Feasibility Study for the Port of Buenaventura Operational and Security Enhancement Project in Colombia

Deliverable No. 8B. Final Report – Public Version

Prepared by AECOM, 2101 Wilson Blvd., Ste. 800, Arlington VA 22201-3044 Tel 1-703-340-3027 Fax 1-703-340-3101
www.aecom.com

This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the U.S. Government. The opinions, findings, conclusions, or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position of USTDA. USTDA makes no representation about, nor does it accept responsibility for, the accuracy or completeness of the information contained in this report.

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May 1, 2012

Mr. Jacob Flewelling
Country Manager, Andean Region - Caribbean
U.S. TRADE AND DEVELOPMENT AGENCY
1000 Wilson Boulevard Suite 1600
Arlington VA 22209-3901

Re: Colombia: Port of Buenaventura Operational and Security Enhancement Project

Appropriation No.	1109/101001
Activity No.:	2009-51005A
Reservation No.:	2009-510008
Grant No.:	GH2009510004

Dear Mr. Flewelling:

We are pleased to submit one (1) complete version of the Final Report, one (1) public version of the report and two (2) CD-Rs each containing the public version of the report.

Sincerely yours,
AECOM

Larry Boorstein
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Consultants

AECOM, based in New York and Los Angeles, has 45,000 employees in 125 countries and achieved US$8.1 billion in revenue in 2011. AECOM is a global provider of professional technical and management support for a wide range of markets, including transportation, facilities, environment, water power, and government.

L-3 Klein, Salem, New Hampshire, is a pioneer in the development of side scan sonar, profiling and subsurface instruments and accessories for underwater search and survey. Its expertise includes sonar, navigation, marine surveillance and security solutions, radar, sonar and sensor-based image to the edge of the water and land perimeter surveillance and security, radar small target detection, detection of divers / swimmers, and Automatic Identification Systems (AIS).
Maritime Exchange for the Delaware River and Bay, Philadelphia, Pennsylvania, is a non-profit trade association dedicated to promoting and encouraging commerce in the Delaware River and Bay. The Maritime Exchange has expanded its role and now serves as a center of communications in the Delaware River and Bay, providing an information network for ports of unprecedented scope in the maritime industry.

Ports and Logistics Consulting, Bogota, Colombia, is a consulting company specializing in professional services in the Port area, maritime and intermodal transportation and logistics.

This study was prepared by a group of experts:

Larry Boorstein, Project Manager, AECOM has 35 years experience in economic, financial and technical feasibility studies and evaluation of alternatives for major development projects, port and transport infrastructure. He has directed and participated in major projects funded by the U.S. Trade and Development Agency (USTDA), the U.S. Agency for International Development (USAID), U.S. Army Corps of Engineers (USACE), the U.S. Maritime Administration (MARAD), the World Bank (IBRD), International Finance Corporation (IFC), the Asian Development Bank (ADB), African Development Bank (AfDB), port authorities and departments of transportation. He has carried out studies and projects in the United States, Mexico, Honduras, Cayman Islands, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Chile, Brazil, Bahamas, Portugal, Italy, Romania, Norway, Egypt, Saudi Arabia, Lebanon, Libya, Morocco, Liberia, Kenya, South Africa, Indonesia, Thailand, Taiwan and the Philippines. He received the degrees of Master of Business Administration (MBA) in Finance and Civil Engineer (CE) from Columbia University in New York, Master of Science (MS) with specialization in Civil Engineering and Bachelor of Arts (AB). His biography appears in Who's Who publications in America, Who's Who in Finance and Business, Who's Who in Science and Engineering and Who's Who in the World.

Billy Vanderbur, Senior Expert in Safety, AECOM, has 25 years experience in security management and telecommunications programs, including support for the Security Director of the Port Authority of Puerto Rico, comprising services such as Project Manager for new fencing at the Port of San Juan, new

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The development of a vessel traffic system was prepared under the direction of AECOM by Rick Wetmore, Senior Expert in Maritime Safety and Security, Michael Fink, AIS Expert and Al Cattalini, VTS Systems and AtoN Expert.

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Captain Al Cattalini, VTS Systems and AtoN Expert, has over 45 years experience in coastal navigation and waterways management. Retired U.S. Coast Guard as deputy chief of the Office of Navigation Safety and Waterway Services, where he was responsible for the systems of aids to navigation (ATON), LORAN and Omega, GPS interface, vessel traffic services (VTS), electronic charts, icebreaking, search and rescue (SAR), bridges and navigational safety. His experience includes assistance to development of VTS in Gulf of Honduras (Honduras, Guatemala, and Belize), Pakistan, Turkey, Panama, Taiwan, and Egypt and AtoN development for Hidrovía waterway (Uruguay, Argentina, Paraguay, Bolivia and Brazil), Egypt and navigation systems of Mexico and Papua New Guinea. Captain in the United States Coast Guard (retired). Commission received from the U.S. Coast Guard School and Master in Public Administration from American University, Washington.

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Fernando Buitrago, Advisor, Ports and Logistics, has 38 years experience in shipping terminals and currently serves as CEO of Ports and Logistics Consulting. His experience includes service as a consultant to Sociedad Portuaria Regional de Buenaventura, General Manager of Granportuaria Colombia at Transportación Marítima Mexicana (TMM), Vice President and Vice President of Traffic, Flota Mercante Grancolombiana. He received a degree in Industrial Engineering, Management, Finance and Marketing, University of Los Andes, Universidad Tecnológica de Pereira.

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Brochures[1]

[1] Not included in the public version of this report. Includes vendor information which is marked as confidential

Feasibility Study for the Port of Buenaventura Operational and Security Enhancement Project in Colombia –

Final Presentation

Larry Boorstein, Project Manager

Prepared for: Sociedad Portuaria Regional de Buenaventura, S.A.
Prepared by AECOM
with
L-3 Klein
Maritime Exchange
APS Technology Group
Ports and Logistics

This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the U.S. Government. The opinions, findings and conclusions expressed in this document are those of the authors and do not necessarily represent the official position of policies of USTDA. USTDA makes no representation about, nor does it accept responsibility for the accuracy or completeness of the information contained in this report.

February 1, 2012

Mission Statement

- The U.S. Trade and Development Agency helps companies create U.S. jobs through the export of U.S. goods and services for priority development projects in emerging economies. USTDA links U.S. businesses to export opportunities by funding project planning activities, pilot projects, and reverse trade missions while creating sustainable infrastructure and economic growth in partner countries.

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Mission:

- We provide and facilitate port and logistics services with quality, safety and effectiveness by meeting customer needs, with technology and competent human talent generating returns for shareholders and contributing to sustainable development of Buenaventura.
- General Manager Ing. Domingo Chinea Barrera
- Director of Security My (r) Gilberto Ocampo

Purpose:

- The professionals of AECOM around the world are united by a common purpose – to create, improve and sustain the built, natural and social environments of the world.

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- Fernando Buitrago, Port and Logistics Specialist
- Richard Wechsler, Project Quality Representative

AECOM

- 45,000 employees in 125 countries
- US $ 8.1 billion in revenues in 2011
- AECOM is a global provider of professional technical and management support services for a broad range of markets, including transportation, facilities, environment, energy, water and government.
- Engineering News Record, Top 500 Design Firms, 2011
  No. 1 in global design
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  No. 1 in mass transit and rail
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  No. 1 in general building
  No. 1 in education
  No. 1 in government and commercial offices

Larry Boorstein, Project Manager, AECOM

- More than 35 years experience in economic, financial and technical feasibility studies and in evaluation of alternatives for major port and transportation infrastructure development projects. Has directed and participated in major projects financed by the U.S. Agency for International Development (USTDA), U.S. Agency for International Development (USAID), U.S. Army Corps of Engineers (USACE), U.S. Maritime Administration (MARAD), World Bank (IBRD), International Finance Corporation (IFC), Asian Development Bank (ADB), African Development Bank (AfDB), port authorities and departments of transportation. Has carried out studies and projects in the United States, Mexico, Honduras, Cayman Islands, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Chile, Brazil, Bahamas, Portugal, Italy, Romania, Norway, Egypt, Saudi Arabia, Lebanon, Libya, Morocco, Liberia, Kenya, South Africa, Indonesia, Thailand, Taiwan and the Philippines.

- Education: Masters in Business Administration (MBA) in Finance and Civil Engineer (C.E.) from Columbia University in New York, Master of Science (M.S.) in Civil Engineering, and Bachelor of Arts (A.B.). Biography appears in the publications Who's Who in America; Who's Who in Finance and Business, Who's Who in Science and Engineering and Who's Who in the World.

Billy Vanderbur, Senior Security Expert, AECOM

- More than 25 years of management of security and telecommunications.
- Projects:
- Port Authority of Puerto Rico, Director of Security Support including service as Project Manager for new fencing at the Port of San Juan, new security gates on all cruise terminals, new guardhouses at the docks, lighting systems security in Mayaguez, San Juan and Fajardo, and improved safety systems for ferry terminal in Fajardo, Culebra and Vieques. Project Manager for Safety Plans for San Juan, East, Arecibo, Mayaguez and Tallaboa. Project manager for the CCTV system the Port of San Juan, Autoridad de Puertos de Puerto Rico.
- Puerto Cortés, Honduras, Development of the security system for new bulk terminal.
- Education: ASE, Electronics and ECT, Electronics Technology.

Fernando Buitrago, Advisor, Ports and Logistics

- 38 years experience in terminals and marine transport
- CEO of Ports and Logistics Consulting
- Consultant at Sociedad Portuaria Regional de Buenaventura
- General Manager, Granportuaria Colombia at Transportación Marítima Mexicana (TMM)
- Previously Vice President and Vice President of Traffic, Flota Mercante Grancolombiana
- Education: Industrial Engineer, Management, Finance and Marketing, Universidad de Los Andes, Universidad Tecnológica de Pereira

Richard Wechsler, Project Quality Representative, AECOM

- More than 27 years experience in security engineering with risk evaluation, design of systems, installation, sale and management of projects. Projects include:
  Port Authority of New York and New Jersey, New York, Midtown Manhattan Heliport, Principal designer of a CCTV system.
  Port Authority of New York and New Jersey, New York, LaGuardia Airport, Project Manager for the upgrade of the CCTV system.
  Port Authority of New York and New Jersey, Associate Project Manager for the Development of a Proposal for Design and Construction of a system of perimeter detection for JFK, LaGuardia, Newark and Teterboro airports.
  Virginia Department of Transportation (VDOT), Program Manager for Integrated Security & Management of bridges, tunnels, ports, command centers, intelligent transportation systems.
  Security specialist, projects for the Department of Homeland Security, U.S. Army Engineers and other governmental and private entities

Study Tasks

Tasks covered in this presentation:

1. Data Collection and Review of Existing Conditions
2. Development of a Vessel Traffic System (VTS)
3. Development of an Optical Character Recognition System (OCR)
4. Development of a Computer Monitoring Security (CMS) System
5. Review of Cargo Inspection
6. Interim Presentation
7. Review Development and Environmental Impacts
8. Final Report and Presentation

Port of Buenaventura

1. Data collection and site visit

Larry Boorstein, Project Manager

Billy Vanderbur, Senior Port Security Expert

February 1, 2012

Kickoff meeting:

- SPRBun: Ing. Domingo Chinea, General Manager, My (r) Gilberto Ocampo, Director of Security, José Roosevelt Ortiz, Supervisor of Security, Norberto Castañeda, Official of Protection ISPS, Alex Micolta, Assistant, Management, Héctor Molina Carrillo, Commercial and Customer Service, SPRBun
- AECOM: Larry Boorstein, Project Manager, AECOM, Billy Vanderbur, Senior Security Expert, AECOM, Fernando Buitrago, Port and Logistics Expert, Ports and Logistics and Manuel Arango, Port and Terminals Expert, Ports and Logistics.

