Meeting Agenda

Carlsbad Desalination Project – NPDES Permit Development Update

Date and Time

Wednesday, November 2, 2016
9:00am-12:00pm

Location

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

Teleconference

Phone number: 888-808-6929 or 213-787-0529
Access code: 2535683

Webex Link:

https://join.me/PW_CB_Office

Meeting participants

Entity	Staff
Poseidon, LLC	Peter MacLaggan Josie McKinley Craig Johns (by phone) Kelly Huffman (by phone) Michael Welch Tim Hogan Chris Stiedemann
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. Revised Hydrodynamic Modeling Report –
3. Intake Alternatives –
   - Lagoon Wedgewire Screen –
   - Lagoon Traveling Screen –
   - Screen Location
   - Through-screen Velocity Calculations
4. Fish Return System Alternatives
5. Outfall Alternatives
   - Encina Ocean Outfall –
6. Mitigation
   - Mitigation Ratio for BMZ Impacts –
7. Schedule Update
   - Deliverables from Poseidon –
   - Permit Development –
8. Additional Discussion –.

CARLSBAD DESALINATION PROJECT
PERMIT RENEWAL MEETING
NOVEMBER 2, 2016

Discussion Topics

1. Revised feasibility assessment of Lagoon Wedgewire Screen Alternative
2. Feasibility assessment of Lagoon Traveling Screen Alternative
3. Method used to establish compliance with 0.5 foot per second through-screen velocity requirement
4. Location of outfall for fish return system

COMPARISON OF LAGOON INTAKE ALTERNATIVES

REVISED FEASIBILITY ASSESSMENT OF LAGOON WEDGEWIRE SCREEN ALTERNATIVE

Introduction

Objective

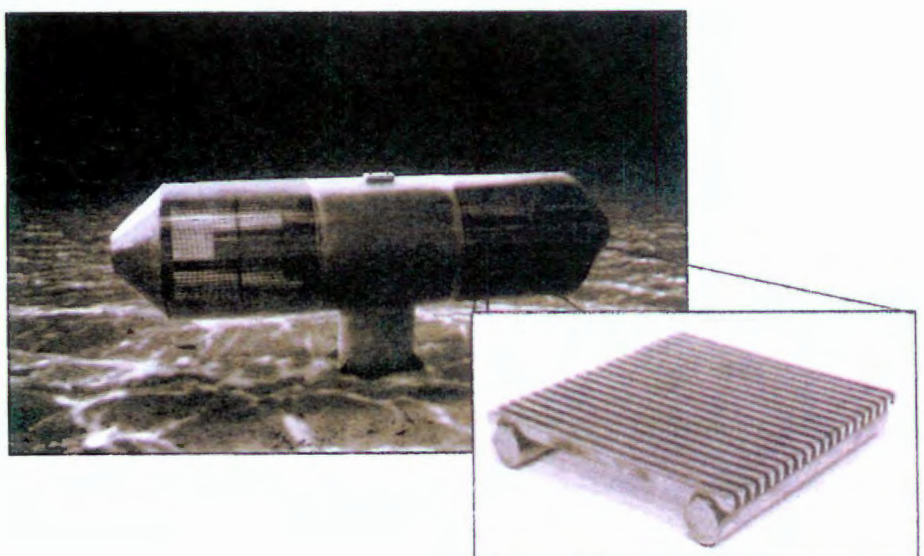
- Re-evaluate WWS Lagoon Alternative in greater detail

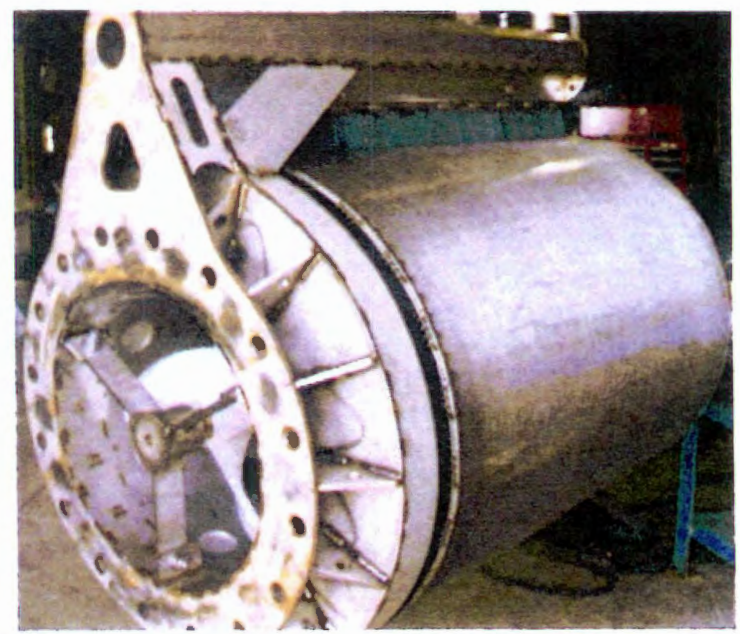
Method

- Review Literature
- Engage Vendors for Feedback
- Assess Technical Aspects
- Assess Environmental Aspects
- Refine WWS design

