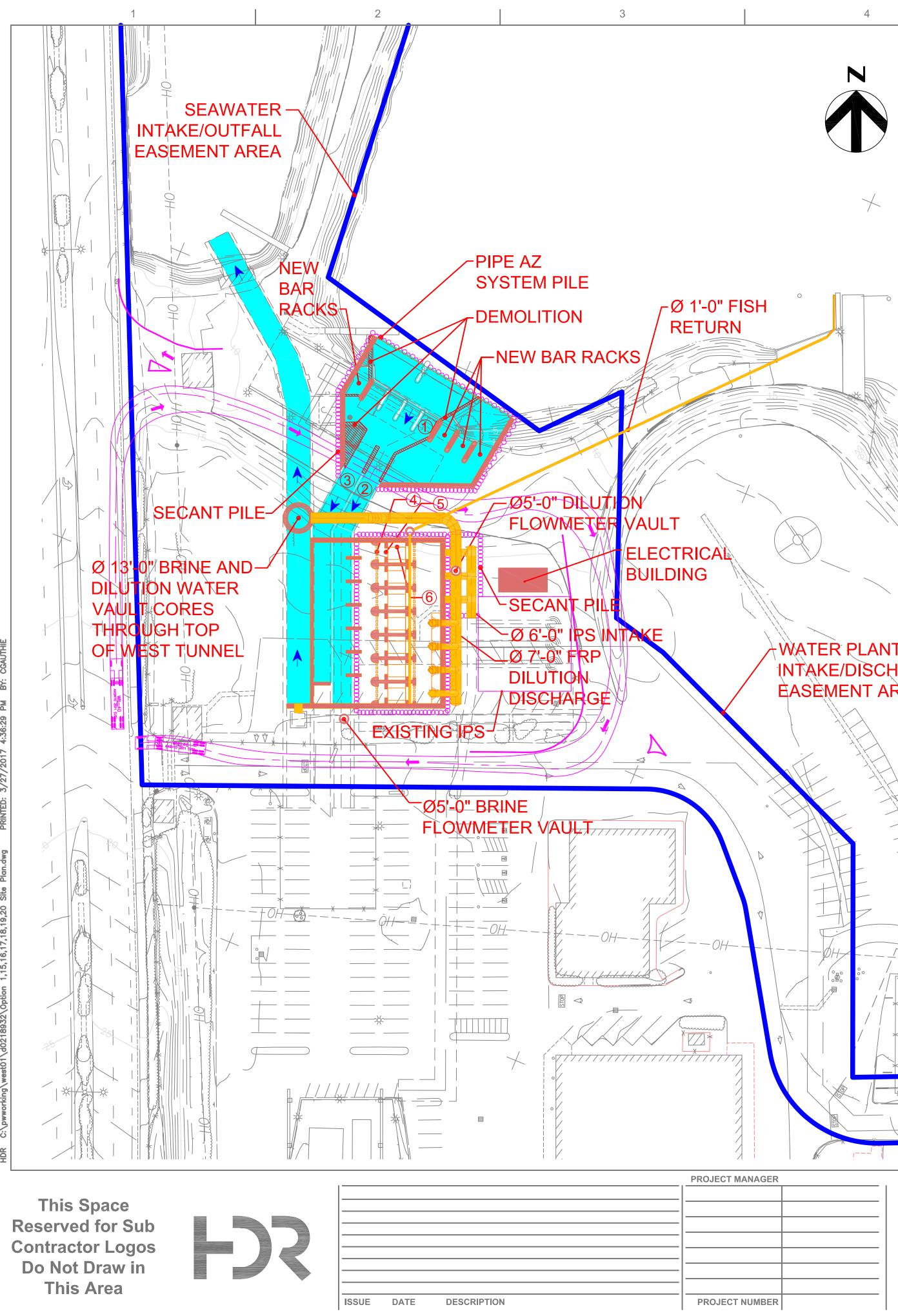
ALTERNATIVE EVALUATION ALTERNATIVE EVALUATION ITEM COMMENT ALTERNATIVE EVALUATION ITEM COMMENT ALTERNATIVE EVALUATION DESCRIPTION Deschargor's proposed project with discharge channel recurposed as an intake. CONSTRUCTION COST \$ 30.3. Million ¹ (Incremental increase form Alt 1s § 3.0. Million) PHASING Phases 13.5.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.		8	7		6	5	
Notes ALTERNATIVE EVALUATION ITEM COMMENT ALTERNATIVE 15 DESCRIPTION Discharger's proposed project with discharge channel repurposed as an indae. KEY ELEMENTS Commonse at 1.41. 1.54 and 1.60 fps indet valouity respectively. CONSTRUCTION COST \$3.83 Million* (incrumental increase from At 1 is \$3.6 Million) PHASING Phase 1.4.Somen intake atocure PHASING Phase 1.4.Somen intake atocure PHASING OPERATION & AMANTENANCE Same as original proposal CONSTRUCTION DURATION 2.2 Years (28.1 Monthe) (113 weeks) (Incremental increase from At 1 is \$0.04 binnel to dy a induit unnel some as original proposal OPERATION & MAINTENANCE Same as original proposal CONSTRUCTION DURATION 2.2 Years (28.1 Monthe) (113 weeks) (Incremental increase from At 1 is \$0.04 binnel to dy a population and bine discharge PLANT SHUT DOWN IMPACT 26 dyp to corner it and 204 turnels to protein connect to 3rd binnel to dyp to populate connection. STE INBRESSYSGRESS IMMACT 16 for totam increase from At 1 is \$7,644.0000 PHASINT DOWN IMPACT 3.788.Some0* COMMENT Note as any population and bine line construction Combined cillution and bine line construction Combined cillution and bine line construction Combined cillution and bine line construction Combined cillu							
ITEM COMMENT ALTERNATIVE 15 DESCRIPTION Discharger's proposed project with discharge channel repurposed as an intake. KEY ELEMENTS -* Sinks channels at 1.0.5 fas inlet velocity respectively. -* Timm center flow screens. -* Addition screens. -* Additional bind discharge and combined dilution and bine line. -* Additional bind discharge and combined dilution and bine line. CONSTRUCTION COST \$ 39 30 Million [®] (Incomonal line case) from All 1 is 3.36 Million [®] PHASING Phase 1A-Scream in liab at structure Phase 1B-Dilution and brine discharge CONSTRUCTION DURATION 2.2 Years (2.1 Months) (113 weeks) (Incremental increase from All 1 is 6 weeks) OPERATION & MAINTENANCE Same as original proposal COMPLEXITY New combined dilution and brine discharge PLANT SHUT DOWN INPACT 24 days to connect 1st and 2nd turnels to screen wet well 28 days to blocking existing channel and cutting roof and connect to 3rd turnel 14 days for pieleire connection. FISH RETURN MARINE LIFE MORTIN \$15,288,000 ^{eff} (INCREMENTAL INCREASE FROM ALT 1 is \$7,644,000) Streen UPERSTRUCT Diluton line construction Diluton line construction Streen INASHIE LIFE MORTIN VELOCITY A COMMENT Streen INASHIE LEAST 1.54 FPS							
ITEM COMMENT ALTERNATIVE 15 DESCRIPTION Decharger's proposed project with discharge channel repurposed as an intake. *** **** *** **** *** ****** **** ************************************	D			ΔΤΙΩΝ	ΔΙ ΤΕΡΝΔΤΙΛΕ ΕΛΔΙ Ι		
ALTERNATIVE 15 DESCRIPTION Discharger's proposed project with discharge channel repurposed as an intake. KEY ELEMENTS - Entating ber rack at 1.06 tps inlet velocity respectively. - 4 racke channels at 1.54. 1,54 and 1.60 tps inlet velocity respectively. - 4 racke channels at 1.54. 1,54 and 1.60 tps inlet velocity respectively. - 4 racke channels at 1.54. 1,54 and 1.60 tps inlet velocity respectively. - 4 racke channels at 1.54. 1,54 and 1.60 tps inlet velocity respectively. - 4 racke channels at 1.55. 1,54 and 1.60 tps inlet velocity respectively. - 4 racke channels of the inlet velocity respectively. - 4 racket channels of the inlet velocity respectively. - 4 racket channels of the inlet velocity respectively. - 4 racket channels of the inlet velocity respectively. - 7 racket channel inder or racket racket respectively. - 7 racket channel LEE Mortify of populate consolution. - 7 racket channel LEE Mortify of population construction. - 7 racket channel LEE Mortify of the inlet respectively. - 7 racket channel LEE Mortify of the inlet respectively. - 7 racket channel LEE Mortify of the inlet respectively. - 7 racket channel LEE Mortify of the inlet respectively. - 7 racket channel LEE Mortify of the inlet respectively. - 7 racket channel LEE Mortify of the inlet respectively. - 7 racket channel LEE Mortify of the inlet respectively. - 7 racket channel LEE Mortify of the inlet racket respectively. - 7 racket channel LEE Mortify of th						ITEM	
* Existing bar rekt at 1.06 fps inlet velocity. * 3 instake channels at 1.54, 1.54 and 1.60 fps inlet velocity respectively. * 4 didional brine discharge and combined dilution and brine line. CONSTRUCTION COST \$ 38.3 Million ⁴ (incremental increase from Alt 1 is \$ 3.6 Million) PHASING Phase 14-Screens. PHASING Phase 14-Screen intake structure Phase 15-Dilution and brine line FOOTPRINT Same as original proposal CONSTRUCTION DURATION 2.2 Years (26.1 Months) (113 weeks) (Incremental increase from Alt 1 is 6 weeks) OPERATION & MAINTENANCE Same as original proposal COMPLEXITY Same as original proposal COMPLEXITY Addition and brine discharge PLANT SHUT DOWN IMPACT Addity for hocking wold ling drummel and culting root and commet to 3rd tunnel 14 days for pipeline contection. FUANT SHUT DOWN COST(\$182.000/40) 5.7.8 PLANT SHUT DOWN COST(\$182.0000/40) 6.7.8 Fish return line construction Dilution		-					