Meetings with Port Security and Pilot

- SPRBun: Review of CCTV systems in the security control room with José Roosevelt Ortiz Quintero, Supervisor of Security, SPRBun, Gilbert Clavijo, Maintenance Engineer, Alex García, Maintenance Engineer, SPRBun, and Jimmy Iván Preciado, Service Coordinator, EMPREVI and later with Javier Geraldo Fonseca, G4S.
- Spilbun: Meeting with Osvaldo Molina Torrente, Pilot, Spilbun SA on navigation by the channel to the port.

Meetings with the DIAN and the Anti-Narcotics Police

- DIAN: Meeting about procedures and requirements for inspection of import cargo with Dra. Maria Constanza Dussan, Operational Chief, Customs, Section Director, Directorate of National Taxes and Customs (DIAN), Américo Mosquera Valencia, Chief, Imports Group, Operational Division Foreign Commerce, Marcos Vivas, Coordinator, Posterior Control, and Major Néstor Wuandurraga, Customs Fiscal Police (POLFA).
- National Police: Meeting on procedures and requirements for inspection of export cargo with TE Jeison Vargas Acevedo, Chief Analysis Room, National Anti-Narcotics Police, Anti-Narcotics Directorate (DIRAN).

Visits to inspection areas of DIAN and the Police

- DIAN: Visit to the inspection area of DIAN with Américo Mosquera Valencia, Chief of Imports Group DIAN
- National Police: Visit to the coffee warehouse with Superintendent (Sergeant) José Verra, National Anti-Narcotics Police, DIRAN
- Visit to the sugar warehouse of Comercializadora Internacional de Azúcar y Mieles, S.A. (CIAMSA)
- Visit to the Nuctech scanner with Patrolman Pablo Cesar Ospina, Anti-Narcotics Police

Meetings with DIMAR, Port Information Technology and Operations Control

- Meeting about the Vessel Traffic System (VTS) with Captain of the Port CF Jorge Enrique Sarmiento, Port Captaincy, General Maritime Directorate (DIMAR) and subsequently with CF Juan Carlos Roa Cubaque, Captain of the Port, and with CN Marco Olier Mendoza, Chief of Port Captaincies, DIMAR and Diana Garavito, Vessel Traffic Control, DIMAR.

- Meeting on information technology infrastructure with Miller Ortiz, Manager, Information technology and Telecommunications, SPRBun

- Visit to the control room of the Cosmos Container Terminal Control System (CTCS) Terminal Operating System (TOS), with José Tello, Dispatcher and Astrid Carolina Mosquera Moreno, Warehousing Coordinator, both of SPRBun

Visit to the navigation channel with Colombian Coast Guard and review meeting

- Coast Guard: Inspection of the bay between Punta Soldado and the Port of Buenaventura in a Coast Guard launch
- SPRBun: Review meeting

Tour of the navigation channel with the Coast Guard

Punta Soldado

Isla Guardacostas

2. Development of a Vessel Traffic System

Rick Wetmore, Senior Maritime Security and Surveillance Expert, L-3 Klein

Michael Fink, AIS Expert, Maritime Exchange

Al Cattalini, VTS and AtoN Systems Expert

February 1, 2012

L-3 Klein

- Headquartered in Salem, New Hampshire, L-3 Klein is a pioneer in the development of side scan sonar, subsurface profilers and instruments and accessories for the search and survey underwater. Its expertise includes sonar systems, navigation, marine security and surveillance, radar solutions. Designs, manufactures and supports equipment that has a reputation as a world standard of excellence in the industry. L-3 Klein clients include the U.S. Navy and other navies around the world, as well as engineering firms, pipeline companies, the oil and gas company, port authorities, organizations of the geology and hydrographs. L-3 Klein offers solutions for radar, sonar imaging and coastal base stations and monitoring of land perimeters and security, radar detection of small targets, detection of divers / swimmers, automatic identification systems (AIS).

Maritime Exchange for the Delaware River and Bay

- Maritime Exchange for the Delaware River and Bay is a non-profit trade association dedicated to promote and encourage trade on the Delaware River and Bay. Our members, which includes all aspects of international trade and related businesses throughout Pennsylvania, New Jersey, Delaware and beyond have joined together under the umbrella of change to address and resolve issues of common interest, and share critical information the timely movement of cargo through the ports.

- Since 1875, Maritime Exchange has been monitoring the movements of ships in the Delaware River and the dissemination of such information to its members to improve freight movement. The Maritime Exchange has expanded its role and now serves as a center of electronic communications in the Delaware River and Bay, providing an information network ports of unprecedented scope in the maritime industry.

Rick Wetmore, Senior Maritime Security and Surveillance Expert, L-3 Klein

- Rick Wetmore, Senior Expert in Maritime Safety and Security: 35 years of experience in operation of radar and navigation systems. Graduate School of Electronics and Radar Systems of the U.S. Navy
- Projects:
- U.S. Navy Base, Guantanamo, Coastal Surveillance System, Project Manager
- Singapore Police Coast Guard, Coastal Surveillance System, Engineering Project Leader
- New Orleans Causeway Bridge, Design Engineer for 4 radars

Michael Fink, AIS Expert, Maritime Exchange for the Delaware River and Bay

- Director of Information Technology for Maritime Exchange for the Delaware River and Bay, responsible for the management and operation of maritime trade computer network and infrastructure.
- He has managed the development of programming and implementation of online system for NOA / D and the AIS website.
- Instrumental in the identification, design and implementation of the Maritime Exchange AIS system, including installation of AIS antennas, receivers, software, integration and database design and implementation of the Maritime Exchange VHF system and the pilots association.

Al Cattalini, VTS and AtoN Systems Expert

- Over 45 years experience in coastal navigation and waterways management. Retired U.S. Coast Guard as deputy chief of the Office of Navigation Safety and Waterway Services, where he was responsible for the systems of aids to navigation (AtoN) Loran and Omega, global positioning system (GPS) Interface, vessel traffic services (VTS), electronic charts, icebreaking, search and rescue (SAR), bridges, and navigational safety.

- Projects:

- VTS development assistance in the Gulf of Honduras (Honduras, Guatemala, Belize), Pakistan, Turkey, Panama, Taiwan, and Egypt.

- AtoN Development for Hidrovia Waterway (Uruguay, Argentina, Paraguay, Bolivia and Brazil), Egypt and navigation systems of Mexico and Papua New Guinea.

- Commission in Coast Guard School U.S. Coast Guard and Master in Public Administration from American University, Washington.

Objectives

Improve monitoring of shipping in the port of Buenaventura, the access channel and off the coast

Improve the safety of ships and meet international standards for the protection of life at sea

Increase control and surveillance of small vessels

Development of Vessel Traffic System

- The **General Maritime Directorate (Dirección General Marítima - DIMAR)** is building the new Maritime Traffic Control Station of Buenaventura
- The Coast Guard (**Guardacostas)** will be responsible for the equipment
- The Directorate of Telematics (**Dirección de Telemática - DITEL)** of the Colombian Navy (Armada Nacional) will be in charge of acquisition of the Vessel Traffic System (VTS o STM)

Port of Buenaventura

Port of Buenaventura of Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun)

341,605 containers (520,362 TEUs), 9,771,272 tons, 1,047 vessels in 2011

Operators:

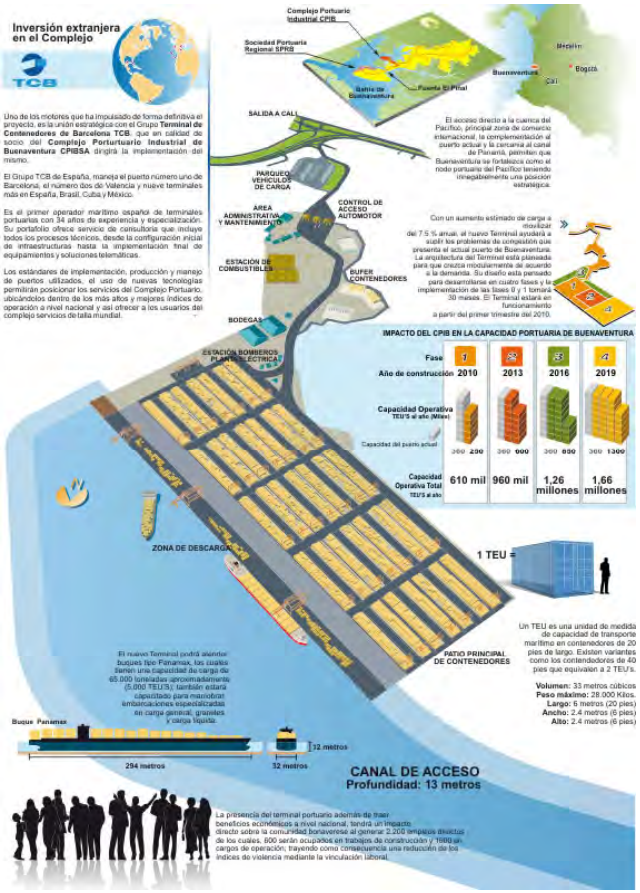
- Terminal Especializada de Contenedores de Buenaventura, S.A. (TECSA), (Containers)
- Comercializadora Internacional de Azúcar y Mieles, S.A. (CIAMSA), (Sugar and Molasses)
- Federación Nacional de Cafeteros de Colombia (Coffee)

Separate wharf (not part of SPRBun):

- Portuaria de Cementos Asociados S.A. (CEMAS). (Cement)

TC Buen

Terminal de Contenedores de Buenaventura (TC Buen) (container terminal)



Cost of USD 224 millions
268,000 containers per year
440 m wharf, 2 gantry cranes and 7 RTG
Start-up of operations 2011