Introduction

- Rotating (ISI brush-cleaned)
- Non-Rotating (airburst cleaned)

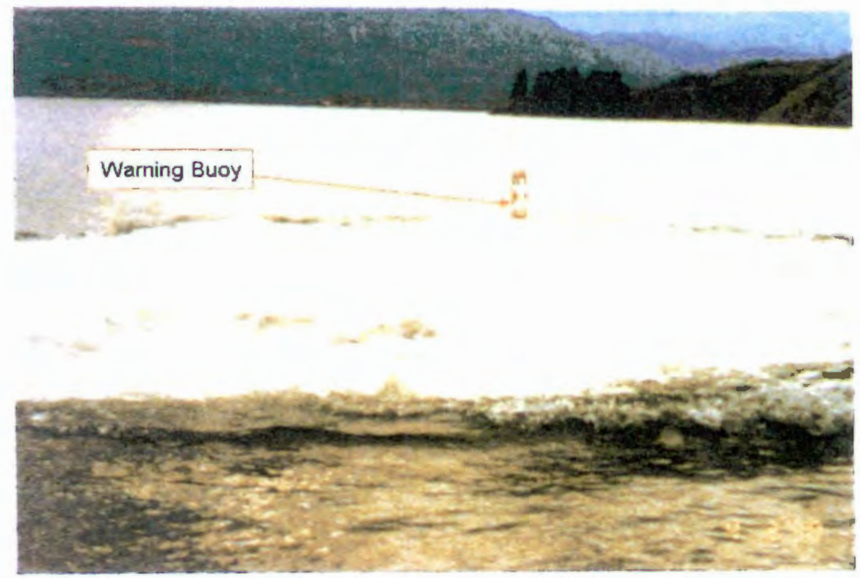




Literature Review

McGroddy et al. 1981 – Lab debris tests with 1-mm WWS and field screen coupon fouling tests.

- WWS are prone to fouling by free-floating debris and multiple airbursts are needed to completely clean the screens.
- Cleaning is most effective when WWS is less than 50% blocked – may require screens to be air-burst daily or more frequently during high debris load.
- Re-impingement of debris on the WWS occurs at low cross-screen velocities.
- Of all materials tested, stainless steel was least prone to biofouling



Literature Review

Wiersema et al. 1979 – 145-day pilot test in seawater with 2-mm WWS (9.5-in diameter) that were stainless, copper-nickel, and silicon manganese; no airbusrting capability

- Copper-nickel material was least prone to biofouling
- Biofouling growth occurred quickly – stainless WWS completely clogged after 2 weeks

US Bureau of Reclamation 2006 – a screening reference manual/design guide for water diversion and dams (freshwater)

- "*Cylinder screen installations should be avoided in backwater areas, dead ends, and the ends of canals because debris tends to accumulate in these areas and there are no means of removing debris from screen surfaces.*"

