Development of Former Oakland Army Base

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Number of Words: 7,000

ABSTRACT
The development of the former Oakland Army Base (Project) by the Port of Oakland and City of Oakland has required innovative funding, adaptable delivery methods and persistence in the face of extreme challenges to successfully bring the Project to the point of construction and delivery. This $1.2 billion Project will boost rail access and capacity at the Port, provide infrastructure to target near-term opportunities in manifest and bulk cargo and develop advanced intermodal container handling facilities to poise the Port of Oakland to take advantage of its deep channels and existing rail connections. The resulting global trade and logistics center is a project of national significance. The Port of Oakland is the only international trade gateway for the northern California mega-region; it is the leading U.S. export gateway on the west coast and it is the fifth-ranked U.S. seaport by containerized cargo movements.

The federal Base Realignment and Closure (BRAC) Commission closed the Oakland Army Base (OAB) in 1993. The land was transferred to the City of Oakland (City) and Port of Oakland (Port) from 2003-2006. After two decades of strategic planning for the redevelopment of the base and the surrounding lands, the implementation of a bold vision to revitalize Oakland’s working waterfront is nearing fruition.

In order for the Port and City to implement this development in the midst of a global economic recession, they created a strategy of project phasing and multi-party public-private-partnerships (PPP). The Project is phased to focus initially on basic rail infrastructure; mainline connections, support rail yard and bulk/manifest delivery facilities (Phase 1). The plans for future Phase 2 include a wide-span gantry intermodal yard, necessary rail access enhancements to support the intermodal operations and other industrial land uses. The PPP includes City, private developer participation, as well as state and federal funding, which imposed stringent scheduling requirements on the Project. In order to meet these schedule milestones, the design-build delivery method was employed for portions of the Project. The design-build delivery method allowed the Project to be bid and initial elements of the construction to be underway in time to meet funding milestones.

The Port has been planning for the redevelopment of the former OAB for decades and refers to the Port’s portion of the Project as the Outer Harbor Intermodal Terminal (OHIT), which is the focus of this paper. The delivery of Phase 1 of OHIT required extensive coordination and collaboration among the Port, the City, private development partners, UPRR, BNSF and affected
public and private utilities. This paper describes the intricate development and provides details of the engineering challenges that had to be addressed.

INTRODUCTION
The Project is located in the Port of Oakland Outer Harbor area with the base of the San Francisco-Oakland Bay Bridge on the north, the residential neighborhood of West Oakland on the east, and the Port of Oakland to the south and west. This 330-acre former base offers a nexus of maritime, rail and highway transportation. After two decades of strategic planning for the redevelopment of the base and the surrounding lands, the implementation of a bold vision to revitalize Oakland’s working waterfront is underway. The Port’s OAB development area is approximately 185 acres of land area and 56 acres of submerged area. The City’s OAB development area is approximately 228 acres. The OAB redevelopment property is shown with shaded areas in Figure 1. The Port’s property is subject to Tidelands Trust obligations, and is restricted to maritime uses. Both the Port and City agree that the best use of the OAB is for marine cargo related activities. The location and constraints of OAB properties made it suitable for rail service infrastructure and cargo transload warehouses.

Figure 1 – OAB Redevelopment Property

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The selected rail infrastructure for the Project include high speed connections to Union Pacific Railroad (UPRR) mainlines, arrival/departure tracks, support yard tracks (storage and classification of rail consists), bulk and manifest delivery facilities (dumpers and ramps), and a wide-span gantry intermodal yard (WSGIY).

Funding for the joint Port and City Project includes private, Port, City, state and federal funding. State funding is provided through the Trade Corridors Improvement Fund (TCIF) managed through the California Transportation Commission. Federal funding is provided through the Transportation Investment Generating Economic Recovery (TIGER) Grants. The Port and the City entered into a Cost Sharing Agreement (CSA) that further defines the funding breakdown, including private investment, and requirements for the various segments of the Project.

TCIF, TIGER and CSA agreements imposed stringent scheduling requirements on the OAB project. In order for the Port of Oakland to meet the CSA and TCIF milestones, construction contracts needed to be in place and construction started by mid-2013. TIGER also had construction milestone requirements. In addition, the Port’s OHIT project was subject to the Port’s Non-Discrimination and Local Business Utilization policies, as well as state and federal procurement requirements. In order to meet the various schedule milestones and comply with procurement requirements, the Port decided to separate the OHIT project into two segments with two different delivery methods:
(a) Design-Build delivery method for the mainline connections and a portion of the rail referred to as the OHIT Manifest Rail Yard. This segment was funded using the state’s TCIF and Port funds. The design-build delivery method allowed the project to be bid and initial elements of the construction to be underway in time to meet the mid-2013 CSA and TCIF milestones.
(b) Design-Bid-Build delivery method for the remainder of the Port’s OHIT Phase 1 development (Support Rail Yard). This segment was fully designed before bidding the construction work and is funded using federal Tiger and Port funds.

