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January 10, 2017

Surface Transportation Board
395 E Street SW
Washington, DC 20432-0001
Attn: Victoria Rutson

Dear Mrs. Rutson:

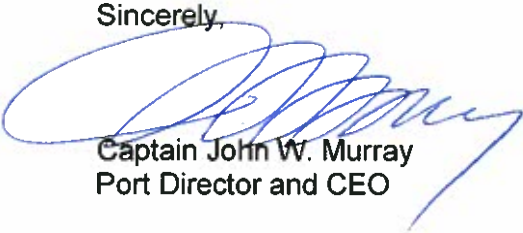
In accordance with your November 9, 2015 letter, the Canaveral Port Authority (CPA) has recently completed a feasibility study for a freight rail extension through the Cape Canaveral Air Force Station (CCAFS). Through our analysis, we have been able to reduce the operability restrictions previously reported to the Surface Transportation Board and are confident that a freight rail alignment through the CCAFS has enough feasibility to be included in the environmental impact statement process.

Please accept the attached feasibility study, completed by Transystems, which outlines the background information, a freight rail alignment description and feasibility evaluations for a possible route through the Cape Canaveral Air Force Station. In conclusion, the Canaveral Port Authority feels there is sufficient feasibility to satisfy the criteria as requested in your November 9, 2015 letter.

CPA requests the Surface Transportation Board reinstate the EIS process with the CCAFS rail route identified as our preferred alternative. After much consideration and debate with community stakeholders, CPA also requests that all other rail routes be removed from consideration and only the CCAFS route be approved for further analysis.

CPA is committed to working with the STB in determining a feasible route through the Air Force Station that can meet the operability and environmental standards required.

Sincerely,


Captain John W. Murray
Port Director and CEO

Port Canaveral

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**CAPE CANAVERAL AIR FORCE
STATION (CCAFS)- KENNEDY SPACE
CENTER(KSC)**

**FREIGHT RAIL EXTENSION
ALIGNMENT**

FEASIBILITY STUDY



December, 2016

CAPE CANAVERAL AIR FORCE STATION (CCAFS) - KENNEDY SPACE CENTER (KSC)

FREIGHT RAIL EXTENSION ALIGNMENT FEASIBILITY STUDY

Prepared for:



December 2016

Prepared by:



4500 Salisbury Rd #440
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TABLE OF CONTENTS

SECTION 1 - Executive Summary.....	1
SECTION 2 - Project Background.....	2-3
SECTION 3 - CCAFS-KSC Freight Rail Alignment Description.....	4-5
SECTION 4 - Evaluation of Feasibility.....	6-19
A. Factors Considered in Evaluating Feasibility	
B. Operability of CCAFS Alignment	
i. Restrictions on Rail Operations	
ii. Operability Evaluation	
iii. Rail Operations Security	
iv. Constructibility of CCAFS Alignment	
C. Environmental Impacts	
i. Jurisdictional Wetlands	
ii. Submerged Aquatic Vegetation	
iii. Protected Species	
iv. Cultural Resources	
SECTION 5 - Conclusions.....	20-23
A. Siting	
B. Constructability and Schedule	
C. Permitting	
D. Cost	
E. Property Availability and Project Funding	
F. Operability	
G. Conclusion	
 FIGURE 1 - Proposed Rail Alignment	
 APPENDIX A - Letter from STB dated November 19, 2015	
APPENDIX B - Duos Technologies Proposal	
APPENDIX C - TUB Crossing Examples	
APPENDIX D - Environmental Impacts (Wetlands, Protected Species, and Cultural Resources)	
APPENDIX E - Rail Alignment from the CPA Area to KSC's J-J Interchange Yard	

The following report evaluates the feasibility of a route for the proposed Port Canaveral rail extension running through the Cape Canaveral Air Force Station (CCAFS). The alignment evaluated within this report was developed by TranSystems with the objectives of minimizing conflicts with CCAFS missions and facilities that could affect rail operations and avoiding or minimizing impacts to the environment and historic resources.

The consultant team completed the CCAFS-KSC feasibility evaluation in close cooperation with the U.S. Air Force and the Canaveral Port Authority. However, all findings, conclusions and recommendations in this report are solely those of TranSystems and have not been endorsed, formally or informally by the Department of Defense. Factors considered in evaluating feasibility include: (1) constructability and operability of a rail line given various CCAFS missions and facilities that may prohibit or restrict such activities; (2) cost and timeline to construct a rail line through the CCAFS; (3) security concerns; and (4) potential impacts to the environment and historic resources. Based on these factors, TranSystems has concluded that it is feasible to construct and operate a rail line running through CCAFS.

First, a route through the CCFAS does not pose any extreme engineering design or construction issues. Although CCAFS missions and facilities could restrict construction activities from time to time, these restrictions would extend the timeline for construction, rather than prohibiting construction altogether. TranSystems estimates that construction of a CCAFS route would take 30 months and would cost approximately \$75 million.

Second, although a number of CCAFS missions and facilities restrict operation of a rail- line at certain times, these restrictions could be mitigated through close coordination with CCAFS operations personnel. TranSystems has estimated a total of only 70 (non-consecutive) days per year during which rail operations would be completely prohibited for a full 24-hour period. Further, security concerns surrounding the operation of a freight rail line through CCAFS can be properly handled through appropriate security measures, including the installation of two inspection portals. The alignment does pass through two zones that would prohibit operation of the rail line, unless a waiver is granted: the Naval Ordnance Test Unit (NOTU) site and the vicinity of the Munitions Storage Area (MSA) farther north on Phillips Parkway. TranSystems believes that such a waiver can be obtained from the Department of Defense Explosives Safety Board (DDESB), given that there is a similar waiver for vehicular traffic passing through the same area.

Finally, the alignment will require permits and coordination with the environmental agencies on both the State and Federal level to resolve development issues regarding wetlands, endangered and threatened species, historical and archaeological sites and storm water quality.

The Canaveral Port Authority (CPA) is proposing to build a freight rail extension that would connect the Port facilities with the Florida East Coast Railway (FEC) mainline to address anticipated, future cargo growth and alleviate truck congestion associated with such growth.

In August 2014, CPA initiated the environmental review process with the Surface Transportation Board (STB), the federal agency with primary jurisdiction for rail construction throughout the United States. During the STB's scoping meetings, a number of alternative routes were suggested, including a route that would travel through the Cape Canaveral Air Force Station (CCAFS). In an information request from the STB to CPA dated February 5, 2015, the STB asked CPA for its opinion on the feasibility of such a route.

CPA had considered a route through the CCAFS during its initial feasibility analyses in 2012-2013. At that time, however, the U.S. Air Force (USAF) was reluctant to support CPA's investigation into the feasibility of a CCAFS route, citing numerous operational impediments—such as “critical days that would prohibit all rail operations for 24 hour periods or longer” in addition to “security concerns, potential environmental impacts, and potential conflicts with future missions.” Based on these discussions, further study of a route through CCAFS was set aside.

Given the renewed interest in a CCAFS route during the scoping process, CPA requested that the STB temporarily suspend the environmental review process so it could engage in further discussions with the USAF and conduct further investigations into the challenges raised by the USAF. The STB agreed to a temporary suspension, pending the Port's production of a feasibility evaluation of the CCAFS-KSC alignment alternative that would be based upon:

- Finding a suitable alignment on the CCAFS, across the NASA Causeway East and through a portion of the Kennedy Space Center (KSC) to merge with the existing KSC plant rail between the KSC Industrial Area and Launch Complex 39 Area, and
- Evaluating the alignment's constructability and operability after construction.

In late 2015, the USAF agreed to allow CPA and its consultant team to make a series of site visits to the CCAFS to evaluate potential rail alignments and discuss operational restrictions and means of mitigation with CCAFS leaders and staff. These site visits began in April 2016. By providing information and operational expertise, the USAF has greatly facilitated the following study and its conclusions. At this time, however, the USAF has not formally endorsed the development of a freight rail alignment on the CCAFS.

The following is a report on the development and planning of a freight rail alignment through the CCAFS and KSC that:

- Is constructible at reasonable cost in a reasonable period
- Is designed to minimize environmental impacts

- Is least operationally impacted by restrictions resulting from CCAFS mission priorities, restricted areas, security and safety concerns and areas earmarked for future mission expansion at the Station.

Based on the analysis in this report, we offer our conclusions regarding the feasibility of a CCAFS-KSC freight rail alignment.

The first step in the feasibility evaluation was the development of a rail alignment that could be reasonably built from the perspectives of construction budget, construction schedule and probable mitigation requirements. The goal was to identify and refine an operationally viable freight rail alignment that was least impacted by USAF operations and restrictions (the “least impacted alignment”). The following constraints were considered in the identification of a least impacted alignment:

- Interference with or risk to CCAFS missions
- Limitations on rail construction or operations / activities
- Security concerns in the vicinity of specific facilities and operations
- Response time requirements for CCAFS first responders
- Future mission requirements
- Wetlands
- Endangered or threatened species' habitat
- Historically or archeologically significant sites
- Disturbance to USAF tenant activities at CCAFS

Based on these considerations, a route was developed that would travel east from the CPA/CCAFS boundary for a distance of approximately 2,000 feet, then turn north to generally follow the Phillips Parkway corridor to exit the CCAFS at the CCAFS/ KSC boundary on the NASA Causeway East (see Figure 1). The distance traveled on the CCAFS is estimated at 6.2 miles. The alignment would then cross the Banana River on the NASA Causeway East. Once on Merritt Island, the route would follow the NASA Parkway East right-of-way and then curve north to merge with the KSC's existing plant rail system, south of Launch Complex 39 Area. The distance from the CCAFS boundary through the KSC to the merge point is approximately 5 miles. The route would then travel another 17 miles on the KSC plant rail system to the FEC main line west of the J-J Interchange Rail yard on KSC property. The total distance of the CCAFS route from the CPA's North Cargo Area to the J-J Interchange Yard is approximately 28 miles.

This alignment has been prepared in close cooperation with USAF personnel at Patrick AFB, CCAFS, as well as KSC personnel. It was developed to evaluate the feasibility of the alignment siting, construction and eventual operation in response to the evaluation criteria in the Surface Transportation Board's letter, dated November 9, 2015 (Appendix A).

The alignment minimizes intrusion into areas on the CCAFS that: have archeological and historical significance, provide habitat for threatened species, are ecologically sensitive, or are either highly restricted or absolutely unavailable because of current and imminent mission requirements. Additionally, this general alignment of the freight rail line follows a well-established and heavily used transportation corridor—Phillips Parkway—and it will not require trestle supported segments in the Banana River with the exception of one new crossing adjacent to an existing roadway bridge, to be provided by a short trestle section and a bascule bridge on the NASA Causeway East.

As explained in Section VI, B, 2 below, the preferred alignment passes directly to the east of the Munitions Storage Area (MSA) and thus through the Explosive Quantity Safety Distance Arc (QD Arc), the designated safety distance surrounding facilities and operations where explosives are handled. When QD Arc restrictions are in effect, rail operations would be prohibited in these areas unless a waiver is obtained from the Department of Defense Explosives Safety Board

(DDESB). Based upon our research, the consultant believes that such a waiver can be obtained for the rail alignment. Vehicular traffic on Phillips Parkway, whether civilian, military or commercial, passes through the QD Arc continuously in accordance with an existing wavier.



Figure 1. CCAFS Proposed Freight Rail Alignment

A. Factors Considered in Evaluating Feasibility

The factors used to evaluate the overall feasibility of the development and operation of a freight rail extension from the CPA to the FEC Mainline that would traverse the CCAFS and the KSC were:

- CCAFS operational, security and potential Base mission concerns
- Environmental impacts
- Cost and timing to construct
- Sufficient, reliable number of unrestricted and partially restricted days per year to make the freight rail service viable.

B. Operability of CCAFS Alignment:

i. Restrictions on Rail Operations:

The following areas may pose operational restrictions on a rail line following the alignment depicted in Figure 1:

Table 1: Potential Rail Operational Restrictions

Area	Restriction
USAF Commercial Tenant NOTU Trident Basin	Operations are highly sensitive to vibration. QD arc restrictions in effect for 5 to 8 days per missile/ ammo operation. No rail operations are permitted when in effect unless waiver is granted. Historically less than 1 missile op/yr and 5 ammo ops/yr.
Space Related Facilities	Operations are highly sensitive to vibration.
FSA 1	Some operations may require suspension of rail operations.
MSA	QD arc restrictions (no rail operations permitted when in effect unless waiver is granted).
NASA Rocket Barge Berth	The barge berth is a specially designed slip and short rail line for loading and unloading barges carrying rocket sections. The facility has not been used in some time. However, this period of disuse does not preclude need for the facility in the future either by NASA or a commercial space operator.

In addition to these sensitive areas, other USAF operations and mission priorities could impact operation of the rail line. These potential conflicts include:

Table 2: Additional Rail Operational Restrictions

Potential Conflict	Restriction
Mission Critical/No Dig Days	No-Dig Days during which rail operations may be prohibited will fall only on launch days. Depending upon location and timing of the launch rail operations may be allowed in consultation and coordination with CCAFS Operations.
National Security & Natural or Man-Made Disasters	Rail operations prohibited.
Prelaunch and launch safety restriction zones	Rail operations were previously prohibited the day before and day of launch. Now only the day of launch is restricted.
RF Silence Periods during Spacecraft Transport and Spacecraft on Launch Pad	Rail operations are permitted but under specific restrictions which could include but are not limited to: restricted use of communications equipment or any equipment within a specified frequency range.
Movement of launch vehicles, spacecraft and Launch hardware	Rail operations are permitted but under specific restrictions which could include but are not limited to: reduced train length, speed restrictions to minimize vibrations, specific hours of operation and no operation, restricted use of communications equipment or any equipment within a specified frequency range.
Prescribed burns of various CCAFS areas	Rail operations are permitted but under specific restrictions which could include but are not limited to: reduced train length, speed restrictions due to limited visibility, specific hours of operation.

As further detailed below, the duration and nature of these restrictions would be subject to the specifics of each situation and could be significantly reduced through rail service scheduling flexibility and close coordination between the rail service operator and Base Operations.

ii. Operability Evaluation

The operational feasibility of the alignment is primarily based upon the relative percentage of the year, or number of days per year, that the freight rail service can operate either unrestricted or with minimal restrictions. Another consideration that impacts operability is the consecutive nature of the restrictions (e.g., a ten consecutive day restricted period is much more detrimental to rail operational feasibility than ten days of restrictions spread over several months).