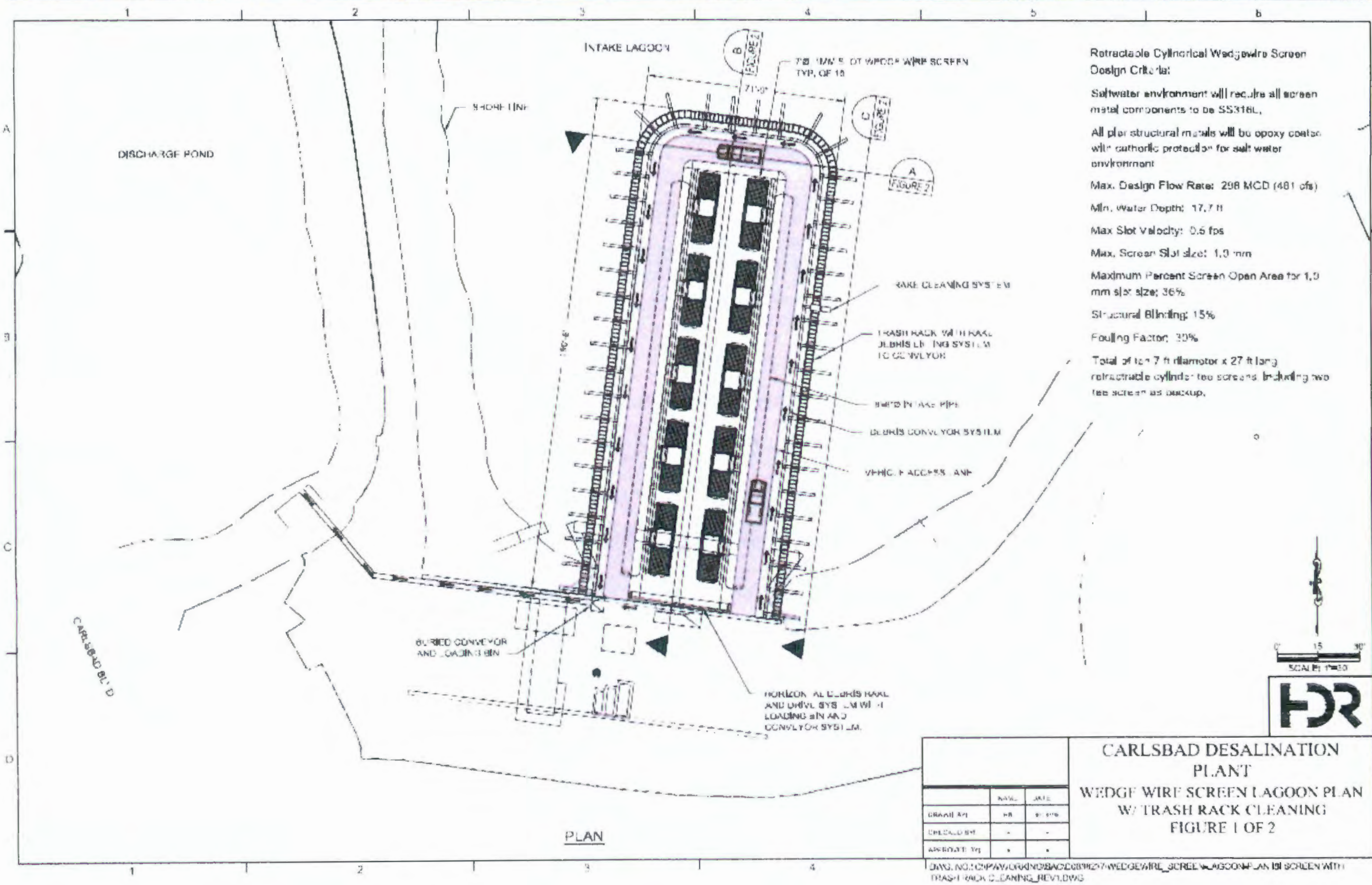
EPRI 2003 – lab flume test for assessing biological performance of WWS

- Higher ambient sweeping velocities result in lower I&E
- Since debris and passive organisms act the same in flow, debris shedding/clearing will also be optimized by increased sweeping velocity