- 3 intake channels af 1.54, 1.54 and 1.60 fps infait velocity respectively. - 4 difficient brine discharge and combined dilution and brine line. - CONSTRUCTION COST \$ 38.3 Million* (Incremental increase from Ait 1 is \$ 3.6 Million) PHASING Phase 1A-Screen intake structure PHASING Phase 1B-Dilution and brine line FOOTPRINT Same as original proposal CONSTRUCTION DURATION 2.2 Years (26.1 Months) (113 weeks) (Incremental increase from Ait 1 is 6 weeks) OPERATION & MAINTENANCE Same as original proposal COMPLEXITY Same as original proposal Very COMPLEXITY Same as original proposal PLANT SHUT DOWN IMPACT 24 days to connect 1st and 2nd turnels to screen wet well 28 days for believe connection. Total of 44 days PLANT SHUT DOWN OST(\$182.000/days) 5 15,288.000* (INCREMENTAL INCREASE FROM ALT 1 is 5 7,644,090) PISH RETURN MARINE LIFE IMORTALITY 0.78 VUTY Dolar Valua Strieve construction Screen UPSLISH RETURN MARINE LIES INFORMACT Tolal of 44 days Screen UPSLISH RETURN MARINE LIES INFORMACT 106 FPS ** (4)(10 FT BAR RACK Screen UPSLISH RETURN MARINE LIES INFORMACT 106 FPS ** (4)(10 FT BAR RACK Screen UPSTIGN 0.33		-	repurposed as an intake.	discharge channel r	Discharger's proposed project wit	DESCRIPTION	
PHASING Phase 1A-Screen intake structure Phase 1B-Ditution and bine line FOOTPRINT Same as original proposal CONSTRUCTION DURATION 2.2 Years (26.1 Months) (113 weeks) (Incremental increase from Alt 1 is 6 weeks) OPERATION & MAINTENANCE Same as original proposal COMPLEXITY Same as original proposal COMPLEXITY Same as original proposal PLANT SHUT DOWN IMPACT 24 days to connect 131 and 2nd turnels to screen wet well PLANT SHUT DOWN IMPACT 44 days for typohing resking channel and cutting roof and connect to 3rd turnel 14 days for typohing resking channel and cutting roof and connect to 3rd turnel 14 days for typohing resking channel and cutting roof and connect to 3rd turnel PLANT SHUT DOWN COST(\$162,000/day) \$ 15,289,000* (INCREMENTAL INCREASE FROM ALT 1 is \$ 7,644,000) PEM RETURN MARINE LIFE MORTALITY - JUVENILE AND ADULT FISH (LBS/D) 0,78 Sitte INGRESS/EGRESS IMPACT 0.78 Sitte INGRESS/EGRESS IMPACT Dilution line construction Combined dilution and brine line construction No. DESCRIPTION ALTERNATIVE 15 No. DESCRIPTION VELOCITY * COMMENT 1 EXIST. INTAKE CHANNEL EAST 1.54 FPS 87.5 MGD 3 EXIST. INTAKE CHANNEL EAST				nd 1.60 fps inlet velo	 3 intake channels at 1.54, 1.54 7-1mm center flow screens. 	KEY ELEMENTS	
PHASING Phase 1A-Screen intake structure Phase 1B-Ditution and brine line FOOTPRINT Same as original proposal CONSTRUCTION DURATION 2.2 Years (26.1 Months) (113 weeks) (Incremental increase from Alt 1 is 6 weeks) OPERATION & MAINTENANCE Same as original proposal COMPLEXITY Sid infat tunnel Mew combined dilution and brine discharge 42 days to connect 1st and 2nd tunnels to screen wet well PLANT SHUT DOWN IMPACT 42 days to connect 1st and 2nd tunnels to screen wet well PLANT SHUT DOWN COST(\$182,000/day) \$ 15,288,000 ⁶ (INCREMENTAL INCREASE FROM ALT 1 is \$ 7,644,000) FISH RETURN MARINE LIFE MORTALITY - JUVENIC AND ADULT FISH (IBS/D) 0,78 FISH RETURN MARINE LIFE MORTALITY - JUVENIC AND ADULT FISH (IBS/D) 0,78 STEE INGRESS/EGRESS IMPACT Dilution line construction Combined dilution and brine line construction Combined dilution and brine line construction No. DESCRIPTION VELOCITY * ALTERNATIVE 15 No. DESCRIPTION VELOCITY * (4)(10 FT BAR RACK Q EXIST INTAKE CHANNEL EAST 1.54 FPS Q 87.5 MGD Q SCREEN INFLUENT THROAT 0.73 FPS Q SCREEN INFLUENT THROAT 0.73 FPS Q SCREEN INFLUENT THROAT </td <td></td> <td>-</td> <td>6 Million)</td> <td>se from Alt 1 is \$ 3.6</td> <td>\$ 38.3 Million[*](Incremental increa</td> <td>CONSTRUCTION COST</td> <td></td>		-	6 Million)	se from Alt 1 is \$ 3.6	\$ 38.3 Million [*] (Incremental increa	CONSTRUCTION COST	
FOOTPRINT Same as original proposal CONSTRUCTION DURATION 2.2 Years (26.1 Months) (113 weeks) (Incremental increase from Alt 1 is 6 weeks) OPERATION & MAINTENANCE Same as original proposal COMPLEXITY 3rd inlet turnal New combined dilution and brine discharge COMPLEXITY 3rd inlet turnal 24 days to opnoet 1st and 2nd turnels to screen wet well 28 days for blocking existing channel and cutting roof and connect to 3rd turnel 14 days for pipeline connection. Total of 84 days PLANT SHUT DOWN IMPACT 25 days for blocking existing channel and cutting roof and connect to 3rd turnel 14 days for pipeline connection. Total of 84 days PLANT SHUT DOWN COST(1982.0000 [±]) 5 15.280.000 [±] (INCREMENTAL INCREASE FROM ALT 1 is \$ 7,644.000) FISH RETION MARINE LIFE MORTALITY~ JUVENILE AND ADULT FISH (LBS/D) 0.76 STE INGRESS/EGRESS IMPACT Fish return line construction Combined dilution and brine line construction STE INGRESS/EGRESS IMPACT Fish return line construction Combined dilution and brine line construction 10 EESCRIPTION ALTERNATIVE 15 No. DESCRIPTION VELOCITY * 10 EFPS ** (4)-10 FT BAR RACK 87.5 MGD 3 EXIST.INTAKE CHANNEL EAST 1.64 FPS 87.5 MGD 3 EXIST.INTAKE CHANNEL EAST 0.73 FPS 1.82 METER					Phase 1A-Screen intake structure	PHASING	
OPERATION & MAINTENANCE Same as original proposal COMPLEXITY 3rd inlet tunnel New combined dilution and brine discharge PLANT SHUT DOWN IMPACT 42 days to connect 1st and 2nd tunnels to screen wet well 28 days for blocking existing channel and cutting roof and connect to 3rd tunnel 1 days for pipeline connection. Total of 84 days PLANT SHUT DOWN COST(\$182,000/day) \$ 15,286,000 ⁴ (INCREMENTAL INCREASE FROM ALT 1 is \$ 7,644,000) FISH RETURN MAINE LIFE MORTALITY- JUVENILE AND ADULT FISH (LBS/0) \$ 15,286,000 ⁴ (INCREMENTAL INCREASE FROM ALT 1 is \$ 7,644,000) FISH RETURN MAINE LIFE MORTALITY- JUVENILE AND ADULT FISH (LBS/0) \$ 15,286,000 ⁴ (INCREMENTAL INCREASE FROM ALT 1 is \$ 7,644,000) FISH return line construction Dilution line construction Combined dilution and brine line construction \$ 0,78 * 2017 Doltar Value Fish return line construction Combined dilution and brine line construction blickton line construction Dilution and brine line construction COMMENT 0 ESCRIPTION VELOCITY * (4):10 FT BAR RACK 1 EXIST. INTAKE CHANNEL EAST 1.06 FPS ** (4):40 FT BAR RACK 2 EXIST.INTAKE CHANNEL EAST 1.54 FPS 87.5 MGD 3 SCREEN UPSTREAM CHANNEL 0.33 FPS 4.0 METER 3 SCREEN INFLUENT THROAT						FOOTPRINT	
