

Capturing Solid Trash Inputs

*California Marine Affairs and
Navigation Conference*

Hyatt Regency, Newport Beach
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PRESENTED BY MICHAEL WEBER, SENIOR PRINCIPAL SCIENTIST



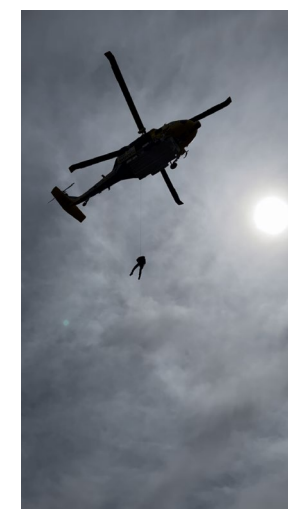
Introductions

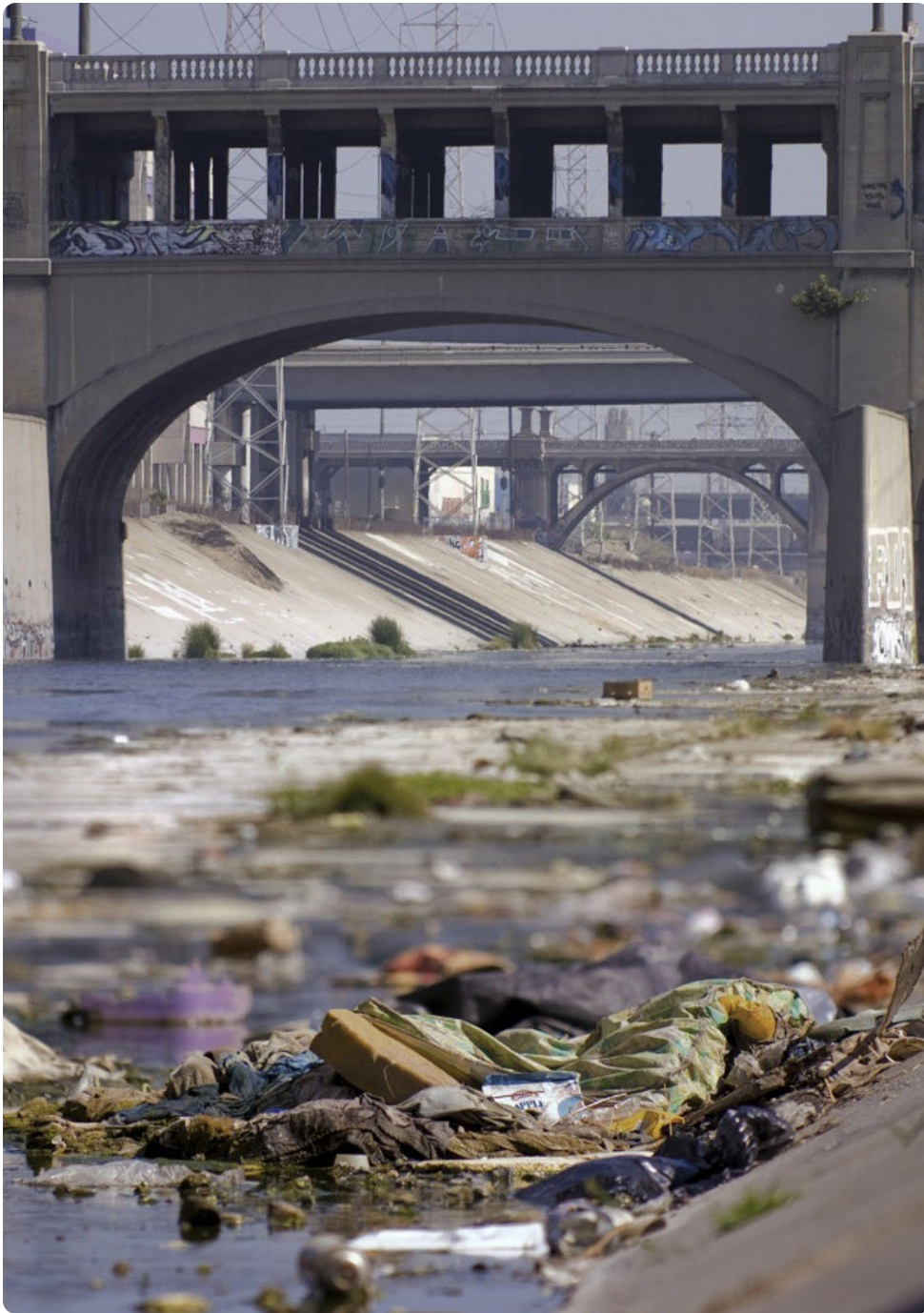
Presenter



Michael Weber
Stantec

- BS, Environmental Studies, UC Santa Barbara
- 27 years consulting experience with a coastal zone focus
- 20 years search & rescue volunteer





Agenda

1. Introductions
2. Setting the Stage
3. Southern California in Focus
4. Local Case Studies
5. Typical Project Approval Process
6. Questions

Setting the Stage



Effects of Marine Trash Pollution

- Plastic pollution has a global impact on ecosystems, health, and economies
- Negative effects include
 - Physical impact on marine life
 - Chemical impact on marine life and humans
 - Transport of invasive species and toxic pollutants
 - Economic impacts on industries such as fisheries, government, and tourism