This paper presents information about delivery of the Project in the following sections:
- Project Planning – Description of the past decade of Project planning;
- Project Funding – Funding sources and requirements for specific Project elements;
- Environmental Approvals – Description of various environment approvals obtained;
- Stakeholder Approvals – Description of stakeholder outreach and approvals;
- Project Delivery Methods – Project delivery methods employed to meet schedule;
- Engineering Challenges – Description of key engineering challenges addressed.

PROJECT PLANNING

Maritime Development Alternative Study
In 2003, the Port of Oakland commenced the preparation of its “Maritime Development Alternative Study” (MDAS) (1) as a comprehensive approach to capacity and demand management. The Port recognized that capacity can be constrained by maritime facilities, roadway links, intermodal rail links and utilities. Rather than focus on one problem at a time,
the Port undertook a comprehensive examination of all of these issues while balancing public access and environmental stewardship.

The MDAS provided comprehensive growth models and capacity models for each transport element. Through an iterative process, a suite of possible plans was developed to address various demand assumptions. The interleaving of maritime, road, and rail developments was based on a unique approach to assessing the capacity of each system with a common set of measurements. The MDAS also provided an Investment Timeline for each scenario and calculated the relationship between investment and throughput. The MDAS gave Port staff a planning tool to evaluate development alternatives and provide a method by which future development plans could be prioritized in response to demand. The MDAS indicated that rail facility development and supporting roadway infrastructure were critical to the near-term and long-term success of the Port as it responds to increasing cargo demand.

**Rail Development Plan**

Subsequent to the MDAS effort, the Port contracted with Parsons to continue their efforts in rail planning through development of a detailed “Outer Harbor Intermodal Terminal Development Planning Study” (2). This planning study evaluated portwide intermodal rail capabilities and developed concepts for rail and roadway expansion to meet forecast cargo demand. The Outer Harbor Intermodal Terminal (OHIT) was envisioned to occupy OAB property that had been recently transferred to the Port through the BRAC process. The Port’s share of the former OAB was found to be ideal for rail development, being a long linear property adjacent to UPRR rail lines.

The OHIT planning study (also referred to as OAB Development Plan) provided a phased approach to the development of an environmentally “green”, high-capacity intermodal facility at the former OAB as well as supporting roadway and utility improvements. The OAB Development Plan also considered potential improvements to existing rail yards at the Port. The OAB Development Plan includes:

- Facility plans suitable for MOUs with railroads and to support the CEQA/NEPA process;
- Conceptual plans include rail facilities, roadway facilities and demolition/relocation/protection of utilities and other affected facilities;
- Project financial data in the form of intermodal lifts, acres of property and development costs;
- Construction phasing, staging, access and contract packaging concepts; and
- An overview of funding strategies and alternative delivery methods.

The OAB Development Plan envisioned maximizing intermodal rail on the OAB with over a dozen loading tracks under two sets of wide span gantry runs. The planning study also developed concepts for Railport/Desert Yard expansions by the Union Pacific, connection of OAB rail facilities with the Port’s JIT rail yard (operated by BNSF as OIG), and a completely new 7th Street grade separation with underpass at UPRR tracks and overpass at OHIT tail tracks.
Figure 2 illustrates the development plans envisioned in 2007 including the Port of Oakland boundaries, proposed rail facilities and roadways. The Port of Oakland was keenly interested that the OHIT incorporate automation and be environmentally green. With this direction and the goal of accommodating a larger share of the Port’s throughput by rail we began to consider a wide range of possible alternatives and settled on the wide-span gantry intermodal yard arrangement. Not all of the features envisioned in 2007 will be carried forward into the ultimate OHIT development, but the elemental concepts are useful to understand development opportunities.

Figure 2 – 2007 Port Rail Development Plan

Features of OHIT in 2007:
- Two sets of 6 loading tracks placed under two RMC runs;
- 14 storage tracks in a yard east of the loading tracks;
- Dual leads and tail into the loading tracks;
- Truck gates with full-function portal technology/Administration building/M&R buildings;
- In-ground compressed air system/Lighting/Fire service;
- Improved OIG lead track alignment/Expansion of OIG loading and working tracks;
- Potential expansion of Railport/Desert Yard tracks.

Roadway requirements:
- Grade separation at 7th St/Maritime St over OHIT tail/OIG leads (likely overhead);
• Grade separation at 7th St under Railport leads (underpass trench);
• Grade separation at 7th St under Railport proposed storage yard (underpass trench);
• Middle Harbor Road Expansion for traffic growth and OHIT tail tracks;
• Maritime St improvements associated with OAB closure and OHIT access;
• Maritime St and 7th St realignment to accommodate OHIT grade separation.

Ancillary and Other Affected Facilities:
• OAB building and facilities demolition;
• Utility relocation/protection/abandonment;
• Maritime Truck Parking Area;
• Customs and Border Protection facilities;
• Cold storage warehouse;
• Davis/Cuthbertson 115kV substation.