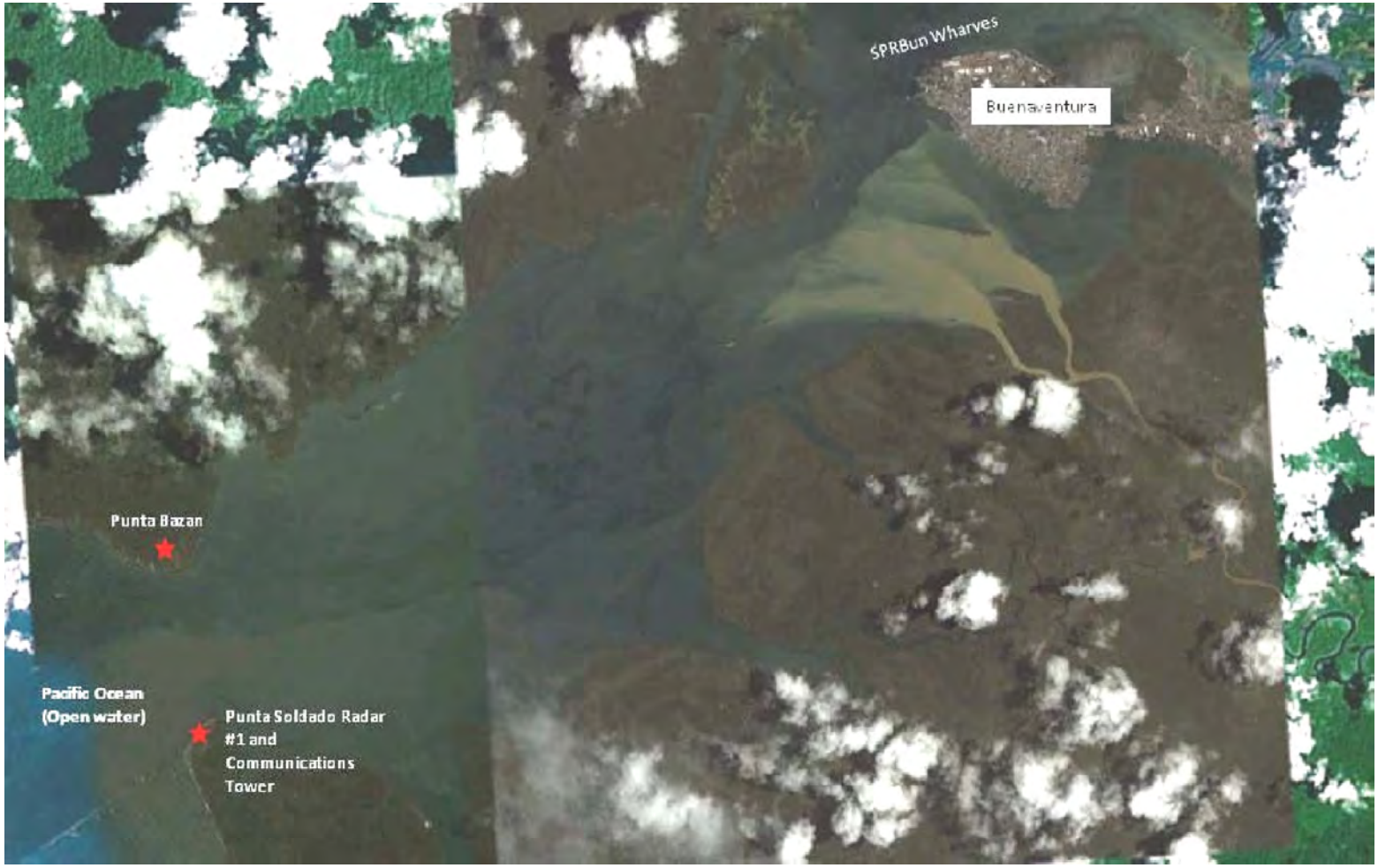
Aguadulce

New terminal of the Sociedad Puerto Industrial de Aguadulce, S.A. (SPIA)

Cost of USD 400 million

- 2,000 m wharf
- 400,000 20 and 40-foot containers with expansion to 1,200,000 containers per year
- 1,000,000 tons per year of dry bulk
- Under construction

Satellite image of the access channel and wharves of the Port of Buenaventura



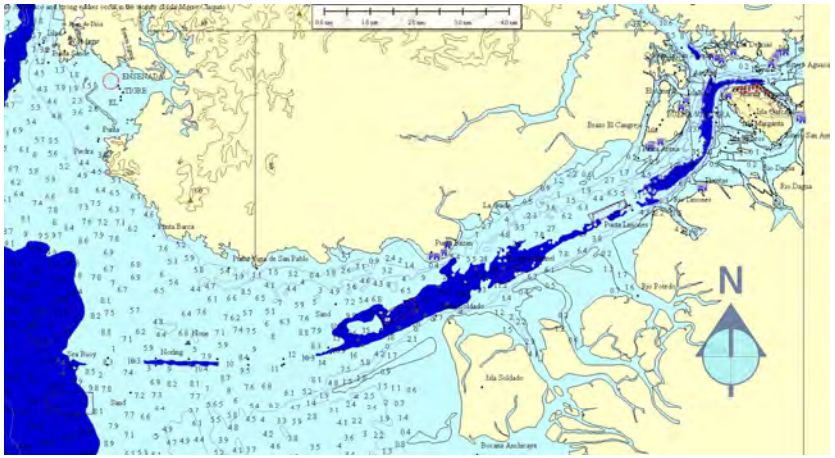
Vessel Traffic Control Center of DIMAR and the Coast Guard

Location of the Vessel Traffic Control Center

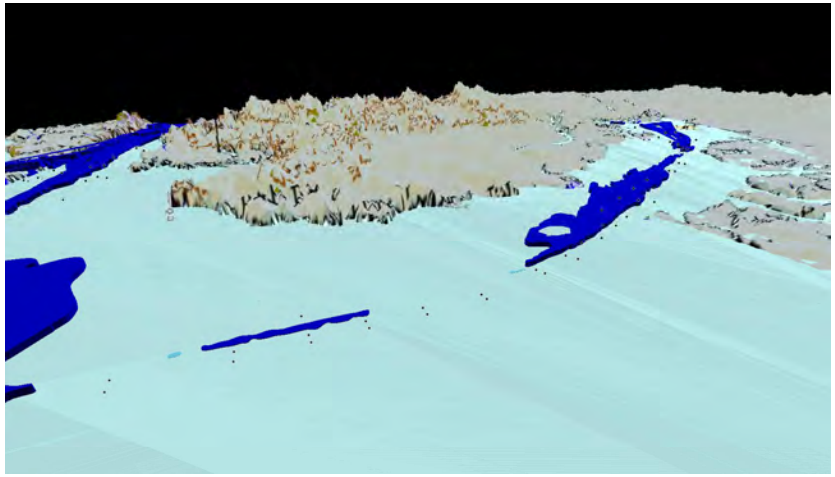
- A 5-story building with a control room above is under construction by the General Maritime Directorate (DIMAR) to house the new Vessel Traffic Control Station on the northwest of Cascajal Island