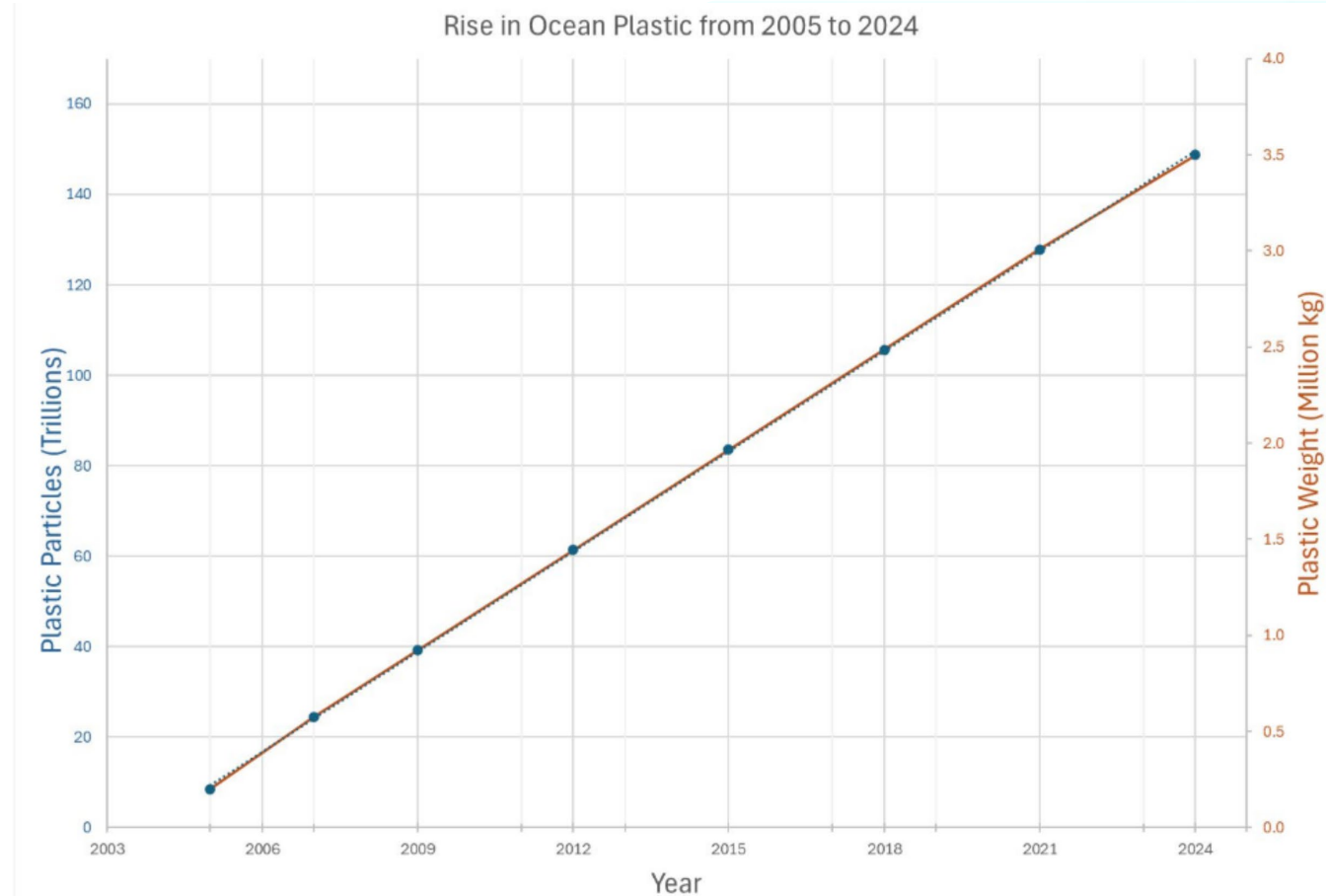
Setting the Stage

Globally

- Steep rise in ocean plastics since 2005
- 170 trillion plastic particles circulating in the worlds' oceans
- 3.5 million kg trash / year enters coastal environments
- 80% of marine debris originates from land-based sources – largely from urban runoff

Southern California

- Network of concrete channels, urban runoff, land-based sources
- Stormwater programs, local TMDLs
- Beaches, public perception

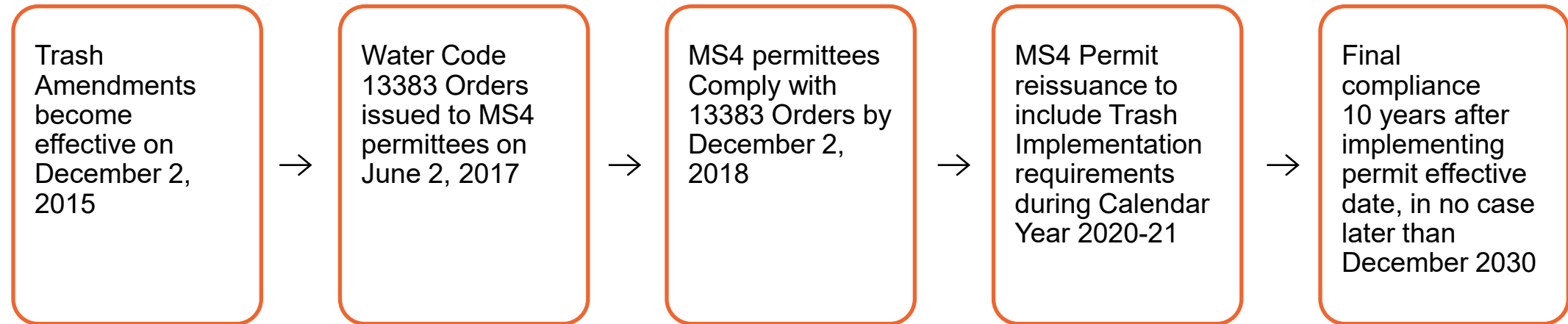


THE WORLD'S 1000 MOST POLLUTING RIVERS EXPLAINED



Regulatory Context

State and regional water board MS4 Permits: Trash Provisions



California has implemented rigorous regulations for stormwater management, requiring stormwater entering the municipal system to be treated through certified full trash capture devices by 2030



Primary Sources of Trash Pollution

- 80% of marine debris originates from land-based sources



Image courtesy of folar.org

Pollutant Source	Transport Mechanism	Contribution to Ocean Trash
Urban litter	Wind, stormwater runoff	High
Illegal dumping	Direct input to waterways	Medium
Overflowing waste bins	Rain, animals, wind	Medium
Extreme weather events	Floodwaters, debris flow	Medium to high
Homeless encampments	Riverbank discharge, rain events	Variable

Audience Question #1

In-stream Treatment Systems: How important do you think instream treatment systems are in the overall strategy for trash capture?

