

2017 WEDA Environmental Excellence Awards

CATEGORY:
Dredging for Navigation

PROJECT NOMINATION:
Bayport Ship Channel (BSC) and Barbour's
Cut Channel (BCC) Improvement Project

SUBMITTING ENTITY:
Port of Houston Authority



SUMMARY

The need to accommodate larger, more efficient, container cargo vessels to remain competitive provided the impetus for the Port of Houston Authority (PHA) to improve its associated navigation channels, a challenge many U.S. ports are facing currently.

Many channels are Federally-constructed or maintained, and invoke a host of Federal permit and approval requirements, primarily with the U.S. Army Corps of Engineers (USACE). Port authorities should know these requirements in detail, to successfully build improvements, as they can significantly impact planning and construction schedules, if they choose to do so outside of a Federally-led feasibility study process.

PROJECT TEAM MEMBERS

Affiliation	Team Member	Role
Port of Houston Authority	Mark Vincent, P.E.*	Project Director
	David Casebeer, P.E.*	Project Manager
Joint Venture of AECOM and Gahagan & Bryant Associates, Inc.	Dana Cheney	Project Permitting
	Rod McCrary, P.E.	Dredge Material Quantities & Characterization
	Carl Sepulveda, P.E.	Agency Coordination
	Ashley Judith, P.E.*	Public Outreach
	Chester Hedderman, P.E.	Engineering Plans & Specifications
	Sara Halpin	Construction Management

* WEDA members

ENVIRONMENTAL BENEFITS

The project will allow larger, more efficient economy-of-scale container vessels to deliver the same needed cargo using less trips, less fuel, with less light-loading, resulting in fewer emissions over the long term. Potential reduction of tug assists for turning into the channel could also reduce emissions. New work dredged material was used beneficially in existing Placement Area (PA) 15 to raise levees to increase system capacity and for future levee raising or repair of Spilmans Island PA. This form of BU increases the capacity of the existing PA, extending the life of the PA, and also eliminates the need to mine new bay bottom to supply levee building clays. The increased levee height at PA 15 and resulting increased capacity from new work levee raising offsets the decrease in overall system maintenance capacity that would otherwise result from this proposed project. Challenges included undergoing three separate Federal and environmental approval processes in a compressed timeline including marrying of private action Regulatory approvals with Federal project approval, air conformity compliance in a Clean Air Act nonattainment area, oyster reef growth that lined one of the navigation channels (Bayport), and quickly dealing with unanticipated tidal marsh mitigation.

The project was designed to avoid reef impacts as much as practicable while still producing needed navigational improvement. Mitigation of impacted oyster reef consisted of constructing an artificial cultch reef using approximately 13,000 tons of clean crushed limestone at Fisher's Reef that replaced impacted reef containing lower measured average



Equipment shaping clay balls to raise the levees at PA 15



Oyster recruitment on reef mitigation cultch



Under water recruitment of oyster spat on placed cultch

live oyster density with reef that recruited greater measures live oyster densities through the first two years of monitoring. Mitigation reef relied on natural recruitment of oysters on the crushed limestone which has been demonstrated to achieve high rates of initial settlement, as observed in initial monitoring. Mitigation also included purchasing wetland mitigation bank credits to offset tidal marsh impacts.

INNOVATION

The PHA was faced with the reality of real-world changes to vessel sizes driving a need to improve key Federal navigation channels ahead of any planned Federal study/project. The increasing nature of related Federal regulations and permitting imposed a timeline that demanded execution significantly faster than business as usual. With the trend towards larger, more efficient container cargo vessels, and the Panama Canal expansion expected to increase their presence in U.S. waters, container ports need to improve navigation channels to accommodate these larger vessels and remain competitive. Many channels are Federally-constructed or maintained, and invoke a host of Federal permit and approval requirements, primarily with the USACE. The challenge to undergo three major approval processes for two major navigation channels in less than two and a half years required innovation and speed in conducting permitting, agency coordination, design and contracting to ensure execution timelines were met.