Entrance to the Port of Buenaventura

Nautical chart of the entrance to the Port of Buenaventura



Nautical and topographic view of the entrance to the Port of Buenaventura



Punta Soldado Radar

Punta Soldado – Radar and radio towers

Punta Soldado – Radar tower

Height of light 56 m, range 19 nm

Punta Bocano Tower

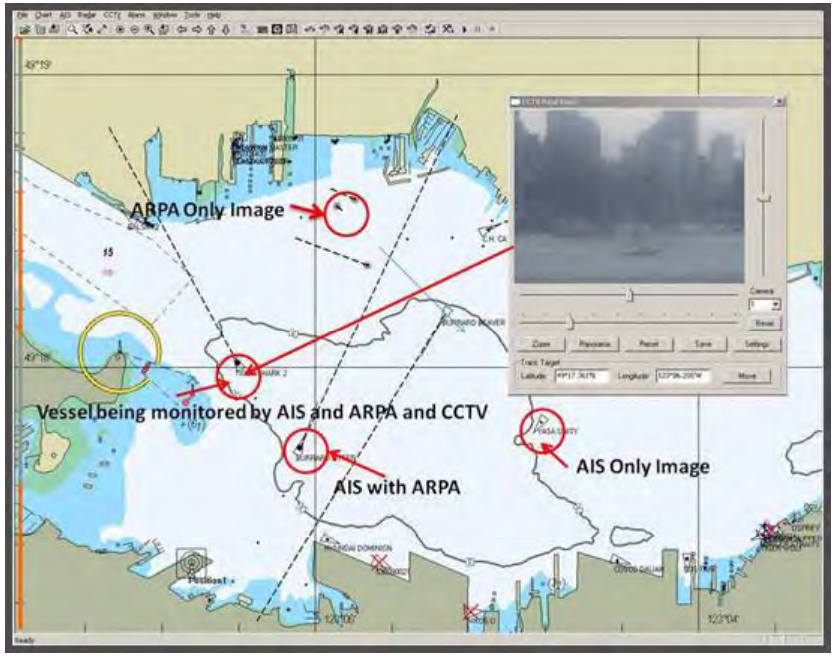
Punta Bocano – Cell tower

Radars and telecommunications at Isla Guardacostas

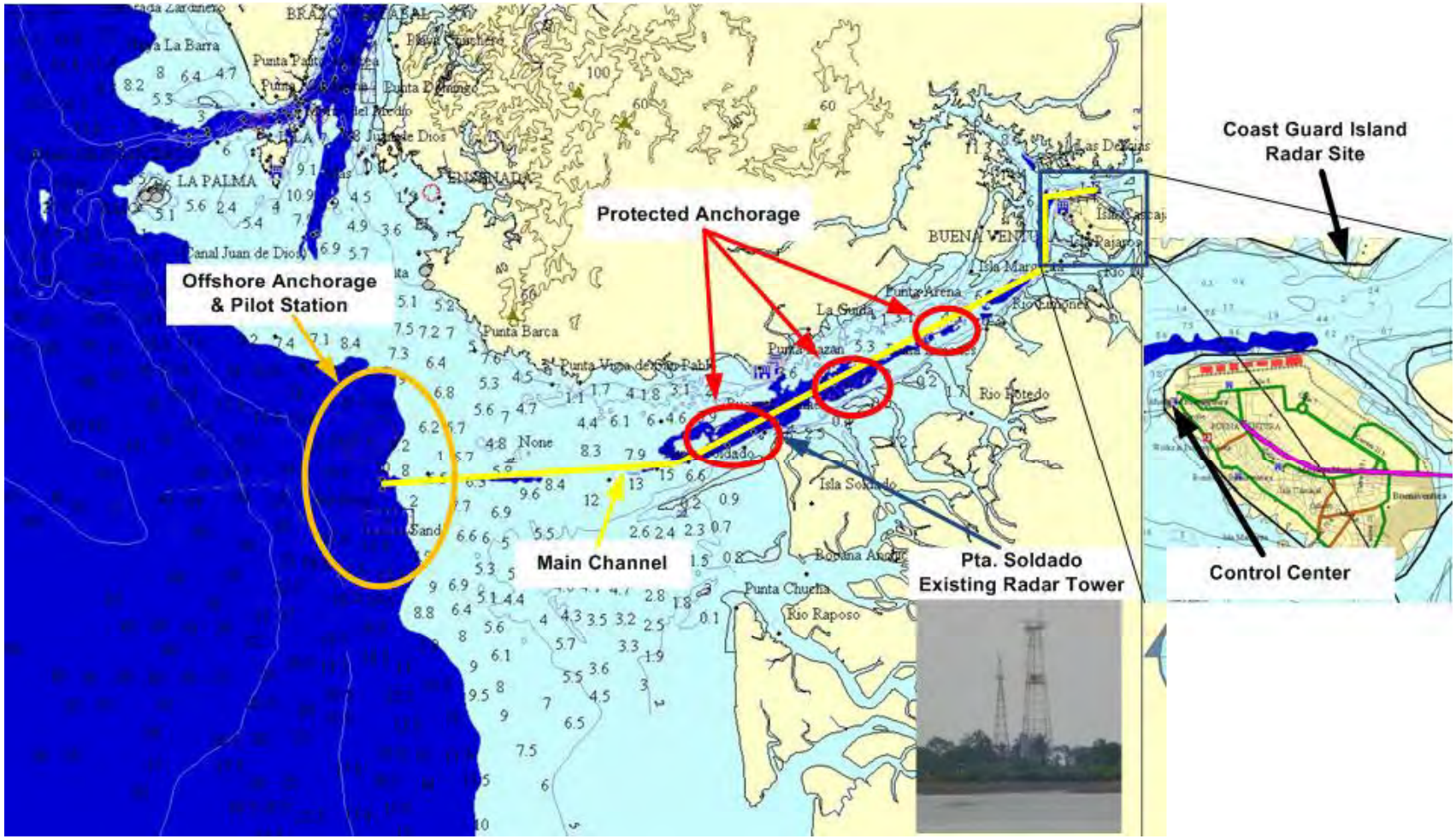
Isla Guardacostas (Coast Guard Island)

- Military radio tower, marine telecommunications tower, and towers for link to Punta Soldado and infrared images of the Port

Integration of radar tracking by VTS, AIS and cameras

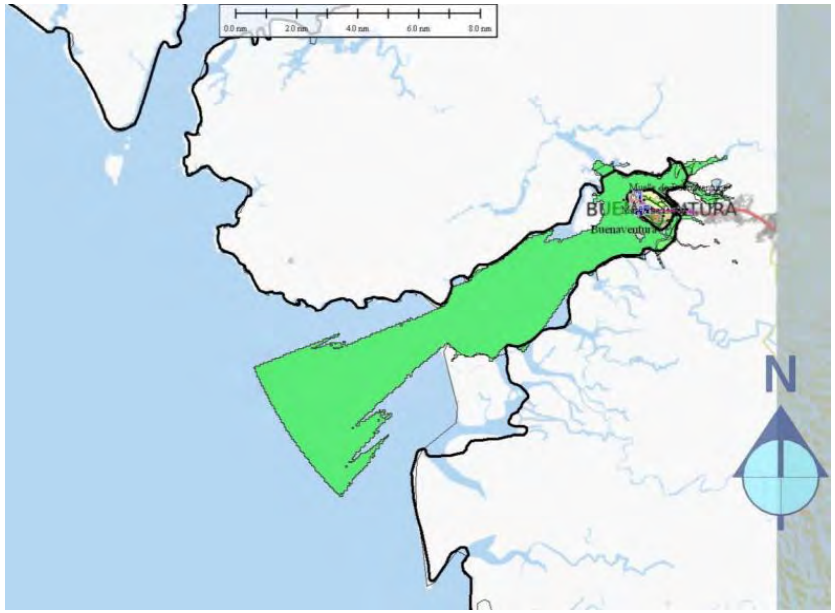


Configuration of the coverage area of the VTS system

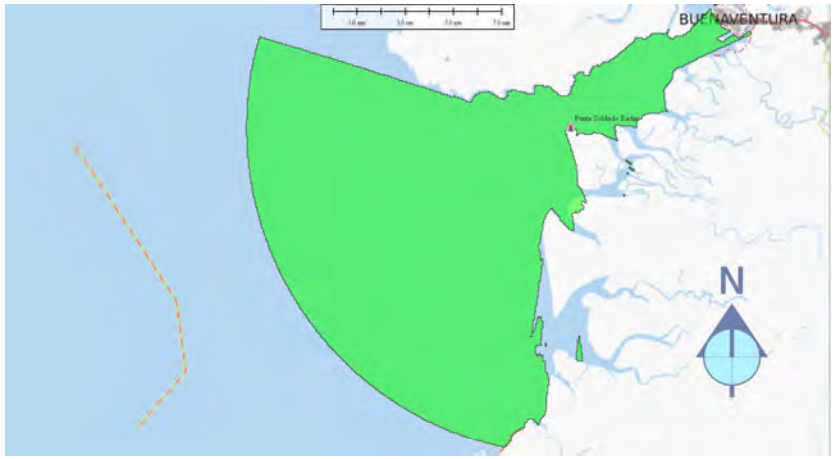


Visibility analysis of the proposed VTS radar

Proposed Control Center radar

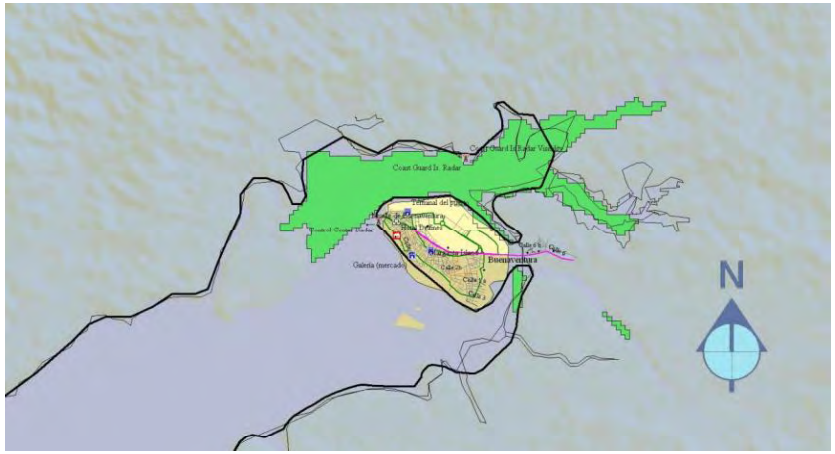


Proposed Punta Soldado radar



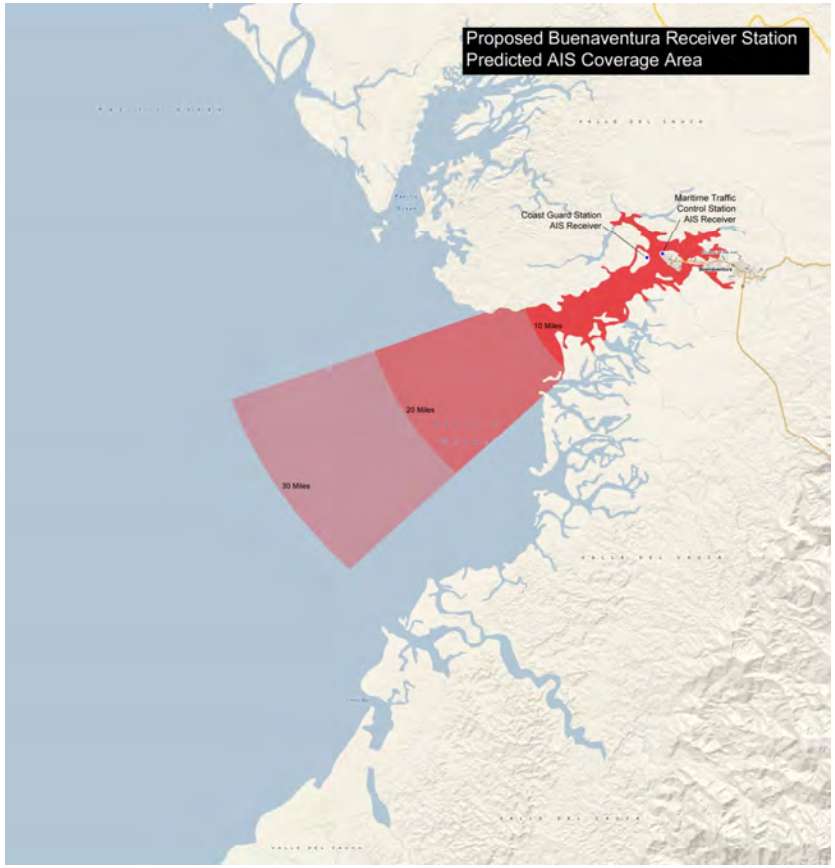
Visibility analysis of the proposed VTS radar