A rendering of the 2007 concept for OHIT development is shown in Figure 3. The former OAB and OHIT are located in the center on the top half bounded by I-880 to the right, Maritime Street to the left, Grand Avenue above and 7th Street running horizontally through the center of the graphic below. Railport storage tracks are to the far right adjacent to I-880 (Railport working tracks are mostly off the graphic). OIG is partially shown at the bottom of the graphic.
Recent Port and City Planning

Subsequent to the 2007 Rail Development Plan, the Port and City continued advancing the OAB plans, exploring business opportunities, seeking stakeholder input and funding sources. Working with CCIG, the OHIT track plans were phased to initially provide a Support Yard and a Manifest Yard with rail access from UPRR mainlines. The focus of initial business was strategized to be bulk train and manifest train operations. This initial phase would later be augmented with a wide-span gantry intermodal yard development in Phase 2. From 2011 to 2012, the Port and City prepared the Master Plan for development of the former OAB.

PROJECT FUNDING

As a result of the Oakland Army Base closure in 1999, the Port of Oakland and the City of Oakland received title to over 400 acres of property surrounding the Port. In order to ensure close coordination of the development of their respective lands, the Port and the City have entered into a Cost Sharing Agreement dated July 27, 2011, pursuant to which the City has contracted with their development partners Prologis and California Capital & Investment Group (CCIG). A summary of project funding is provided in Table 3.

Table 3: Phase 1 OHIT Funding

<table>
<thead>
<tr>
<th>Project Segments</th>
<th>TIGER Grant</th>
<th>Port Match</th>
<th>City Match</th>
<th>Private Match</th>
<th>Total TCIF Grant</th>
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<td>$ 5.7</td>
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<td>2. Rail Access Imps &amp; Manifest Yard</td>
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TCIF Funding

The funding sources for the proposed OAB development included approximately $242 million from the Trade Corridors Improvement Fund granted and administered by the California Transportation Commission (CTC) and the California Department of Transportation (CalTrans) for Phase 1 of the OHIT. Of this, the Port’s share of the TCIF is approximately $65.8 million and the City’s share is approximately $176.2 million along with matching funds.

TIGER Funding

The Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant program, provides a unique opportunity for the U.S. Department of Transportation to invest in road, rail, transit and port projects that promise to achieve critical national objectives. The TIGER program enables a rigorous process to select projects with exceptional benefits, explore ways to deliver projects faster and make investments in our nation’s infrastructure that make...
communities more liveable and sustainable. The Port was awarded $15 million under TIGER IV for the Phase 1 OHIT development.

**Scope of Funded Project**

The scope of the funded Port and City Project improvements includes:

1. **Common Infrastructure**
   - New or improved utility system;
   - Improved roadway network including Maritime Street;

2. **City Improvements**
   - Recyclers into north gateway site;
   - New warehouses on central and east gateways;
   - Berth 7 as a new marine terminal for bulk cargo;
   - Truck parking and service center;

3. **Port Improvements**
   - Phase 1 Rail Yard (Track L1, Manifest Yard, Storage Yard)

Under the proposed delivery plan, the City and its development partners will be responsible for delivering the common utility and roadway work, as well as the City improvements as noted above. The Port will be responsible for delivery of Phase 1 OHIT Rail Yard. Each entity is responsible for complying with the TCIF grant requirements, including starting construction by 2013. The City and the Port each anticipate constructing portions of their projects through separate Design-Build project delivery methods.

The Port OHIT Rail Yard, Phase 1 Project consists of constructing an approximately 35 acre freight rail yard for the storage and inspection of unit train and manifest train railcars, lead tracks, and signal equipment to connect the Port’s Phase 1 OHIT Rail Yard to UPRR’s existing mainline track system, and track connections to the City of Oakland’s Gateway rail development. The Project will require protection and/or relocation of utilities including a Kinder Morgan fuel line that serves the Oakland International Airport, East Bay Municipal Utility District water lines, Pacific Gas & Electric Company electric lines, and AT&T telecommunication lines. In addition, the project will require a significant amount of coordination with UPRR to connect into their existing rail system. Notice to Proceed for the Port’s OHIT Manifest Yard design-build project was issued April 29, 2013. The TIGER IV grant funded OHIT Support Yard design-bid-build project achieved notice to proceed for construction on September 26, 2013. The Port anticipates completing both projects by the end of 2015.

**ENVIRONMENTAL APPROVALS**

To comply with both California and federal regulations, the Port and City studied the Project to identify potential environmental impacts and to mitigate such impacts to the greatest extent feasible.
California Environmental Quality Act (CEQA)
Upon the announcement of the OAB’s closure, the Port and City collaborated with the Oakland Base Reuse Authority and the West Oakland Community Advisory Group to agree upon a Reuse Plan for the former military facility. In compliance with California law, the Port and City then studied the environmental impacts of the Reuse Plan, prepared an Environmental Impact Report (EIR) and developed mitigations for aesthetics; air quality; biological resources; consistency with plans and policies; cultural resources; geology, seismicity and soils; groundwater; hazardous materials; land use; noise; public services and utilities; surface water; and transportation.

In July 2002, the City, as the lead agency under CEQA, certified the Environmental Impact Report. On September 17, 2002, the Board of Port Commissioners, acting on behalf of the Port as a responsible agency under CEQA, adopted findings and the mitigation program in the City’s EIR. To ensure that both the Port’s and City’s latest development plans for the Project were properly analyzed under CEQA, City and Port staff prepared a 2012 Initial Study/Addendum to the 2002 EIR that evaluated the proposed Project and concluded that the Project would not result in new significant environmental impacts or a substantial increase in the severity of significant impacts already identified in the prior CEQA review.