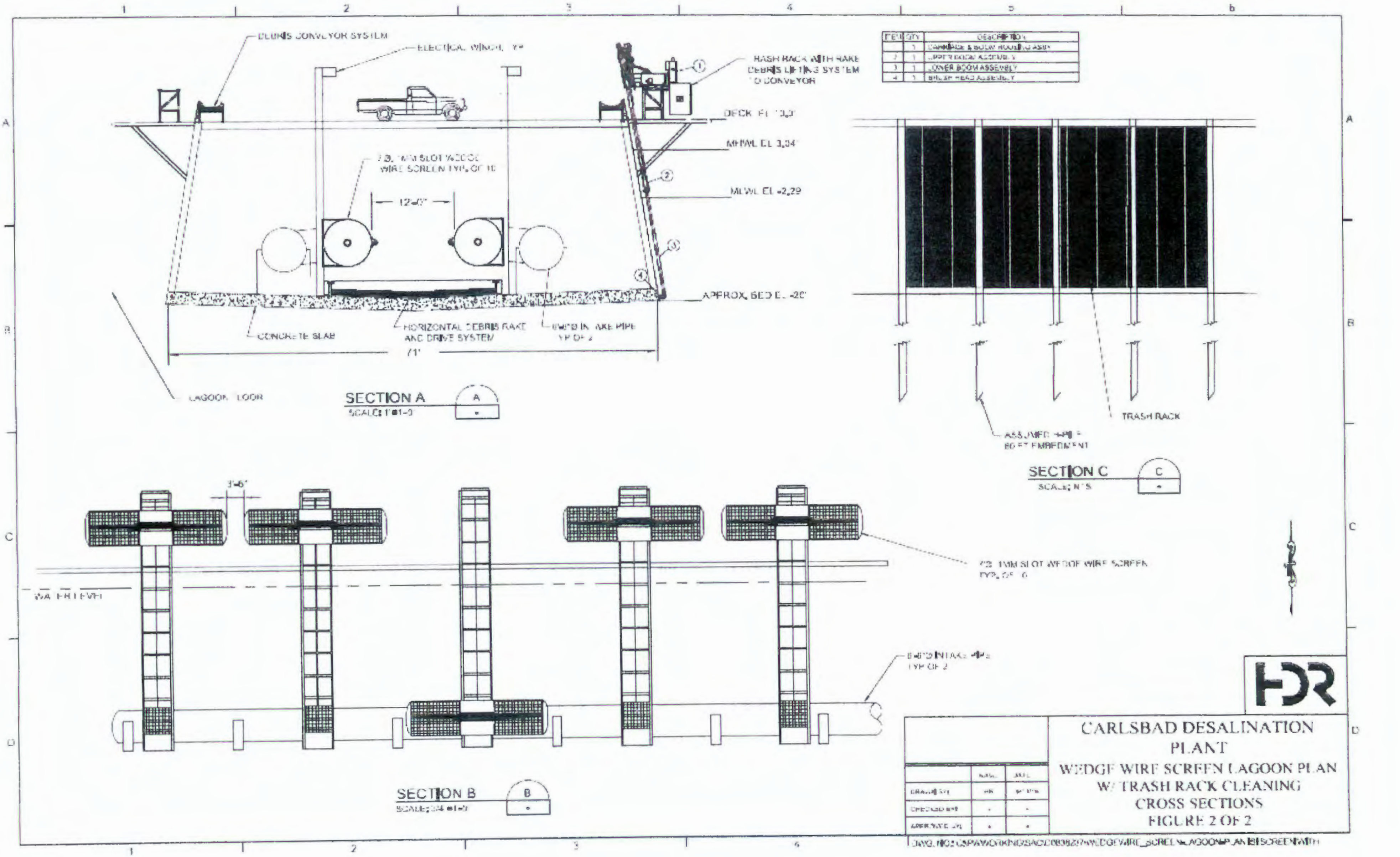
Vendor Feedback

- **ISI (rotating screen)**
  - Would need to have design that allows retraction of screens for inspection/cleaning
  - Key design goal would be keeping free-floating debris from occluding screen
  - Biofouling on screen may be managed by brush-cleaning system, but very little experience to date and none at this scale (~300 MGD)
  - Need means for removing accumulated sediment
- **Bilfinger Water Technologies (non-rotating screen)**
  - Application and scale would be "*first-of-a-kind*" globally
  - Concerned that location will encourage accumulation of debris near screens
  - Need means for removing accumulated sediment
  - Design developed would be minimum required given debris concerns