- a) Extremely important
- b) Moderately important
- c) Not important

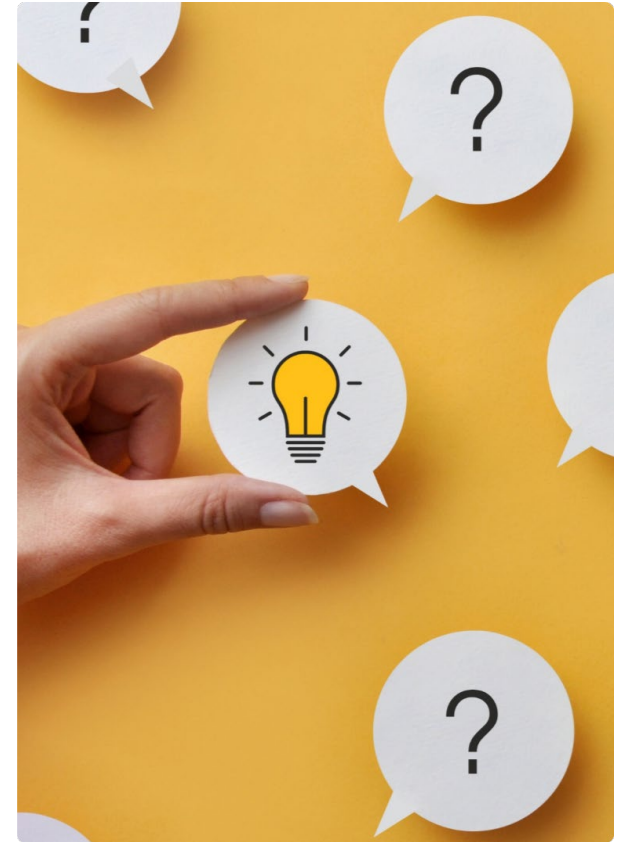




Audience Question #2

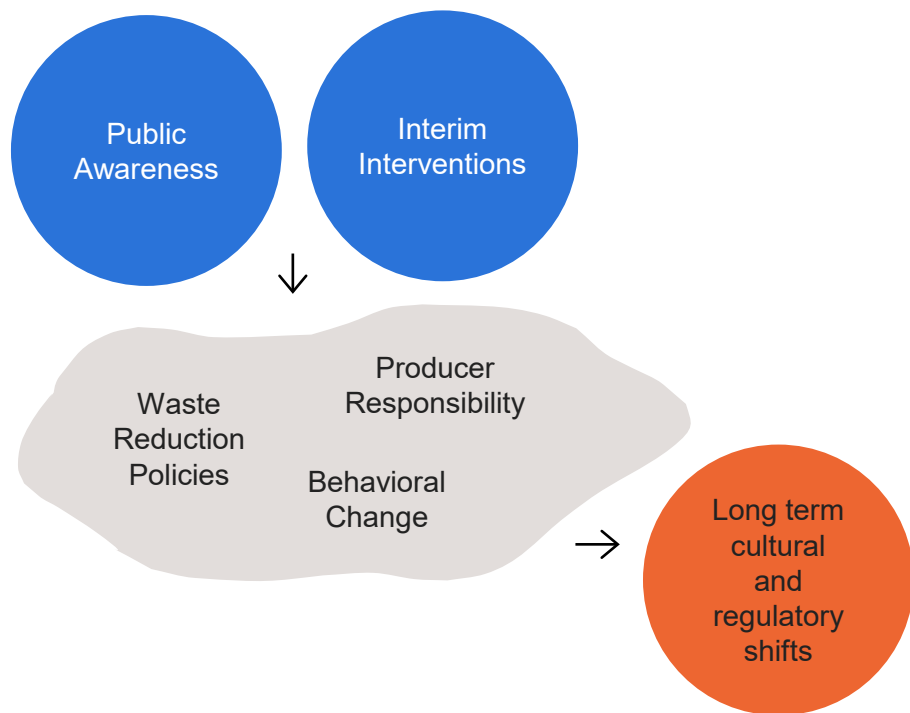
What do you think should be the primary focus for future regional trash capture solutions?

- a) Technological innovation
- b) Policy and regulation
- c) Community engagement
- d) Other