National Environmental Policy Act (NEPA)
Since Federal TIGER IV grant funding was awarded for the OHIT Support Yard, the Port prepared a NEPA Environmental Assessment (EA) to analyze the environmental impacts of the Support Yard project. The U.S. Department of Transportation’s Maritime Administration reviewed the EA and determined on January 25, 2013, that the improvements to be funded with the TIGER grant did not involve significant environmental impacts and were categorically excluded from further review under NEPA.

RAP/RMP
Transfer of the OAB property from the Army included extensive investigations of soil and groundwater contamination. The State of California Department of Toxic Substances Control and the Oakland Base Reuse Authority (5) agreed to a September 27, 2002 Remedial Action Plan ("RAP") and Risk Management Plan ("RMP") that requires remediation of soil and groundwater contamination and includes requirements for managing groundwater and soil during project construction.

Mitigation and Benefits
Numerous approvals and agreements established mitigations and public benefits associated with construction and operation of the Project. The City entered into a community benefits agreement with a coalition of community groups, covering employment, contracting and environmental benefits related to the Project. The City also signed a Lease Disposition and Development Agreement (“LDDA”) with its Developer that included a requirement for a construction air quality monitoring program to be established in consultation with federal, state and local air quality and public health agencies and the community. Both the Port and the City adopted a Standard Conditions of Approval and Mitigation Monitoring and Reporting Program
(“SCA/MMRP”) in connection with the approval of the 2002 EIR and the 2012 Initial Study/Addendum for the Project under CEQA. All Project construction is subject to relevant mitigations in the SCA/MMRP. Collectively, these commitments provide substantial benefits to the Oakland community.

STAKEHOLDER APPROVALS
The Port’s OHIT Phase 1 Project requires the approval of the stakeholders described below.

UPRR
The Port is working with UPRR for approval of an Industry Track Application for development of and service for a new OHIT rail yard. Parsons has worked closely with the Port and UPRR to achieve a rail operating plan and rail infrastructure designs that will be approved by UPRR.

BNSF
BNSF accesses their Port of Oakland facility, which is primarily at the Oakland International Gateway (OIG) using UPRR trackage rights granted by a Surfack Transportation Board agreement. The OIG is located south of OHIT across 7th Street. Since OHIT accesses UPRR tracks, UPRR is the primary approver. Throughout Project development, the Port has maintained communications with BNSF, facilitated meetings and sought cooperation from UPRR to address BNSF concerns.

Kinder Morgan
Kinder Morgan has two large fuel lines (10 inch and 12 inch) running the length of the OHIT project on UPRR property. The proposed railroad tracks cross or encroach on the Kinder Morgan lines in several locations. The Port and Parsons, with UPRR cooperation, are working with Kinder Morgan to develop pipeline protection plans as part of the Phase 1 OHIT project.

PG&E
Pacific Gas & Electric (PG&E) have a transmission line crossing the mid-point of the OHIT rail yard with existing poles where railroad tracks need to be placed. The Port and Parsons are working with PG&E to locate new power poles and potentially to underground some of their service.

AT&T
AT&T has service lines and underground vaults on the OAB site that need to be coordinated with the proposed rail yard design. AT&T must approve vault protection and maintenance access to the vault.

EBMUD
East Bay Municipal Utility District (EBMUD) has a major 24-inch water line crossing the mid-point of the OHIT rail yard. They will also approve relocation of sanitary sewer lines and lift stations and provide water service for fire hydrants on OAB. The Port and Parsons are working with EBMUD to achieve the design and construction of these elements funded by the Phase 1 OHIT project.
City of Oakland
The City and its development partner CCIG have reviewed and commented on Phase 1 OHIT plans, which provide railroad access and support of their bulk and manifest rail operations. The City/CCIG is designing their portion of the OAB development, which includes West Gateway Leads connected to the north end of the Port OHIT rail yard. The West Gateway Leads are dual tracks that also serve as tail tracks for the Port.

PROJECT DELIVERY
A competitive selection of an engineering firm to support the Port in their OHIT development resulted in Parsons being engaged in May of 2012. Since the TCIF funding agreement required construction to commence by mid-2013, the Port had only a year to accomplish the following activities, with typical time requirements noted parenthetically:

- Prepare design of Port facilities to be constructed on OAB (six months);
- Prepare bid documents to advertise for construction contract (six months);
- Advertise for bids, evaluate proposals, obtain Board of Port Commissioners’ approval, and negotiate a construction contract (six months);
- Contractor mobilization to begin construction (two months).

As can be ascertained by the above list, a traditional approach to project delivery would not satisfy the TCIF schedule requirements. The Port selected the design-build delivery method since this would allow design of more complicated elements of the project to be performed concurrently while early construction activities such as demolition and site preparation proceed.