The approval "journey" involves the familiar, such as the Clean Water Act (CWA) Section 404 permit, and less familiar processes under Section 408 of Title 33 of the U.S. Code (33 U.S.C. 408), and Federal assumption of maintenance (AOM) under Section 204(f) of the Water Resources and Development Act (WRDA) of 1986. Besides the Section 404 permit, separate reports are required for Section 408 and Section 204(f), variously covering how the Federal channel will be modified, what effect if any, it will have on the intended performance for the existing Federal project, economic justification for AOM, and what are the potential change in Federal maintenance amounts. At the time, very few projects in general, and even less for navigation, had undergone all processes, especially simultaneously, since more recent policy emerged. Section 408 of 33 U.S.C. requires Secretary of the Army approval (since delegated to the Chief of Engineers) to modify existing USACE projects, which includes Federally-maintained channels. Renewed emphasis on 33 USC 408 for navigation is emerging given the impending navigation improvement needs in the nation. Section 204(f) of WRDA 1986 sets the basic requirement for Federal AOM of the improved channel to be approved if economically justified, environmentally acceptable, and it meets appropriate engineering and design standards.

Given the typical lengths of these individual processes, completing all three in a timely manner to meet most ports' needs, necessitates performing these concurrently, leading to the need to integrate all three processes, and for high levels of consistency in report documentation, terminology, project extent/amounts, conclusions and other reporting aspects.



New cranes in transit to Barbours Cut Container Terminal

Time Constraints

Growing shipping demand driven by the fast growth of Houston and Texas, plus the Port of Houston's role in delivering the majority of Gulf Coast container tonnage, makes improving the Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC) crucial and time-sensitive. To address obsolescence of the BCT, the PHA planned upgrades to the terminal including replacement of ship-to-shore gantry cranes with new ones to service a 69 m (225-foot) beam. The crane span and new setback would encroach on the current Federal channel. BSC inefficiencies, larger vessel presence already happening and growing, and dependence on the BSCCT's planned capacity to accommodate growing demand, also required executing BSC improvements soon. Since both projects were needed expediently and collocated in the same port system, it only made sense to plan, permit and construct these projects under a single coordinated effort. BCT crane delivery formed the key time constraint.

Policy Constraints

Each approval requires a separate decision document (i.e. report), generates a need for a National Environmental Policy Act (NEPA) document, and is managed by different District. Section 204(f) typically led by the Planning Section of the District Planning and Environmental Branch, Section 408 led by the Section 408 coordinator, who may be in the District Operations Division, while Section 404 is led by the District Regulatory Division. Different project aspects (e.g. environmental, real estate) may require approval by functions different from the managing organization. NEPA and environmental compliance of Section 204(f) and Section 408 reports are managed by the Environmental Section of the District Planning Branch, while these are handled by the District Regulatory Division for Section 404.

Section 204(f) and Section 408 decision documents require Agency Technical Review that may involve a

separate set of reviewers for each. If not exempted by USACE, the Section 408 report will be subjected to a Type II Safety Assurance Review (SAR) IEPR for any projects deemed to have life safety issues. The approval process also includes review at each level of command (e.g. district, division) and Section 204(f) and Section 408 approvals from the District through Division, to HQUSACE, with only the Section 408 having a possibility of exemption from Division or HQUSACE approval as specified in EC 1165-2-216. Finally, the Assistant Secretary of the Army for Civil Works [ASA(CW)] must sign and approve the Section 204(f) report.

Approach to Constraints

It was necessary to minimize the sequential review and separate document preparation, in order for the contract to be awarded and the BCC improved in time for delivery of the cranes. This required a mutual agreement between the PHA and the USACE on ground rules for combining reports and review processes. Though approvals have to occur sequentially, it does not mean that reviews have to. Permittees should discuss with the USACE which reviews can occur concurrently. Because each approval focuses on different purposes and decision documents, reviews should mostly be able to progress concurrently. However, policy in EC 1165-2-216 limits consolidation and review concurrency, specifying that no Section 404 permit decision documentation will be forwarded to Division or HQUSACE commanders approving Section 408, to preserve the independent 404 decision-making authority of the District and Division Commanders. This results in impacts for Section 404 being documented separately from the NEPA documentation for Sections 204(f) and 408.