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PLANT SHUT DOWN IMPACT 28 days for blocking existing channel and cutting roof and connect to 3rd tunnel 1 days for pipeline connection. Total of 84 days PLANT SHUT DOWN COST(\$182,000/day) \$ 15,288,000* (INCREMENTAL INCREASE FROM ALT 1 is \$ 7,644,000) FISH RETURN MARINE LIFE MORTALITY- JUVENILE AND ADULT FISH (LBS/D) 0.78 SITE INGRESS/EGRESS IMPACT Fish return line construction Dilution line construction Dilution ine dilution and brine line construction Combined dilution and brine line construction * 2017 Dollar Value ALTERNATIVE 15 No. DESCRIPTION VELOCITY * COMMENT { 1.06 FPS ** (4)-10 FT BAR RACK { EXIST. INTAKE CHANNEL EAST 1.06 FPS ** (4)-10 FT BAR RACK { EXIST. INTAKE CHANNEL EAST 1.54 FPS 87.5 MGD { SCREEN UPSTREAM CHANNEL EAST 0.33 FPS 4.00 METER { SCREEN INFLUENT THROAT 0.73 FPS 1.82 METER { SCREEN INFLUENT THROAT 0.73 FPS 1.82 METER { STR FINCIGN SCREEN VELOCITIES WITH 15% FOULING 0.44 FPS 3.5 METER CENTER FLOW { STR FINCIGN SCREEN VELOCITIES WITH 15% FOULING 0.44 FPS 3.5 METER CENTER FLOW		-		lischarge		COMPLEXITY	
FISH RETURN MARINE LIFE MORTALITY - JUVENILE AND ADULT FISH (LBS/D) 0.78 SITE INGRESS/EGRESS IMPACT Fish return line construction Dilution line construction Combined dilution and brine line construction * 2017 Dollar Value * 2017 Dollar Value No. DESCRIPTION VELOCITY * COMMENT 1 EXIST. BAR RACK INTAKE 2 EXIST. INTAKE CHANNEL EAST 3 EXIST.INTAKE CHANNEL EAST 4 SCREEN UPSTREAM CHANNEL 5 SCREEN UPSTREAM CHANNEL 6 THROUGH SCREEN VELOCITIES WITH 15% FOULING 0.44 FPS 7 EXIST. DISCH. CHANNEL REPURPOSED 1.60 FPS					28 days for blocking existing char 14 days for pipeline connection.	PLANT SHUT DOWN IMPACT	
JUVENILE AND ADULT FISH (LBS/D) 0.78 SITE INGRESS/EGRESS IMPACT Fish return line construction Combined dilution and brine line construction * 2017 Dollar Value * 2017 Dollar Value K ALTERNATIVE 15 No DESCRIPTION VELOCITY * COMMENT 1 EXIST. BAR RACK INTAKE 2 EXIST.INTAKE CHANNEL EAST 1 EXIST.INTAKE CHANNEL EAST 1 1.54 FPS 87.5 MGD 3 EXIST.INTAKE CHANNEL WEST 4 SCREEN UPSTREAM CHANNEL 6 SCREEN INFLUENT THROAT 6 THROUGH SCREEN VELOCITIES WITH 15% FOULING 7 EXIST DISCH. CHANNEL REPURPOSED 8 THROUGH SCREEN VELOCITIES WITH 15% FOULING 9 EXIST DISCH. CHANNEL REPURPOSED		-	LT 1 is \$ 7,644,000)	ICREASE FROM AL	\$ 15,288,000 [*] (INCREMENTAL I	ANT SHUT DOWN COST(\$182,000/day)	PLAI
SITE INGRESS/EGRESS IMPACT Fish return line construction Dilution line construction Combined dilution and brine line construction * 2017 Dollar Value ALTERNATIVE 15 No. DESCRIPTION VELOCITY * COMMENT ① EXIST. BAR RACK INTAKE 1.06 FPS ** (4)-10 FT BAR RACK ② EXIST.INTAKE CHANNEL EAST 1.54 FPS 87.5 MGD ③ EXIST.INTAKE CHANNEL WEST 1.54 FPS 87.5 MGD ④ SCREEN UPSTREAM CHANNEL 0.33 FPS 4.0 METER ⑤ SCREEN INFLUENT THROAT 0.73 FPS 1.82 METER ⑥ THROUGH SCREEN VELOCITIES WITH 15% FOULING 0.44 FPS 3.5 METER CENTER FLOW ⑥ EXIST.DISCH. CHANNEL REPURPOSED 1.60 FPS 124 MGD		-			0.78		
ALTERNATIVE 15No.DESCRIPTIONVELOCITY *COMMENT①EXIST. BAR RACK INTAKE1.06 FPS **(4)-10 FT BAR RACK②EXIST.INTAKE CHANNEL EAST1.54 FPS87.5 MGD③EXIST.INTAKE CHANNEL WEST1.54 FPS87.5 MGD④SCREEN UPSTREAM CHANNEL0.33 FPS4.0 METER⑤SCREEN INFLUENT THROAT0.73 FPS1.82 METER⑥THROUGH SCREEN VELOCITIES WITH 15% FOULING0.44 FPS3.5 METER CENTER FLOW⑦EXIST.DISCH. CHANNEL REPURPOSED1.60 FPS124 MGD	В	-		onstruction	Dilution line construction		
No.DESCRIPTIONVELOCITY *COMMENT①EXIST. BAR RACK INTAKE1.06 FPS **(4)-10 FT BAR RACK②EXIST.INTAKE CHANNEL EAST1.54 FPS87.5 MGD③EXIST.INTAKE CHANNEL WEST1.54 FPS87.5 MGD④SCREEN UPSTREAM CHANNEL0.33 FPS4.0 METER⑤SCREEN INFLUENT THROAT0.73 FPS1.82 METER⑥THROUGH SCREEN VELOCITIES WITH 15% FOULING0.44 FPS3.5 METER CENTER FLOW⑦EXIST.DISCH. CHANNEL REPURPOSED1.60 FPS124 MGD					1	2017 Dollar Value	*
1EXIST. BAR RACK INTAKE1.06 FPS **(4)-10 FT BAR RACK2EXIST.INTAKE CHANNEL EAST1.54 FPS87.5 MGD3EXIST.INTAKE CHANNEL WEST1.54 FPS87.5 MGD4SCREEN UPSTREAM CHANNEL0.33 FPS4.0 METER5SCREEN INFLUENT THROAT0.73 FPS1.82 METER6THROUGH SCREEN VELOCITIES WITH 15% FOULING0.44 FPS3.5 METER CENTER FLOW7EXIST.DISCH. CHANNEL REPURPOSED1.60 FPS124 MGD					ALTERNATIVE 15		
Image: Control of the state		-	COMMENT	VELOCITY *		DESCRIPTION	No.
③EXIST.INTAKE CHANNEL WEST1.54 FPS87.5 MGD④SCREEN UPSTREAM CHANNEL0.33 FPS4.0 METER⑤SCREEN INFLUENT THROAT0.73 FPS1.82 METER⑥THROUGH SCREEN VELOCITIES WITH 15% FOULING0.44 FPS3.5 METER CENTER FLOW⑦EXIST.DISCH. CHANNEL REPURPOSED1.60 FPS124 MGD			(4)-10 FT BAR RACK	1.06 FPS **			
④SCREEN UPSTREAM CHANNEL0.33 FPS4.0 METER⑤SCREEN INFLUENT THROAT0.73 FPS1.82 METER⑥THROUGH SCREEN VELOCITIES WITH 15% FOULING0.44 FPS3.5 METER CENTER FLOW⑦EXIST.DISCH. CHANNEL REPURPOSED1.60 FPS124 MGD		_		1.54 FPS			
(a) (b) (_					
6 THROUGH SCREEN VELOCITIES WITH 15% FOULING 0.44 FPS 3.5 METER CENTER FLOW 7 EXIST.DISCH. CHANNEL REPURPOSED 1.60 FPS 124 MGD		_					-
7 EXIST.DISCH. CHANNEL REPURPOSED 1.60 FPS 124 MGD		-					
		-					~
* ALL VELOCITY SHOWIN ARE AT WILLVU UNLESS OTHERWISE NOTED.							
** VELOCITY THROUGH BAR RACK.	A				W UNLESS OTHERWISE NOTED		
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0 40 80 Scale I"=40'							