Parsons quickly proceeded to develop the design-build bid documents, which included conceptual plans and construction requirements. The RFP for the design-build procurement was prepared in two months by July 2012. At that time two events arose that challenged the ability to deliver the project on-time and used much of the schedule contingency that was available. First, the Port was awarded TIGER IV funding, which required re-prioritizing elements of the OHIT that would be constructed under TCIF and those that would be constructed using TIGER funds. Second, the Port revised access to the OHIT Rail Yard to address UPRR concerns regarding constraints on their track system north of the Port. The Master Plan included a “North Lead” concept with leads to the north of OAB on UPRR property and a connection to existing UPRR Desert Yard tracks at Emeryville. UPRR raised the following concerns: their Martinez Subdivision, which runs north from Oakland, would not support additional Port trains due to capacity constraints; the Desert Yard track to which OAB was to connect would often have staged intermodal trains blocking OHIT access; and they also stated that development on UPRR property should be avoided. However, UPRR offered an alternative rail connection to the south of OAB with service provided along the Niles Subdivision (South Lead). The proposal suggested that Niles Subdivision has greater available capacity than the Martinez Subdivision.

The impact of these two events was that significant redesign and repackaging of construction packages needed to be performed. The resulting construction packages are described below. Figure 4 provides a site plan of the various OHIT Phase 1 project elements.
Manifest Yard
The first OHIT Phase 1 construction package provides for development of a Manifest Yard and Track L1, which provides connection to the South Lead as well as to an existing turnout into Desert Yard near the I-880 overpass. The Manifest Yard has five tracks totaling 15,000 feet and Track L1 is 6,700 feet. The Manifest Yard and Track L1 are the eastern most elements of the OHIT development, which allows for a contiguous construction area and a desirable first construction package to be completed in order to avoid conflicts between construction contractors. The Manifest Yard construction is funded by TCIF, which has the most stringent schedule requirements and compelled the use of design-build delivery method. The design-build package was successfully bid and awarded to a Joint Venture of Balfour Beatty with Gallagher & Burk in April 2013.

Support Yard
The second construction package provides for development of a Support Yard located immediately west of the Manifest Yard. The Support Yard has eight tracks totaling 35,000 feet.
and connects to the same lead tracks as the Manifest Yard. The Support Yard construction is funded by TIGER IV grant, which has a similar deadline to TCIF for project completion, but was not as stringent in schedule for start of construction. Parsons was therefore requested to prepare final plans, specifications and estimate to bid for construction with a traditional design-bid-build delivery method. The Support Yard package was successfully bid and awarded to Stacy & Witbeck in September 2013.

**UPRR Connections**

UPRR mainline access is currently planned to be provided from the Niles Subdivisions through Jack London Square on Embarcadero. The “South Lead” connection to the OAB will tie into UPRR mainline tracks just north of Martin Luther King Drive on UPRR West Oakland Yard Lead (MP 6.0) near Adeline Street overpass. The proposed OHIT South Lead track shares the same alignment as the south end leads to UPRR’s Oakland Railport and then follows the western perimeter of Railport. This proposed South Lead track then crosses the 7th Street underpass on an alignment 15 feet westerly and parallel to the existing UPRR Track Number 806 and ties into the existing OIG Arrival/Departure Track.

UPRR has taken responsibility for performing engineering design of the South Lead and performing construction on UPRR property with funding from the OHIT project. The current plan includes significant renewal of the south end of Desert Yard to ensure that existing Railport operations are not affected by OHIT train operations. The construction of the South Lead and connections between the mainline tracks and the Port’s Manifest and Support Yards are included in the TCIF-funded project.

**Utility Protection**

AT&T, PG&E and Kinder Morgan will all self-perform the design and construction of modifications to their facilities. EBMUD designed its waterline relocation and the Port’s contractor will perform construction. The Port is working closely with these utility companies to guide and approve the necessary modifications, which are included in the TCIF funded project.

**ENGINEERING CHALLENGES**

**Track Design**

A rail operating plan was prepared as part of the Industry Track application to UPRR. The operating plan evaluated track utilization and identified any bottlenecks indicated by unacceptably high utilization. The south lead into OHIT is constrained to a single track, but the track utilization by the planned bulk and manifest trains did not exceed acceptable utilization level. The confluence of BNSF OIG trains with OAB trains at the south lead will not allow OAB trains to be switched at this end with a double-over into Support/Manifest Yard tracks; instead, OAB trains will need to be pulled through the Support/Manifest Yard and onto the West Gateway Leads to the north, drop the tail in OHIT and then shove the front portion of the train back onto Support/Manifest Yard tracks. The combination of train arrival/departure switching activity and industry deliveries will strain the West Gateway Leads and we therefore designed increased flexibility in routes for these dual lead tracks. A graphic illustration of the schematic track diagram is presented in Figure 5.
The horizontal and vertical alignments of OHIT track were developed to meet UPRR standards and maximize yard track lengths within the available site footprint. The turnouts from UPRR tracks onto OHIT leads are No. 11s with power switch machines that are Dual Tone Multi-Frequency (DTMF) controlled; all other OHIT yard tracks are No. 9 turnouts with hand throw switch stands. Turnouts are based on BNSF/UPRR Common Standards for Turnouts. Curves are all less than 9 deg 30 minutes. The Manifest Yard track spacing is 15 feet on centers and the Support Yard track spacing is 14.5 feet on centers except for tracks with additional clearance to allow for inspection and maintenance vehicles. There are three primary vehicle lanes running the length of the Manifest/Support Yard. Rail is 136 RE, ties are timber for special trackwork, concrete for running rail, and all ties utilize resilient fastening systems. An illustrative representation of the track design is presented in Figure 6 showing the south end of OHIT Phase 1.