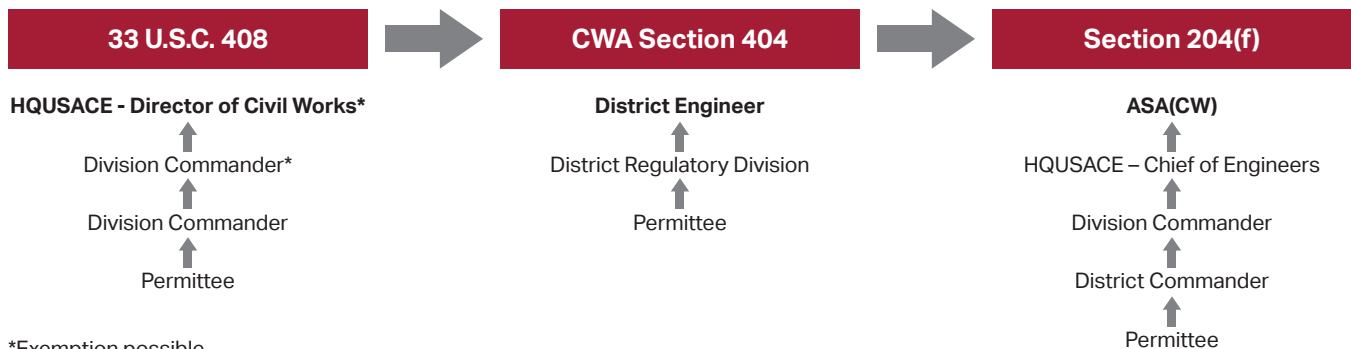
EC 1165-2-216 emphasizes that a Section 404 permit decision cannot be rendered before the Section 408 decision. The EC also states clearly that a Section 204(f) report cannot be submitted to ASA (CW) for approval until Section 408 and 404 approvals are made. This is summarized in Figure 1. This puts either

the Section 408 report or Section 404 permit approval on the critical path. Both EC 1165-2-216 and ER 1165-2-124 make clear that the Non-Federal Sponsor must have 204(f) approval before the project starts construction to be eligible for Federal AOM. EC 1165-2-216 clarified that “start of construction” is defined as award of the first construction contract, and requires ASA (CW) approval to grant an exception to allow for solicitation prior to the required approvals. Therefore, the timing and risk for procuring project construction can also be affected greatly by this critical path.

Steps and Timeline

Because of the short timeframe for three approval processes, a planning charrette was conducted in January 2013 to set the scope and framework of each approval, discuss schedule constraints, timelines, review strategy, issue resolution, vertical chain coordination, identify and if possible, resolve policy gray areas, and identify who will produce the decision documents and perform certain analyses. There had to be a clear division of responsibilities, constant communication, and acceptance of roles critical to meeting the production, review, and resolution of decision documents mandated by policy by both the PHA as Non-Federal Sponsor, and the USACE as approver. The PHA produced Section 408 and Section 204(f) decision documents and NEPA reports, except for economic analysis. The USACE was charged with issue resolution, review, Section 204-related analyses, and expediting the Section 404 permitting process. District, Division, and HQUSACE staff integrated through the Vertical Team, including formed the USACE team. District staff formed the Project Development team (PDT) responsible for managing progress and development of Section 204(f) and Section 408 decision documents on behalf of the USACE. The USACE’s Deep Draft Navigation Planning Center of Expertise (DDNPCX) performed the navigation economic analysis. Periodic in-progress reviews were also used for early and continued issue resolution through the vertical chain of command, and

Figure 1: Federal approvals sequence (technical and legal reviews not shown)



with DDNPCX to minimize higher-level review issues during formal review.