PRELIMANRY **NOT FOR** CONSTRUCTION OR RECORDING





ALTERNATIVE-15







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			ALTERNATIVE EVALU	ΑΤΙΟΝ			
	/	ITEM		COMMENT			
	7	ALTERNATIVE		16			
	° 1	DESCRIPTION		ck inlet structure improv tion phases as identified oon construction. Phase			
FISH N		KEY ELEMENTS	 Additional bar racks at 0.53 fps in 2 east intake channels at 2.63 fps 7-1mm center flow screens. Existing west channel for combin 	s respectively.	e line.		
		CONSTRUCTION COST	\$ 47.2 Million [*] (Incremental increas	se from Alt 1 is \$ 12	.5 Million)		
		PHASING	Phase 1-Screen intake structure				
0		PHASING	Phase 2- Additional bar rack struct	ture			
		FOOTPRINT	Same as original proposal + Additi	onal bar rack			C
4		CONSTRUCTION DURATION	2.1 Years (24.7 Months) (107 Wee 1.3 Years (15.5 Months) (67 Wee Total: 3.3 Years (40.2 Months) (17	ks) Phase 2	ntal increase from Alt 1 is 67 weeks)		
		OPERATION & MAINTENANCE	Same as original proposal + Additi	onal 4 bar racks			
		COMPLEXITY	Phase 2 double width of bar racks				
		PLANT SHUT DOWN IMPACT	42 days for 1st and 2nd tunnels to 300 days Phase 2 double width of)' of new bar rack		\vdash
	WATER PLANT	PLANT SHUT DOWN COST(\$182,000/day)	\$ 62,244,000 [*] (INCREMENTAL IN	CREASE FROM AL	T 1 is \$ 54,600,000)		
	INTAKE/DISCHARGE	FISH RETURN MARINE LIFE MORTALITY - JUVENILE AND ADULT FISH (LBS/D)	0.85				
	EASEMENT AREA	SITE INGRESS/EGRESS IMPACT	Fish return line construction Dilution line construction Double width of intake and install 4	10' of new bar racks			B
		* 2017 Dollar Value					
			ALTERNATIVE 16				
\ °		No. DESCRIPTION		VELOCITY *	COMMENT		
		1 UPGRADED BAR RACK INTAKE		0.53 FPS **	(8)-10 FT BAR RACK		
		2 EXIST.INTAKE CHANNEL EAST		2.63 FPS	149.5 MGD		
		(3) EXIST.INTAKE CHANNEL WEST		2.63 FPS	149.5 MGD		
∇		(4) SCREEN UPSTREAM CHANNEL		0.33 FPS	4.0 METER		
/		(5) SCREEN INFLUENT THROAT		0.73 FPS			
		(6) THROUGH SCREEN VELOCITIES W		0.44 FPS	3.5 METER CENTER FLOW		
		* ALL VELOCITY SHOWN ARE AT MLL	W UNLESS OTHERWISE NOTED.				
		** VELOCITY THROUGH BAR RACK.					A
		4					
		 				0 40 80 I20 SCALE I"=40'	
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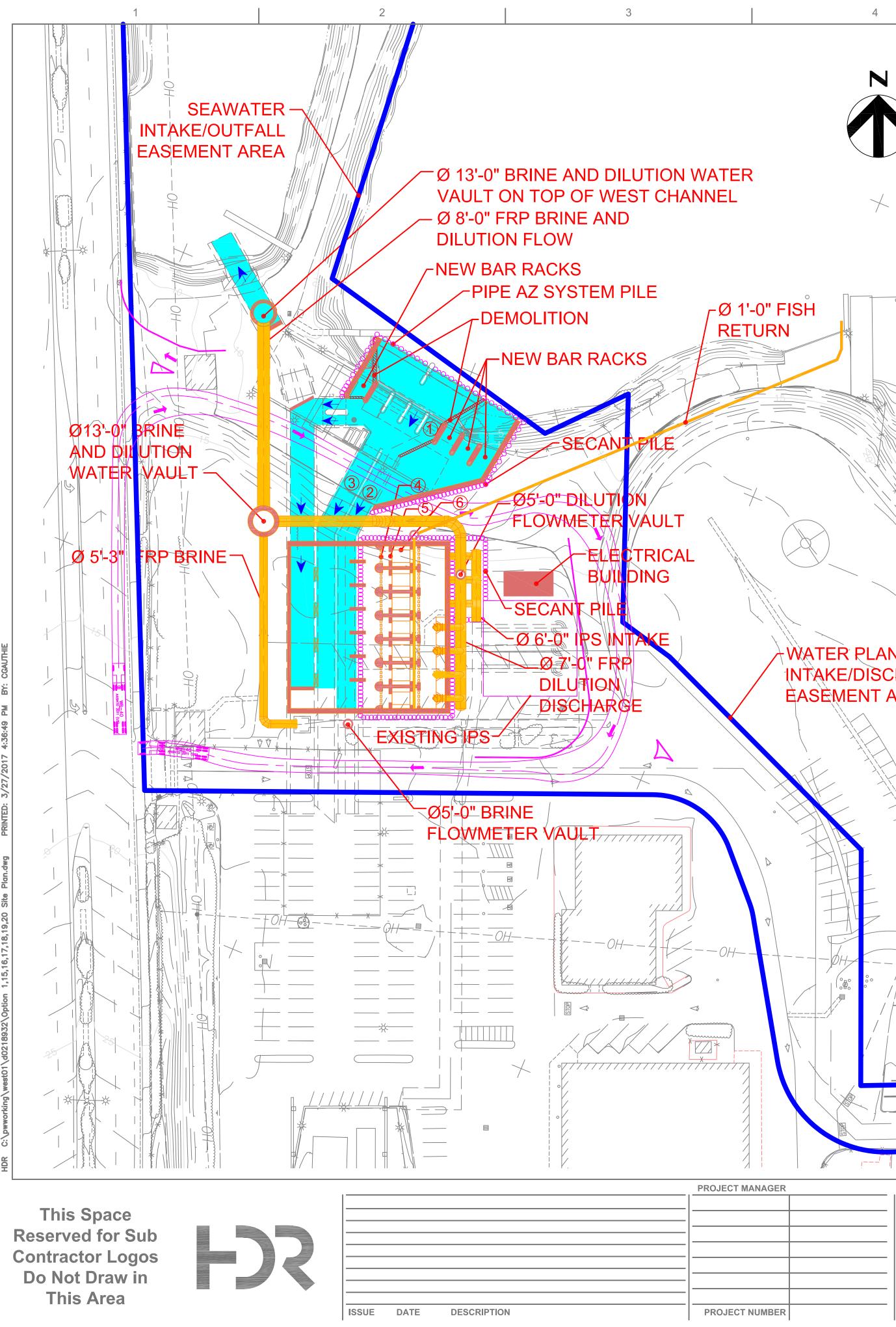
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	ALTERNATIVE EVALU	ATION		
ITEM		COMMENT		
ALTERNATIVE		16		
DESCRIPTION		ick inlet structure improve tion phases as identified oon construction. Phase	· · · · · · · · · · · · · · · · · · ·	
KEY ELEMENTS	 Additional bar racks at 0.53 fps i 2 east intake channels at 2.63 fp 7-1mm center flow screens. Existing west channel for combiner 	s respectively.	e line.	
CONSTRUCTION COST	\$ 47.2 Million [*] (Incremental increa	se from Alt 1 is \$ 12.	5 Million)	
	Phase 1-Screen intake structure			
PHASING	Phase 2- Additional bar rack struc	ture		
FOOTPRINT	Same as original proposal + Addit	ional bar rack		
CONSTRUCTION DURATION	2.1 Years (24.7 Months) (107 Wee 1.3 Years (15.5 Months) (67 Wee Total: 3.3 Years (40.2 Months) (17	ks) Phase 2	tal increase from Alt 1 is 67 weeks)	
OPERATION & MAINTENANCE	Same as original proposal + Addit	ional 4 bar racks		
COMPLEXITY	Phase 2 double width of bar racks			
PLANT SHUT DOWN IMPACT	42 days for 1st and 2nd tunnels to 300 days Phase 2 double width of		' of new bar rack	
LANT SHUT DOWN COST(\$182,000/day)				
FISH RETURN MARINE LIFE MORTALITY - JUVENILE AND ADULT FISH (LBS/D)	0.85			
SITE INGRESS/EGRESS IMPACT	Fish return line construction Dilution line construction Double width of intake and install	40' of new bar racks		
2017 Dollar Value				
	ALTERNATIVE 16			
DESCRIPTION		VELOCITY *	COMMENT	
UPGRADED BAR RACK INTAKE		0.53 FPS **	(8)-10 FT BAR RACK	
) EXIST.INTAKE CHANNEL EAST		2.63 FPS	149.5 MGD	
) EXIST.INTAKE CHANNEL WEST		2.63 FPS	149.5 MGD	
SCREEN UPSTREAM CHANNEL		0.33 FPS	4.0 METER	
) SCREEN INFLUENT THROAT		0.73 FPS	1.82 METER	
THROUGH SCREEN VELOCITIES W	ITH 15% FOULING	0.44 FPS	3.5 METER CENTER FLOW	
ALL VELOCITY SHOWN ARE AT MLL	W UNLESS OTHERWISE NOTED.			
VELOCITY THROUGH BAR RACK.				
				0 40 80 120
				SCALE I"=40'