Proposed Isla Guardacostas (Coast Guard Island) radar

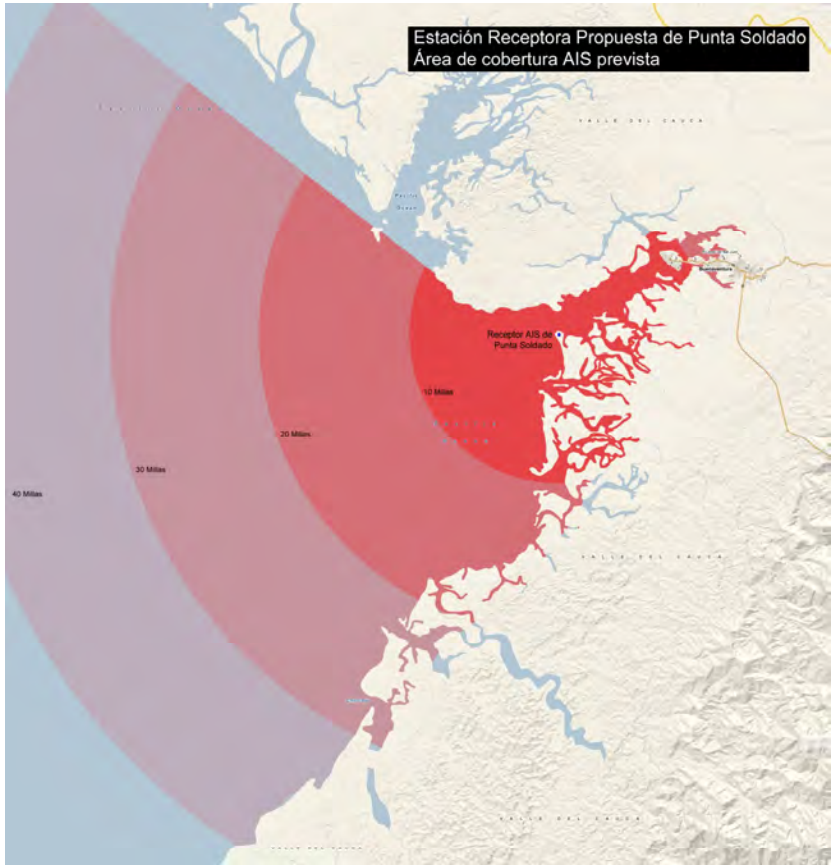


Coverage analysis of the proposed AIS system

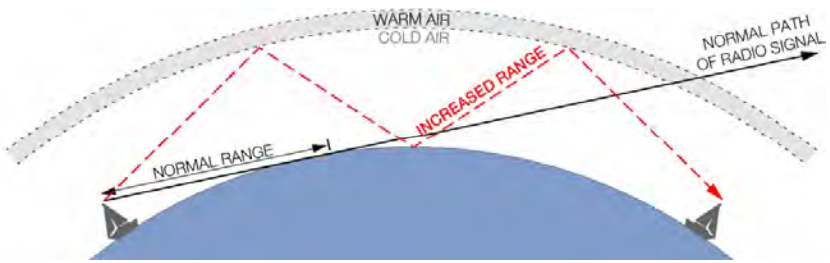
Proposed Buenaventura AIS system



Proposed Punta Soldado AIS system



Increase in the range of the AIS system with temperature inversion



Comparison of the advantages and disadvantages of different levels of VTS systems

Levels of VTS	Advantages	Disadvantages
Basic	Low cost	Minimum performance capability Requires many remote sites for superposition of coverage
Standard	Cost efficient in relation to performance. Performance levels can achieve superposition of coverage for limited sites. Wide selection of vendors	No significant disadvantages
Advanced	Higher performance levels	Higher cost. Fewer competitive selections. Large and heavy radar antennas require stronger tower structures

Propagation in rain

- Propagation in rain: The absorption or attenuation of radar energy at the longer wavelength of S-Band (10cm) is less than at the shorter X-Band wavelength (3.2cm)
- One way Attenuation based on 16mm/hour rain-rate

  S band 0.01dB/km approx

  X band 0.40dB/km approx

Backscatter caused by rain

- Backscatter caused by rain: With strong rain, important targets of interest can be masked by the rain clutter and go undetected. The rain backscatter is less per unit volume at lower wavelengths, so the S-Band system will have less rain clutter than X-Band.

Comparison of the detection range of the recommended X-band solution vs. S-band options

Condition	Recommended 18X High Resolution X-Band Radar w/ circular polarized antenna	Typical S-Band VTS radar with low gain 12-15ft antenna, 30kW transmitter
Small Boat (RCS=1m2@X-band, 0.4m2 @ S-Band) Clear weather	6.9 nautical miles	4.0 nautical miles
Small Boat (RCS=1m2@X-band, 0.4m2 @ S-Band) 25mm/hr rain-rate	5.4 nautical miles	2.4 nautical miles

A circular polarized antenna mitigates the disadvantage of X band in relation to backscatter caused by rain. X band is recommended for its availability, greater range, lower cost and lower weight.

Selection criteria for high resolution VTS radar

- Radar performance, accuracy and discrimination per IALA V-128 “Standard” capability
- 25 Kilowatts or equal X-Band transmitter
- Antenna horizontal beam equal or better than 0.45 degrees
- Detection of small ships, fishing vessels and the like in up to sea state 4 conditions
- Minimize performance degradation in moderate rain (up to 10mm/hr rain rate)
- Compact antenna system size and low weight
- Low maintenance requirements
- Best value

Radars

L-3 Klein Coastal Surveillance Radar 1000 Series
Origin: U.S.
Advantages:
Transmitter-receiver integrated into turning unit, no external waveguide requiring less maintenance
Simple design, based on Magnetron system
Light weight, 136kg: Does not require structural modifications to existing tower or planned roof
18 ft circular polarized array, mitigates the performance degradation due to rain
Minimum AC power requirements, simplifies emergency back-up power design
Disadvantages:
Magnetron requires annual replacement

Radars - continued

Scanter 2001 with 18 ft Slotted Wave Guide X band antenna
Origin: Denmark
Advantages:
High Performance Magnetron based system
18ft Circular polarized antenna array, mitigates performance degradation due to rainfall
Disadvantages:
Transmitter-receiver (TR) unit separate from antenna turning unit requires waveguide run and TR unit must be mounted in environmentally protected shelter near antenna
Antenna unit weight 400kg. The existing tower structures may require substantial engineering modifications
Antenna requires heavy duty, three phase AC power

Radars - continued

Kelvin Hughes Radar VTS SharpEye
Origin: UK
Advantages:
Solid State Transmitter design (no Magnetron), lower annual maintenance requirements
Transmitter-receiver integrated into antenna turning unit, no external waveguide required
Disadvantages:
Horizontal polarized antenna, not ideal for performance in heavy rainfall
Antenna weight 300kg: The existing tower structures may require substantial engineering modifications

L-3 Klein Series 1000 Coastal Surveillance Radar offers the best value.

Radar Extractor / Tracker / Controller

L-3 Klein RadarPro Advanced Radar Processor
Origin: USA
Functionality
Meets IALA recommendations
Tracker Capacity: 1000 targets
Plot Extractor Capacity: 10,000 plots per scan or greater
Land mask, unlimited polygons
TCP/IP Client-Server interface to VTS software
Automatic acquisition
Discriminators
Multiple signal processing stages for enhanced performance in clutter (rain and sea)
Small Target Detection processing
Dual channel tracker

Radar Extractor / Tracker / Controller

SSR Engineering PC-RP
Origin: USA
Functionality
Tracker Capacity: 800 targets
Network interface to VTS software
Automatic Gain/Clutter control
Land mask
Automatic acquisition

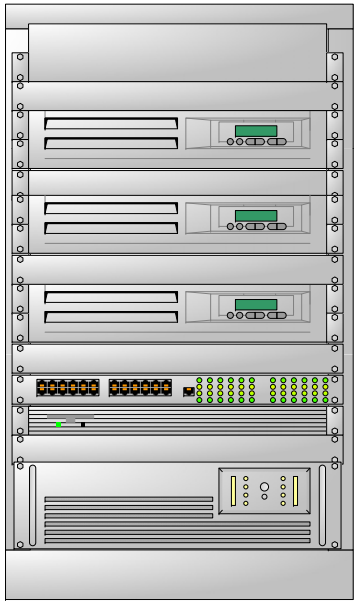
Radar Extractor / Tracker / Controller - continued

Kongsberg – Norcontrol VET5070
Origin: Norway
Functionality
Meets IALA recommendations
Tracker Capacity: 500 targets
Automatic and manual acquisition
TCP/IP or UDP/IP interface to VTS software

The L-3 Klein RadarPro Advanced Radar Processor is recommended as being the most capable system to provide both the VTS radar functionality and the small target detection functionality for security operations.