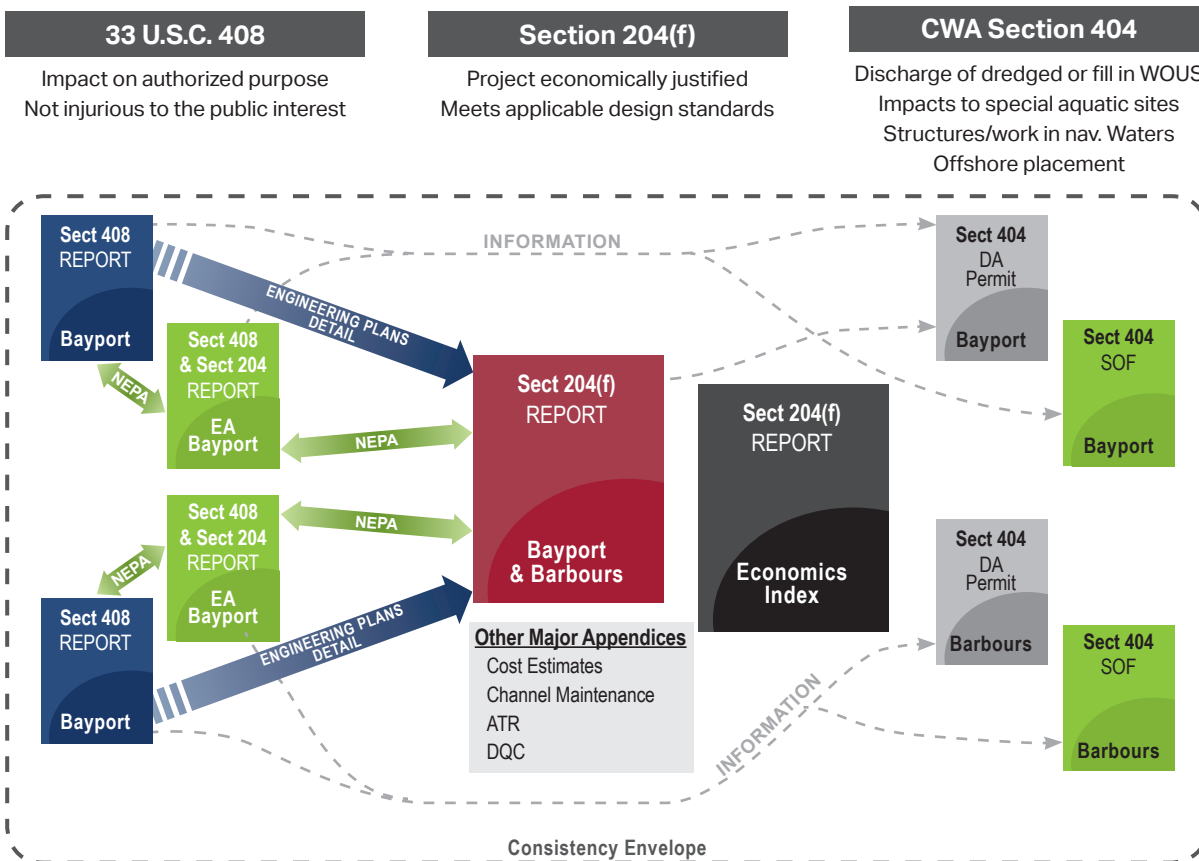
PHA sought exemptions to risk analysis and review more related to managing flood risks to further expedite the approval process. Though project costs met one of the triggers to perform a Type I IEPR, the project actions did not involve the life safety factors to trigger Type II SAR. The PHA provided input to building the case that the project did not involve several factors for exclusion including lack of complexity and novelty of design, and no presence of life safety factors associated with the project not performing as intended. These exclusions were granted and saved another level and round of review.

Documents were shared or referenced where possible. Figure 2 summarizes the approvals, the sharing and flow of documents, and information. In this figure, green reports represent NEPA documents. EAs were written to serve as common NEPA documentation for both the 408 and 204(f) purposes, shown by the green, two-way arrows. Section 408 engineering plans and design detail were used to satisfy the 204(f) requirement, shown by the blue arrows. The Section 404 Statement of Findings (SOF), equivalent to an Environmental Assessment (EA), is kept separate. Finally, the dark blue dashed line shown as the "Consistency Envelope" is meant to illustrate that all

the sharing and referencing of documents resulted in a requirement for consistency spanning all including wording of the project purpose and need, project name, terminology, description of the placement plan, dredged material quantities, channel dimensions, impact acreages, and impact phrasing. The level of consistency often rose to requiring verbatim phrasing or exact same significant digits of quantities. Therefore, the level of consistency expected from the USACE should be discussed early in the process, to minimize editing and revision later.