In order to determine operational feasibility, we divided the days of the year into three operational categories as follows:

Red Days: These are days (24 hour periods) during which freight rail operations on the CCAFS are prohibited.

Yellow Days: These are days during which freight rail operations are permitted but under specific restrictions which could include, but are not limited to: reduced train length, speed restrictions to minimize vibrations, specific hours of operation and no operation, restricted use of communications equipment or any equipment on a specific band of radio frequencies

Green Days: These are days during which the freight rail service may operate normally with no additional or special restrictions.

Table 3: Rail Operational Restriction Days

Conflict/Restriction	Number of Days per Year
RED DAYS	
Security & Natural or Man-Made Disasters	Unknown
Navy Operations at Trident Basin (QD Arc Restrictions)	32 days in effect (5-8 days per operations; historically less than 1 missile operation per year and five ammo operations per year)
Mission Critical or No-Dig Days - Prelaunch and safety restriction zones	50 days total (not all no-dig days will require a prohibition of rail operations as the No-Dig Day designation will now be in effect now only on the day of launch, and dependent upon location and time of launch, rail operations may be permitted on a case-by-case basis. The estimate of days assumes 50 launches per year)
YELLOW DAYS	
Mission Critical or No Dig Days	No-Dig Day designation applies only to launch days, and dependent upon location and time of launch, rail operations may be allowed during the no-dig day (see explanation of Mission Critical or No-Dig Days above in RED DAYS)
RF Silence Periods during Spacecraft Transport and Spacecraft on Launch Pad	<1 day for transport 2 - 3 days on pad 28 periods this year
Movement of launch vehicles and hardware and spacecraft	<12 hours 50 movements this year
Prescribed burns	Mid-morning to dusk 1-3 days 4 burns per year

Scheduling To Mitigate Rail Operation Restrictions: While we can expect rail operations to be restricted by “No Dig” periods, which are now limited to launch days; controlled burns; launch hardware and encapsulated satellite transport operations; prelaunch and launch safety zones; and periods of no communications on a specific band of radio frequencies, these operational restrictions can be effectively minimized with minimal negative impact on either the CCAFS mission, security, or the viability of the freight rail operability.

Discussions with CCAFS leadership and staff have greatly clarified the nature and impact of the issues, mission priorities, and constraints that would impact operability. We have concluded that close and continuous operational coordination between the rail service operator and the CCAFS operations staff will allow rail services to be scheduled with sufficient advance notice to avoid operational conflicts.

With the change in imposition of the “No Dig” day designations from potentially multiple, consecutive 24 hour periods—which could have interrupted train operations for a week or more—

With the change in imposition of the “No Dig” day designations from potentially multiple, consecutive 24 hour periods—which could have interrupted train operations for a week or more—to only apply to actual launch days, the issue of prolonged operational prohibitions no longer presents an insurmountable barrier to rail service operability. The ability to schedule freight rail operations between 1600 and 0600 will further minimize conflicts with normal daylight missions at the CCAFS. On dates when a night launch is scheduled, the train schedule can be changed to daytime operations. Rail operations will also be scheduled to avoid peak commute hours to the extent possible. Finally, when the barge berth is needed for the barge transport of rocket sections, freight rail operations could be rescheduled to preclude and conflict or interruption at the facility.

If rail operations are scheduled and coordinated properly, the number of red days during which rail operation are actually prohibited should not exceed 70 days. Nearly 300 days per year should accommodate unrestricted or acceptably restricted freight rail operations on the CCAFS.

QD Arc Wavier Amendments and the Department of Defense Explosive Safety Board (DDESB):

The entity within the Department of Defense that controls the size and restrictive nature of Explosive Safety Quantity Distance Arcs (QD Arcs) surrounding facilities and operations where explosives are handled is the DDESB. On the CCAFS there are two QD Arcs that impact the proposed freight rail alignment. One is in the vicinity of the NOTU and Trident Basin and the other protects the MSA, to the immediate west of Phillips Parkway. The DDESB has granted perpetual waivers to each QD’s restrictions in order to allow for vehicular traffic to pass freely on the final easternmost portion of SR 401 inside the USAF gate and along Phillips Parkway farther north immediately east of the MSA.

TranSystems has researched both the process and probability of the DDESB favorably considering a request to amend the existing QD Arc waivers to add freight rail operations through the arcs. Because the precedent has been set for allowing passage of much more vulnerable civilian and commercial vehicular traffic through the arcs, we believe request for a freight rail waiver has a high probability of success. The waiver process begins with concurrence of the local command and then works up through the chain of command. This process can be somewhat protracted before the amendment to the existing waiver is considered by the DDESB, but the risk to “life and limb” for the passage of a freight train through the QD Arc is miniscule as compared to the risk to permitted vehicular traffic passing through the QD Arc. Therefore, it is TranSystems’ opinion that, an amendment to the existing QD Arc waivers is highly probable.

Vibration Sensitivity: Vibration sensitivity of various facilities may cause passage restrictions. However, after discussion with CCAFS staff, we believe that an understanding of projected vibration attenuation over distance and empirical determination of the actual vibrations expected at the sensitive facilities due to the slow (< 10 mph) passage of the train coupled with design and construction procedures specially implemented at those sensitive sites to minimize the effects of vibrations from train passage, will significantly reduce “no passage” periods. Then through coordinated service scheduling, the negative impacts of train passage vibrations can be minimized.

TranSystems has performed vibration attenuation testing at multiple sites at the KSC and along the FEC mainline in Titusville. Since there is no existing track at the CCAFS for the empirical collection of vibration attenuation data, we can extrapolate from the seismographic data collected at the KSC and in Titusville to predict vibrations and the attenuation of amplitude and frequency over distance within a tight confidence interval at the CCAFS.

iii. Rail Operations Security

Another operational issue for the CCAFS, given the sensitive nature of their operations, is security. Specifically, the CCAFS has voiced concern about the nature of cargoes to be transported, their inspection and confirmation at some point before they traverse the Air Force Station, and the vetting of railroad crews and insurance that the train does not carry unauthorized personnel or stowaways. This is an operational issue that will be thoroughly examined by USAF security personnel, the rail operator, and the Port to identify the CCAFS's requirements and determine how railroad and cargo terminal operations can comply with CCAFS security criteria.

As an element of this feasibility analysis we have contacted a company, Duos Technologies, to evaluate the physical parameters of the alignment and the characteristics and specifications of the freight rail service to develop the preliminary planning for two inspection portals, one on CPA property and another on the KSC. The two inspection portals would be equipped and staffed to inspect and verify cargo and rail personnel before the freight train, its cargo and crew enters the CCAFS. Duos Technologies is highly skilled and well-practiced in providing freight rail security of this nature at some of the nation's most sensitive areas. Pertinent portions of their proposal follow:

*Duos Technologies (**duostech**) has been asked to provide the security solution required to allow railcar traffic through the targeted route to be deployed. We propose the use of our latest **xtd™** (Extreme True Definition) enhanced version of our Railcar Inspection Portal (**rip®**) technology, a state of the art railcar inspection system that captures a 360-degree view of every railcar passing through the portal. This system, while operationally similar to the **rip®** system currently in use at selected crossings on the Southwestern border of the United States, includes a myriad of upgrades over the systems currently operated by the United States Customs and Border Protection (USCBP). The new generation **xtd rip®** combines sensor and advanced machine vision technologies as well as providing a drive-through scanner with a 6 MeV X-ray imaging system that is integrated into the **duostech rip®** that allows capture of images and cargo at speeds up to 20 km/h.*

PROJECT DETAIL

*The project is to supply, install and commission a complete **duostech** Railcar Inspection Portal (**rip®**) integrated with a Rapiscan EAGLE® R60 drive-through scanner at **Cape Canaveral Air Force Station (CCAFS) – Kennedy Space Center (KSC)** at two locations within the targeted route, one incoming from the port to CCAFS, the other entering into KSC.*

The **duostech rip®** with integrated X-ray scanner system is designed as a completely modular system and provides a number of modules for analysis, detection and inspection. The **rip®** system to be deployed consists of the following system modules:

1. **Vehicle Undercarriage Examiner (vue™)**
 - Top Panorama System w/ **xtd™**
 - Side Panorama System w/ **xtd™**
 - Open Door/Missing Hatch Detection System
 - Train Rider Detection System (**trids™**)
 - Virtual Fence Subsystem
 - Recognition Systems for Safe Automated Cargo Scanning
 - Integrated Shielding Walls
 - Access Controlled Area
 - Control Bunker
 - Linear Accelerator 6 MeV Dual Energy
 - Scan Speed Up to 20 km/h

Each of these system modules incorporated together will provide an optimum solution to accomplish the following goals:

- Digitally Scan & Screen Railcars
- Capture Railcar AEI Tags
- Provide 360-degree view of every railcar with Scanning Control and Monitoring System for automated scanning utilizing the **centraco™** platform
- X-ray scan all types of non-passenger rail freight from cargo containers, double-stacked containers and two 20-foot containers on rail cars
- Deliver high-quality X-ray imaging in a high-throughput operation
- Enables inspection of cargo containers transported by rail for verifying manifests and identifying contraband, such as explosives, weapons and narcotics.
- Capability to detect radioactive material in cargo.

- Identify open/missing hatches on hopper cars
- Identify open doors on boxcars
- Detect the presence of people riding in visible areas of the train
- Share operational and functional workflow locally and remotely
- Increase security awareness and response

PROJECT PRICING

Systems listed below include all hardware, software, and labor to provide, install, and commission the complete project. **Railcar Inspection Portal with Integrated Scanner System**

<u>System Description</u>	<u>Qty</u>	<u>Unit Price</u>	<u>Total Price</u>
Railcar Inspection Portal with Intergrated Scanner System	2	\$6,119,477	\$12,238,954
Five-year maintenance and warranty service for the two portals:			<u>\$5,323,330</u>
Total Project Price:			\$17,562,284

A comprehensive description of the system's components, their capabilities, and performance record is included at Appendix B.

iv. Constructability of CCAFS Alignment

A. Restrictions on Construction Activities

The time needed to construct the CCAFS route will be impacted by CCAFS operational priorities. The CCAFS envisions the imposition of No Dig Days on each launch day. Additionally, there are prelaunch and launch safety restriction zones. Both may impact construction of the rail alignment. The degree to which construction operations will be impacted and temporarily curtailed is dependent upon the nature of the construction activity and the risk that specific activity presents to safety and the successful execution of a launch. The USAF and other commercial space operators

using the CCAFS have no tolerance for such risk; however, construction activities that pose no risk may be permitted on a case-by-case basis.

Other restrictions that may impact the construction schedule would be the transport of space hardware and encapsulated satellites along Phillips Parkway, controlled burns and periods of restricted radio transmissions on a specific band of radio frequencies.

Schedule coordination between the Base operations group and the contractor will serve to efficiently forecast no-construction periods and reschedule construction activity accordingly. Therefore, we estimate that construction of the rail, signalization and grade crossings on the CCAFS, the inspection portals on the KSC and CPA, the crossing of the NASA Causeway East and the bascule bridge at the navigation channel and the connecting portion on the KSC will require approximately 30 months.

B. Design Considerations

Design and construction of the CCAFS-KSC alignment poses no extreme engineering design or construction issues. It will be standard railroad construction consisting of earthwork excavation and fill, railroad sub-ballast track bed, ballast, ties and rail. However, several points are worthy of note:

- In areas adjacent to and on the NASA Causeway East, special consideration will be given to avoid buried utilities and minimize any incursion into the water areas of the Banana River, a bascule lift bridge will be constructed across the gap in the causeway to allow for passage of navigational traffic, and other features allowing for causeway drainage will be incorporated into design and construction.
- At several areas on the CCAFS, vibration minimizing features will be designed and constructed. The features include hardening of the track bed (ballast matting) and specialized supporting ties (direct fixation plates) and other items to minimize the transmission of vibrations set up by the passage of freight rail cars.
- Given the size (width and length) and extreme sensitivity of encapsulated satellites during transport along Phillips Parkway to launch areas, we are recommending the use of minimum vibration TUB Crossings (Appendix C) at the two points at which the rail alignment crosses the southbound lane of Phillips Parkway.
- Encapsulated satellites are highly sensitive to tilt in both the longitudinal or lateral axes; therefore, we suggest the relocation of the merging of the northbound and southbound lanes of Phillips Parkway farther to the north and lessening the severity of the "S" curve thus enhancing the pass-ability for tractor trailers transporting encapsulated satellites and space hardware. This accommodation will require the construction of approximately 2,000 feet of new roadway.
- Traversing the NASA Rocket Barge Berth area may require the installation of a TUB Crossing, depending upon the vibration sensitivity of operations at the facility.

C. Cost to Construct

Probable costs have been divided into the following categories and cover construction from a rail marshalling yard immediately north of the Canaveral Port Authority's North Cargo Area to the merge point with the existing plant rail system at the Kennedy Space Center.

The preliminary Opinion of Probable Cost is comprised of:

- General Requirements: \$7,826,140
- Erosion Control: \$1,036,628
- Site Work: \$41,626,536
- Track Work: \$11,452,119
- Opinion of Probable Construction Cost: **\$61,941,422** (without contingency)

We estimate mitigation costs for this alignment would add an additional \$1,150,000 to the project. Additionally, if the CPA were to engage Duos Technologies to build and equip the two inspection portals described in Section 4.B.iii of this report, an additional \$12,238,954 would be incurred as project cost.

Two potential costs not added to the preceding total are a contingency to cover the potential for additional project scope and unforeseen issues and conditions, nor have we added the cost quoted by Duos technologies for a five-year maintenance and warranty contract for the inspection portals and their equipment.