WWS Design for Lagoon



WWS Design for Lagoon



Conclusions

Technical Aspects

- Site constraints
  - Biggest concern is lack of ambient current
    - Impacts ability to clear debris
    - Impacts overall biological performance
  - Construction impacts in Lagoon
  - Potential use conflict with Aquafarm
- Equipment
  - WWS not designed to collect/remove debris
  - Non-rotating WWS – fouling potential/cleaning effectiveness unknown
  - Rotating WWS – potential for managing biofouling, but untested at this scale in seawater

Conclusions

Marine Life Impact Comparison

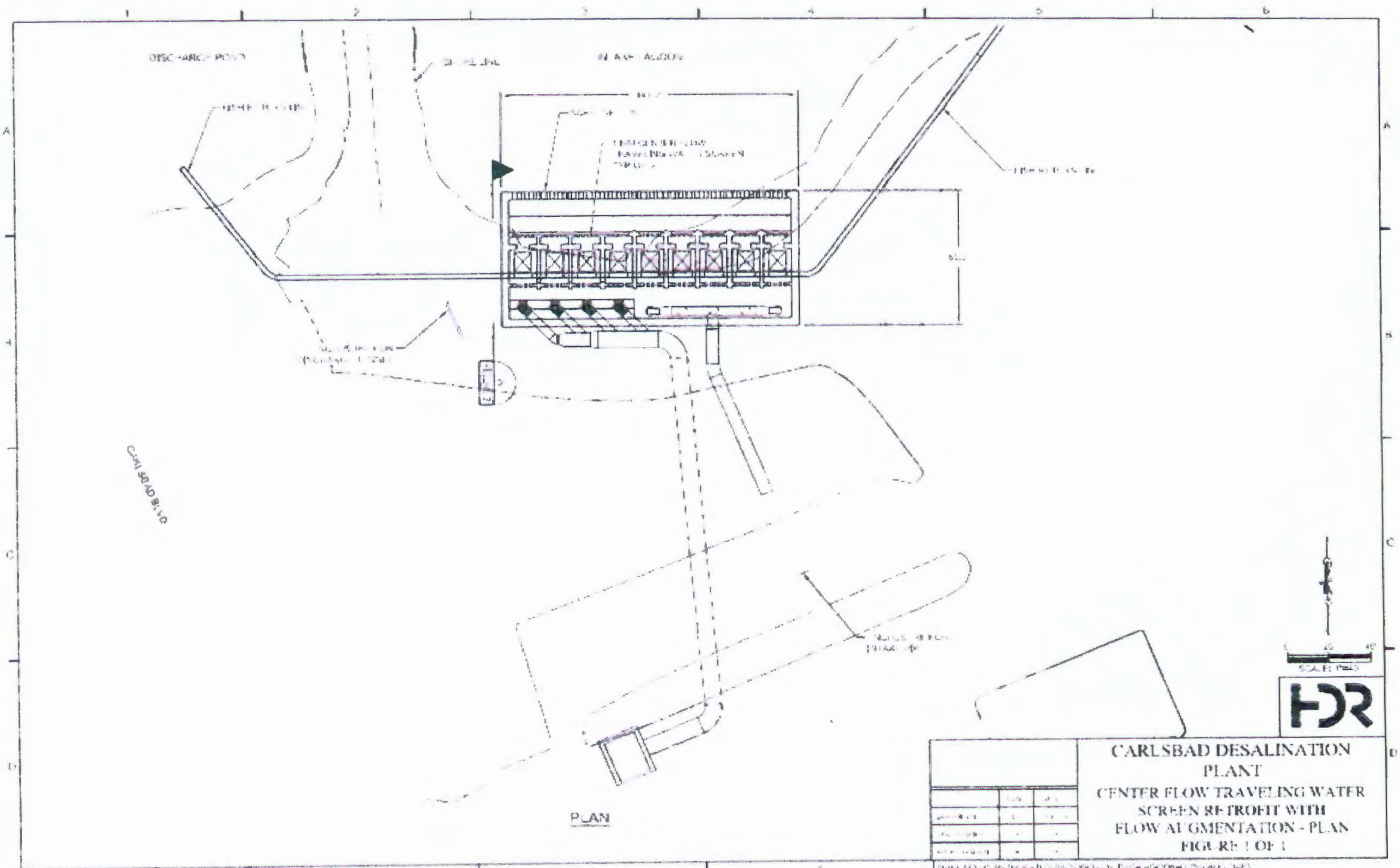
- On par with onshore screened (TWS) intake alternative
  - 99.9 acres total impacted area for WWS in Lagoon
  - 99.8 acres impacted area for TWS onshore