The track design for both Manifest Yard and Support Yard were developed to a final design level of detail. The Manifest Yard is a design-build contract and the track alignment was not identified as prescriptive, however, the Parsons track design was used by the design-builder without modification. Track, ties, fasteners, ballast, subballast, filter fabric and special trackwork were specified prescriptively.
Site Demolition
The site was encumbered by several building foundations, material stockpiles, buried utilities and railroad tracks that will be displaced by the new OAB development. Each of these are identified on the plans and specified to be reused on-site to the extent practicable. Concrete building foundations are to be removed, crushed and reused as aggregate base. Track ballast material is to be reused as aggregate base or subballast, once processed to meet project specifications for these uses.

Grading/Subgrade Preparation
Soil conditions: The OAB generally has four strata: 1) Recent terrestrial fill that is generally granular sandy silt to clayey sand, from 5 to 15 feet thick Below Ground Surface (BGS); 2) Soft fat clay know regionally as Young Bay Mud (YBM) ranging from 5 feet to 30 feet thick below the recent terrestrial fill; 3) Cemented fine grain sand known regionally as Merritt or Posey sand; and 4) Stiff, highly consolidated clays known regionally as Old Bay Mud (OBM). The OHIT project was designed to minimize excavation depth to railroad track Roadbed (subgrade). The subsurface conditions were known to present a risk of settlement, and as part of the geotechnical investigation and design considerations the rail yard were scheduled to be fully lined with filter fabric to prevent migration of fines into the subballast/ballast below the railroad track throughout the site. The project will generate an excavation quantity of 95,000 cubic yards with no significant excavated soil re-used as embankment. All excavated material is to be stockpiled on-site to be used as part of the subsequent OHIT Phase 2 development.

Consolidation Settlement: The amount and rate of consolidation settlements along the proposed track alignment was estimated based on fill and YBM thicknesses. The consolidation estimates were performed for three time periods: six months after embankment construction is complete, 10 years after the Project is complete, and after the primary consolidation is complete. The following observations can be made regarding estimated settlements: For six months after the embankment construction is complete: settlement ranges from ½ inch to 3 inches For 10 years after the Project is complete: settlement ranges from 2 to 7 inches After primary consolidation is complete: ultimate settlement ranges from 2 to 9 inches. The maximum ultimate settlement occurs where the young Bay Mud is thickest.

Improvement Methods: The depth from existing ground surface to the top of YBM is critical. When the contractor removed the load bearing layer of terrestrial fill to a depth where the soft, sensitive, YBM began to deform and "pump" as is virtually guaranteed when excavating toward the YBM surface in the areas of fast land created along the original San Francisco Bay margin. Areas where YBM deformations were notable were treated by the typical methods used regionally including over-excavation, placement of geotextile fabric, and backfill to roadbed elevation with coarse, angular base. Some areas of poor subgrade were mitigated with over-excavation; geotextile fabric; geoweb, geogrid, or geocell; followed by backfill with base. None of the mitigation measures or areas where poor subgrade were encountered was unusual or fully unexpected and the mitigation process is a part of nearly all projects in the Port of Oakland Seaport area.
Storm Drainage

The storm drain design presented the greatest engineering challenge on the project. The Phase 1 project was required to tie into the trunk lines of an existing drainage system on the OAB site. These aged trunk lines are expected to be replaced during future phased development of the OAB, with deeper and larger pipes. The Port OAB storm drains currently outfall at the nearest wharf locations to the west. The City is redeveloping Maritime Street with new utilities and a new City storm drain system. Maritime Street borders the Port OAB property to the west. Port trunk lines that currently cross Maritime Street will conflict with City utilities proposed by the Master Plan. As part of the City/Port common infrastructure development, the OHIT drainage system will connect to the new storm drain trunk line constructed along Maritime Street.

The Support Yard drainage is facilitated with standard bottom-perforated track drains in trenches located at least every other track with subgrade and subballast of the contributing tracks sloping towards the track drain. Track drains are sloped towards eight trunk lines running perpendicularly through and away from the rail yard. The Manifest Yard used track drains and connected to the same eight trunk lines, however, track drains were placed in shallower ditches below the subballast compared to traditional track drain ditches.

The Port operates its storm drain systems under the requirements of the California State Water Resources Control Board Water Quality Order No. 2013-0001-DWQ, National Pollutant Discharge Elimination System (NDPES) General Permit No. CAS000004 (Permit). The Permit is titled "Waste Discharge Requirements (WDRs) for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) (General Permit). The Port permit is independent of the regional permit by which the City of Oakland and most incorporated cities and counties within the region are regulated.