The following is a more detailed spreadsheet of the calculation of our opinion of probable cost:

PORT CANAVERAL RAIL ACCESS
PRELIMINARY OPINION OF PROBABLE COSTS

8/15/2016

Title	Units	Unit Price	ROUTE THROUGH AIR FORCE BASE		
			Quantities	Item Cost	Total Cost
General Requirements					\$ 7,826,140
1.00 General Requirements			1		\$ 7,826,140
1.01 Contractor Mobilization	%	1.00%	1	\$ 541,153	
1.02 Bonds and Insurance	%	1.00%	1	\$ 541,153	
1.03 General Conditions	%	2.00%	1	\$ 1,082,306	
1.04 Engineering	%	5.00%	1	\$ 2,705,764	
1.05 Engineering - Construction Support	%	5.00%	1	\$ 2,705,764	
1.06 Wetland Mitigation	AC	\$ 100,000	2.5	\$ 250,000	
Erosion Control					\$ 1,036,628
2.00 Erosion Control			1		\$ 1,036,628
2.01 Silt Fence	LF	\$ 2.50	116,851	\$ 292,128	
2.02 Stabilized Construction Entrance	EA	\$ 5,000	30	\$ 150,000	
2.03 Seeding & Mulching	ACRES	\$ 1,500	63	\$ 94,500	
2.04 General Erosion Control	LSUM	\$ 500,000	1	\$ 500,000	
Site Work					\$ 41,626,536
3.01 Site Preparation and Site Demolition			1		\$ 141,750
3.0101 Clearing and Grubbing	ACRES	\$ 1,500	95	\$ 141,750	
3.0102 Track Removal	TF	\$ 15	0	\$ -	
3.02 Drainage			1		\$ 2,337,022
3.0201 Class V - Pipe	LF	\$ 200	2,921	\$ 584,256	
3.0202 Concrete Headwall	LF	\$ 15,000	117	\$ 1,752,767	
3.03 Earthwork			1		\$ 10,542,465
3.0301 Earthwork - Common Excavation	CY	\$ 4.00	254,914	\$ 1,019,657	
3.0302 Earthwork - Embankment	CY	\$ 12	490,620	\$ 5,887,440	
3.0303 Subballast	SY	\$ 20	181,768	\$ 3,635,368	
3.04 Structures and Retaining Walls			1		\$ 25,347,632
3.0401 Railroad Trestle	LF	\$ 12,000	962	\$ 11,544,000	
3.0402 Bascule Bridge	LF	\$ 50,000	115	\$ 5,750,000	
3.0403 Rip Rap	TN	\$ 60	134,227	\$ 8,053,632	
3.05 Pavement and Pavement Markings			1		\$ 2,482,667
3.0501 Access Roadways	EA	\$ 25,000	15	\$ 375,000	
3.0502 Traffic Control	LSUM	\$ 15,000	15	\$ 225,000	
3.0503 Gravel Access roads	LF	\$ 120	10,000	\$ 1,200,000	
3.0504 Rerouted Asphalt road	SY	\$ 128	5,333	\$ 682,667	
3.06 Guard Rail and Traffic Barriers			1		\$ 175,000
3.0601 Site Signage	LSUM	\$ 50,000	1	\$ 50,000	
3.0602 Monument Sign	LSUM	\$ 25,000	1	\$ 25,000	
3.0603 Security Fencing	LSUM	\$ 50,000	2	\$ 100,000	
3.09 Electrical and Site Lighting			1		\$ 600,000
3.0901 Signal / Gate Arms	EA	\$ 300,000	2	\$ 600,000	

PORT CANAVERAL RAIL ACCESS
PRELIMINARY OPINION OF PROBABLE COSTS

8/15/2016

Title		Units	Unit Price	ROUTE THROUGH AIR FORCE BASE		
				Quantities	Item Cost	Total Cost
Trackwork					\$	11,452,119
4.00	Trackwork			1		\$ 11,452,119
4.0100	Unload and Distribute Track Materials	LSUM	\$ 100,000	1	\$ 100,000	
4.0200	136RE CWR Track Complete – Wood Ties - Labor Only	TF	\$ 35	58,426	\$ 2,044,895	
4.0300	Install No. 10 Turnout Complete - 136RE (Wood) (Labor	EA	\$ 125,000	1	\$ 125,000	
4.0400	Tub Crossings	TF	\$ 1,000	1,470	\$ 1,470,000	
4.0500	Ballast (Labor and Material)	TON	\$ 35	70,111	\$ 2,453,874	
4.0600	Resurface Existing Track	TF	\$ 25	0	\$ -	
4.0700	Other Track Material (Material Cost @ \$10/TF)	TF	\$ 10	58,426	\$ 584,256	
4.0800	Rail - Material Costs	TF	\$ 50	58,426	\$ 2,921,278	
4.0900	Wood Ties - Material Costs (every 20' of TF)	EA	\$ 50	35,056	\$ 1,752,817	
Base Costs					\$	61,941,422
Contingency					20%	\$ 12,388,284
Environmental Mitigation Cost					\$	1,150,000
Total					\$	75,479,706

C. Environmental Impacts:

Environmental Services, Inc. (ESI) has conducted environmental evaluation of the alignment presented in this report. That review included consideration of information on jurisdictional wetlands, protected species, and cultural resources to determine potential environmental impacts of the proposed project. ESI also conducted a preliminary field assessment of the alignments to verify existing environmental information and identify potential areas of concern.

The alignment contains a number of environmental and physical constraints. These constraints include protected species, wetlands, sea grasses, and cultural resources

i. Jurisdictional Wetlands

The alignment would impact wetlands that may fall under the jurisdictional purview of U.S. Army Corps of Engineers (ACOE) and the State of Florida through the Florida Department of Environmental Protection (FDEP) or the St. Johns River Water Management District (SJRWMD). The preliminary wetland information collected along the alignment indicates that approximately 10 to 15 acres of both forested wetlands and herbaceous wetlands could be impacted (Figure 1 in Appendix D).

In connection with the permitting process before ACOE and the State agencies, wetland mitigation likely will be needed to offset the proposed wetland impacts of the rail alignment. Wetland mitigation can be accomplished through the purchase of mitigation bank credits, wetland preservation, wetland enhancement and/or wetland creation. There are also existing wetlands on both CCAFS and KSC that have been impacted by the invasive species Brazilian Pepper Tree (*Schinus terebinthifolius*) that could be restored as mitigation for the proposed wetland impacts. Based on a preliminary functional assessment of the proposed impacts and past experience with this type of wetland enhancement activities, it would take approximately 80 to 115 acres of wetland mitigation to offset the potential wetland impacts.

ii. *Submerged Aquatic Vegetation*

Submerged aquatic vegetation (seagrass) is known to occur within the Banana River and could be impacted by the railway crossing along the NASA Causeway East. Historic seagrass maps of the area show bands of seagrass along the shoreline of the Banana River but nothing along the NASA Causeway shorelines. A seagrass survey would be conducted to determine the extent of potential impacts to seagrass and assess potential seagrass mitigation.

iii. *Protected Species*

The protected species located within and adjacent to the alignment include Florida scrub-jay, bald eagles, wading birds, gopher tortoises and manatees.

Florida Scrub-Jay

The Florida scrub-jay is a federally listed threatened species that falls under the jurisdictional purview of the U.S. Fish and Wildlife Service ("FWS"). There is some Florida Scrub-Jay habitat located within and adjacent to the alignment on CCAFS and KSC. On KSC, the alignment will directly impact approximately 0.5 acre of Florida Scrub-Jay Habitat classified "Support" (Cat 2 on Figure 2 in Appendix D) habitat that is adjacent to existing development and 11.9 acres of "Auxiliary" (Cat 3) habitat that is adjacent to existing development.

Pursuant to the KSC Florida Scrub-Jay Compensation Plan these direct impacts will require the restoration of 12.9 acres of Florida Scrub-Jay habitat on KSC property. According to KSC staff, the cost for Florida Scrub-Jay habitat restoration is approximately \$1,500.00 per acre. Because the proposed alignment on KSC is along the existing NASA Parkway East, secondary impacts to the Florida Scrub-Jay habitat on KSC was not anticipated and included in this feasibility study. Florida Scrub-Jay habitat potential impacts and compensation will be evaluated as part of NEPA process including review by the FWS Environmental Management Branch.

The alignment on CCAFS will have direct impacts to approximately 9.1 acres of "Good" Florida Scrub-Jay habitat and 4.6 acres of "Poor" quality habitat which will require 40.8 acres of habitat restoration on CCAFS. The secondary impacts for the alignment could require an additional 72 acres of habitat restoration if the entire habitat to the west of the new railway is deemed impacted. There are two groups of Florida Scrub-Jays in the alignment foot print that could be lost. The loss to these two groups of birds would probably not affect CCAFS ability to reach their 200-group goal. If acceptable mitigation areas can be agreed upon, the cost for the Florida Scrub-Jay habitat restoration will be at an initial cost of \$5,000.00 per acre with an annual cost of \$400 per acre for a minimum of 5 years.

Bald Eagle

Bald eagles were removed from the endangered species list in 2007 but are still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. FWS and the Florida Fish and Wildlife Conservation Commission (FWC) have established Bald Eagle Monitoring Guidelines for construction activities that occur within 660 feet of a bald eagle nest during the eagle nesting season. Currently there is one known eagle nest on KSC that the alignment will encroach just inside the 660 feet protection zone. Authorization to construct and operate the railway within the 660-foot protection zone would likely be granted due to the proximity of the nest to NASA Causeway East and the visual buffer that will remain between the nest and the railway as it traverses the edge of the protection zone along the NASA Causeway East right-of-way.

Wading Bird Colonies

KSC has identified a number of wading bird colonies located on the dredge spoil islands in the Banana River. These colonies can support a number of species that are protected by both FWS

and FWC. The CCAFS – KSC alignment would not impact any of these colonies; therefore, no authorization likely would be required regarding to the wading bird colonies.

Gopher Tortoise

Gopher tortoises are a State threatened species and are known on areas in and adjacent to the CCAFS – KSC alignment. Before the start of construction, the gopher tortoises in and within 25 feet of the railway footprint will need to be relocated. Site specific gopher tortoise burrow surveys will need to be conducted pursuant to FWC survey methodologies.

Manatees

Manatees are known to occur within the Banana River. Open water crossings for the alignment would be required in the Banana River. The construction of the railway bridges would require adherence to the Standard Manatee Guidelines for In-water Construction Activities.

iv. Cultural Resources

A number of cultural resource evaluations have been conducted along the northern portion of the proposed railway alignment within the CCAFS. These previous studies identified a historic district, several historic structures and four archaeological sites. Other portions of the CCAFS-KSC alignment have not been previously subjected to systematic archaeological testing. In addition, according to the Florida Master Site File data base, nine archaeological sites have been recorded within the proposed corridor, with an additional six archaeological sites to the immediate west of the proposed corridor (Figure 3, Appendix D). The CCAFS cultural resource specialist informed ESI that the boundaries of the six sites located to the west of the corridor in the southern portion of CCAFS have not been thoroughly tested and could extend further to the east than presently mapped. The section of the rail alignment located on KSC property has not been subjected to a cultural resource assessment. Additional Phase I cultural resource assessment surveys within portions of the corridor not previously tested will need to occur during the NEPA process. The NEPA process will also determine potential adverse effects to the historic structures and historic district from the CCAFS-KSC alignment.

A. Siting

The alignment impacted the least by CCAFS operations and restrictions is displayed in Figure 1. This alignment will require the favorable consideration of the DDESB for an amendment (the addition of a freight train) to the existing QD Arc waivers that allow continuity of vehicular traffic on Phillips Parkway through the arc.

The alignment follows the general alignment of Phillip Parkway and thus does not impact CCAFS facilities and operations in the vicinity of Phillip Parkway more than the vehicular traffic that already passes by on Phillip Parkway. We believe concerns about vibration can be mitigated through vibration absorbing or dampening construction methods and restricting the speed of the freight train to 10 mph.

B. Constructability and Schedule

Given the potential for operationally-driven interruptions to construction and a lack of flexibility in construction activity scheduling, we believe this project could take 30 months to construct. The consultant team has not identified any extraordinary construction requirements that change this evaluation of constructability.

C. Permitting

The proposed alignment will require permits and coordination with the environmental agencies on both the State and Federal level to address potential impacts to wetlands, endangered and threatened species, historical and archaeological sites, and stormwater quality. The coordination with these agencies will be initially conducted through the NEPA process and will be carried through the various permitting processes. On the State level, wetland impacts and stormwater quality treatment systems will be permitted through FDEP and/or SJRWMD. ACOE will permit wetland impacts on the federal level. Coordination and authorization will be required from FWS and FWC regarding the potential impacts to the Florida Scrub-Jays and their habitat and the potential encroachment into the buffer zone around the eagle nest. The potential impacts to historical and archaeological sites will also need to be addressed through coordination with the State of Florida Division of Historical Resources.

D. Cost

The consultant team engineers and environmental scientists have performed an adequate level of route planning, preliminary engineering and mitigation-permitting identification to provide an opinion of probable cost of \$61,941,422 (without contingency) for construction and an estimated \$1,150,000 for mitigation. Given the heightened security concerns and requirements at the CCAFS, a significant addition to the project would be the development of two inspection portals that would thoroughly vet freight trains before they enter the CCAFS gates either from the CPA or the KSC. The development, equipping and operation of the security inspection portals are discussed in detail in Appendix B. The additional cost to the project for the security is estimated

at \$12,238,954. Thus, the total estimated cost of design, engineering, construction, mitigation and the two security inspection portals (fully equipped) is \$75,330,376.

E. Property Availability and Project Funding

In the course of discussions with USAF staff on July 15, 2016 at the CPA, we learned that the means by which the USAF property could potentially be made available to the CPA for a freight rail alignment's development and operation might be accomplished by one of several land acquisition strategies from a joint land use agreement or shared use lease to the more time-consuming enhanced use lease (EUL). At this time the means of property conveyance, whether by joint land use agreement or through an EUL, remains to be determined. However, the ability to secure the property needed for the freight rail alignment through a shared use lease would shorten the development timeline and add to the project's feasibility.

A significant concern is project funding and the origin and availability of funds from other entities than just the CPA. We have identified several other sources of funding that would significantly lessen the financial burden on the CPA.

- **Use by and support from others:** The KSC's conclusion, in 2012, that to be more commercially attractive to potential NGO – private sector tenant activities, as the space industry continues towards commercialization, might be considerably enhanced by the development of a viable freight rail service that traversed and served the Center and linked the CPA to the FEC mainline. The development of a viable freight rail service would serve potential tenant activities that would lease property and facilities from the KSC and would relieve the Center from the expense of maintaining a seldom used plant rail system and rolling stock.