PRELIMANRY **NOT FOR** CONSTRUCTION OR RECORDING



ALTERNATIVE-16

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	N			ALTERNATIVE EVALUA	TION
			ITEM	C	OMMEN
			ALTERNATIVE		1
WATER ANNEL	\checkmark		DESCRIPTION	Discharger's proposed project with bar rack with discharge tunnel repurposed as an inta alternative requires two construction phases applying for USACE permits for lagoon cons allow construction to occur in dry conditions	ake (combir s as identifi struction. P
ட∕Ø 1'-0" FISዞ			KEY ELEMENTS	 Additional bar racks at 0.53 fps inle 3 intake channel at 1.54, 1.54 and 7-1mm center flow screens. Additional brine discharge and corr 	1.60 fps i
			CONSTRUCTION COST	\$ 50.2 Million [*] (Incremental increase	from Alt
			PHASING	Phase 1A-Screen intake structure Phase 1B-Dilution and brine line	
				Phase 2- Additional bar rack structur	
			FOOTPRINT	Same as original proposal + Addition	
°			CONSTRUCTION DURATION	2.2 Years (26.1 Months) (113 weeks 1.3 Years (15.5 Months) (67 Weeks Total: 3.5 Years 41.5 Months) (180 V) Phase 2
			OPERATION & MAINTENANCE	Same as original proposal + Additior	nal 4 bar
			COMPLEXITY	3rd tunnel connection Phase 2 double width of intake, insta New combined dilution and brine dis	
			PLANT SHUT DOWN IMPACT	42 days to connect 1st and 2nd tunn 28 days for blocking existing channe 14 days for pipeline connection. Total of 84 days	
				300 days Phase 2 double width of in	take and
		PLA	NT SHUT DOWN COST(\$182,000/day)	\$ 69,888,000 [*] (INCREMENTAL INCI	REASE F
	AKE/DISCHARGE		SH RETURN MARINE LIFE MORTALITY - IVENILE AND ADULT FISH (LBS/D)	0.78	
EA	SÈMENT AREA		SITE INGRESS/EGRESS IMPACT	Fish return line construction Dilution line construction Double width of intake and install 40 Combined dilution and brine line con	
		*	2017 Dollar Value		
				ALTERNATIVE 17	
		No.	DESCRIPTION		VELOCI
			UPGRADED BAR RACK INTAKE		0.53 FF
		2	EXIST.INTAKE CHANNEL EAST		1.54 FF
		3	EXIST.INTAKE CHANNEL WEST		1.54 FF
		(4)	SCREEN UPSTREAM CHANNEL		0.33 FF
= - () H - 1		(5)	SCREEN INFLUENT THROAT		0.73 FF

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	ALTERNATIVE 17	
No.	DESCRIPTION	VELOCI
1	UPGRADED BAR RACK INTAKE	0.53 FI
2	EXIST.INTAKE CHANNEL EAST	1.54 FF
3	EXIST.INTAKE CHANNEL WEST	1.54 FF
4	SCREEN UPSTREAM CHANNEL	0.33 FI
5	SCREEN INFLUENT THROAT	0.73 FI
6	THROUGH SCREEN VELOCITIES WITH 15% FOULING	0.44 FI
7	EXIST.DISCH. CHANNEL REPURPOSED	1.60 F
۰. ۲	ALL VELOCITY SHOWN ARE AT MLLW UNLESS OTHERWISE NOTED).

ALL VELOCITY SHOWN ARE AT MILLW UNLESS OTHERWISE NOTED.

VELOCITY THROUGH BAR RACK.

PRELIMANRY **NOT FOR** CONSTRUCTION OR RECORDING



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17		Avoid Drawing in This Area	
bination of Alt tified below. F Phase 2 requ	ed to limit intake velocities to 0.5 fps and ernatives 15 and 16). Note that this Phase 1 allows for plant operations while uires shoring around the existing intake to shutdown durations for each phase.		D
ity. s inlet veloc	city respectively.		
dilution and	brine line.		
lt 1 is \$ 15.	5 Million)		
rack			
ase 1 e 2			
	al increase from Alt 1 is 73 weeks)		С
r racks			
bar racks			
creen wet v utting roof a	well and connect to 3rd tunnel		
d install 40	' of new bar rack		
FROM AL	T 1 \$ 62,244,000)		
	· · · · · · · · · · · · · · · · · · ·		
v bar racks on			В
CITY *			
FPS **	(8)-10 FT BAR RACK		
=PS =PS	87.5 MGD 87.5 MGD		-
FPS	4.0 METER		
FPS	1.82 METER		
FPS	3.5 METER CENTER FLOW		
FPS	124 MGD		
			A
		0 40 80 120	
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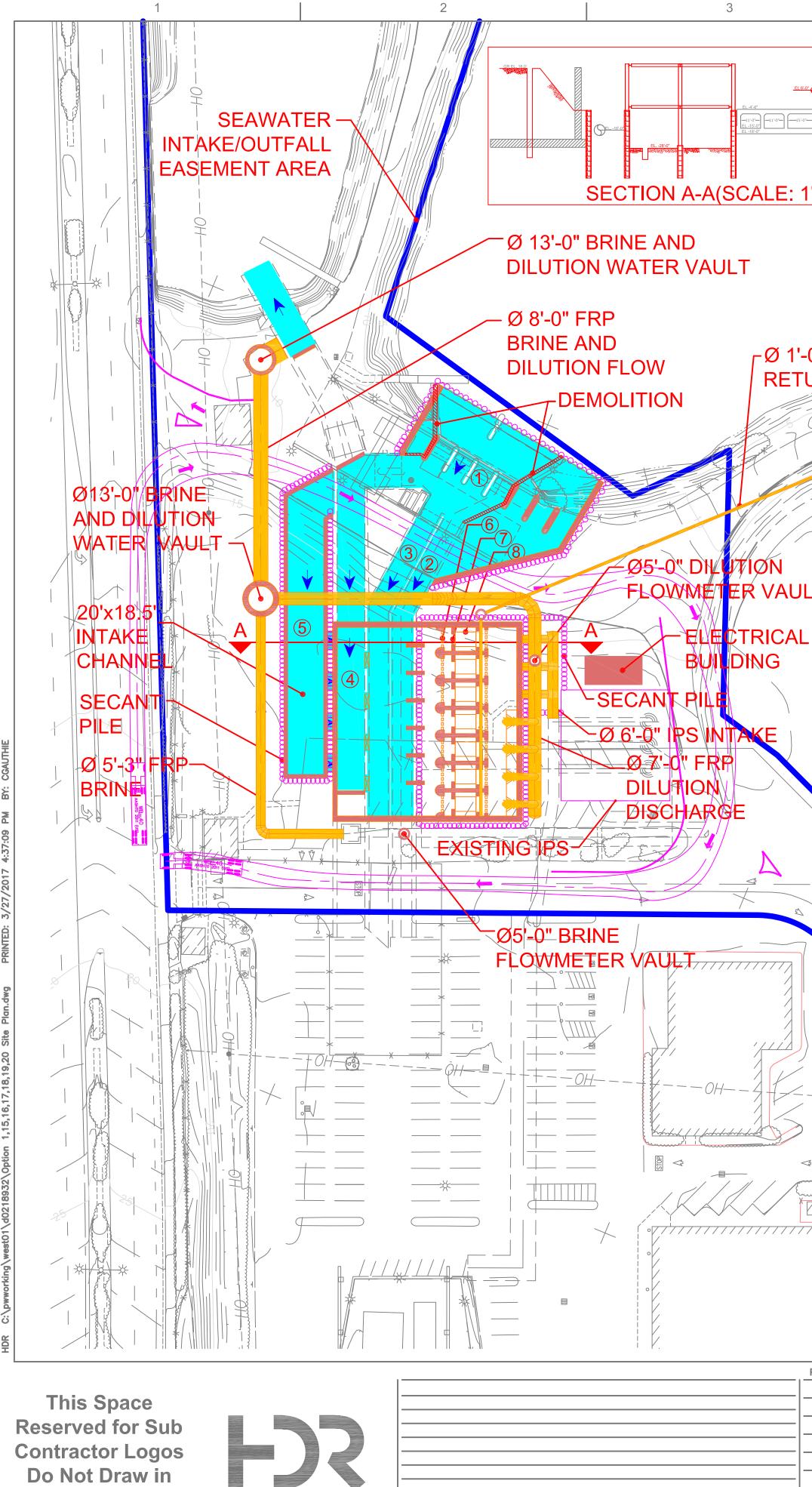