Overall

- WWS in Lagoon is high risk given lack of ambient currents and dead-end location
- Optimal biological performance requires ambient current as well
- Determined not to be feasible based on consideration of technical, economic, and schedule, feasibility factors
- Not the environmentally preferred alternative

FEASIBILITY ASSESSMENT OF LAGOON TRAVELING SCREEN ALTERNATIVE

Lagoon TWS Alternative



Conclusions

Technical Aspects

- Site constraints
  - Offshore location limits invert elevation
  - EPS will likely need to be offline due to size and location of intake
  - Construction impacts in Lagoon
  - Longer completion schedule due to constrained site in marine setting
- Equipment
  - All equipment is commercially available and proven for marine applications

Conclusions

Marine Life Impact Comparison

- On par with onshore screened (TWS) intake alternative
  - 99.9 acres total impacted area for TWS in Lagoon
  - 99.8 acres total impacted area for TWS onshore

Overall

- Determined not to be feasible based on consideration of economic and schedule feasibility factors
- Not the environmentally preferred alternative.

METHOD USED TO ESTABLISH COMPLIANCE WITH 0.5 FOOT PER SECOND THROUGH-SCREEN VELOCITY REQUIREMENT

Design Process

Engineering Constraints

Design Concept

Hydraulics

Hydraulic Analysis

Design Refinement

Preliminary Design

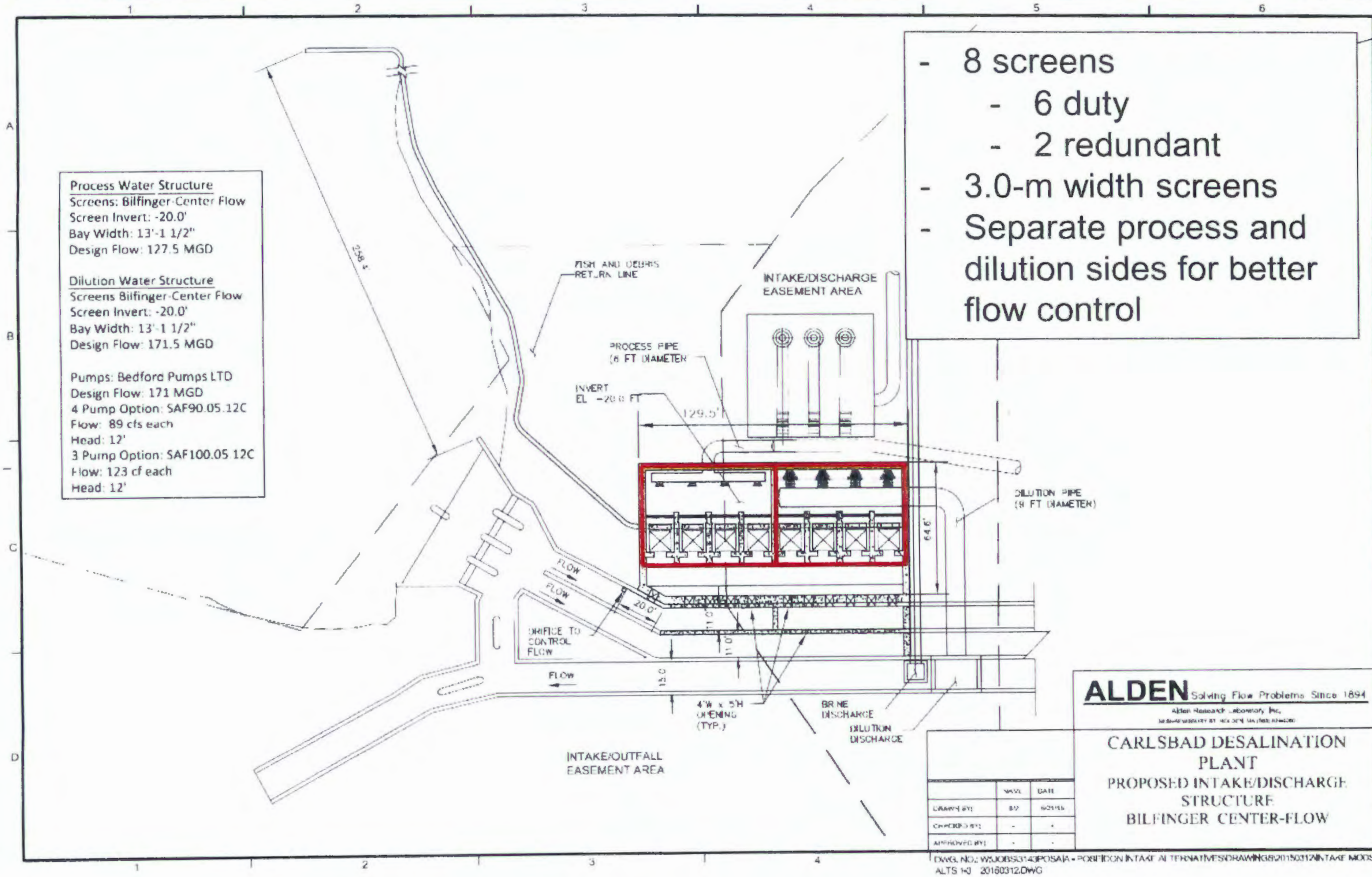
Nuts and Bolts

Design Criteria

- 1-mm mesh
- 0.5 ft/sec or less
- 15% fouling
  - With fouling, design velocity is 0.5 ft/sec x 0.85 = 0.425 ft/sec
  - 1 redundant screen
- Q = AV or V= Q/A
- Mean Lower Low Water level -2.27 ft.

Original 8-screen design

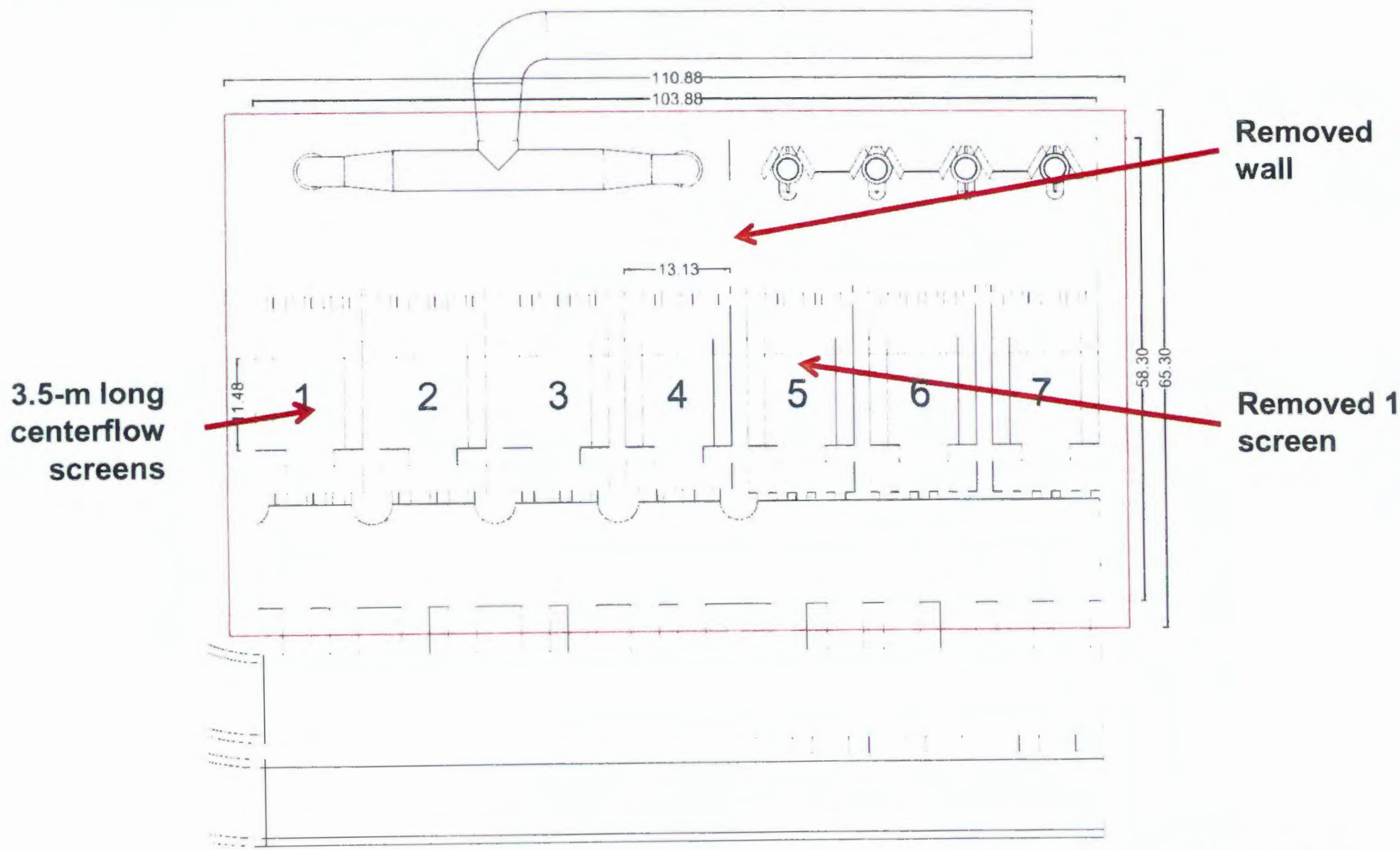
- 8 screens
  - 6 duty
  - 2 redundant
- 3.0-m width screens
- Separate process and dilution sides for better flow control