VTS Server Rack

VTS Server Rack



Shelf/Storage

LCD Monitor/Keyboard

VTS Server

Video Manager/Server

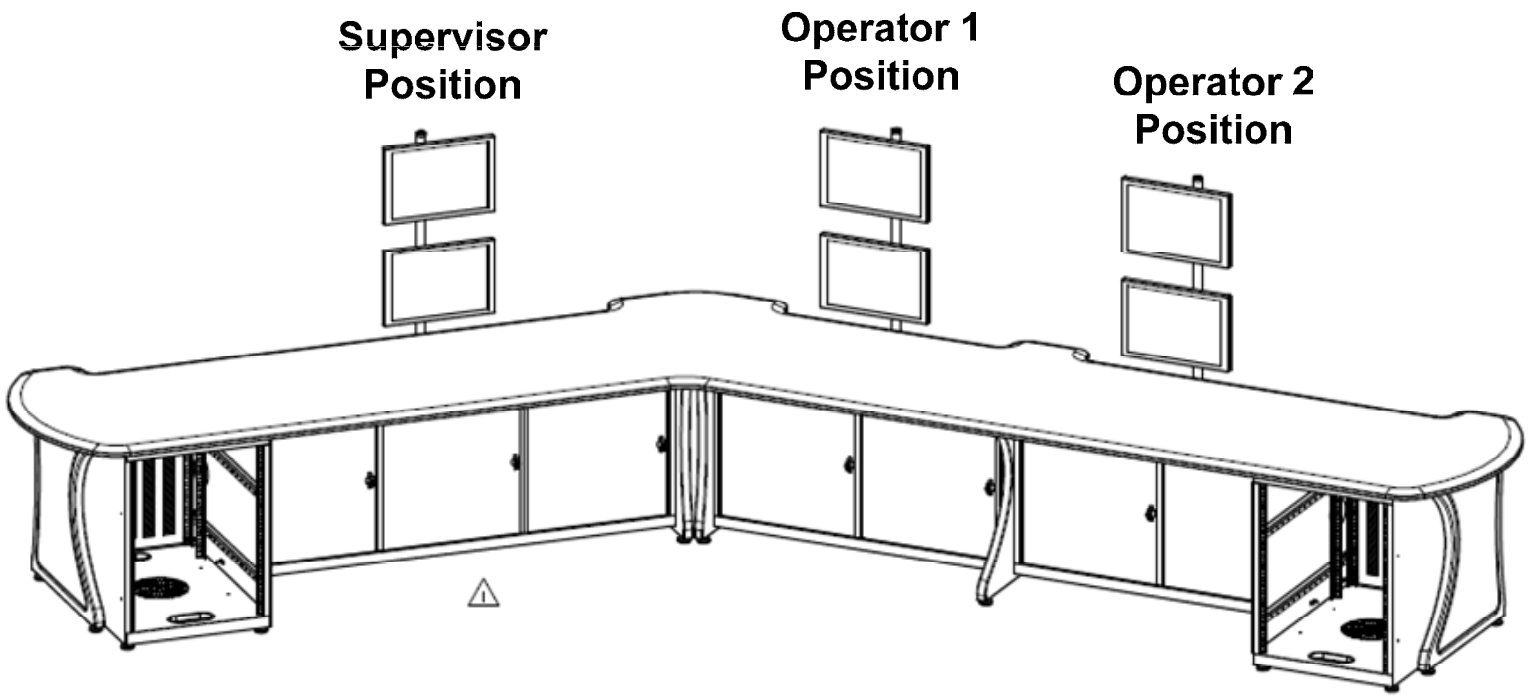
IP Security Center Server

Network Switch
Router

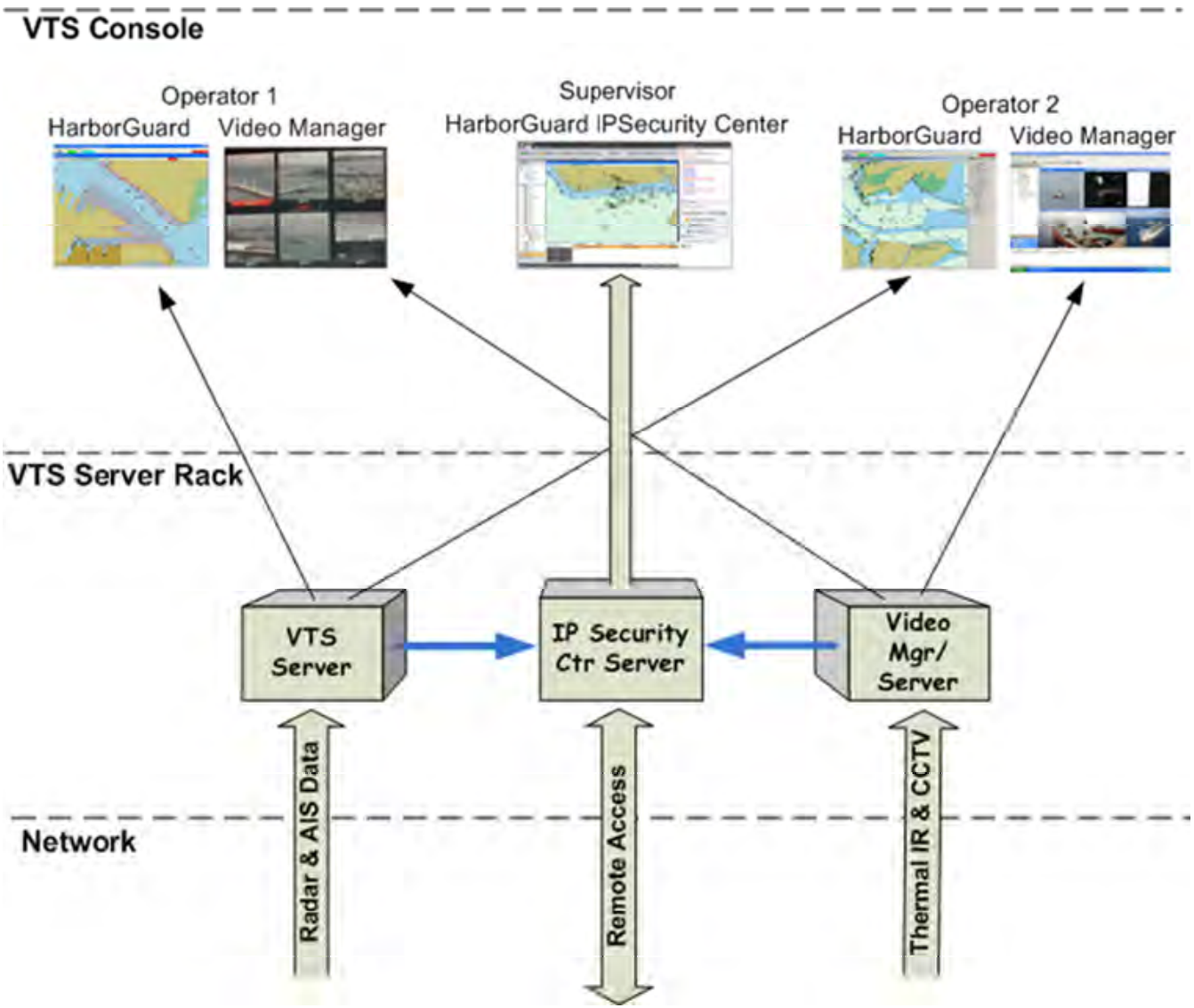
UPS

Proposed configuration of the Control Center Operators Console

- Emcor Enclosures



VTS Control Center Components



Comparison of VTS software

	L-3 Klein Harbor Guard	Transas Navi-Monitor	Kongsberg-Norcontrol VTMIS5060
Country of origin	USA	Russia	Norway
Client / Server based	✓	✓	✓
Open architecture	✓	✓	✓
Multiple secure clients	✓	✓	✓
Radar track processing / display	✓	✓	✓
Accepts inputs from AIS	✓	✓	✓
Fuses radar and AIS data	✓	✓	✓
Processes small targets	✓	✓	
Slew to track and slew to cue	✓	✓	
Target Vector display	✓	✓	✓

Comparison of VTS software - continued

	L-3 Klein Harbor Guard	Transas Navi-Monitor	Kongsberg-Norcontrol VTMIS5060
Target Identity label	✓	✓	✓
Target Data Query	✓	✓	✓
Collision Alerts	✓	✓	✓
User generated alarm and warning zones	✓	✓	✓
Target Intercept Calculator tool	✓		
Digital Navigational Chart background map	✓	✓	✓
User created map layers	✓	✓	✓
Spanish language Graphical User Interface	✓		

Comparison of VTS software - continued

	L-3 Klein Harbor Guard	Transas Navi-Monitor	Kongsberg-Norcontrol VTMIS5060
Event and Alarm recording/log	✓	✓	✓
Target History recording/log	✓	✓	✓
Target history trails graphic display	✓	✓	✓
Preset Display Views	✓	✓	✓
Automatic Camera Handoff for tracked targets	✓		
Programmable Response Plans for Events	✓		
Web Access	✓	✓	
Generate email, SMS alerts	✓		

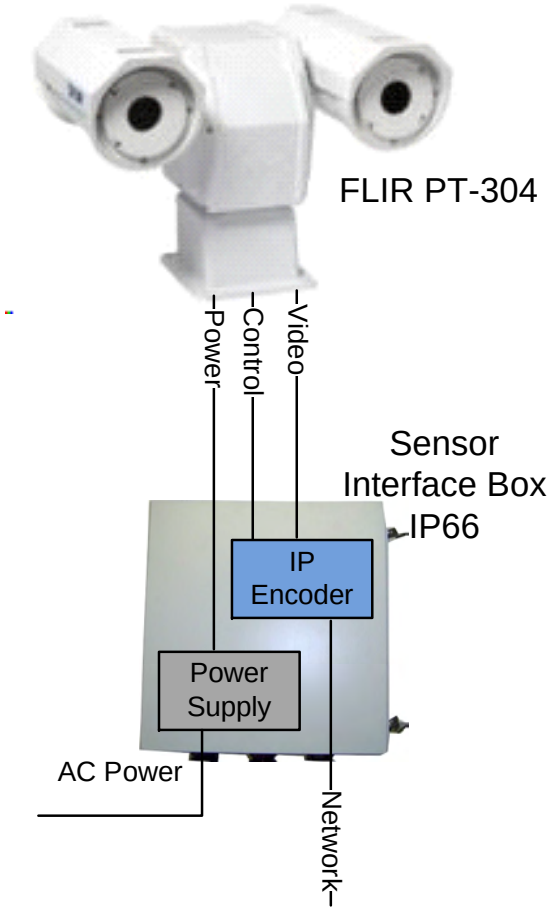
Comparison of VTS software - continued

L-3 Klein HarborGuard is recommended because it combines the capabilities of

- Target interception calculator
- Automatic camera handoff to track targets
- Programmable event response plans
- Spanish language Graphical User Interface
- Generates e-mail, SMS alerts

Thermal Infrared camera

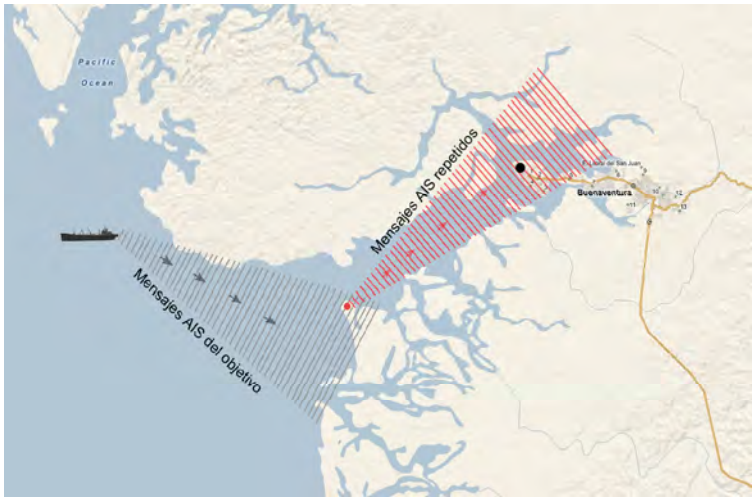
FLIR PT-304



- The thermal IR camera integrates with the VTS system to provide the VTS operators a means of real-time assessment, observation, classification and identification of radar and AIS targets. IP66 rated enclosure (dust tight, protected from heavy seas and strong water jets)

AIS Receivers

AIS with repeater at Punta Soldado



Two options are:
1) A repeater at Punta Soldado and a receiver at Buenaventura with VHF connection
2) Two receivers with microwave or Internet connection

- Option 1 (repeater at Punta Soldado) is recommended: The AIS receiver will be equipped with the functionality of a repeater. The input AIS signals are received by the repeater and retransmitted. As long as the AIS base station is in range of the AIS repeater, direct connectivity between the base station and the receiver is not necessary because the repeater retransmits the information by VHF to the receiver.

Comparison of the AIS System Base Stations

	L-3 Protec AIS Shore Station	Kongsberg AIS BS500 AIS Base Station	Saab R40 AIS Base Station
Country of Origin	USA	Norway	Sweden
IALA Recommendation A-124 Compliant	✓	✓	✓
IEC 62320-1 Compliant	✓	✓	✓
Type A Messages	✓	✓	✓
Type B Messages	✓	✓	✓
AToN Messages	✓	✓	✓
Receive AIS Text Messages	✓	✓	✓
Transmit AIS Text Messages	✓	✓	✓
Local AIS Storage	✓	✓	✓

Comparison of the AIS System Base Station - continued

	L-3 Protec AIS Shore Station	Kongsberg AIS BS500 AIS Base Station	Saab R40 AIS Base Station
AIS Repeater	✓		✓
Separate Transmit/Receive Antenna Interface	✓	✓	✓
Ethernet Connectivity	✓	✓	✓
Serial Interface Connectivity	✓	✓	
Redundant Configuration	✓	✓	✓
Hot Swap Capable	✓		✓
Remote Management	✓	✓	✓
Local Management Interface	✓	✓	
Rack Mountable	✓	✓	✓

Comparison of the AIS System Base Station - continued

- In all cases, the suppliers provide a robust and quality AIS base station solution with minor differences.
- All meet the recommended international standards for the industry level base station implementations.
- **The L-3 AR Maritime system is recommended for its scalability, redundancy features, and compatibility with the recommended VTS solution.**

Comparison of AIS receivers

	Shine Micro RADARPLUS SM1610-2AN	Automatic Power AIS-RX Pro Receiver
Country of Origin	USA	USA
AIS A	✓	✓
AIS B	✓	✓
Ethernet Connectivity	✓	✓
Serial Interface Connectivity	✓	

The Shine Micro receiver is recommended due to its wide and successful use in the U.S. maritime industry, and its dual connectivity options (serial and Ethernet connectivity).