Transitional Removal Approach

Trash technologies should be used as a transitional strategy



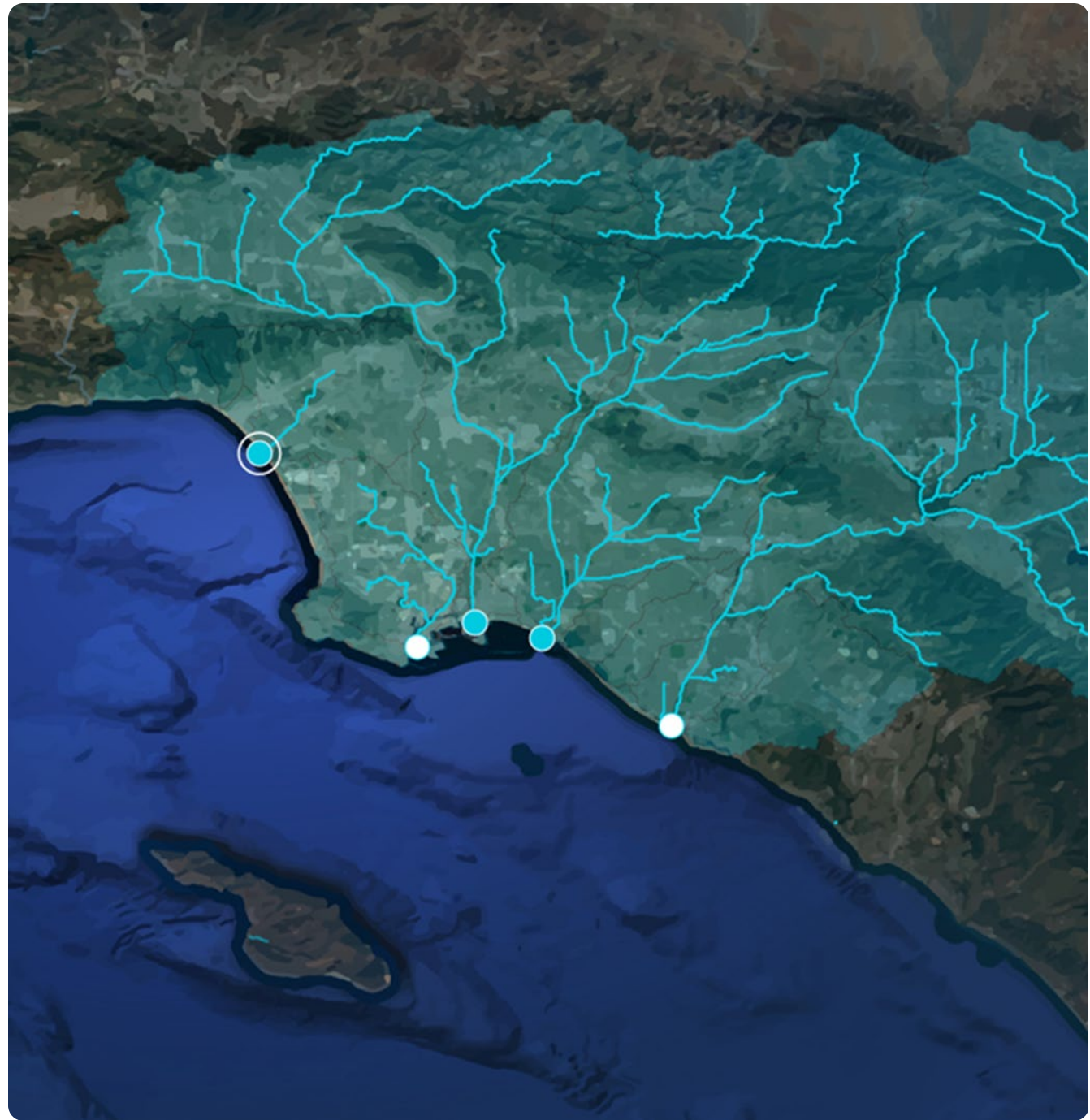


Southern California in Focus



Southern California Focus

- Large diverse sources of trash pollution
- Intermixed with vegetative debris
- Subject to stock and flush
- Source waters across many municipalities
- Complex regulatory requirements
- Funding gaps





Audience Question #3

Project Challenges: Which of the following do you think presents the largest challenge to implementing a trash capture project?

- a) Finding a proponent
- b) Identifying suitable site/engineering
- c) Environmental review/obtaining permits
- d) Funding
- e) Other



Audience Question #4

Funding Strategies: Which funding strategy do you think is the most effective for supporting trash capture projects?

- a) Municipal funds
- b) Government grants
- c) Private investments
- d) Public-private partnerships
- e) Other



Early Planning for Project Success

- Evaluate feasibility of trash removal projects
- Early stakeholder engagement
- Chart a pathway for engineering design, permitting, funding, and operations and maintenance of future projects





Common Feasibility Study Scope

- Collect and analyze data:
 - Existing trash mitigation efforts
 - Identify pollutant sources
 - Estimate trash volumes and types
 - River characteristics (flow rates, width, depth, tidal influence, etc)
 - Understand agency jurisdictions
- Engage stakeholders
- Study range of mitigation locations and technology types
- Identify potential environmental and design constraints
- Estimate costs and evaluate funding

Identify each catchment with its associated drainage system

Identify and measure the area of each land use

Estimate the litter load from Equation 1 or by using other available data

$$T = \sum_{fsc} (V_i + B_i) A_i$$

Conduct hydrological assessment of:

- Flood peak/frequency
- Treated flow volume/design capacity

Consider candidate trapping structures

Determine the expected storm loads from Equation 2:

$$S = f_s T / \sum_{fsl}$$

For the structure, consider a range of design capacities and calculate:

- Overall efficiency (Equation 3): $\eta_o = \eta_s \eta_f$
- Total storage capacity (Equation 4): $V_t = F_c \eta_o S_{av} / F_s$ and $V_t \geq S_{max}$
- Capital recovery amount (Equation 5): $A = P i (1+i)^n / ((1+i)^n - 1)$
- Total volume of litter trapped (Equation 6): $L = T \eta_o$
- Annual cost of the structure (Equation 7): $C_t = A + C_c$
- Unit cost of litter removal (Equation 8): $C = C_t / L$

Choose the most acceptable solution balancing:

- Cost
- Efficiency
- Trash removal
- Aesthetics, etc.

Main Categories:

- Commercial
- Industrial
- Residential

For each land use, estimate:

- Street cleaning factor
- Vegetation load
- Basic litter load

Main Criteria:

- Location
- Flow rate
- Allowable head loss
- Trap size
- Trap efficiency
- Trap reliability
- Ease of maintenance
- Cost effective

Estimate:

- Storm factors
- Sum of all storm factors

Input from Project Partners:

- City of Seal Beach
- Stantec
- Local municipalities
- Regulatory agencies



System Evaluation – Site Conditions

Stormwater and Tidal Flow Analysis

- Tidal influences and design storm analysis

Watershed Land Use Types

- Understanding permeable surfaces and proxy for trash load

Trash Load Characterization

- Type of debris, volume, nature of trash load (plug and flow, gradual, etc)

Proximity to Sensitive Ecological Areas

- Ensuring minimal impact and compliance with local regulatory requirements

Infrastructure Availability for Maintenance Access

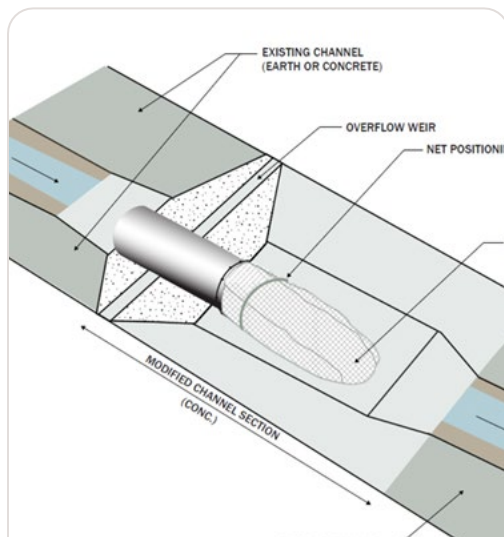
- Constraints related to regular O&M of device along with maintaining public access