In the past four years a number of commercial space operators and equipment manufacturers have become tenants at both the KSC and the CCAFS. The trend is expected to continue, and these entities are potentially candidates for using the proposed freight rail capability to move materials and finished products. As users of the freight rail service, it is possible that they would contribute to its development and maintenance.

- This freight rail service would be exclusively FEC's as all cargo destined for or originating from the CPA, CCAFS or KSC would use the FEC mainline to travel south or north. At other ports in Florida where one Class 1 railroad has exclusivity, that railroad has provided capital for facility development and system maintenance, e.g. FEC at Port Everglades (ICTF) and CSX at JaxPort's Blount Island Marine Terminal.

Other viable sources of project funding are found at state and federal level. At the federal level the most common intermodal rail grants come from the TIGER programs and the FAST Act Program. The Department of Commerce has also provided grant funding for rail rehabilitation and improvement at Florida ports (e.g. JaxPort's Blount Island rail rehabilitation circa 2006 - 2007). At the state level under the current administration, unprecedented resources have been

provided to the state's ports to develop both waterside/landside infrastructure and intermodal rail facilities through the Florida Seaport Transportation and Economic Development Council (FSTED) and the SeaCIP process. The State also has previously made loans through the State Infrastructure Bank (SIB), under the auspices of the FDOT, to both ports and private railroads, serving a port facility, for intermodal rail infrastructure (e.g. FEC and the Port Everglades ICTF). We believe that there are a number of sources for the funding that would be required for the development of the freight rail alignment besides the CPA. These sources would certainly include freight rail service users - both government and non-government organizations and tenants at the KSC and CCAFS, the FEC Railway, the federal government and the state. The benefits of the freight rail alignment would accrue to a number of beneficiaries and thus the financial burden of its development could be accordingly distributed.

F. Operability

Our research and discussions with both the USAF and KSC have indicated that there may be potential users of the freight rail service besides the CPA. These users are current and potential tenant organizations, both government and commercial, at the two installations. Such "internal" use of the service will enhance its value to the CCAFS and the KSC and thus enhance its operability. The other factors that have heavily influenced our estimation of operability are:

- The siting of the alignment to be the least impacted by CCAFS constraints.
- Flexibility in the scheduling of freight rail operations to fit generally within the 1600 to 0600 timeframe to avoid Air Force Station commuter, daily operating (launch) and space hardware movement activities.
- Enforcement of a maximum rail speed of 10 mph to minimize vibrations.
- Implementation of special construction items to minimize vibrations at crossings and in the vicinity of sensitive facilities.
- Close and daily collaboration among CCAFS operations and security, KSC operations, the Port's operations and the rail service operator to minimize interference with CCAFS and KSC operations and maximize the ability for rail operations.
- A reduction in the number of no-dig days (applying only to launch days) and the reduction in the probability of prolonged operating restrictions.
- Accommodation of CCAFS first responders' response time requirements by including development of an emergency access roadway to preclude being delayed by a train passage.

Our estimate of the number of days during which the freight rail service could operate, albeit some days with restrictions (Yellow Days) is close to 300. While the demand at the Port for intermodal rail capability will grow over time, it is not expected to exceed three trains per week initially, and may grow to four trains per week over time. If rail operations required three days per week or 156 days per year, we conclude that with close coordination among the Port, the KSC, the CCAFS and the rail operator, there is operational feasibility.

G. Conclusion

Based on the study, it is TranSystems' view that a freight rail alignment that traverses the CCAFS has sufficient feasibility to satisfy the criteria as stated in the November 9, 2016 letter from the STB Office of Environmental Analysis.

**APPENDIX A
LETTER FROM STB
DATED NOVEMBER 19, 2015**



SURFACE TRANSPORTATION BOARD
Washington, DC 20423

Office of Environmental Analysis

November 9, 2015

Kathryn Kusske Floyd
Venable LLP
575 Seventh Street NW
Washington, DC 20004

Re: Docket No. FD 35852, Canaveral Port Authority — Construction and
Operation Exemption — Rail Line Extension to Port Canaveral, Florida;
Applicant's Request to Temporarily Suspend OEA's Environmental Review

Dear Ms. Floyd:

The Board's Office of Environmental Analysis (OEA) has received your October 29, 2015 letter requesting that OEA temporarily suspend its environmental review of the proposed project while the Canaveral Port Authority (CPA) further evaluates a potential rail alternative through the Cape Canaveral Air Force Station (CCAFS). As discussed below, OEA will grant your request for temporary suspension.

Background

A potential CCAFS rail alternative for this project would originate at Port Canaveral, extend north through CCAFS (generally parallel to Phillips Parkway), turn west to cross the Banana River to Kennedy Space Center (KSC) via NASA Parkway East, and finally connect with KSC's existing rail line. To assist in OEA's evaluation of this potential rail alternative, Dave Navecky of my staff traveled to CCAFS in July 2015, met with U.S Air Force 45th Space Wing (45 SW) personnel to discuss the potential alternative, and received a tour of the CCAFS grounds encompassing the corridor of the potential alternative.

Following this site visit, OEA sent an August 10, 2015 letter to 45 SW requesting written confirmation of information conveyed during the July 2015 45 SW meeting and site visit and requesting additional information OEA needed to complete a feasibility evaluation of this potential alternative. A written reply from 45 SW's was received on October 6, 2015.

Based on OEA's July 2015 site visit and 45 SW's October 6, 2015 written reply, OEA is concerned that numerous and substantial constraints would be associated with siting, constructing and operating a common carrier rail line through CCAFS. The siting constraints identified to date at CCAFS include:

- Historic cemeteries and Native American burial sites including recently repatriated remains;
- National Historic Landmark designation;
- Several Federally listed threatened and endangered species and associated critical habitats;
- Wetlands;
- Stormwater management ponds that assist in managing contaminated groundwater and reducing nonpoint source pollution;
- Facilities essential to CCAFS's mission that are sensitive to potential vibration impacts including satellite-payload processing facilities, munitions storage sites, and rocket launch and satellite communication buildings;
- Utility lines including water, sewer, natural gas, electric, telephone, mission-critical communication, high-pressure helium and nitrogen gas; and
- Explosive Quantity Distance (EQD) arcs; that is, defined zones within which activities are temporarily or permanently prohibited for safety and security purposes.

There appear to be other constraints to constructing and operating a potential rail line through CCAFS. Numerous mission-critical activities take place at CCAFS, including activities related to 45 SW and commercial rocket launches and to U.S. Navy operations at the CCAFS-located submarine turning basin and wharf. During these activities, all rail construction activities and train movements likely would have to stop. The days during which these prohibitions would occur apparently are so-called "mission critical" or "no dig" days. The types of activities that would result in mission critical/no dig days include rocket launches, national disaster/national security exercises, naval ordnance movements and other naval operations, rocket payload movements, and prescribed burns for Florida scrub jay (a Federally listed threatened species) habitat maintenance. The duration of the prohibition of rail-related activities would range from several hours to several weeks, but the majority of the prohibitions are likely to extend for approximately five days per event. Based on the information supplied in 45 SW's October 6, 2015 letter, OEA estimates that future mission critical/no dig days could reach or exceed 200 days annually in the foreseeable future.

Feasibility of a Potential CCAFS Rail Alternative

Collectively, these above-mentioned constraints suggest that it is not reasonable or feasible to site, construct or operate a common carrier rail line through CCAFS, and that a potential CCAFS alternative should not be studied in the Draft Environmental Impact Statement (EIS). However, your October 29, 2015 letter indicates that CPA intends to further evaluate a potential CCAFS route with a new project partner, the Gilbane-Renuart-Larkin-Mid-Atlantic Railway Services Group. OEA believes it is appropriate to temporarily suspend the Board's environmental review process so that CPA and its new partner can attempt to resolve or mitigate the numerous constraints associated with routing a common carrier rail line through CCAFS.

CPA should notify the Board when it has completed its further evaluation and request that the temporary suspension of the environmental review process should be lifted. If, after

completing its further review, CPA believes that a potential rail line through CCAFS remains potentially reasonable and feasible, OEA asks that CPA provide OEA with specific details on where and how a common carrier rail line through CCAFS could be successfully sited, constructed and operated. These details should include a preliminarily engineered route through the CCAFS that addresses the siting constraints mentioned above and should provide a thorough explanation of how the potential common carrier rail line could successfully operate (and be constructed) given the large number of mission critical/no dig days that are expected to occur, if the Board were to authorize a common carrier rail line through CCAFS.

Once OEA has received CPA's request to resume the EIS process and a detailed accounting (if any) of how CPA believes a potential rail line through CCAFS could be successfully sited, constructed and operated, OEA will consider CPA's response. OEA will then complete the Final Scope of Study for the Draft EIS with the assistance of the five Federal cooperating agencies. The Final Scope of Study will identify the alternatives being carried forward in the Draft EIS for detailed study and the alternatives being dismissed based on all the information that is available at that time.

We look forward to receiving CPA's evaluation of a potential CCAFS rail alternative. Please send your evaluation to Dave Navecky at 395 E Street, SW, Washington, DC, 20423, 202-245-0294 (David.Navecky@stb.dot.gov). Please feel free to contact Mr. Navecky if you have any questions. Thank you for your assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "Victoria Rutson".

Victoria Rutson
Director
Office of Environmental Analysis

cc: Jay Johnson

APPENDIX B

Duos Technologies Proposal



**Railcar Inspection Portal
with
Integrated X-Ray Cargo Scanner**

From:

Duos Technologies, Inc.
Jacksonville, FL

Submitted to:



EXPERIENCE | Transportation

For

**Cape Canaveral Air Force Station (CCAFS)/Kennedy Space
Center (KSC)**

Freight Rail Extension Alignment

Railcar Inspection Portal with Integrated X-Ray Cargo Scanner Project

BACKGROUND

In 2012 the Canaveral Port Authority (CPA) began researching the need for freight rail service at the Port to support a growing cargo business. This potential freight rail use identified need for rail service and precipitated the feasibility analysis, comparative evaluation, alignment selection and preliminary design of two alternative routes that would connect the Port's North Cargo Area with the FEC mainline.

The CPA undertook the required feasibility analysis of the CCAFS – KSC alignment and in April the CPA and its rail consultant – TranSystems, were allowed access to the CCAFS. In close collaboration with USAF staff and CCAFS tenant organizations, TranSystems began to develop the least impacted route alignment, evaluate the operating restrictions due to multiple mission operations, security and safety concerns and identify, evaluate and attempt to minimize impacts to ecologically sensitive areas and areas of historical and archeological significance.

Duos Technologies (**duostech**) has been asked to provide the security solution required to allow railcar traffic through the targeted route to be deployed. We propose the use of our latest **xtd™** (Extreme True Definition) enhanced version of our Railcar Inspection Portal (**rip®**) technology, a state of the art railcar inspection system that captures a 360-degree view of every railcar passing through the portal. This system, while operationally similar to the **rip®** system currently in use at selected crossings on the Southwestern border of the United States, includes a myriad of upgrades over the systems currently operated by the United States Customs and Border Protection (USCBP). The new generation **xtd rip®** combines sensor and advanced machine vision technologies as well as providing a drive-through scanner with a 6 MeV X-ray imaging system that is integrated into the **duostech rip®** that allows capture of images and cargo at speeds up to 20 km/h.

PROJECT DETAIL

The project is to supply, install and commission a complete **duostech** Railcar Inspection Portal (**rip®**) integrated with a Rapiscan EAGLE® R60 drive-through scanner at **Cape Canaveral Air Force Station (CCAFS) – Kennedy Space Center (KSC)** at two locations within the targeted route, one incoming from the port to CCAFS, the other entering into KSC.

The **duostech rip®** with integrated X-ray scanner system is designed as a completely modular system and provides a number of modules for analysis, detection and inspection. The **rip®** system to be deployed consists of the following system modules:

- Vehicle Undercarriage Examiner (**vue™**)

- Top Panorama System w/ **xtd™**
- Side Panorama System w/ **xtd™**
- Open Door/Missing Hatch Detection System
- Train Rider Detection System (**trids™**)
- Virtual Fence Subsystem
- Recognition Systems for Safe Automated Cargo Scanning
- Integrated Shielding Walls
- Access Controlled Area
- Control Bunker
- Linear Accelerator 6 MeV Dual Energy
- Scan Speed Up to 20 km/h

Each of these system modules incorporated together will provide an optimum solution to accomplish the following goals:

- Digitally Scan & Screen Railcars
- Capture Railcar AEI Tags
- Provide 360-degree view of every railcar with Scanning Control and Monitoring System for automated scanning utilizing the **centraco™** platform
- X-ray scan all types of non-passenger rail freight from cargo containers, double-stacked containers and two 20-foot containers on rail cars
- Deliver high-quality X-ray imaging in a high-throughput operation
- Enables inspection of cargo containers transported by rail for verifying manifests and identifying contraband, such as explosives, weapons and narcotics.
- Capability to detect radioactive material in cargo.
- Identify open/missing hatches on hopper cars
- Identify open doors on boxcars
- Detect the presence of people riding in visible areas of the train
- Share operational and functional workflow locally and remotely
- Increase security awareness and response

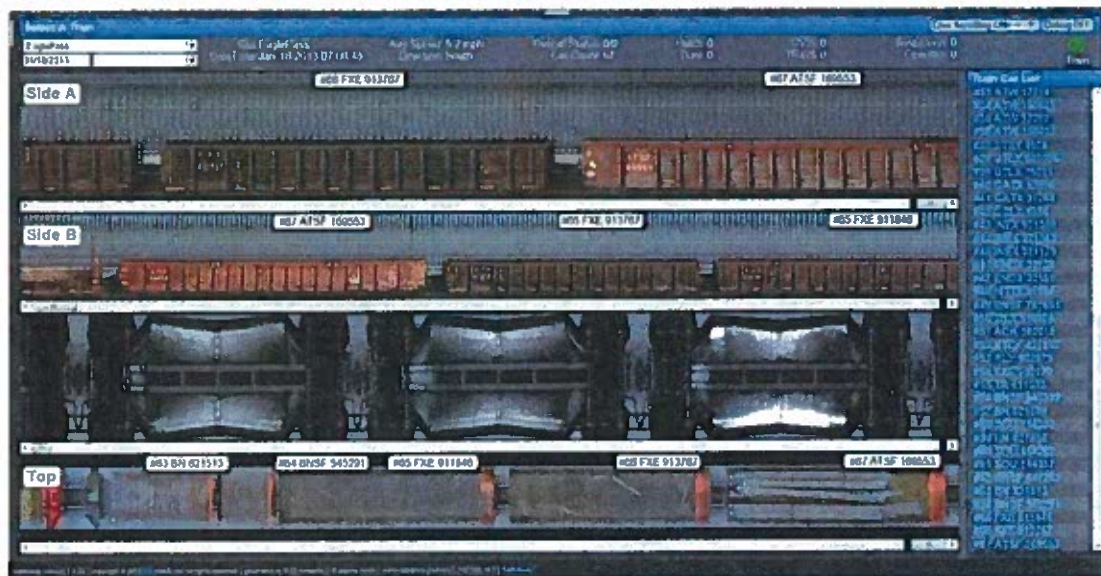
Core System Head End Equipment

The system will be installed in a new environmentally controlled railroad signal hut provided by **duostech** as part of this project scope. **duostech** will also provide, install and configure all necessary

cabinets, servers, networking equipment, including battery backup and other required devices within this building.