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ALTERNATIVE-17

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	ITEM		COMMEN
	ALTERNATIVE		
<u>1'=40')</u>	DESCRIPTION	Discharger's proposed project with be discharge tunnel repurposed as an ir (combination of Alternatives 16 and 2 construction phases as identified below permits for lagoon construction. Phase to occur in dry conditions. See below	ntake, and a four 17 with a new tun ow. Phase 1 allor se 2 requires sho
-0" FISH	KEY ELEMENTS	 Additional bar racks at 0.53 f 4 intake channels at 0.68, 0.6 7-1mm center flow screens. Additional brine discharge an 	56, 0.67 and 1
	CONSTRUCTION COST	\$ 56.3 Million [*] (Incremental inc	rease from Al
	PHASING	Phase 1A-Screen intake struct Phase 1B-New 4th intake char Phase 1C-Dilution and brine lir Phase 2- Additional bar rack st	nnel ne
	FOOTPRINT	Same as original proposal + A	dditional 4 bar
	CONSTRUCTION DURATION	2.7 Years (32.5 Months) (141 v 1.3 Years (15.5 Months) (67 V Total: 4 Years (48.0 Months) (2	Veeks) Phase
JLT,	OPERATION & MAINTENANCE	Same as original proposal + Ao other fouling organisms in the	
	COMPLEXITY	3rd tunnel connection Phase 2 double width of intake Construct 4th intake channel New combined dilution and brin	
WATER PLANT INTAKE/DISCHARGE	PLANT SHUT DOWN IMPACT	42 days to connect 1st and 2nd 28 days for blocking existing cl 14 days for pipeline connection 28 days for new tunnel connec Total of 112 days for plant shu	hannel and cu n. etion.
EASEMENT AREA		300 days Phase 2 double widtl	h of intake and
	PLANT SHUT DOWN COST(\$182,000/day)	\$ 74,984,000 [*] (INCREMENTA	L INCREASE
	FISH RETURN MARINE LIFE MORTALITY - JUVENILE AND ADULT FISH (LBS/D)	0.75	
	SITE INGRESS/EGRESS IMPACT	Fish return line construction Dilution line construction Double width of intake, install 4 Construct 4th intake channel Combined dilution and brine lin	
		ALTERNATIVE 18	
	No. DESCRIPTION		VELOCITY
	1 EXIST. BAR RACK INTAKE		0.53 FPS
	2 EXIST.INTAKE CHANNEL EAST		0.68 FPS
	3 EXIST.INTAKE CHANNEL WEST		0.66 FPS
	(4) EXIST.DISCH. CHANNEL REPURPOR	SED	0.67 FPS
	5 NEW INTAKE CHANNEL		1.04 FPS
	6SCREEN UPSTREAM CHANNEL7SCREEN INFLUENT THROAT		0.33 FPS 0.73 FPS
	 (7) SCREEN INFLUENT THROAT (8) THROUGH SCREEN VELOCITIES W 	ITH 15% FOULING	0.73 FPS
	 * ALL VELOCITY SHOWN ARE AT MLLV ** VELOCITY THROUGH BAR RACK. 		

CONSTRUCTION

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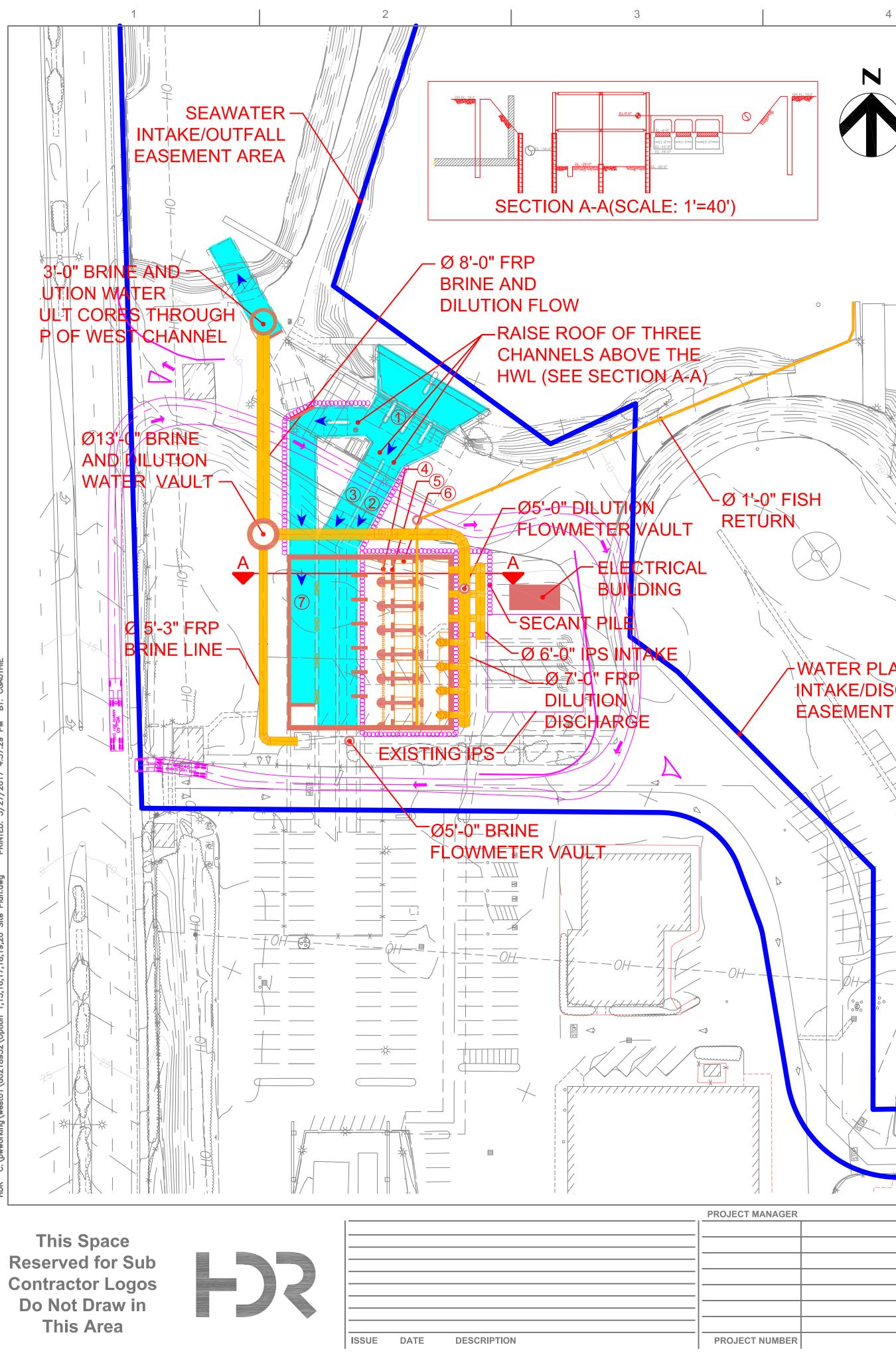
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18		Avoid Drawing in This Area	
ourth inta tunnel). allows for shoring a	mproved to limit intake velocities to 0.5 fps, ake tunnel added to reduce intake velocities Note that this alternative requires two r plant operations while applying for USACE around the existing intake to allow construction urations for each phase.		D
ocity 1 1.04 f	ps inlet velocity respectively.		
dilutio	n and brine line.		
Alt 1 is	\$ 21.6 Million)		
oar rack	s+Additional 4 th tunnel		
Phase 1 se 2			С
	mental increase from Alt 1 is 201 weeks)		
oar rack	s + Additional removal of mussels and		
v bar ra	cks		
е			
	n wet well roof and connect to 3rd tunnel		
cutting			
and inst	all 40' of new bar rack		
SE FRO	DM ALT 1 is \$ 67,340,000)		
			B
ar rack	e		
	5		
ion			
TY *	COMMENT		
PS *:	* (8)-10 FT BAR RACK		
PS	39 MGD		
PS	37 MGD		
PS	52 MGD		
PS	171 MGD OPEN CHANNEL		A
PS	4.0 METER		
PS	1.82 METER		
PS	3.5 METER CENTER FLOW		
		0 40 80 120	
		SCALE I"=40'	
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ALTERNATIVE EVALUATION ITEM ALTERNATIVE Discharger's proposed project with discharge tunnel raised to accommodate HWL without restriction. Not as identified below. Phase 1 allows for plant operation construction. Phase 2 requires shoring around the e conditions. Phase 3 allows for construction of dilution DESCRIPTION durations for each phase. • Existing bar rack at 1.06 fps inlet velocity. 3 intake channels at 0.94, 0.94 and 1.05 fp Raise roof of three intake channels 10.5 ft KEY ELEMENTS • 7-1mm center flow screens. Additional brine discharge and combined of CONSTRUCTION COST \$ 43.6 Million^{*}(Incremental increase from Al Phase 1A-Screen intake structure Phase 1B-Raising existing channel walls an PHASING Phase 1C- Dilution and brine line FOOTPRINT Raise roof on intake channels 10.5 ft 2.4 Years (29 Months) (124 Weeks) (Increm CONSTRUCTION DURATION **OPERATION & MAINTENANCE** Same as original proposal 3rd tunnel connection Raising all three tunnel walls and adding nev COMPLEXITY New combined dilution and brine discharge 224 days for raising all three tunnel roofs (to tunnels to screen wet well and 28 days for b and connect to 3rd tunnel); PLANT SHUT DOWN IMPACT 84 days for pipeline construction. WATER PLANT 14 days for pipeline tie-in. INTAKE/DISCHARGE Total of 322 days plant shut down. **EASEMENT AREA** PLANT SHUT DOWN COST(\$182,000/day) \$ 58,604,000^{*} (INCREMENTAL INCREASE FISH RETURN MARINE LIFE MORTALITY -0.75 JUVENILE AND ADULT FISH (LBS/D) Fish return line construction Dilution line construction SITE INGRESS/EGRESS IMPACT Combined dilution and brine line construcito Raise roof on intake channels 10.5 ft 2017 Dollar Value ALTERNATIVE 19 X No. DESCRIPTION EXIST. BAR RACK INTAKE EXIST.INTAKE CHANNEL EAST EXIST.INTAKE CHANNEL WEST (3) SCREEN UPSTREAM CHANNEL (4) SCREEN INFLUENT THROAT 5 THROUGH SCREEN VELOCITIES WITH 15% FOULING 6 EXIST.DISCH. CHANNEL REPURPOSED