System Evaluation – Cost Benefit

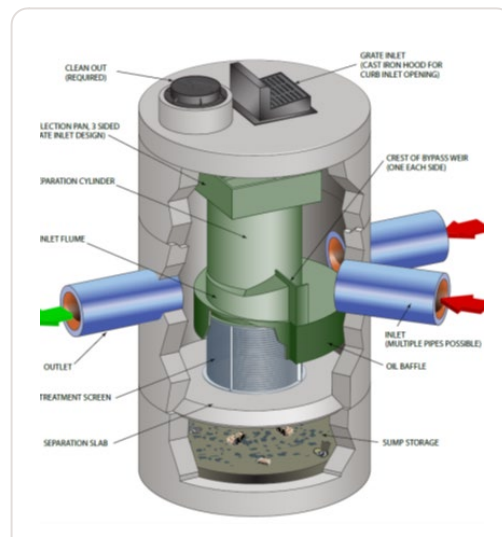
- **Long-term value:** automated systems' continuous capture versus labor-intensive manual trash removal
- **Lifecycle costs:** capital investments required, but reduced O&M costs over time
- **Public-private partnerships opportunity:** corporate responsibility and public sustainability goals
- **Non-cost related benefits:** visible trash capture devices offer
 - Public education
 - Community engagement



System Evaluation - Technologies



**In-Line
Nets/Screens**



**Hydrodynamic
Separators**



**Floating Boom
Collectors**



**Trash
Fence**



Example Feasibility Study Results

- Evaluation criteria include the following:
 - Trash volume at location
 - Trash capture ability
 - Implementation complexity
 - Operation and maintenance level of effort
 - Land use considerations
 - Environmental factors

ite #	Location	Trash Capture Device	Total Score
11b	Between E 7 th and 2 nd Streets	Trash Interceptor with Floating Boom	24
7b	South of 405 Fwy	Trash Interceptor with Floating Boom	23
2	Haynes Channel Inlet	Trash Screen Inlets	19
1a	Downstream of Marina Bridge	Trash Interceptor with Floating Boom	17.5
3	Willow/SGR	Dual Vane Trap	17.5
7a	Soft Bottom Start (i.e. Confluence SGR and Coyote)	Aquatic Litter System	17.5
1b	Downstream of Marina Bridge	Floating Booms	17
4	Willow/Coyote Creek	Dual Vane Trap	16.5
6b	Moody Creek Outlet	Floating Booms	16.5
12	Artesia/SGR	Trash Net In-Channel	16.5
10	Wardlow/SGR	Dual Vane Trap	16
11a	SGR in-stream near bend	Trash Wheel System	16
14	Confluence of Brea and Coyote Creek	Trash Net In-Channel	15.5
15	ROW West of Coyote and Artesia	Trash Net In-Channel	15.5
13	Outfall at Artesia & La Canada Verde	Caltrans Trash Net	13.5
5	Carbon Creek Outlet	Drop Rack Trap	12.5
6a	Moody Creek Outlet	Drop Rack Trap	12.5

A higher score corresponds to a more preferable option. Thus, darker green values are more preferable and darker red values are less preferable.