Top and Side Linear Panorama Generator w/**xtd**™

The Linear Panorama Generator (LPG) assembles images gathered from cameras on each side, the top, and the undercarriages of the train (optionally) and creates a continuous 360-degree view of the entire train, as shown below. Operators can quickly inspect the entire train consist by selecting any surface of the train (side, top, or undercarriage optionally) and scrolling through the continuous panorama view. The main purpose of the linear panorama is to provide inspection personnel with geo-spatial information of detections. The system marks the approximate location of detection on the linear panorama image and displays the target car location specifying the "car sequence number" and the approximate distance from the locomotive and/or the AEI tag data if available. The operator can select areas to enlarge, tag, save, or print any image of interest. Panoramas can be stored indefinitely, dependent only on the size of the storage drives.



Sample Panoramic View from **centracore**™ Interface

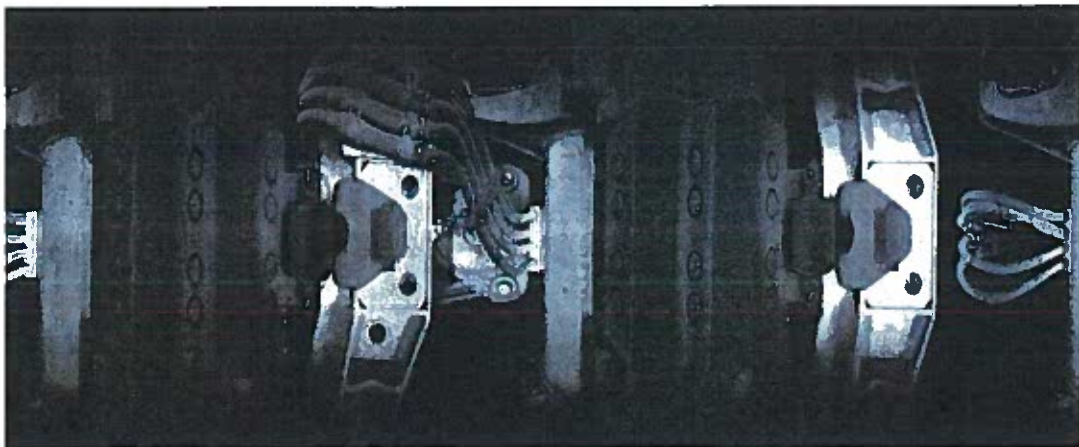
We have enhanced our LPG design with greater resolution and developed **xtd**™ (Extreme True Definition) technology that provides increased resolution at higher speeds. **xtd**™ utilizes megapixel line scan camera images that operators will view utilizing our **centracore**™ command and control platform, taking advantage of its robust feature set.

vue™ Vehicle Undercarriage Examiner w/ xtd™

In order to achieve a 360-degree view, we have developed a vehicle undercarriage inspection system or **vue™** with our proprietary extreme true definition images. This system provides high resolution images of the train underside with incredible detail.

Using the identical line scan camera technology utilized in our Panoramic **xtd™** Camera System, we are able to produce images of the undercarriage of a moving train at track speeds.

The Vehicle Undercarriage Examiner System (**vue™**) is embedded between the rails and captures three distinct undercarriage views of the train in order to maximize the visual information. The images are assembled (stitched) to create a continuous panoramic view of the entire length of the rail car's undercarriage. Image storage is subject to the size of the storage drives. By employing the **vue™** the undercarriage can be remotely inspected safely and efficiently.



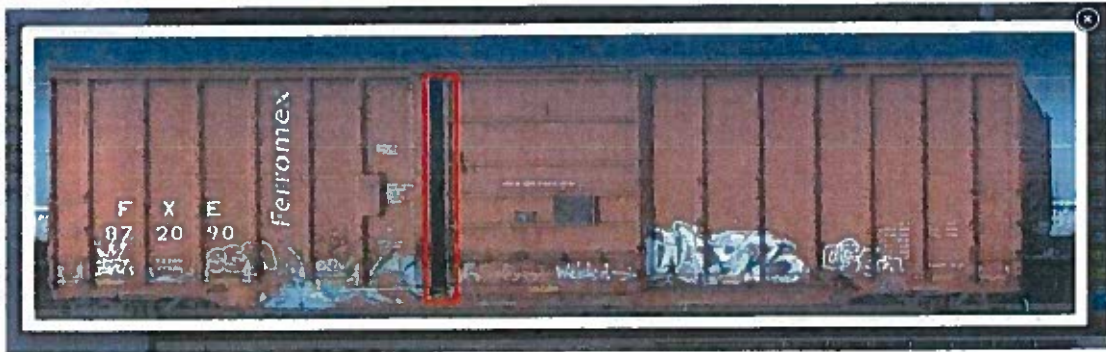
vue™ Sample Image

The **vue™** sub system will include capabilities such as high definition imaging, measurement of speed measurement of distance to check point, and determination of car start and end points, which are necessary components to accurately stitch the image tiles prior to submission to the various detection engines. All system components will be simultaneously accessible (and operable) from multiple remote locations via a variety of communication strategies. The individual image frames will be classified and combined (stitched) to create a continuous panoramic view of the rail car undercarriages. As part of the operating system, the **vue™** images will be "matched up" for comparison by our automated **vue™** Foreign Object Detection (FOD) engine. The FOD process looks for "suspicious" differences and automatically detects and reports potential anomalies. The FOD module will feature automated Foreign Object Detection (FOD) algorithms that compare the undercarriage images to reference images taken from the

same car during an earlier scan. The system also resolves the particularly difficult process of inspecting rail car undercarriages by providing high resolution images of the entire undercarriage. The system is not intended to “replace” the human operator; rather it is designed to help streamline the physical inspection process by narrowing the number of inspection targets down to cars with “potential” anomalies. Consequently, the detection sensitivity is intentionally set at the highest resolution possible to err on the safe side so as to avoid false negatives.

Automated Detection of Open Doors and Missing or Open Hatches

As the train passes through the portal, laser sensors scan the top and sides of the train to detect open/missing hatches and open doors. In the event of a “potential” detection, the system saves a series of images and enters the corresponding car information into a database. The detections are marked on the panorama images and presented to the operator who will either acknowledge the suggested detection as valid (green button) or reject the detection as invalid (red button). The operator can expand the event to view car and consist information, additional images, or can enlarge specific areas for a closer view of the detection. In addition, the operator has the ability to add a marked-up image to the existing detections that the system has identified.



Sample Open Boxcar Door Capture

Train Rider Detection System – **trids**™

Our proprietary Train Rider Detection System (**trids**™) is designed to detect illegal riders on the sides and tops of the moving railcars. This system will provide special cameras and non-visible lighting that will enable the software to detect people riding on the train in most visible areas. **trids**™ is designed to offer inspection personnel an expedient and efficient method of isolating and identifying anomalies of interest, particularly unauthorized train riders. Images of areas of interest are identified automatically by the software algorithms and presented to the operator for validation.

Precision Speed Sensor

This specially designed sensor array provides unparalleled accurate speed (within 0.02 mph) information to our systems. When using high resolution line scan cameras, speed is a critical variable in the stitching process. The system is designed to monitor speeds as well as when a train stops which allows our systems to provide extremely high detail imaging of the train cars.

Car Cutting Subsystem

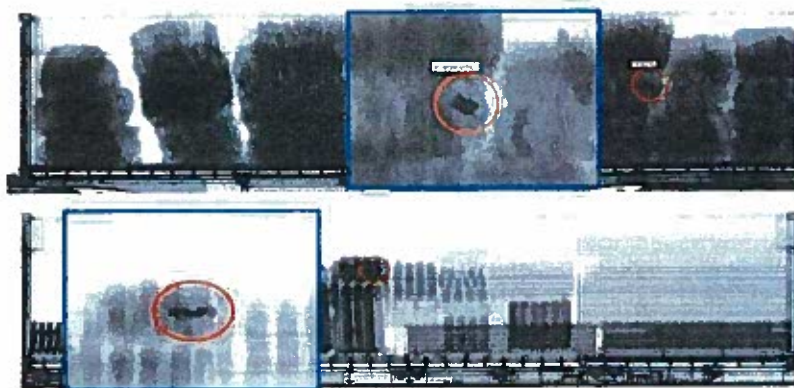
This proposal also includes an RFID sub system to accurately cut cars for viewing and analysis. This system interprets existing AEI tags attached to each rail car as well as providing synchronization of images with the specific cars. Additionally, with the **centraco™** software, authorized users can search for cars by using the AEI tag number.

Integrated Rapiscan EAGLE® R60 drive-through scanner

The Rapiscan Eagle® R60 rail scanner delivers high quality X-ray images of cargo transported by trains for use by customs officers for the detection of suspicious and fraudulent trade. Cargo on rail cars is safely screened as the cars continuously move past the scanner. The scanners' ability to rapidly scan rail cars, including cargo containers transported on rail cars, supports high inspection throughput at sites. The highly automated scanning process scans rails cars as they travel past the unit at speeds of up to 60 km/hr.

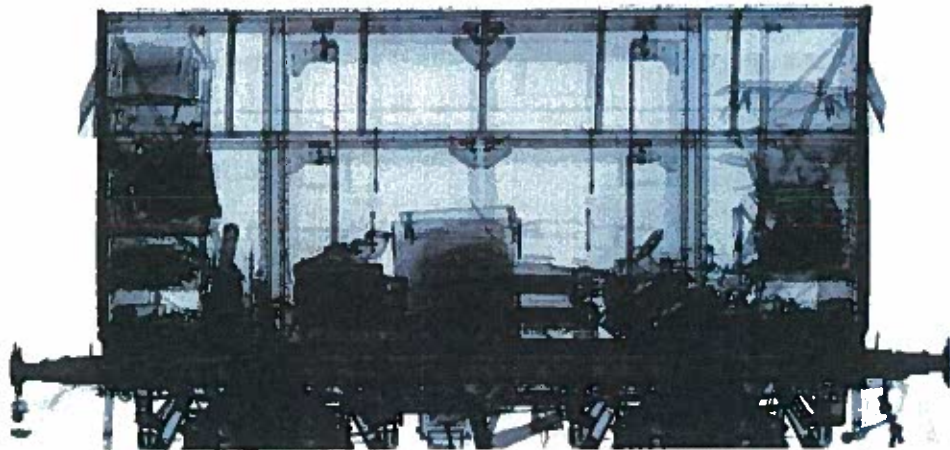
The Eagle R60 comprises a number of core components which work together to form the imaging system. These core components include:

1. The X-ray source and associated radiation shielding,
2. The X-ray detector array and associated radiation shielding,
3. Trackside sensors and an automatic control system that together manage the scanning process, and
4. A video surveillance system for site security and safe system operation.



Anomalies in images that have been detected using an Eagle R60 system

New features, such as scanning based on RFID information and automated anomaly detection, are also incorporated to help streamline and maximize the efficiency of the scanning operation. Further, to ensure the necessary safety critical operation of the system, key scanning decisions are made in real time by a digital signal processor-based hardware platform that checks the status of all connected sensors every microsecond (so one million times per second) and makes the decision whether to switch the X-ray beam on or whether to turn it off. These decisions are made for every single train component, including locomotives, wagons, tankers, carriages and containers and have proven to result in a reliable, fail-safe, system for effective real-time scanning of cargo transported by rail. As well as utilizing highly efficient scanning processes, the Eagle R60 also addresses radiation safety and site safety through its comprehensive video surveillance system which can also include video analytics for the detection of intruders with audio feedback to warn intruders to leave the scanning site. The size of the operating site for the Eagle R60 can be optimized based on local radiation regulations and anticipated train throughput. Each operating site for any customer requirement is always minimized subject to these local constraints.