ALL VELOCITY SHOWN ARE AT MLLW UNLESS OTHERWISE NOTED.

VELOCITY THROUGH BAR RACK.

PRELIMANRY **NOT FOR** CONSTRUCTION OR RECORDING

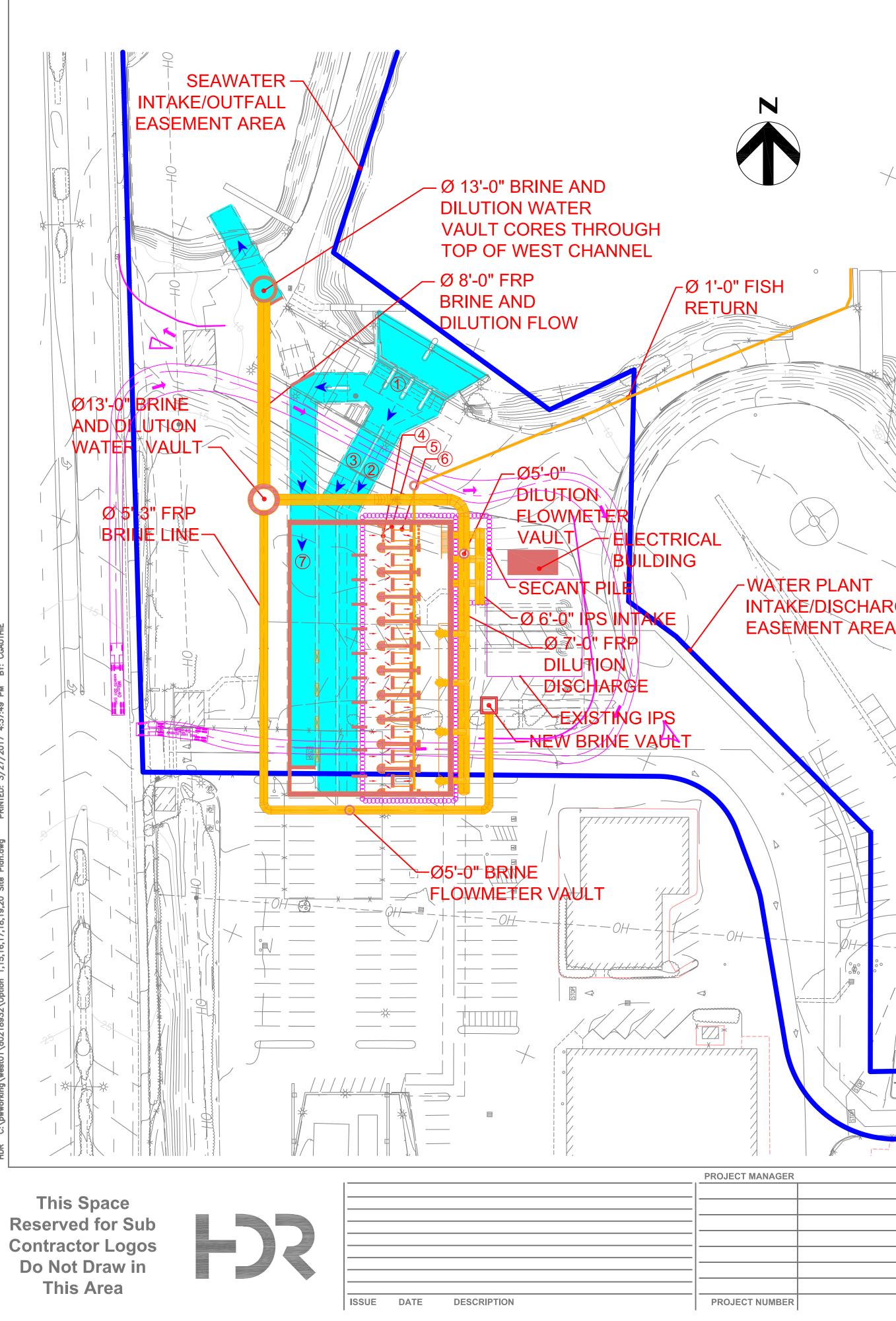


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COMMENT		Avoid Drawing in This Are	a
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striction. Note that this alt lant operations while app round the existing intake	as an intake and all intake tunnel roofs rernative requires three construction phases olying for USACE permits for lagoon to allow tunnel modifications to occur in dry nes. See below for plant shutdown		
t velocity. and 1.05 fps inlet velo els 10.5 ft	ocity respectively.		
ombined dilution and	brine line.		
use from Alt 1 is \$ 8.9	9 Million)		
el walls and adding n			
5 ft			C
(Incremental incre	ease from Alt 1 is 17 weeks)		
adding new roof discharge			
el roofs (to include 4	2 days to connect 1st and 2nd		-
days for blocking ex	isting channel and cutting roof		
l			
ICREASE FROM AL	.T 1 is \$ 50,960,000)		
			В
construciton			
5 ft			
VELOCITY *	COMMENT		
1.06 FPS **	(4)-10 FT BAR RACK		
0.94 FPS	85 MGD		
0.94 FPS	85 MGD		
0.33 FPS	4.0 METER		
0.73 FPS			
0.44 FPS	3.5 METER CENTER FLOW		A
1.05 FPS	129 MGD		
		SCALE I"=40'	