Comparison of AIS Repeaters

	Automatic Power IS-R	L-3 Protec AIS ATON
Country of Origin	USA	USA
AIS A	✓	✓
AIS B	✓	✓
Ethernet Connectivity	✓	✓
Serial Interface Connectivity	✓	✓

Both units adequately provide the required repeater functionality. The Protec AIS ATON repeater is recommended because of its capabilities to implement virtual Aids to Navigation (AtoN) broadcasts.

Comparison of Integration of AIS Software in VTS Base Stations

	L-3 HarborGuard IP Security Center	Transas Navi-Monitor	Kongsberg VTMIS5060
Country of Origin	USA	Russia	Norway
Display AIS A	✓	✓	✓
Display AIS B	✓	✓	✓
Display target direction	✓	✓	✓
Display AIS transmitted data	✓	✓	✓
Target Names	✓	✓	✓
Radar Integration	✓	✓	✓
Geo-Based Alerts	✓	✓	✓
Replay	✓	✓	✓
Web access	✓	✓	

Comparison of Integration of AIS Software in VTS Base Stations - continued

- **In all cases, the AIS components included with the VTS systems met the base criteria.**
- **It is recommended that the using the AIS system which is included in the selected VTS be used, for which reason it is recommended to use L-3 Klein HarborGuard IP Security Center.**

Comparison of AIS Software

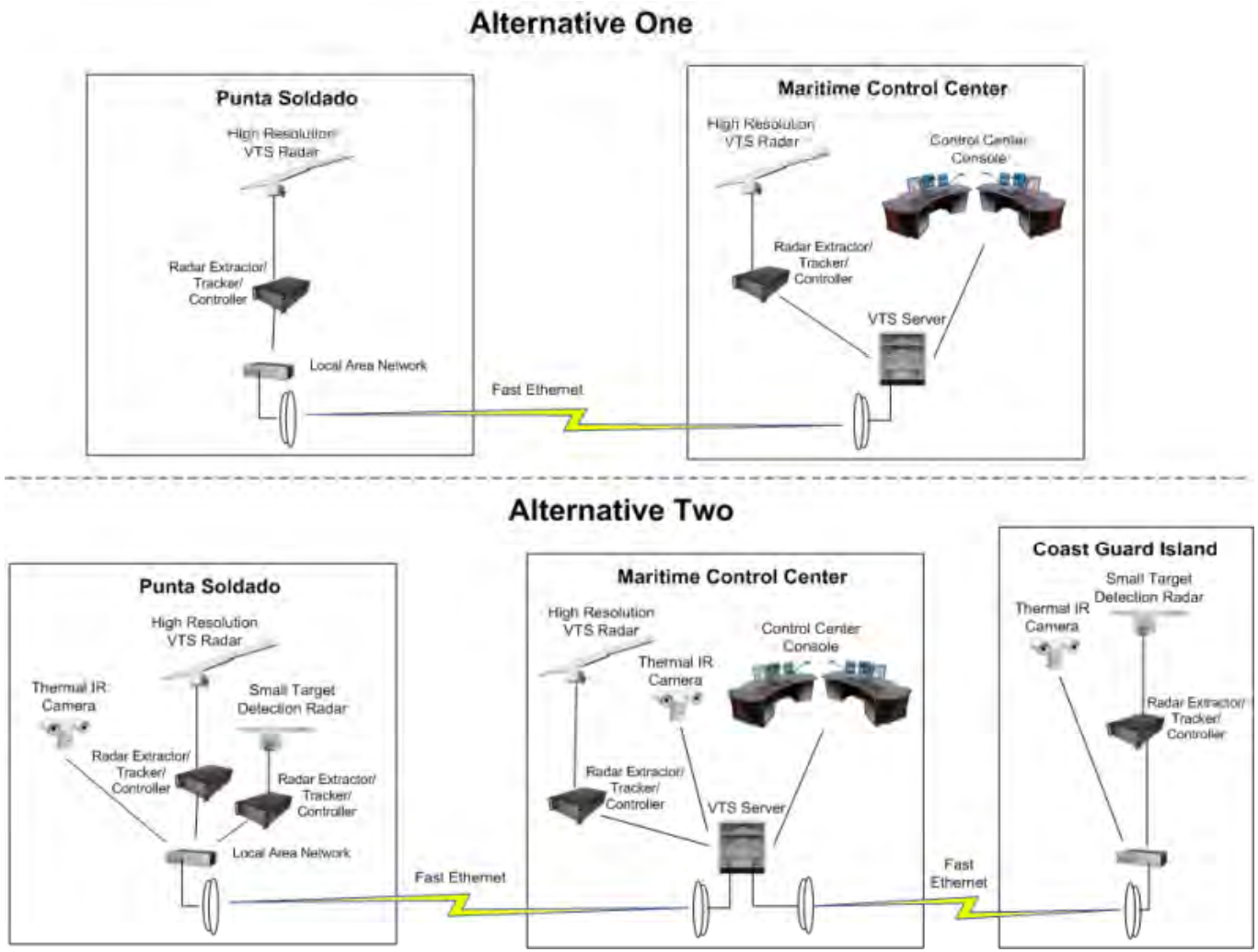
	Maritime Exchange Maritime On-Line	Xanatos Titan Viewer
Country of Origin	USA	Canada
Display AIS A	✓	✓
Display AIS B	✓	✓
Display target direction	✓	✓
Display AIS Transmitted Data	✓	✓
Internal map source		✓
External map source	✓	
Pan and Zoom	✓	
Display latitude and longitude.	✓	✓
Display target names	✓	✓
Display target list	✓	✓

Comparison of AIS Software -- continued

	Maritime Exchange Maritime On-Line	Xanatos Titan Viewer
Vessel Schedule Integration	✓	
Supporting Vessel Database	✓	✓
User-Defined Location Markers	✓	
Geo-Based Alerts	✓	
ReplayRepetición	✓	
Web Access Acceso Web	✓	✓

The Maritime On-Line® system is recommended because of the additional vessel data/schedule module, and superior map features and functionality.

Comparison of Alternatives and Recommendations for VTS



Comparison of VTS Alternatives according to Criteria

Selection Criteria for alternatives	Alternative 1	Alternative 2
Meets standards (IALA V-128)	✓	✓
Provides improved navigation and monitoring of all vessels	✓	✓
Incorporates current, state of the art technology	✓	✓
Suitable for installation and operation in hot, humid and rainy environment	✓	✓
Integrate with AIS subsystem	✓	✓
Provide all weather coverage	✓	✓
Expandable for future system growth	✓	✓

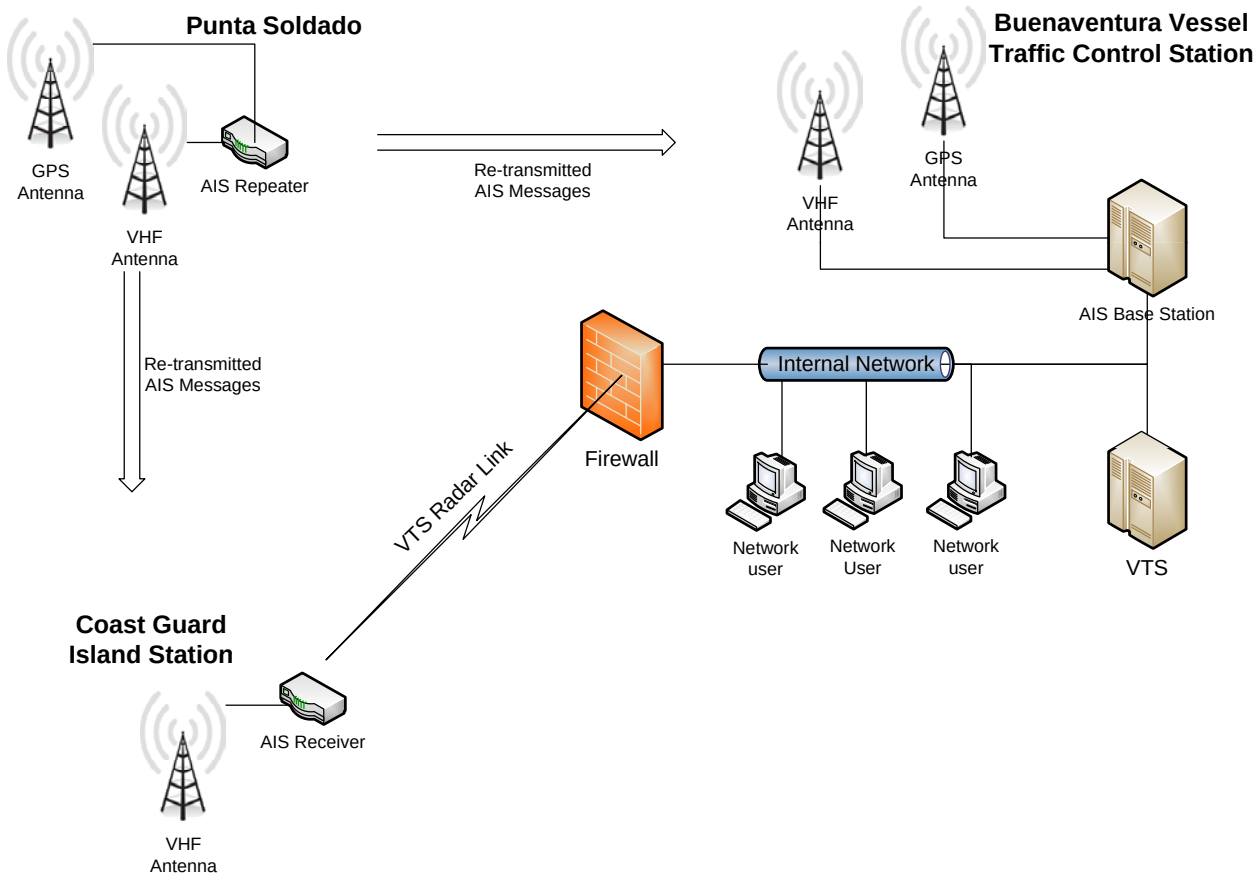
Comparison of VTS Alternatives according to Criteria -- continued

Selection Criteria for alternatives	Alternative 1	Alternative 2
Ease of operation	✓	✓
Remote stakeholder access	✓	✓
Thermal infrared camera		✓
Backup radar coverage		✓
Special security/surveillance enhancements for defense and law enforcement		✓
Estimated equipment cost	US$700,000	US$1,117,506

Both alternatives would comply with the basic functionality for a vessel traffic system at an economical cost. Alternative 2 with a small target detection radar, radar processor and infrared camera on Isla Guardacostas (Coast Guard Island) would provide superior capabilities of security and surveillance, with the benefit to security, as well as for the management and safety of maritime traffic.