A complete X-ray image of the target container is sent to the Image Review Workstation for evaluation

centraco™ Command & Control Platform

The **centraco™** platform will be the main user interface into the **duostech** Railcar Inspection Portal (**rip®**) integrated with a Rapiscan EAGLE® R60 drive-through scanner. The **centraco™** platform acts as the Graphical User Interface (GUI) for all **duostech** engineered solutions. This multi-layered command and control interface functions as the central point for information consolidation, connectivity and communications for what exist today as independent, disparate sub-systems in an enterprise environment. This browser based platform is agnostic to the interconnected sub-systems and provides

full LDAP (Active Directory) integration for seamless user permissions and network system access controls. It also performs the following major functions:

- **Collection:** Device management independent collection of data from any number of disparate devices or sub-systems;
- **Analysis:** Correlation and analysis of data, events, and alarms to identify any real-time situations and their priority for response measures and end user's Concept of Operations (CONOPS);
- **Verification:** Contextual representation of the relevant information in a quick and easily interpreted format which provides operators optimum situational awareness;
- **Resolution:** Event-specific presentation of user-defined Standard Operating Procedures (SOPs), including step-by-step instructions to resolve the situation;
- **Reporting:** Tracking of all data and events for statistical, pattern or forensic analysis;
- **Auditing:** Device-level drill down and logging of each operator interaction with the system to track any manual changes to the system including calculation of operator alertness and reaction times for each event.

centraco™ highlights include:

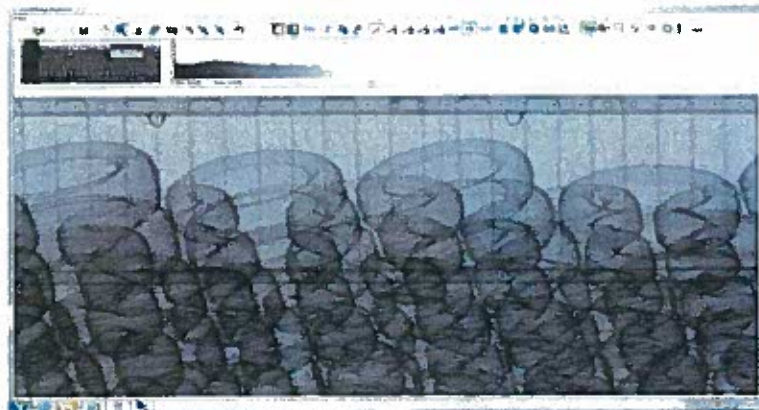
- Completely Browser Based Graphical User Interface
- Device management independent software collects data from any number of disparate devices or systems.
- The system analyzes and correlates the data, events, and alarms, to identify the real situations and their priority.
- Presents the relevant situation information in a quick and easy to understand format for an operator to verify the situation.
- The system provides Standard Operating Procedures (SOPs), step-by-step instructions based on best practices and an organization's policies, and tools to review and resolve the highlighted situations.
- Tracks all the information and steps for compliance reporting, training and potentially, in-depth investigative analysis.
- Monitors how each operator interacts with the system, tracks any manual changes to inspection systems and calculates reaction times for each event.
- Utilizes LDAP/Active Directory Authentication
- Incorporates Autocheck to monitor the health and status of all connected devices and networks

The system will also have the capability to interface into other systems as may be required through the included **centraco™** platform, a dynamic and flexible command and control platform. As the primary interface to the Railcar Inspection Portal System, it consolidates data and alarm events from an unlimited number of sensor and information sources into a unified, interactive user interface, which is customized to the individual customer's concept of operations. It provides situational awareness and data visualization for security and operational objectives.



centraco™ screenshot with integrated scanner panorama.

An example of the **centraco™** operating screen is shown above. This screen provides the operator with high resolution views of the railcar (top, side A, undercarriage, side B) and merges jpeg images from the Eagle R60 scanner system.



EAGLE R60 Screen Layout.

The **centraco™** platform will also allow isolated viewing of the scanner system (see above) and is designed to also provide the instruction (via the standard Eagle R60 parallel IO interface on the System Controller) as to whether each railcar should be scanned or not. Therefore, there is no requirement for an OCR system for determining container code numbers.

Virtual Fence Subsystem

In order to protect the system, we propose the use of our DHS SAFETY Act designated, **praesidium®** analytics to provide a virtual fence around the system. This sensor detection software that will be used to accomplish this, processes and analyzes the video feeds, using intelligent video analytics to detect a perimeter breach, visualize the location of the intrusion, and send a real-time event alert to the **centraco™** GUI, accompanied by a video clip of the event. Based upon the established concept of operations, the event alert and video clip can also be sent to any authorized remote user, including outside agencies.



duostech's praesidium® video analytics were originally developed and customized to meet the specific challenges faced by the railroad industry and have been successfully used to secure rail bridges, tunnels, and yards. The software is trained not to generate alarms for trivial movement, such as wind-blown debris or small animal activity. During a start-up period, **duostech** personnel further customize the software, based on the local environment, to minimize false alarms. False alarms are defined as events occurring that would be deemed, after appropriate investigation, as non-threatening.

Our **praesidium®** video analytics software is based on the principal of behavioral analytics and employs distributive layer analysis (DLA) technology for optimal video analytics accuracy. DLA splits a video scene into three separate layers, and then independently analyzes each layer to allow for statistical variations in the scene, which reduces false alarms. This allows us to guarantee, with a high level of certainty, that when our system generates an alarm event that it is a positive alarm and not a false alarm.

praesidium® also includes superior video analytics to reduce false alarms using the following:

Continuously adaptive background modeling

A statistical model of the background is automatically built and adapted in every frame to ensure the best representation of the scene. This allows for detecting and tracking 'foreground objects' which may not necessarily be moving at that time. This method allows for statistical variations in the scene that could be nuisance motion to be automatically ignored. This is a strong component for avoiding false positive alarms.

Prediction based saliency estimation

Several cues such as speed and multiple movement patterns are considered and analyzed by our algorithms. Each frame analysis renders a “prediction” of speed and movement “expected in the next frame.” The real-time information is compared to the “prediction” and matched against a set of rules that defines “allowed vs. disallowed” activities. If the predicted motion is statistically close to measured motion, there is an increased probability that the object is a human. This result is one of many powerful indicators that identify an object as a person or non-person. This method yields maximum reliability in the classification of moving objects and minimizes false alarms.

Weather filters to ignore ambient motion

Weather conditions like rain and snow are the bane of video surveillance systems. They provide significant ambient motion that causes most intelligent video systems to either throw incessant false alarms or fail to detect a true intrusion. A statistical model of this motion is developed and incorporated into our algorithms. This model is used to filter weather motion and detect only purposeful motion (coupled with the saliency estimation).

Elimination of shadows

Other important cues used for accurate classification are the “dimension” and the “aspect ratio” of an object. (For example, the dimension and aspect ratio of a human being are quite different from those of an animal or vehicle). A shadow cast by an object on the ground masks these dimensions. In order to be able to detect intruders with acceptable sensitivity, most video surveillance systems either decrease the detection thresholds or decrease the weight of the variables used for detection. This leads to an increased false alarm rate. Using a patent pending ‘Drop Histogram’ method, the width and the height of the unfiltered object (object with the shadow attached to it) are adjusted to the contour of just the object, thereby eliminating shadows as a cause for false alarms.

Accurately modeling the scene surface by using piece-wise planar models

Dimensions of a potential intruder at any point (coordinate) in the field of view (FOV) are predicted based on site calibration. A typical calibration procedure includes fitting a plane (or two) onto the FOV surface. However, real world scenes are not planar, so prediction using these planar models can lead to inaccurate results. We use a piece-wise planar model in which a surface is approximated by a number of small planes (from tens of planes to hundreds of planes, depending on the scene surface). This leads to more accurate dimension prediction, further minimizing false alarms.

Additional Standard Features

With our experience of deploying the Rail Inspection Portals, we have also learned and incorporated many enhanced features into our system design. Of note is the adaptation to various concept of operations (CONOPS) where trains change speed, slow down, speed up, stop and reverse direction all while

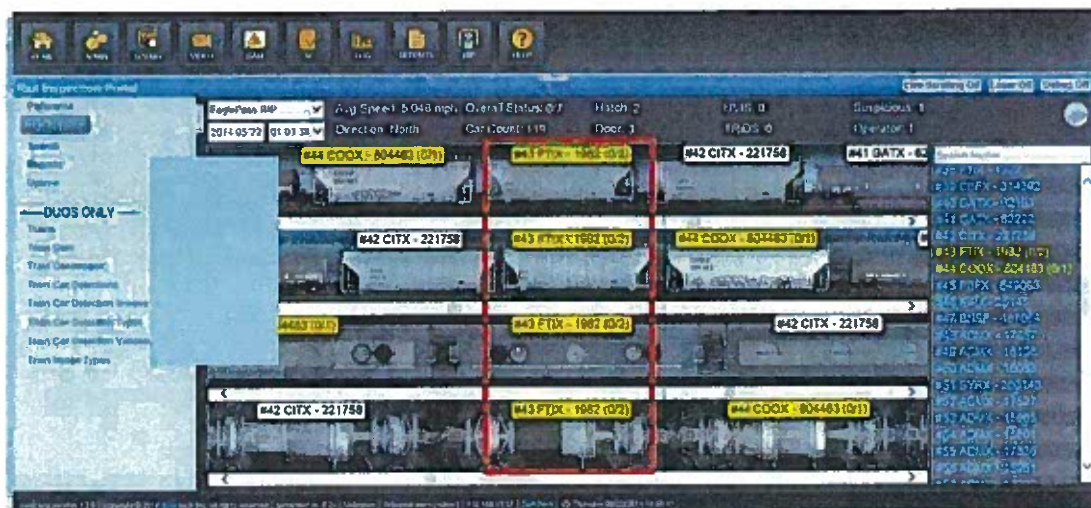
maintaining full imaging and inspection of the trains. We are also able to keep the consist imaging logically intact throughout this range of CONOPS.

An arsenal of sensor technologies allows precise train and railcar detection capabilities so that 360-degree images of each railcar are saved along with AEI tag information into a database for inspection and later retrieval or review. Duos has also developed a precise custom speed sensor system that will be installed as part of the system that further refines its car cutting and assessment capabilities.

Some of the key advantages of our system are:

Ability to Integrate Image stream with AEI consist data

AEI consist data is the primary methodology we utilize to synchronize captured images of each railcar. The system is searchable by using the AEI tag or sequence in the train.



AEI to Image Synchronization Sample

Optical zoom in/out functions

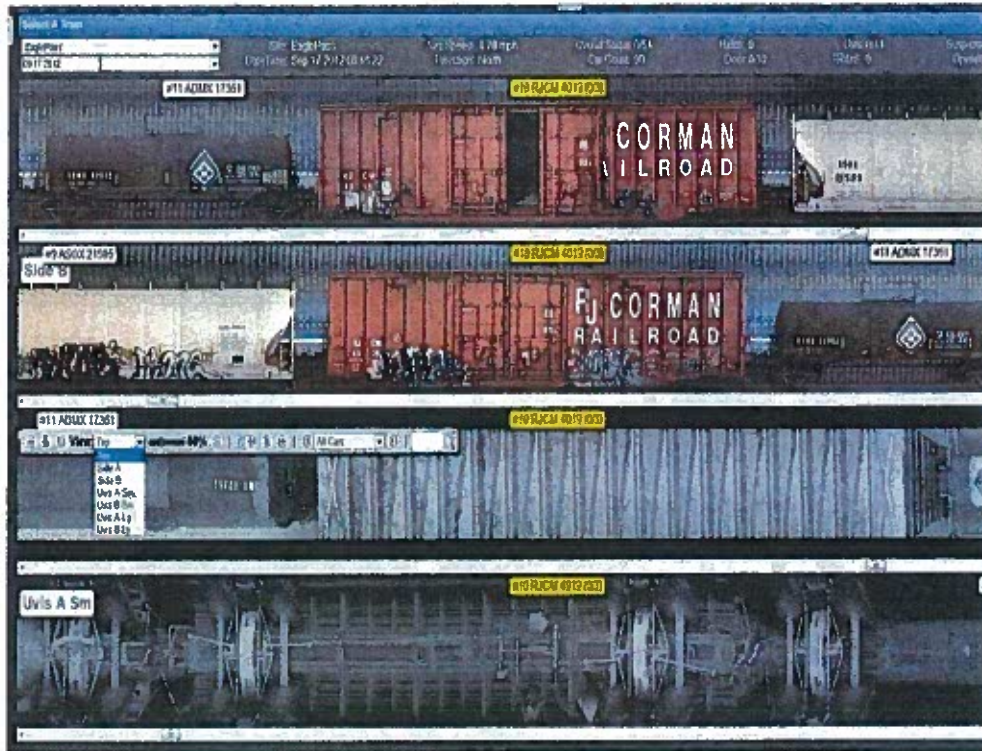
The system has the ability to zoom-in train panorama views up to 200%.

Resolution to view common defects

The system has the resolution necessary to view common defects with **xtd™** (Extreme True Definition) imagery.

View of all sides of train and roof

The system has the ability to view all sides of the train, including both sides, top, and bottom



All four sides of a railcar sample image

Ability to process a minimum of forty 150-car trains per day

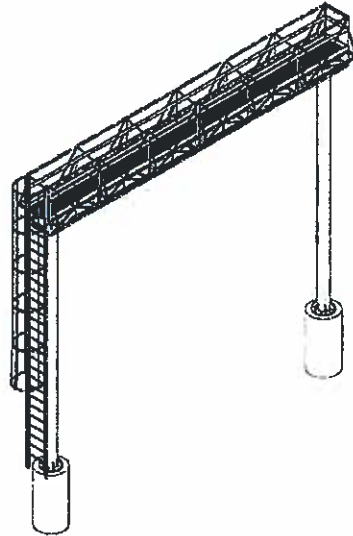
The system has the ability to process a minimum of forty 150-car trains per day and will inspect all locomotive & car types typically found in North America at track speeds.

Ability to send defects to other systems

The system has the ability to send defects and alerts to other systems utilizing the **centraco™** platform.

Truss Structure for Panoramic System

As opposed to using standard wooden poles, we prefer to use a metal truss structure. This structure provides a stable and convenient platform to mount equipment specific to our systems. The structure also includes a maintenance catwalk eliminating the need for bucket trucks and lift vehicles for equipment maintenance.



Typical Truss Structure w/Maintenance Catwalk

Canopy

Demonstrable improvement has been shown from the implementation of a canopy (already deployed at several **rip™** sites) that has controlled lighting foundations and provides consistent image generation through a variety of external conditions including weather, sun glare and shadows from the truss and equipment. The canopy design can withstand winds of up to 200MPH. The provision and installation of a canopy will provide optimum environmental conditions for digital imaging. This proposal includes the materials price, shipping and installation. The canopy specified has been previously approved for use in a Class 1 Freight railroad environment.



Electrical Services

The level of effort and costing for electrical services will be provided after the exact locations of the systems has been determined. A detailed site survey will be performed at this point to determine the scope of work and cost for this effort.

Internet Service Provision

The level of effort and costing for Internet Services will be provided after the exact locations of the systems has been determined. A detailed site survey will be performed at this point to determine the types of bandwidth services available, scope of work and cost for this effort.

OUTLINE SPECIFICATIONS

The following table presents overview of system performance parameters for the CCAFS and KSC X-ray systems.