Stormwater treatment measures have been designed to be compliant with Stormwater Technical Guidance (C.3) (6) requirements based on a meeting held with the Regional Water Quality Control Board (RWQCB) on April 4, 2013, regarding the Phase 1 OHIT project. The RWQCB indicated acceptance of: a) bioretention areas for stormwater treatment along the paved maintenance access road "RW1,” and b) open ballast areas with underdrains as a suitable treatment BMP (best management practice) for the rail yard including the paved maintenance road “MR” between tracks S7 and S8. The impervious nature of subballast was noted during the meeting, but the RWQCB did not consider it to be a matter of concern since runoff will be directed into track drains and exposed to infiltration in the existing soils. Since infiltration is a key element of both of the selected treatment measures, the upper strata soils were sampled and subjected to various laboratory tests as part of the project design. The geotechnical report, “Port of Oakland Outer Harbor Intermodal Terminal, Geotechnical Report for High Mast and Street Light Post Foundations” (URS Corporation, August, 2013) states that the upper strata consists of 6 to 9 feet of imported fill characterized as loose to medium dense silty/clayey sand and gravel. The geotechnical memorandum, “Geotechnical Criteria for Outer Harbor Intermodal Terminal Rail Yard, Phase 1” (7) characterizes the in-situ soils as "Fill [consisting] of both dry fill materials, including of a wide range of materials ranging from clayey sands to angular gravels, and dredged spoils, which includes high-plasticity clay, clean sand, and silty/clayey sand. The thickness of fill varies from 5 feet to 15 feet along the proposed railroad track alignment."
The calculations for the bioretention areas were performed as recommended in the C.3 procedures for infiltration and retention. Bioretention areas have been designed to the size required to treat the calculated water quality flow rate and volume of water for bioretention collection area. The typical cross section for bioretention areas consists of:

- An energy dissipation rock section at the upstream entrance where concentrated flows are anticipated
- A 6” drop from the edge of pavement to the slope of bio-soil, where sheet flow is expected
- A bottom width of 4’ with sloped sides and an 8” depth
- An 18” deep bio-soil mixture with draught tolerant vegetation on the surface
- An irrigation system for vegetation establishment
- A 4” bottom-perforated underdrain surrounded by at least 12” of drain rock
- A grated inlet for high-flow bypass
- A 3” difference in grade between the top of grate of the inlet and the finished surface of the bio-soil mix, which allows for stormwater retention

The bioretention areas are designed to treat a combination of the flow and volume regimes. The volume calculations take into account the infiltration through the bio-soil mix. As recommended in the C.3, the infiltration rate within the soil mixture is assumed to be five inches per hour based on the type and gradation of the soil mixture. The flow calculations consider flow through and retention of stormwater. The C.3 recommends a ponding depth of between six and twelve inches. Due to the limited width available for the bioretention areas and the limited depths constrained by shallow existing storm drains, a ponding depth of between three and four inches was chosen for sizing purposes. The top of grate for high flow bypass structure (drop inlet) is designed to be three inches above the bioretention area flow line.

CONCLUSIONS

The development of the former Oakland Army Base by the Port of Oakland and City of Oakland has required innovative funding, adaptable delivery methods and persistence in the face of extreme challenges to successfully bring the project to the point of construction and delivery. The Port’s portion of the Project is known as Outer Harbor Intermodal Terminal (OHIT). Funding includes a combination of Port, City, and private investments that are matched by a combination of State Trade Corridors Improvement Fund (TCIF) and Federal Transportation Investment Generating Economic Recovery Grants (TIGER IV). The OAB project has been under development since 2003 and planning needed revisions to respond to economic downturns, funding requirements, and stakeholder requirements.

The extremely challenging schedule imposed by TCIF and TIGER funding were accomplished through innovative delivery methods. The design-build delivery of TCIF funded portions of the project enabled a value-based selection of a contractor and start of construction at least six months sooner than a traditional design-bid-build approach. The Port was able to maintain much of the control over elements of the project that they felt should be prescriptive, which is not typical. The TIGER funded portion of the project was successfully bid quickly after the design-build contract and has proceeded on a parallel schedule.
The next step in the Project will be the OHIT Phase 2 development of a wide-span gantry intermodal yard and other industry and warehouse facilities. It is anticipated that rail service to the intermodal yard will require north lead access to OAB, which will necessitate a major corridor improvement along the Martinez Subdivision south of Richmond and through the highly constrained area at Emeryville.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the valuable contributions of the following people on the Port OAB project:

- Imee Osantowski, Port of Oakland
- Mark Erickson, Port of Oakland
- Chris Chan, Port of Oakland
- Mary Richardson, Port of Oakland
- Anne Whittington, Port of Oakland
- David Duey, Parsons
- Larry Godbold, Parsons
- Kathryn Grack, Parsons
- Darren Ito, Parsons
- Ken Eichstaedt, URS
- Sathish Murugaiah, URS
- George Cheung, YEI