Local Case Studies





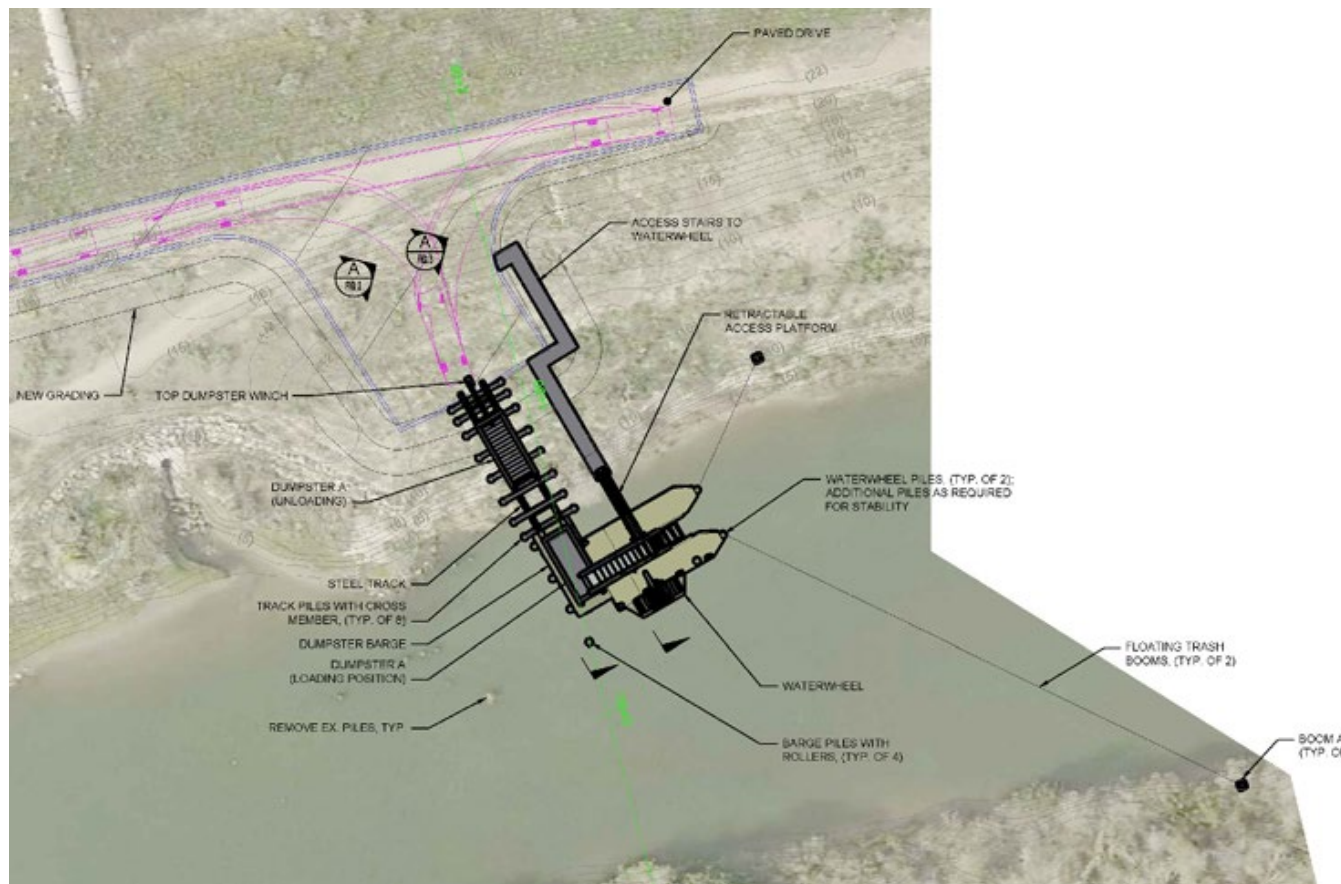
Newport Bay Trash Interceptor



Case Study	Newport Trash Wheel
Location	City of Newport Beach, Orange County, California
Receiving Water Body	San Diego Creek
Project Implementation Status	Completed construction in March 2025
Proximal Environmentally Sensitive Area	Upper Newport Bay Nature Preserve (estuarine habitat)
Technology Classification	Solar-powered trash wheel system with floating containment booms and conveyor belt system
Funding Mechanism	Joint funding: municipal capital budget and private-sector partnerships



Newport Bay Trash Interceptor





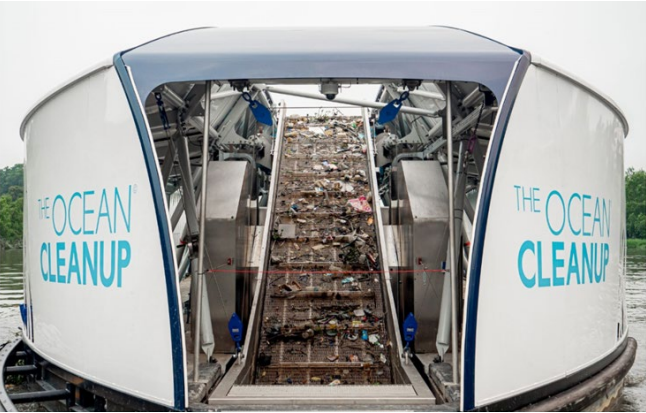
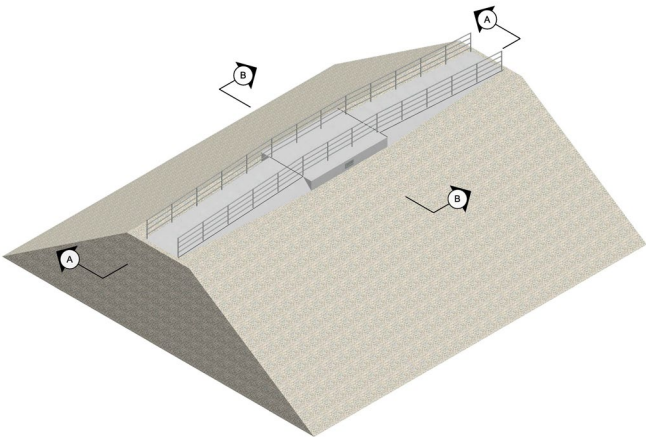
Ballona Creek Trash Interceptor™

Case Study	Ballona Creek Interceptor
Location	City of Los Angeles, Los Angeles County, California
Receiving Water Body	Ballona Creek
Project Implementation Status	Operational since October 2022, permanent configuration approved in 2024
Proximal Environmentally Sensitive Area	Ballona Wetlands Ecological Reserve (tidally influenced wetland complex)
Technology Classification	Surface-floating boom array with mid-channel, solar-powered barged interceptor
Funding Mechanism	Hybrid funding model: municipal, NGO, and private sponsorship

Project website: <https://ballonainterceptor.lacounty.gov/>



Ballona Creek Trash Interceptor™





Tijuana River Trash Boom



Case Study	Tijuana River Trash Boom
Location	U.S. Section of the International Boundary and Water Commission, San Diego County
Receiving Water Body	Tijuana River
Project Implementation Status	Operational since November 2024
Proximal Environmentally Sensitive Area	Wetland of International Importance
Technology Classification	Boom interceptor anchored in riverbed, loader/excavator removal
Funding Mechanism	State Water Resources Control Board, funding running out



San Gabriel River Trash Mitigation Project

Case Study	Ballona Creek Interceptor
Location	City of Seal Beach or City of Long Beach
Receiving Water Body	San Gabriel River/Pacific Ocean
Project Implementation Status	Feasibility Study completed end of 2025
Proximal Environmentally Sensitive Area	Proposed critical habitat for Pacific green sea turtle/Los Cerritos Wetlands
Technology Classification	Floating boom interceptor, details and removal method TBD
Funding Mechanism	Hybrid funding model: municipal, federal, NGO, and private sponsorship

Project website: <https://www.sgrcleanup.com/>



San Gabriel River Trash Mitigation Project



Evaluating Solutions

Trash Capture Devices in the San Gabriel River



1

How does trash end up in our rivers?

During storms, runoff can take trash littered on the sidewalk, roads, or other areas and bring them into the rivers and channels that eventually flow to the ocean. Urban trash is mostly made up of floatables like plastic bottles or containers, but can also contain textiles and larger items like tires and mattresses.

80% of marine debris originates from land sources.

2

Trash Capture Devices

There are various methods for capturing trash in river systems. These kinds of devices have been deployed or installed across the country to combat trash pollution.

There are many differences and trade-offs when considering trash capture devices. For example, mechanized devices can have higher capital costs but are more efficient and have a higher capture rate than passive systems.



In-line Trash Nets or Screens
Placing a trash net, screen, or other type of grate in the direction of flow captures trash that would otherwise flow past.



Treatment Chambers
These treatment chambers can be installed to capture trash before flows outlet to the rivers, such as at catch basins.

3

Trash Capture is an Interim Solution

Trash capture devices are just one part of the solution. Behavior change, producer responsibility and improved waste management practices are all needed to reduce the amount of litter that makes its way into rivers and oceans.



Floating Booms
Floating booms installed on the water surface are typically anchored and collect trash while water flows past and underneath.



Trash Wheel Systems
Typically installed on the side of a river, a water wheel powers a conveyor belt that brings trash from the water surface and into trash bins.