The other innovation in this multi-pronged permitting process was the level of involvement, broadcasting and commitment to critical planning, contracting, and approval milestones that would ensure construction could both meet the PHA's needed timeline for the BCC crane delivery, and execution of the new work dredging could fold in with the timelines and needs of maintenance dredging, ongoing maintenance material placement, and PA management. This is discussed further in the next section. Meeting these timelines required flexibility and interpretation of gray areas of policy to the favor of meeting these commitments, and the constant communication of the needs and timelines between the PHA and the USACE vertical chain of command was crucial to staying on the same page.

Figure 2: Report documentation consolidation and sharing for Sections 204, 408, and 404



ECONOMIC BENEFITS

As maintenance material placement capacity is always needed in the Houston Ship Channel system, extending the life of PAs through levee raising and other such measures place a perpetual demand for construction material, that this project met through beneficially using necessary new work dredging and coordinating that with needed PA construction actions. This effectively eliminates separate mobilization, cost, and bay impacts of separately dredging just to mine materials, saving many tens of millions of dollars for an effort similar in scale as the projects in question. Other benefits were combining projects for both channels into an umbrella approval and contracting effort, realizing efficiencies in permitting, contracting, engineering, and mobilization costs. The new work dredging effort with placement in PA 15 was coordinated with ongoing PA maintenance placement and ditching/dewatering, and timed to follow this event, so as not to lose the opportunity to place construction material where it was needed, without having to stockpile and rehandle it. Other project efficiencies were to schedule the project construction dredging to coincide with other scheduled channel maintenance to further avoid separate contracts and mobilization just to maintenance dredge separately. Even for the portion of the project where material was not directly used in levee raising at Spilmans Island PA, stockpiling of material avoided robbing interior capacity, and used as material positively as much as possible to avoid extra dredging, mining, and impacts for future repairs and capacity.

To receive approval for continued Federal maintenance under Section 204, the projects had to demonstrate through USACE deep draft navigation economic analysis that the proposed projects provide more economic benefit than they cost to build. The National Economic Development (NED) navigation benefits



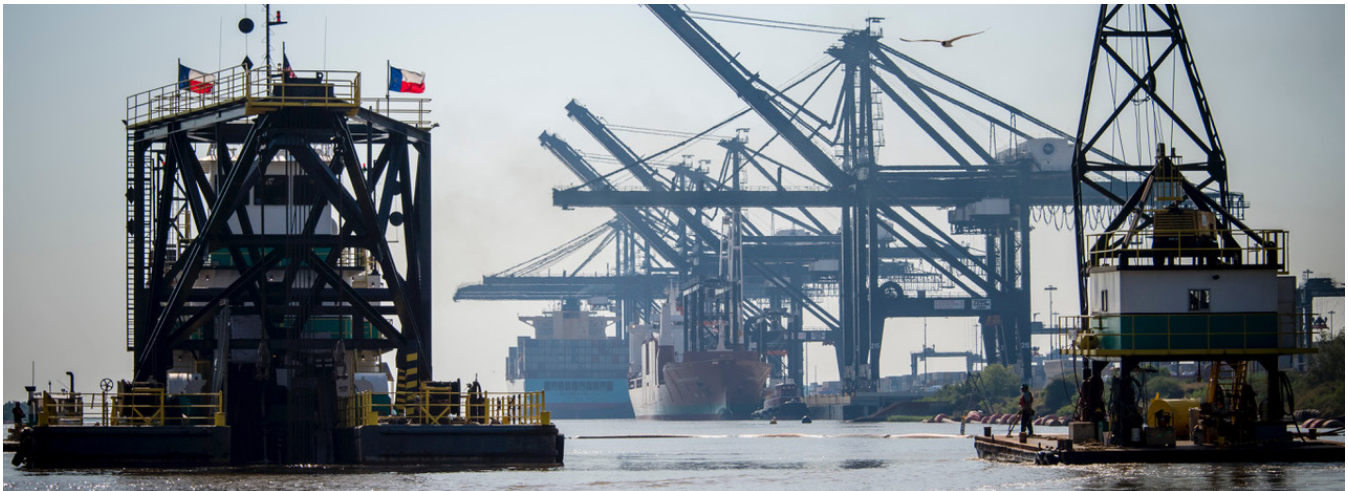
Shore protection being redistributed to accommodate channel modifications

were based on reducing vessel transportation costs between future without and with project conditions over a 50 year period of analysis. Much of these benefits come from reducing light loading and vessel delays associated with a shallower, unimproved channel. The net benefits for the best performing alternatives (and selected projects) are provided in the table below.