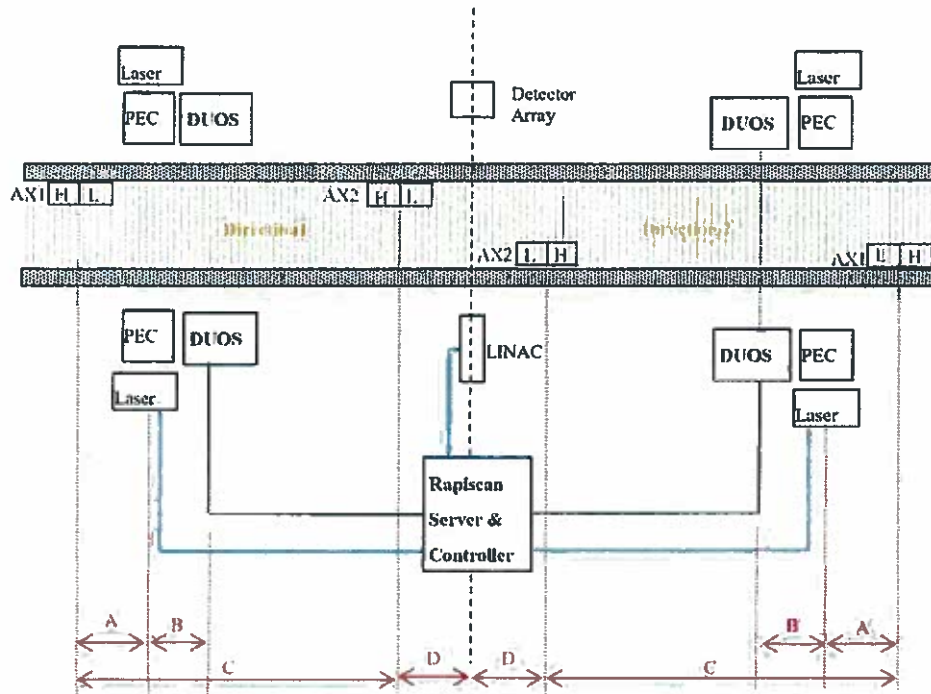
REQUIREMENT	R60 SPECIFICATION
Physical Specifications	
Platform Type	Fixed site Rail scanner solution
Platform	Portal structure for single track applications
View direction	Side shooter
Overall Dimensions (m, typical)	Length: 25m Width: 20m Height: 7m (single stacked) 9.4m (double stacked 2)
Scan Area (m)	Width: 2.5m Height: 3.4m (single stacked) 5.84m (double stacked 2)
Recommended Maximum Object Scan size (m)	Number of scan objects; unlimited, containers tend to be 20ft or 40ft in length Width: 2.5m Height: 3.4m (single stacked) 5.8m (double stacked 2)
Minimum Scan Height (m)	Base of cargo as standard
Overall System Weight (kg)	Civil works
Boom Orientation (x°)	90° to inspected object

REQUIREMENT	R60 SPECIFICATION
Operating Environment (°C at Sea Level)	Operational Temperature: -10°C to +40°C -40°C with optional cold weather package +55°C with optional hot weather package
Relative Humidity	5 to 95% non-condensing
Maximum Baseline Wind Speed (km/h)	40km/h
Operation	
Set-up	24-hour operation system set in standby mode
Crew	1 image inspector - multiple inspectors
Scan Modes	Fully automated container cargo scanning standard, RFID based cargo selection optional
Scan Direction	Single direction (Standard) Bi-Directional (option)
Scanning speed (km/h)	2- 20km/h (R60)
X-ray Generator and Image Performance	
Linac energy	6 MeV
Steel Penetration (mm)	290mm (Double stack 2) 300mm (Single stack)
Wire Resolution in Air (mm)	2mm
Spatial Resolution - Horizontal (mm)	5mm
Spatial Resolution - Vertical (mm)	5mm
Contrast Resolution Behind 100mm (unless specified), %	1%

REQUIREMENT	R60 SPECIFICATION
Material Separation	Low Z organic, Low z inorganic, High Z inorganic
Radiation Detection (Option)	Integrated Gamma Radiation detection Integrated Gamma and Neutron Radiation detection
Radiation Safety	
Shielded Radiation Exclusion Zone, L (m) x W (m)	50m x 30m Typical. Actual values depend on site configuration and local radiation regulations.
Radiation Dose at Exclusion Zone Boundary in One Hour ($\mu\text{Sv/hr}$)	Depends on train throughput. Less than 1 mSv/yr at boundary when scanning at highest available throughput
Radiation Dose to Crew in One Hour ($\mu\text{Sv/hr}$)	Not Applicable for remote sited operators.
Radiation Dose to Cargo per Scan (μSv)	Less than 20 μSv
Shielding type	1m thick concrete shielding around the Linac, 2m thick shielding at detectors, 0.5m shielding walls

PROPOSED SYSTEM LAYOUT – INITIAL CONCEPT

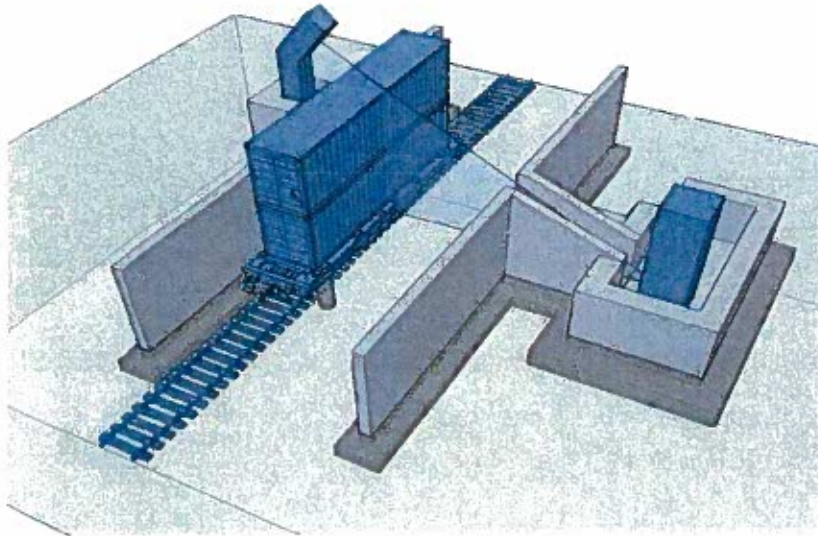
Please note this layout is for reference only.



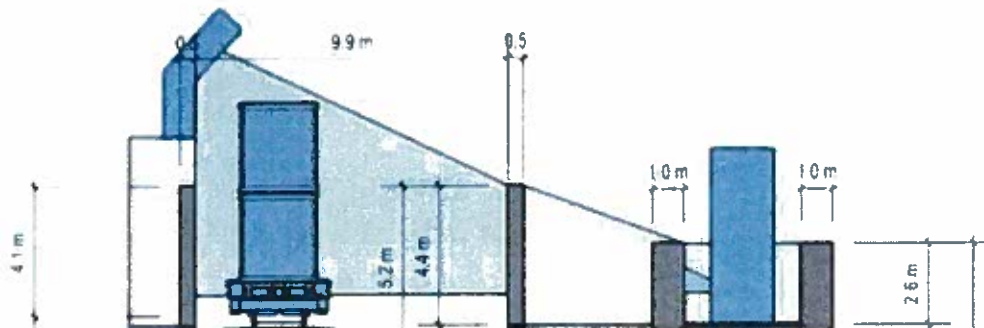
Dimension	Value
A	4m
B	1m
C	80m *
D	4m

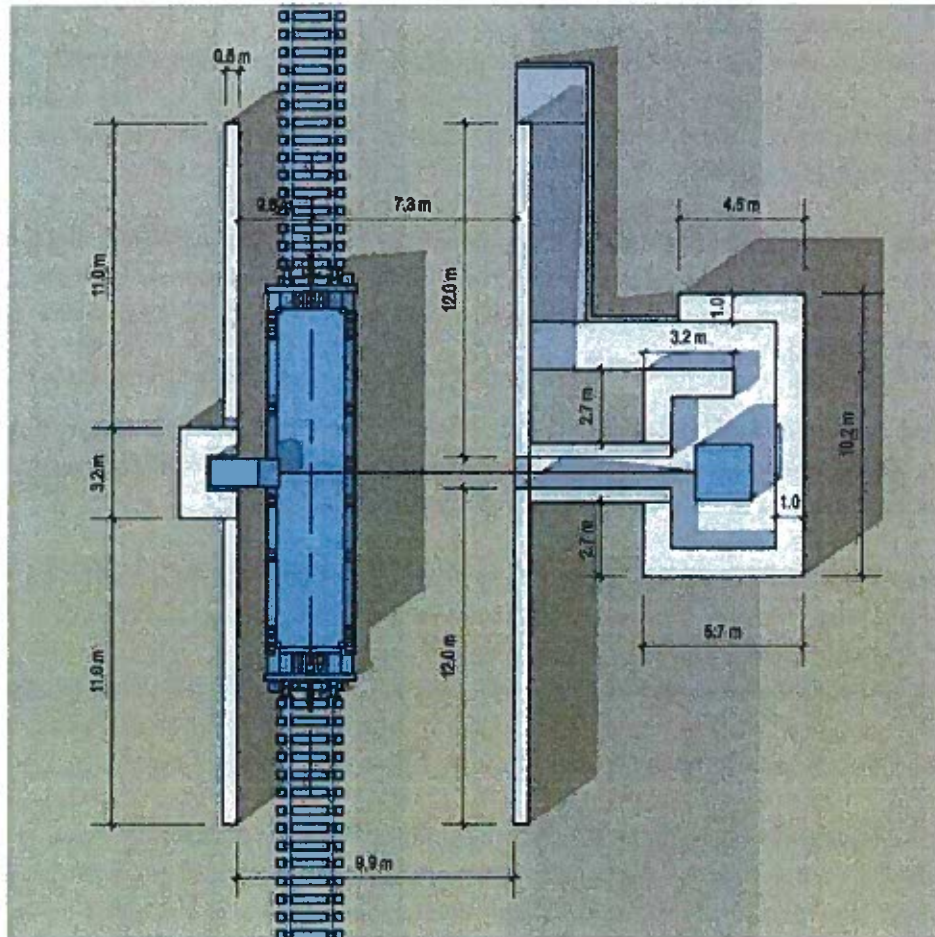
*Dimension C is dependent upon the time video analytics takes to process and validate an object for X-Ray scanning.

In order to accommodate double stacked containers for scanning, the Linac must be placed further away than a standard single track system. The track is not centric to the scan tunnel as less wall height is required if it is further away from the source of scatter.



Initial system concept





Initial System Concept

SERVICE & MAINTENANCE

We propose a complete five-year maintenance program. This program includes an immediate response time to all issues and requests for services. Our help desk is available 24/7/365 and incorporates a standardized ticketing system for issue tracking. The sections below outline information on the service levels offered in this proposal.

Enhanced Service: This Service level is the routine labor required to troubleshoot equipment/systems 24/7/365. The service includes remote troubleshooting and programming as well as technical telephone support. The Customer is responsible for allowing Duos access to its systems via secure Virtual Private Network (VPN) connection.

Technical Telephone Support: Duos provides telephone support 24/7/365 to address simple technical questions/issues. Telephone support is handled in a routine manner. The intent of this service is to provide timely answers to simple technical questions regarding system operations.

Software Support and Updates: Under this service option, Duos will provide technical software and hardware support, software patches and updates, and software maintenance, 24/7/365.

System Documentation Maintenance: Duos will maintain all relevant system documentation to support the system, including changes. Documentation and system information will be available to Customer via the Duos Extranet. Access to the Extranet will be limited to authorized personnel.

Preventive Maintenance Program: This option includes a comprehensive annual preventive maintenance (PM) program for major system components. PM work consists of inspecting, testing and cleaning system components and devices, as well as minor part replacement/repair up to a predetermined amount, per contract year. Subject to customers' pre-approval, replacement/repair work not covered by the Preventive Maintenance Program will be billed to Customer separately.

PROJECT PRICING

Systems listed below include all hardware, software, and labor to provide, install, and commission the complete project.

Railcar Inspection Portal with Integrated Scanner System			
System Description	Qty	Unit Price	Total Price
Railcar Inspection Portal with Integrated Scanner System	2	\$6,119,477	\$12,238,954
duostech Railcar Inspection Portal (rip*) Integrated Rapiscan EAGLE® R60 drive-through scanner Turnkey Installation* centraco Software Licensing Labor, Shipping, Training Included			
Five-year Maintenance and Warranty per system	2	\$2,661,665	\$5,323,330
Total Project Price			\$17,562,284*

* Cost for installation and consumption of electrical and internet service is not included in this pricing;

* Local, regional, state or federal taxes are not included in this pricing.

We thank you for the opportunity to submit this proposal. Please do not hesitate to contact us should you require any additional information.

Best regards



Felix W. Krupczynski
Executive Vice President and General Manager

EXCLUSIONS & CLARIFICATIONS

1. This proposal was prepared based on Duos' understanding of discussions with TranSystems(Client). As a result, certain assumptions have been made. Should a change to the system functionality and/or hardware/software be required, Duos will respond by issuing an addendum (or revision) to this proposal describing the impact on the schedule and to the cost for the system. Work related to any changes will not begin until the respective changes are mutually agreed to in writing.
2. Professional Engineering Stamp of drawings (if required), specifications, studies, etc. are not included in the Scope of Work unless specified otherwise.
3. Permitting is not included unless specified otherwise.
4. Deviation from any of the components listed herein may be necessary due to physical limitations, design considerations, and availability. We reserve the right to adjust the design and/or change equipment specification if it is deemed that such adjustments and/or changes would result in an improvement over the specifications contained in this proposal. Substitution of special purpose components will be from a reputable manufacturer and suitable for the application.
5. We do not assume any consequential damage liability. Subject to the extent allowable by law, in no event shall Duos' total liability to client hereunder exceed the sum paid to Duos by Client, exclusive of any sums paid and/or owing directly to any subcontractor.
6. Performance and/or payment bonds are not included.
7. All supplied documentation will be written in U.S. English. Translation into other languages is available at an extra charge that will be provided upon request.
8. Operating manuals, documentation, and drawings will be provided in electronic format. Pricing for the production of hard copies of this documentation will be provided upon request.
9. Construction and consumption of electric service at the sites are not included.
10. Internet service is not included.