ALTERNATIVE-19

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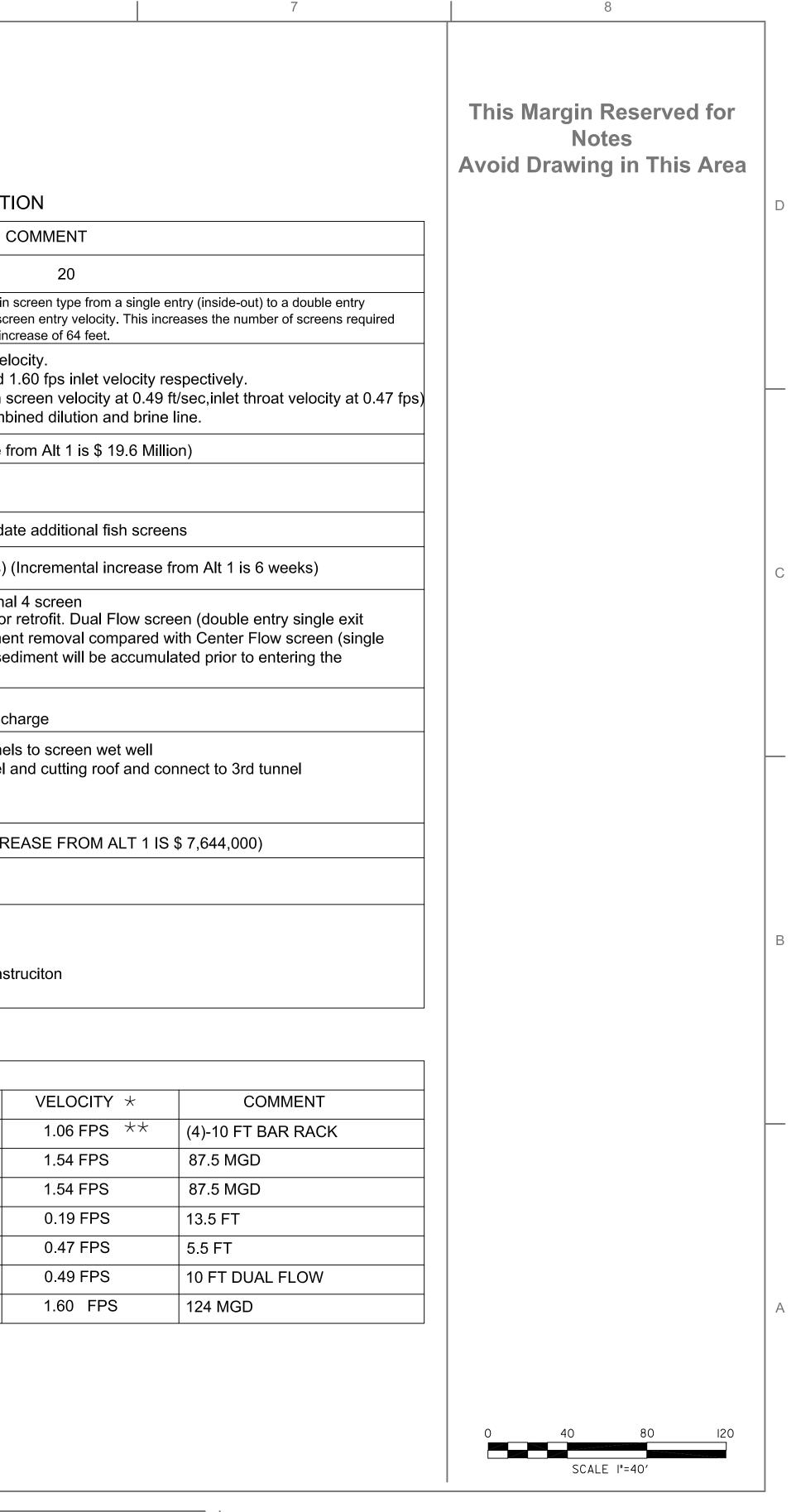
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N		ALTERNATIVE EVALUAT	
	ITEM		
	ALTERNATIVE		20
	DESCRIPTION	Discharger's proposed project with change in (outside-in) type screen to achieve 0.5 fps sc from 7 to 11, resulting in a structure length in	n screen type fro reen entry veloc
-Ø 1'-0" FISH RETURN	KEY ELEMENTS	 Existing bar rack at 1.06 fps inlet ve 3 intake channels at 1.54, 1.54 and 11-1mm dual flow screens (through secret or and combined brine discharge and combined brined brine discharge and combined brined br	1.60 fps inlet screen velocit
	CONSTRUCTION COST	\$ 54.3 Million [*] (Incremental increase t	from Alt 1 is \$
	PHASING	Phase 1A-Screen intake structure Phase 1B-Dilution and brine line	
	FOOTPRINT	Larger intake structure to accommoda	ate additional
	CONSTRUCTION DURATION	2.2 Years (26.1 Months) (113 weeks)	(Incremental
	OPERATION & MAINTENANCE	Same as original proposal + Additional Dual Flow screen is primarily used for outside in) has O&M issue on sedime entry double exit inside out) as the se screen from outside.	r retrofit. Dual ent removal co
TRICAL	COMPLEXITY	3rd tunnel connection New combined dilution and brine disc	harge
OING -WATER PLANT INTAKE/DISCHARGE EASEMENT AREA	PLANT SHUT DOWN IMPACT	42 days to connect 1st and 2nd tunne 28 days for blocking existing channel 14 days for pipeline connection. Total of 84 days	
	PLANT SHUT DOWN COST(\$182,000/day) \$ 15,288,000 [*] (INCREMENTAL INCR	EASE FROM
	FISH RETURN MARINE LIFE MORTALITY - JUVENILE AND ADULT FISH (LBS/D)	0.78	
	SITE INGRESS/EGRESS IMPACT	Intake screen structure Fish return line construction Dilution line construction Combined dilution and brine line cons Brine line construction	struciton
	* 2017 Dollar Value		
		ALTERNATIVE 20	
	No. DESCRIPTION		VELOCIT
	1 EXIST. BAR RACK INTAKE		1.06 FP3
	2 EXIST.INTAKE CHANNEL EAST		1.54 FP3
	3 EXIST.INTAKE CHANNEL WEST		1.54 FP3
	(4) SCREEN UPSTREAM CHANNEL		0.19 FP
	(5) SCREEN INFLUENT THROAT		0.47 FP
	(6) THROUGH SCREEN VELOCITIES		0.49 FP
	(7) EXIST.DISCH. CHANNEL REPURF	POSED	1.60 FF
	 * ALL VELOCITY SHOWN ARE AT MI ** VELOCITY THROUGH BAR RACK. 	LLW UNLESS OTHERWISE NOTED.	
PROJECT MANAGER			

PRELIMANRY **NOT FOR** CONSTRUCTION OR RECORDING







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			d Desalination Project				
		Intake Alterna	itives Capital Cost Analys	is (\$)			
Construction Cost				Alternatives			
Alternative	#1	#15	#16	#17	#18	#19	#20
Construction Duration (yrs)	2.06	2.17	3.35	3.46	4.00	2.38	2.17
Construction Costs							
Additional Permitting	3,150,000	3,150,000	3,150,000	3,150,000	3,150,000	3,150,000	3,150,000
Intake/Outfall Construction	34,675,000	38,311,000	47,178,000	50,157,000	56,300,000	43,642,000	54,274,000
Construction Management	2,373,529	2,500,271	3,859,866	3,986,607	4,608,795	2,742,233	2,500,271
Construction Insurance	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Construction Rent	309,000	325,500	502,500	519,000	600,000	357,000	325,500
Post Construction Entrainment Study	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Subtotal	42,707,529	46,486,771	56,890,366	60,012,607	66,858,795	52,091,233	62,449,771
Transaction Costs, legal	972,401	1,059,917	1,326,843	1,402,852	1,580,316	1,191,057	1,423,576
Capitalized Interest	2,554,752	2,849,808	4,536,491	4,895,628	6,019,721	3,319,639	3,880,079
Additional 6 Mo Debt Service Reserve	1,362,806	1,488,401	1,905,007	2,018,490	2,298,609	1,678,953	1,999,074
Debt Underwriting	398,684	434,566	544,006	575,169	647,929	488,333	583,666
Additional 1 month O&M Reserve	237,229	244,426	251,815	258,464	267,750	248,868	261,895
Outstanding Equity Fee	386,509	431,826	830,374	908,318	1,251,610	534,576	580,530
Total Project Cost	48,619,910	52,995,714	66,284,901	70,071,529	78,924,730	59,552,659	71,178,591
Incremental Increase		4,375,804	17,664,991	21,451,619	30,304,819	10,932,749	22,558,681

Carlsbad Desalination Project Intake Alternatives Annualized Cost Analysis (\$/yr)								
Annualized Cost	nnualized Cost Alternatives							
Alternative	#1	#15	#16	#17	#18	#19	#20	
Construction Debt Charge	2,725,612	2,976,802	3,810,014	4,036,980	4,597,218	3,357,907	3,998,148	
Construction Equity Charge	1,343,851	1,465,336	1,833,513	1,937,774	2,186,179	1,647,814	1,968,089	
Additional O&M Charge	2,846,750	2,933,110	3,021,780	3,101,570	3,213,000	2,986,420	3,142,740	
Total Annual Costs	6,916,213	7,375,248	8,665,307	9,076,324	9,996,398	7,992,141	9,108,976	
Incremental Increase		459,034	1,749,094	2,160,111	3,080,184	1,075,928	2,192,763	

Carlsbad Desalination Project Intake Alternatives Cost/Benefit Analysis							
Cost/Benefit Analysis	ost/Benefit Analysis Alternatives						
Alternative	#1	#15	#16	#17	#18	#19	#20
Net Productivity Loss Proposed Intake (lbs/d)	0.85	0.78	0.85	0.78	0.75	0.75	0.75
Reduced Mortality (lbs/d)		0.07	0.00	0.07	0.10	0.10	0.10
Reduced Mortality (lbs/yr)		25.55	0.00	25.55	36.50	36.50	36.50
Incremental Cost increase (\$/yr)		\$459,034	\$1,749,094	\$2,160,111	\$3,080,184	\$1,075,928	\$2,192,763
Unit Cost of Reduced Mortality (\$/lb)		\$17,966	n/a	\$84,544	\$84,389	\$29,477	\$60,076

Carlsbad Desalination Project Plant Shutdown Cost (\$)							
Alternative	#1	#15	#16	#17	#18	#19	#20
Length of Shutdown (d)	42	84	342	384	412	322	84
Unit Cost of Shutdown (\$/d)	\$182,000	\$182,000	\$182,000	\$182,000	\$182,000	\$182,000	\$182,000
Plant Shutdown Cost	\$7,644,000	\$15,288,000	\$62,244,000	\$69,888,000	\$74,984,000	\$58,604,000	\$15,288,000