Of the plans evaluated, the alternatives that maximize net benefits were those greatest in scope of those considered: BSC 45 feet deep and 400 feet wide and BCC 45 feet deep and 300 feet wide. These alternatives together had estimated average annual benefits of \$38,680,000, average annual construction costs of \$6,551,000, net benefits of \$32,129,000, a B/C ratio of 5.90, and incremental annual O&M of \$2,310,000. As previously noted, plans with depths in excess of 45 feet were not considered as both BSC and BCC are constrained by the controlling depth of the Houston Ship Channel (-45 feet MLT). These improvements will reduce cost to shippers and to the supply chain.

Table 2: Benefit Cost Analysis - Summary

Alternative	Average Annual Benefits	Average Annual Costs	Net Benefits	Benefit-to-Cost Ratio
BSC 43 x 400	\$14,560,000	\$5,450,000	\$9,110,000	2.67
BSC 45 x 400	\$20,060,000	\$6,048,000	\$14,012,000	3.32
BCC 43 x 300	\$13,740,000	\$458,000	\$13,282,000	30.02
BCC 45 x 300	\$18,620,000	\$503,000	\$18,117,000	37.02
BSC 43x400 and BCC 43x300	\$28,300,000	\$5,908,000	\$22,392,000	4.79
BSC 43x400 and BCC 45x300	\$33,180,000	\$5,953,000	\$27,227,000	5.57
BSC 45x400 and BCC 43x300	\$33,800,000	\$6,506,000	\$27,294,000	5.20
BSC 45x400 and BCC 45x300	\$38,680,000	\$6,551,000	\$32,129,000	5.90



Dredge working to deepen and widen the channel

TRANSFERABILITY

The lessons learned from undergoing the approval process are transferable to any U.S. port planning to modify the existing Federal channels serving their port, as any such modification will invoke the need to undergo all three approvals to a) improve the channel, and b) keep maintenance of the improved channel under Federal auspices. The trend towards larger vessels, whether container, bulk liquid, or other, should make these lessons learned applicable to any port contemplating improvements in the near future, without waiting for a Federal study to do so. Staging new work dredging opportunistically to coincide with existing or future maintenance contracts is a concept that can be implemented by other ports as well.

OUTREACH AND EDUCATION

The PHA engaged in early public coordination for the BSC permit application through open house public meetings, targeted meetings with local leadership and municipal government, and local recreational stakeholders, ahead of permit public comment periods. These efforts went beyond what is typically done for an EA. Comments were received from approximately 316 respondents, approximately 258 of them individuals, and 10 of them resource agencies. This coordination was instrumental in shaping project components, as an estimated 92 percent of comments were related to a dredged material placement option that was removed from the permit request. Constant coordination with Federal and State resource agencies was critical to smooth determination of impacts and implementation of mitigation. They were consulted primarily through the long-standing Beneficial Uses Group (BUG) where project alternatives were presented and input sought especially dredged material placement and oyster mitigation. Subject matter input was sought for existing resource data and mapping, survey methodology, T&E species, oyster

habitat surveillance and mitigation siting, and Essential Fish Habitat (EFH) assessments. The representatives were from the local districts, regions, and field service offices pertinent to the project area. Federal and State agencies consulted:

Federal Agencies

- U.S. Army Corps of Engineers (USACE), Galveston District
- U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS)
- National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS)
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)
- U.S. Environmental Protection Agency (USEPA)

State Agencies

- Texas Parks and Wildlife Department (TPWD)
- Texas Commission on Environmental Quality (TCEQ)
- Texas General Land Office (TxGLO)
- Texas Historical Commission (THC)

Latter stages of outreach included an industry day for the dredging community during the contracting phase, ahead of releasing solicitations, in order to answer questions that would shape the solicitation into a biddable, constructible effort. This was done for both the dredging and oyster mitigation contracts. The outreach to the dredging and port management communities to share in these lessons learned include presentations at ASCE's Coasts, Ocean, Ports and Rivers Institute (COPRI) Ports 2013, American Association of Port Authorities (AAPA) 2014, WEDA Dredging Summit and Expo 2015 and PIANC Dredging 2015.