TERMS AND CONDITIONS**1. Payment Terms:**

- Issuance of Purchase Order – 50%
- Prior to Shipment – 30%
- Upon Substantial (Mechanical) Completion – 10%
- Upon Commissioning – 10%

2. All payments are due NET 30 days.**3. No modification, alteration, or amendment to this order will be effective unless in a written change order signed by Client representative and Duos.****4. Warranty:**

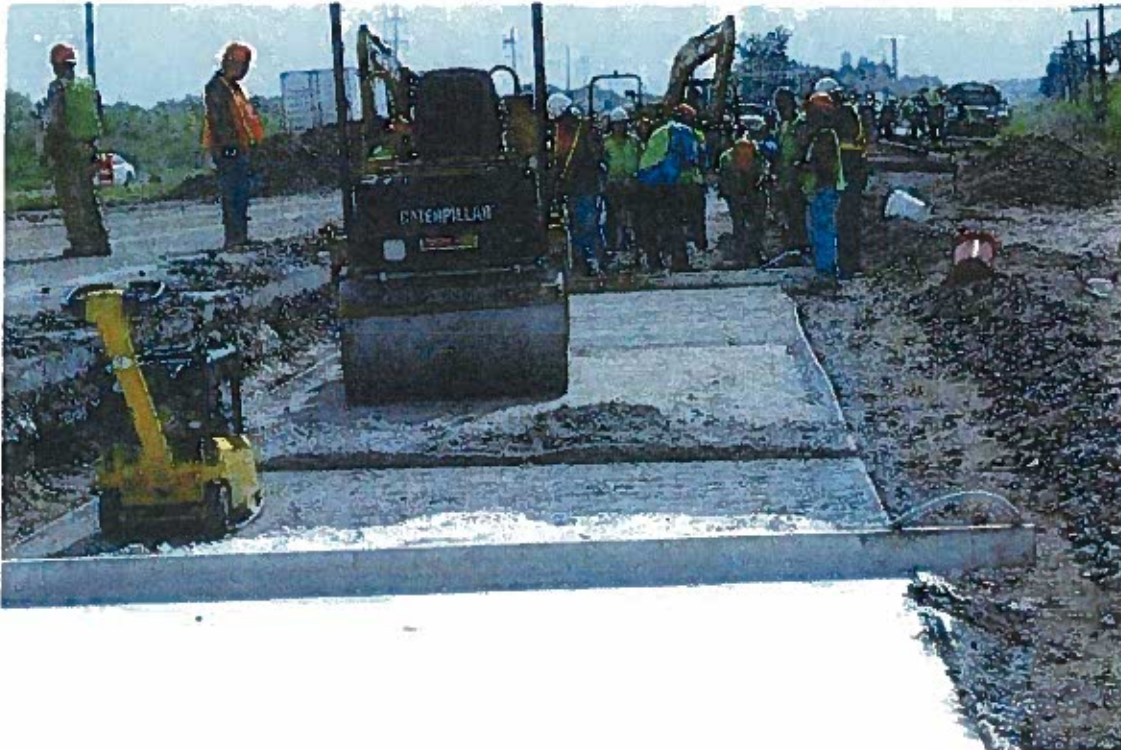
Warranty for services and equipment provided under this proposal covers the term stipulated in the service agreement and includes a complete five-year maintenance program as outlined in the Service & Maintenance section of this proposal.

5. General:

This proposal is valid for ninety (90) days from the date of submittal and is subject to omissions and errata.

APPENDIX C

TUB Crossing Examples













R. W. SUMMERS RAILROAD CONTRACTOR, INC.



3693 E. GANDY ROAD
BARTOW, FLORIDA 33830
(863) 533-8107
FAX (863) 533-8100



**LIST OF EXISTING MBM CROSSING SYSTEM™ INSTALLATIONS
UPDATED DECEMBER 15, 2014**

- 1) **ST. JOHNS RIVER POWER PARK**
Jacksonville, Florida
Three each 40' MBM Crossings
Installed December 1990
RWS Job No. 90-122

- 2) **FLORIDA CENTRAL RAILROAD**
Lake Jem, Florida
Shirley Shores Drive, off C.R. 448
One each 40' MBM Crossing
Installed February 1994
RWS Job No. 94-083

- 3) **SOUTH CENTRAL FLORIDA EXPRESS**
Clewiston, Florida
U.S. Highway 27
One each 60' MBM Crossing was installed on North lane,
One each 40' Omni full depth rubber was installed on South lane.
(Cross Reference MBM List Crossing 22)
Installed April 1994
Rubber Epflex Interface
Installed September 2004
RWS Job No. 94-216

- 4) **AVATAR PROPERTIES (POINCIANA TOWNSHIP)**
Poinciana, Florida
U.S. Highway 17/92
One each 40' MBM Crossing
Installed January 1995
RWS Job No. 94-201

- 5) **CAMP BLANDING TITAN STORAGE BUILDING**
Camp Blanding, Florida
Railroad track approach to Titan Storage Building
One each 100' MBM Crossing
Installed January 1996
RWS Job No. 94-196

- 6) **SOUTH CENTRAL FLORIDA EXPRESS**
S.R. 70 South of Lake Placid, West of U.S. Highway 27
One each 40' MBM Crossing
Installed March 1996
RWS Job No. 95-128
Rubber Epflex Interface
Installed October 2002
RWS Job No. 03-007
- 7) **CITY OF LAKELAND, FLORIDA**
Lakeland, Florida
S.R. 33-A at McIntosh Power Plant
One each 60' MBM Crossing
Installed June 1996
RWS Job No. 96-049
REMOVED AND REPLACE ASPHALT
Installed July 2009
RWS Job No. 08-069
- 8) **FLORIDA NORTHERN RAILROAD**
Ocala, Florida
C.R. 326
One each 100' MBM Crossing
Installed August 1996
RWS Job No. 96-026
**REMOVED ASPHALT AND REPLACED
WITH RUBBER EPFLEX INTERFACE**
Installed February 2010
RWS Job No. 04-109
- 9) **FLORIDA CENTRAL RAILROAD**
Ocoee, Florida
Bowness Road
One each 40' MBM Crossing
Installed December 1996
RWS Job No. 97-036
- 10) **FLORIDA CENTRAL RAILROAD**
Orlando, Florida
John Young Parkway (North of Silver Star Road)
Two each 40' MBM Crossings
Installed February 1997
RWS Job 97-029
**REMOVED ASPHALT AND REPLACED
WITH RUBBER EPFLEX INTERFACE**
Installed March 2010
RWS Job No. 04-109
- 11) **FLORIDA CENTRAL RAILROAD**
Orlando, Florida
U.S. Highway 441 @ Silver Star Road
One each 100' MBM Crossing installed in 12° curve
Installed April 1997
RWS Job No. 97-037
**REMOVED ASPHALT AND REPLACED
WITH RUBBER EPFLEX INTERFACE**
Installed March 2010
RWS Job No. 04-109

- 12) **FLORIDA NORTHERN RAILROAD**
Ocala, Florida
C.R. 329
One each 40' MBM Crossing
Installed September 1997
RWS Job No. 97-158

- 13) **TARMAC AMERICA, INC.**
Medley, Florida
Pennsuco Quarry,
One each 160' MBM Crossing (60' Tangent, 100' 12° curve)
Installed December 1997
RWS Job No. 97-105

- 14) **SOUTH CENTRAL FLORIDA EXPRESS**
South Bay, Florida
U.S. Highway 27
One each 120' MBM Crossing
Installed October 1998
Rubber Epflex Interface
Installed July 2002
RWS Job No. 98-120

- 15) **ORLANDO UTILITIES COMMISSION**
Orlando, Florida
Narcoossee Road
One each 120' MBM Crossing
Installed February 1999
RWS Job No. 93-143

- 16) **ORLANDO UTILITIES COMMISSION**
Orlando, Florida
Spur Road
One each 20' MBM Crossing
Installed March 1999
RWS Job No. 98-151

- 17) **ORLANDO UTILITIES COMMISSION**
Orlando, Florida
Old Wetherbee Road
One each 40' MBM Crossing
Installed April 1999
RWS Job No. 98-151

- 18) **FLORIDA CENTRAL RAILROAD**
Orlando, Florida
U.S. Highway 441 @ Sears Branch
One each 100' MBM Crossing
Installed April 1999
RWS Job No. 98-129
- REMOVED ASPHALT AND REPLACED
WITH RUBBER EPFLEX INTERFACE**
Installed March 2010
RWS Job No. 04-109
- 19) **FLORIDA CENTRAL RAILROAD**
Orlando, Florida
S.R. 50
One each 80' MBM Crossing
Installed March & April 1999
RWS Job No. 99-063
- 20) **FLORIDA CENTRAL RAILROAD**
Apopka, Florida
13TH Street & Tilden
One each 100' MBM Crossing
Installed June 1999
RWS Job No. 98-069
- 21) **FLORIDA MIDLAND RAILROAD**
Eagle Lake, Florida
S.R. 540
One each 140' MBM Crossing
Installed September 1999
RWS Job No. 98-088
- 22) **SOUTH CENTRAL FLORIDA EXPRESS**
Clewiston, Florida
U.S. Highway 27 - South Lanes
One each 40' MBM Crossing
(Cross reference MBM List Crossing 3)
Installed October 1999
Rubber Epflex Interface
Installed September 2004
RWS Job No. 99-158
- 23) **FLORIDA NORTHERN RAILROAD**
Ocala, Florida
Magnolia Avenue
One each 60' MBM Crossing
Installed January 2000
RWS Job No. 99-119

APPENDIX D

Environmental Impacts

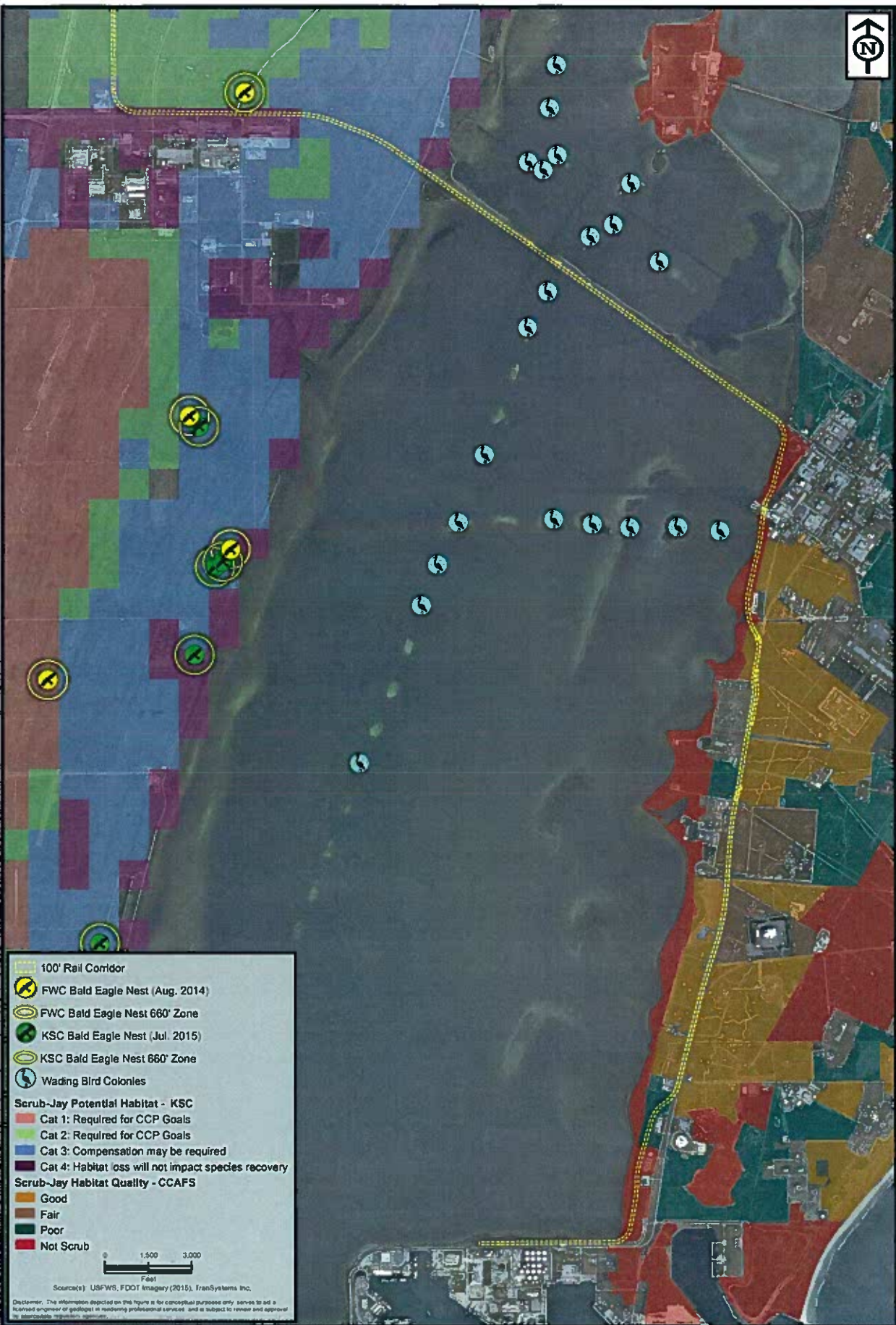


100' Rail Corridor
 Wetlands
 0 1,500 3,000
 Feet
 Sources: USFWS; FDOT Imagery (2015);
 TranSystems Inc.
 Disclaimer: The information depicted on this figure is for
 conceptual purposes only. It is not intended to be used as a basis for
 engineering or other professional services, and is subject
 to review and approval by appropriate regulatory agencies.


**ENVIRONMENTAL
SERVICES, INC.**
 7220 Flanders Way, Suite 100
 Jacksonville, Florida 32256
 (904) 478-2399
 (904) 478-2112 Fax
 www.environmentalservicesinc.com

Wetlands
CCAFS - KSC Rail Alignment
 Brevard County, Florida

Project:	EJ13250.04
Date:	Sep 2018
Drawn By:	JRN
Checked By:	GKH
Approved By:	GKH
Figure:	1



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Protected Species
CCAFS - KSC Rail Alignment
Brevard County, Florida

Project:	EJ13256.04
Date:	Sep 2016
Drawn By:	JRN
Checked By:	GKH
Approved By:	GKH
Figure:	2



Cultural Resources
CCAFS - KSC Rail Alignment
Brevard County, Florida

Project:	EJ13259.04
Date:	Sep 2016
Drawn By:	JRN
Checked By:	GKH
Approved By:	GKH
Figure:	3

APPENDIX E
Rail Alignment from CPA area to KSC's
J-J Interchange Yard

PROPOSED ROUTE
THROUGH CAPE CANAVERAL
AIR FORCE STATION
AND KSC