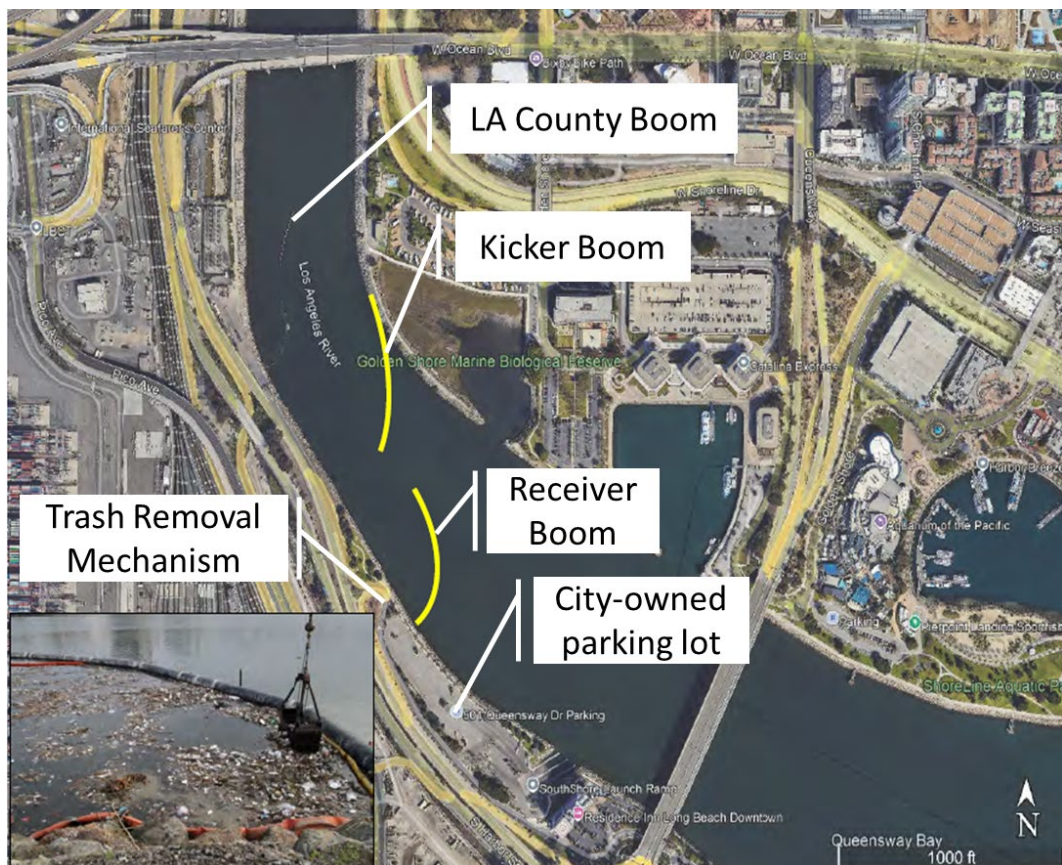
Los Angeles River Marine Debris and Trash Capture Pilot Project



Case Study	Lower Los Angeles River Marine Debris and Trash Capture Pilot Project
Location	City of Long Beach
Receiving Water Body	Los Angeles River/Pacific Ocean
Project Implementation Status	Feasibility Study completed April 2026
Proximal Environmentally Sensitive Area	Golden Shores Marine Biological Reserve
Technology Classification	Floating kicker and receiver boom with options for removal
Funding Mechanism	Hybrid funding model: municipal, NGO, and private sponsorship



Los Angeles River Marine Debris and Trash Capture Pilot Project





Pico Kenter Outfall Trash BMP Improvements Project

Case Study	Ballona Creek Interceptor
Jurisdiction/Location	City of Santa Monica
Receiving Water Body	Santa Monica Bay/Pacific Ocean
Project Implementation Status	Advanced feasibility study, design, and permitting underway
Proximal Environmentally Sensitive Area	Sandy beach
Technology Classification	TBD
Funding Mechanism	Municipal general funds