REFERENCES


7. URS Corporation, October 9, 2012, “Geotechnical Criteria for Outer Harbor Intermodal Terminal Rail Yard, Phase 1.”

8. URS Corporation, August, 2013 “Port of Oakland Outer Harbor Intermodal Terminal, Geotechnical Report for High Mast and Street Light Post Foundations.”
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Development of Former Oakland Army Base

Michael Leue, PARSONS
Barry Mac Donnell, Port of Oakland
Oakland Army Base
A Complex Package

Project Location

Project Master Plan
Transforming the former Oakland Army Base into a modern, world-class, intermodal trade and logistics hub

Project Overview
- Developed Jointly by City and Port of Oakland
- Master Planned for Over a Decade
- 366 Combined Acres
- Connect Rail to Marine Terminals
- Increase Rail Transport / Decrease Truck Traffic / Reduce Emissions / Improve Roadway Safety

Project Components
- Transload Warehouses
- Bulk Rail Served Marine Terminals
- Industry Tracks
- Support Rail Yard
- Future Wide-span Gantry Intermodal Yard

Project Funding

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<tr>
<th>PHASE 1 PROJECT</th>
<th>Total Cost (in $ millions)</th>
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<tr>
<td>RAP/RMP – DTSC Remediation</td>
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<tr>
<td>Rail Access and Manifest Yard</td>
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<td>Unit Train Support Yard</td>
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<tr>
<td>City Site Prep/ Backbone Infrastructure</td>
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<td>Recycling Facilities</td>
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Development Timeline

- **OAKLAND ARMY BASE DEVELOPMENT**

  - Safety
    - Chief Conceptual Design
    - Detailed Design
    - Final Design
    - Final Design Review
  - MDAS 1/1/2003 - 1/1/2004
  - POAK Planning 1/1/1998
  - North Lead
  - South Lead
  - Construction Start 6/14/2013
  - Completion: 12/25/2015

- **Engineering Timeline**

  - Process/Negotiate Bid: 9/10/2012 - 12/21/2012
  - Prepare Design/Build RFP: 7/14/2012 - 9/7/2012
  - Contractor Shovel In Ground: 3/1/2013 - 4/30/2013
  - Contingency: 2013 - 2015
  - Construction Start: 6/14/2013
  - POAK Engagement for Port: 1/2/2012

Major Events

- Change Lead Track Arrangement
- Re-prioritize Elements to use TIGER IV Funds
- Break Construction Packages into TCIF and TIGER
- Modify Engineering Plans
  - Remove North Lead
  - Incorporate South Lead
  - Break Construction Packages into TCIF and TIGER

Schedule Impact

- Response Schedule
- Modify Engineering Plans
  - 5/1/2012 - 9/1/2012
  - 12/1/2012 - 3/30/2013
  - 4/1/2013 - 6/30/2013
  - 7/1/2013 - 9/30/2013
  - 10/1/2013 - 12/31/2013
  - 1/1/2014 - 3/31/2014

PROJECT IMPLEMENTATION

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Port Contractor Teams

- Site Grading, Drainage, Subgrade, Subballast, Manifest Yard & Lead Tracks
- Support Yard Tracks & Infrastructure
- Balfour Beatty/ Gallagher & Burk JV
- Stacy and Witbeck, Inc.

Stakeholders

- UPRR South Lead & Infrastructure*
- BNSF OIG Access
- Kinder Morgan Pipeline Protection*
- East Bay Municipal Utility District Waterline Protection*
- Pacific Gas & Electric Power Line Relocation*
- AT&T Conduits & Vault Protection*
- City of Oakland

Site Grading

- Maintain Flat Grades Through Rail Yards
- Minimize Track Grades Through Leads
- Tie into Existing UPRR Desert Yard Tracks
- Elevate Yard to Extent Practical for Drainage
- Scheduled to Occur Before Rainy Season

Storm Drainage

- Phase 1 Ties into Existing Site SD System
- Future Phase will Redevelop Site SD System
- Designed to Port/County Stds
- Stormwater Treatment per RWQCB
  – Track Drains/Bio-retention Areas

Track

- Rail Operating Plan
- South Lead
- 7th Street Throat
- Manifest Yard
- Support Yard
- West Gateway Leads
- North Tie-in to Desert Yard

Track

- Track Spacing
  – Manifest Yard @ 15 ft
  – Support Yard @ 14.5 ft
  – Inspection/Maintenance Aisles
- Turnouts & Curves
  – Leads are No 11 Power DTMF
  – Yard are No 9 Manual
  – Curves < 9 deg 30 minutes
- Materials
  – 136 RE Rail
  – Concrete Ties / Timber at Turnouts
  – Heavy Duty Clip Fastening System
  – Prescriptive Specifications
Construction

Jan 2014

Looking North

Site Preparation & Rough Grading

Construction

April 2014 Looking North

Grading & Drainage

Construction

July 2014 Looking North

Prepared for Ballast & Track

Challenges

• Procurement to Meet Funding Deadlines
• Coordination of Numerous Stakeholders
• Management of Multiple Contractors
• Site Conditions

Conclusions

• Development of Former OAB has Required:
  – Innovative Funding
  – Adaptable Delivery Methods
  – Persistence
• OHIT Phase 2 will Require More of Same