Design Iteration

- Needed to shrink footprint to address construction aspects
- Removed wall downstream of process and dilution screens
- Removed 1 redundant screen (from 8 to 7 total)
- Increased screen width (from 3.0 m to 3.5 m)
- Needed to re-evaluate flow patterns with CFD

Revised Design



LOCATION OF OUTFALL FOR FISH RETURN SYSTEM

Introduction

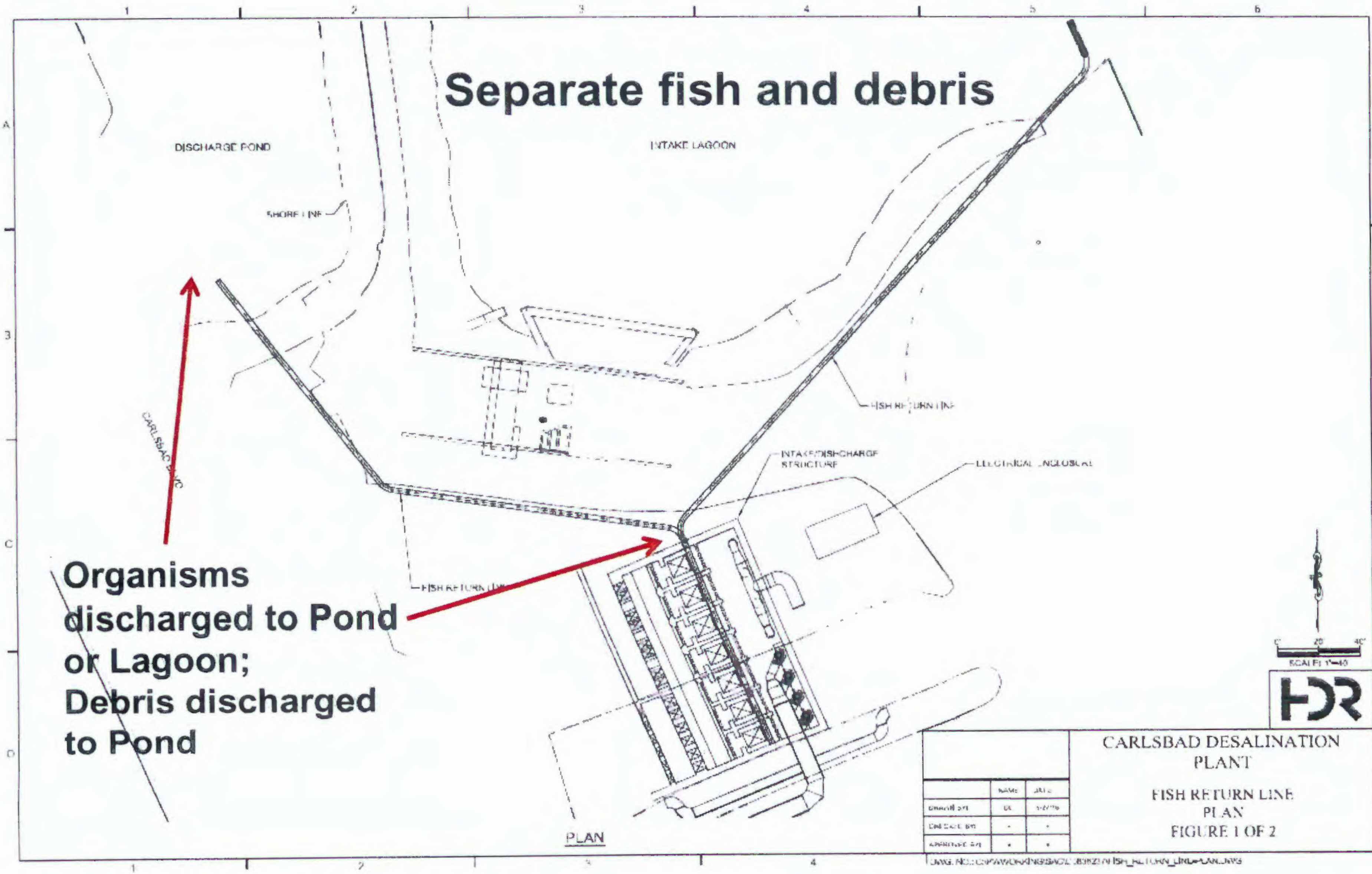
Objective

- Compare the impacts of the pond and lagoon fish return discharge alternatives

Method

- Describe the modified fish return design for the CDP
- Define each component in a fish return system that has potential to negatively affect organism survival
- Determine (comparatively for each alternative) the level of impact associated with each component, and
- Discuss the issue of predation at the fish return discharge.

Fish Return Modification



Comparison of Fish Return Discharge Locations

Design-related Factors

- Fish return length
  - Greater potential for clogging for Lagoon option
  - Potential for temperature swings is unlikely given pipe is below grade
- Cleaning
  - Debris (essentially TSS) from physical pipe cleaning (pigging) may have greater impact on Lagoon

Comparison of Fish Return Discharge Locations

Receiving Water-related Factors

- Water quality – **DO** slightly higher in Pond, **salinity** higher in Pond, **temperature** slightly higher in Pond, **TSS** higher in Lagoon during wet weather
- Habitat – better in Lagoon
- Predation – greater risk in Lagoon

More on Predation

Literature Review

- Predation is common at fish returns (e.g., thermal power, hydroelectric, water diversion, manufacturing)
- Mortality caused by predation is not a net loss to the system
- Technical (design) solutions are typically either impractical or discouraged if they limit free movement of wildlife (e.g., screening out predators)
- Best approach is to manage risk during design by:
    - Picking best location
    - Installing avian deterrents
    - Identifying good flushing flow

Conclusions

- Predation likely to be greater at Lagoon location
- New intake has been designed to minimize I&E and Poseidon has assumed 100% mortality to offset any loss of all larval fish entrained into the intake system – including larvae collected and returned.

COMPARISON OF FEASIBILITY ASSESSMENT FINDINGS FOR LAGOON INTAKE ALTERNATIVES

Lagoon WWS Intake Feasibility Considerations

- Plant operational reliability
  - Operation of critically needed $1 billion water production facility would be dependent on performance of technology that has never been tested under the proposed operating conditions
  - Ability to meet CDP's 96% operational reliability mandate at risk
  - Repayment CPCFA bonds and private equity investment is directly linked to operational reliability
  - Financing authorities would likely require greater than 30% redundancy
- Project completion schedule would be delayed 3.5 years
  - CWQA, NEPA, CWA §401 and §404 permits, and property acquisition
  - Construction in the Lagoon will take longer to complete
- Economic considerations
  - Capital cost increase of $78 million
  - Cost differential does not include: (i) increased redundancy; (ii) trash rack (iii) debris collector system; and (iv) concrete floor and deck
  - Fixed capital and operating costs not recovered due to delay $200 million
- Not environmentally preferred alternative

Lagoon Traveling Screen Feasibility Considerations

- Project completion schedule would be extended 3.5 years
  - CWQA, NEPA, and CWA §401 and §404 permits
  - Property acquisition
  - Construction along shoreline of Lagoon will take longer to complete
- Economic considerations
  - Capital cost increase of $32 million
  - Construction would require EPS offline due to location and size of structure
  - Fixed capital and operating costs not recovered while plant is out of service $200 million
- Not environmentally preferred alternative

Comparison of Feasibility Assessment Findings for Lagoon Intake Alternatives

Alternative	Project Capable of Being Accomplished in a Reasonable Period of Time?			Is Project Economically Feasible?		Marine Life Mortality Ranking	Socially Feasible	Technically Feasible	Overall Feasibility
	Completion Time (Years)	Delay Cost	Yes/No	Capital Cost	Yes/No	Impacted Area (Acres)	Yes/No	Yes/No	Yes/No
Surface Screened Intake with Flow Augmentation	2.5	$0	Yes	$49,061,041	Yes	99.8	Yes	Yes	Yes
Lagoon Wedgewire Screen with Flow Augmentation	6	$199,925,313	No	$126,904,402*	No	99.9	Yes	No	No
Lagoon Traveling Screen with Flow Augmentation	6	$199,925,313	No	$80,783,075	No	99.9	Yes	Yes	No

* August 2016 cost estimate has not been updated to include addition of trash rack, debris collector system and concrete decking above and below screening area. Actual cost expected to be significantly higher.

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