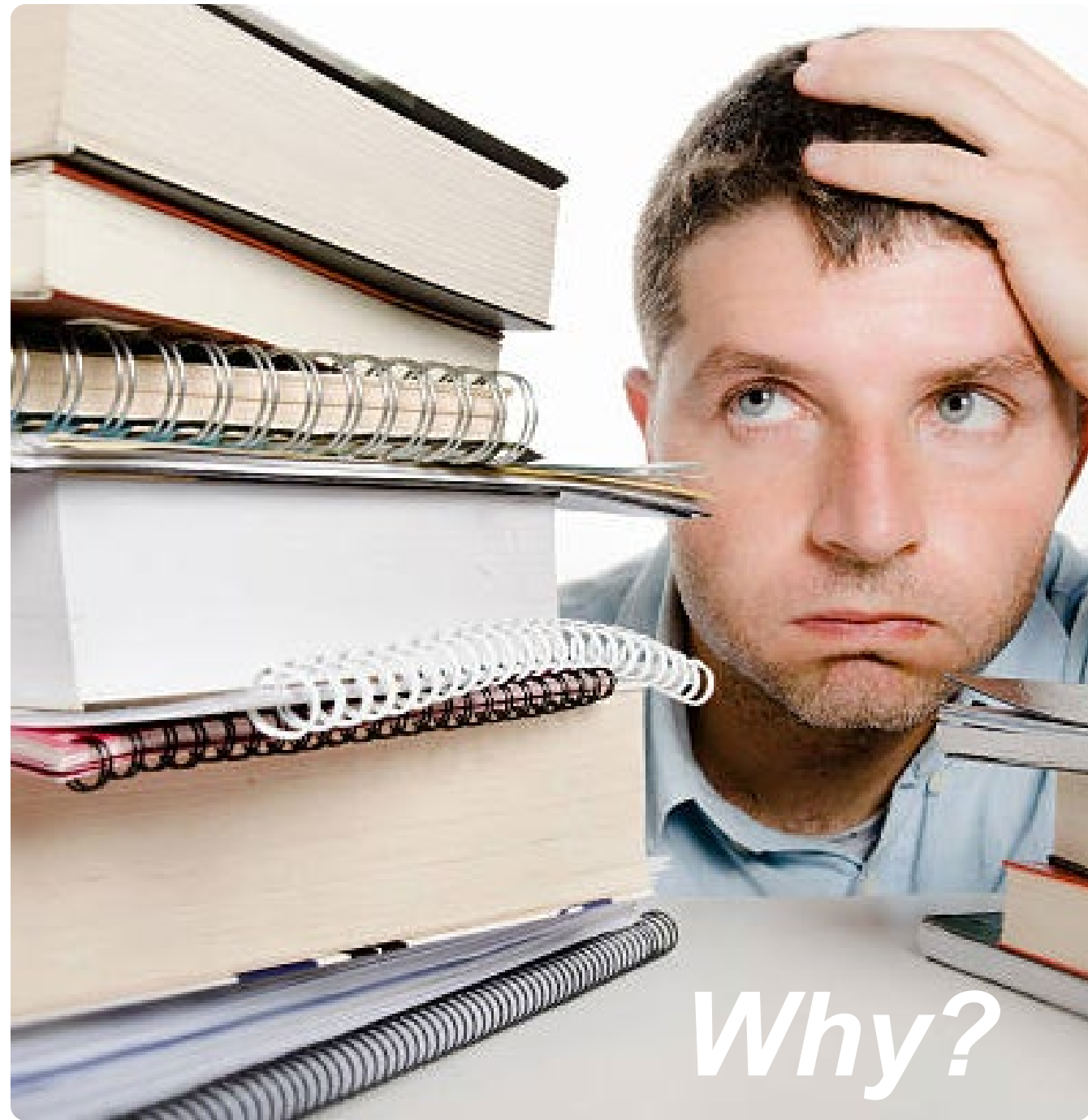


Typical Project Approval Process



Common Technical Studies

- Geotechnical Investigation
- Hydrologic and Hydraulic Analyses
- Topographic/Bathymetry Surveys/Utility Locating
- Agency/Aquatic Resources Delineation
- Aquatic Biological Resources Study
- Upland Biological Resources Study
- Essential Fish Habitat Assessment
- Eelgrass Survey
- Archaeological Resources Study
- Historical Resources Study
- Recreation Use Consistency Study
- Visual Impact Assessment
- Noise Study
- Odors Analysis
- Vectors Analysis



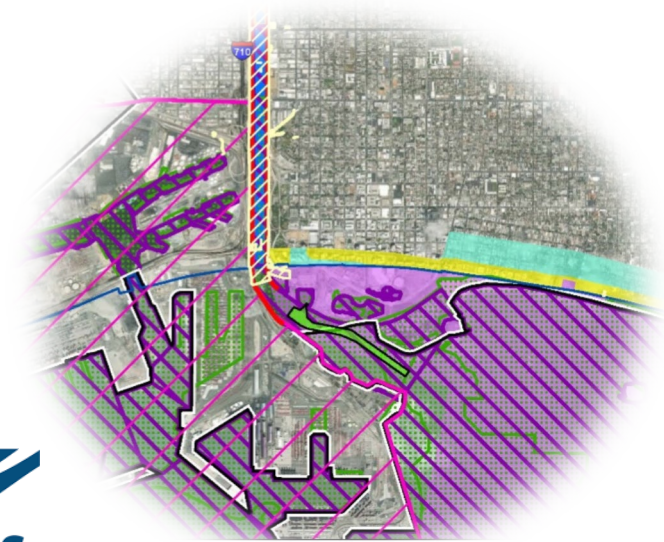
Why?

Permitting

- Many Local, State, and Federal agencies involved in approval process
- Can involve public environmental review
- Permitting is a critical part of project schedule



**US Army Corps
of Engineers®**





Permitting - Federal

Regulatory Agency	Permit/Approval	Potential Trigger
United States Army Corps of Engineers	U.S. Rivers and Harbors Act, Section 408 Authorization	Alteration of a USACE Civil Works project
	U.S. Rivers and Harbors Act, Section 10 Permit	Construction of any structure in or over any navigable water of the United States
	Clean Water Act, Section 404 Permit	Discharge of dredged or fill material into Waters of the United States
	National Environmental Policy Act	Issuance of a federal permit/approval
United States Fish and Wildlife Service	Federal ESA, Section 7 Consultation	Federal actions that may affect terrestrial or freshwater T&E species or designated critical habitat
National Marine Fisheries Service	Federal ESA, Section 7 Consultation, Magnuson-Stevens Fishery Conservation and Management Act	Federal actions that may affect marine or anadromous T&E species or designated critical habitat, essential fish habitat
State Historic Preservation Office	National Historic Preservation Act, Section 106 Consultation	Requires federal agencies to evaluate the impact of their actions on historic properties
United States Coast Guard	Navigational safety	Installation of infrastructure in navigable waters



Permitting – State and Local

Regulatory Agency	Permit/Approval	Potential Trigger
California Coastal Commission	California Coastal Act	Development in Coastal Zone
Los Angeles Regional Water Quality Control Board	Clean Water Act, Section 401 Water Quality Certification	Required for projects with a federal nexus that may have an impact on water resources
California Department of Fish and Wildlife	California Fish and Game Code, Section 1602 Streambed Alteration Agreement	Potential alterations to a river or streambed, banks, or adjacent riparian vegetation
	California Endangered Species Act, Section 2081 Incidental Take Permit	Take of a state-listed threatened or endangered species
City or County Site Development Permit	Municipal Code	Use of onshore trash collection facilities
County Flood Control	Encroachment Permit, Non-federal sponsor for Section 408 Authorization	Trash capture facility in stormwater management infrastructure
Lead Agency	California Environmental Quality Act	Public agency proposes, funds, or approves a "project" that may cause a direct or foreseeable indirect physical change to the environment



How can the Process be Accelerated?

- Choose your locations and technologies wisely
- Early agency/stakeholder consultations
- Avoid federal levee alteration
- Design within limitations for abbreviated permitting
- Don't invite unnecessary approvals
- Utilize CEQA Exemptions/NEPA Exclusions
- Consider pilot phase
- Positive influence by elected officials
- Don't forget about the geotechnical phase
- Secure funding



Cutting ^{the} Green Tape



For more information, please contact:

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Questions