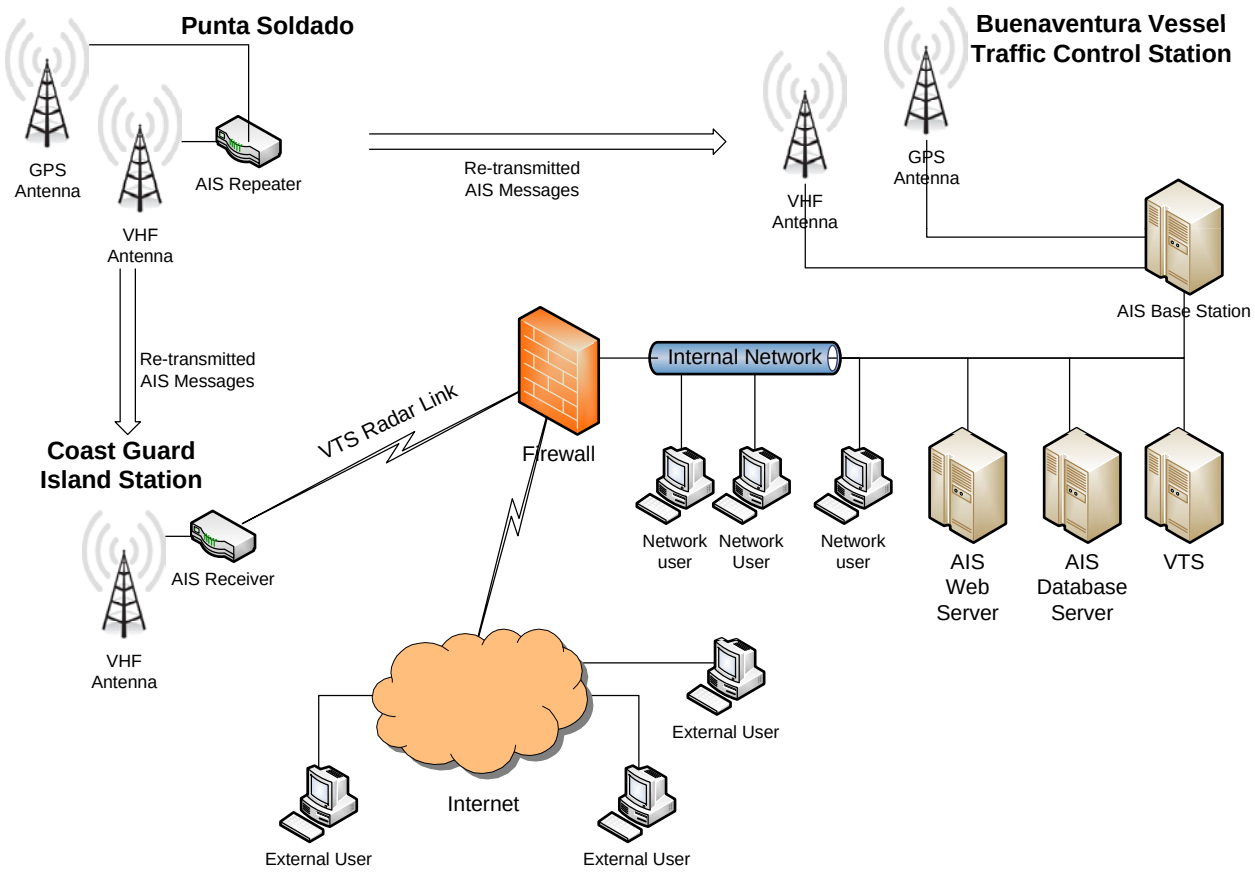
Comparison of Alternatives and Recommendations for AIS

Option 1: Proposed AIS Configuration



Comparison of Alternatives and Recommendations for AIS -- continued

Option 2: Proposed AIS Configuration



Comparison of the AIS Options

- Both Options provide Automatic Identification System functionality. Option 1 provides access to AIS information to the Coast Guard. Option 2 is recommended because it also provides controlled access to AIS information to authorized users such as marine terminal and vessel operators.

Cost estimate for VTS system

Component	Subtotal	Total
VTS		USD
Control Center equipment		$547,950
Punta Soldado radar equipment		318,250
Isla Guardacostas equipment		$195,800
Wireless network link equipment		55,506
Subtotal		$1,117,506
General and administrative costs, integration, program management, installation and spares		1,382,494
Total		$2,500,000

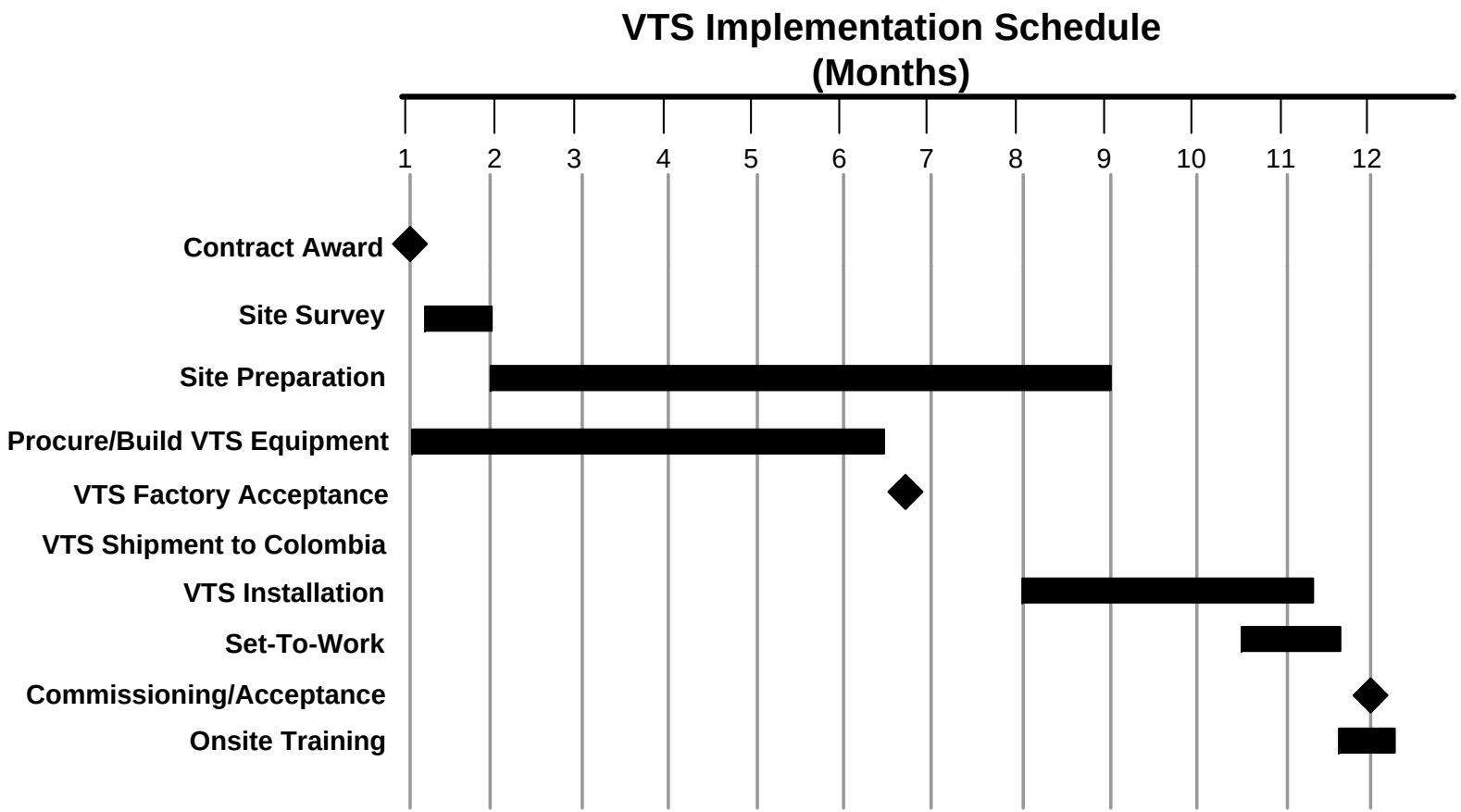
Cost estimates for AIS system – Option 1

AIS		USD
Control Center equipment		$28,200
Isla Guardacostas equipment		7,400
Punta Soldado equipment		7,600
Spares		22,000
Delivery		5,000
Installation		17,000
Training		15,000
Total		102,200

Cost estimates for AIS system - Option 2 and total for VTS + AIS

AIS		USD
Control Center equipment		$28,200
Isla Guardacostas equipment		7,400
Punta Soldado equipment		7,600
Web software		22,000
Spares		240,000
Delivery		5,000
Installation		17,000
Training		28,600
Total AIS		$355,800
Total Cost VTS and AIS		$2,855,800

Implementation program for VTS system



3. Develop an Optical Character Recognition (OCR) System

Allen Thomas, Senior Optical Character Recognition (OCR) Systems Expert, APS Technology Group

Edgar L. Capps, Senior Information Technology Expert

February 1, 2012

APS Technology Group

- APS Technology delivers optical character recognition (OCR) and process automation solutions to the port authorities and container terminal operators around the world. Our solutions leverage ultra-industrial hardware and cutting edge software to identify, inspect, track and manage equipment in real time. Lower operating costs, increased capacity and safe, efficient processes lead to improved market share and higher margins. We help our customers to implement and maintain improvements like this every day.

Allen Thomas, Senior Optical Character Recognition (OCR) Expert, APS Technology Group

- APS Vice President of Operations Technology Group, a market leader in OCR systems for intermodal transportation industry / containers.
  Previous positions:
  Director of Operations, Nascent Technology, suppliers of systems management and automation container terminal port for the transportation industry.
  Project Manager, Maersk Sealand, previously Sea-Land Service, for software and systems for marine terminal operations of containers.

Edgar L. Capps, Senior Information Technology Expert, AECOM

- 40 years experience in IT and systems analysis. Retired as Chief Information Officer of Virginia International Terminals, previously Director of the Information Systems Department.
- Previous positions:
- Computer Sciences Corporation, Information Systems Manager
- Newport News Shipbuilding Company, Project Leader for Integrated Publishing System
- Various positions with Tandem Computers, Hewlett-Packard y Control Data Corporation.
- Master's, University of Richmond, Virginia y Bachelor's, Virginia Polytechnic Institute.

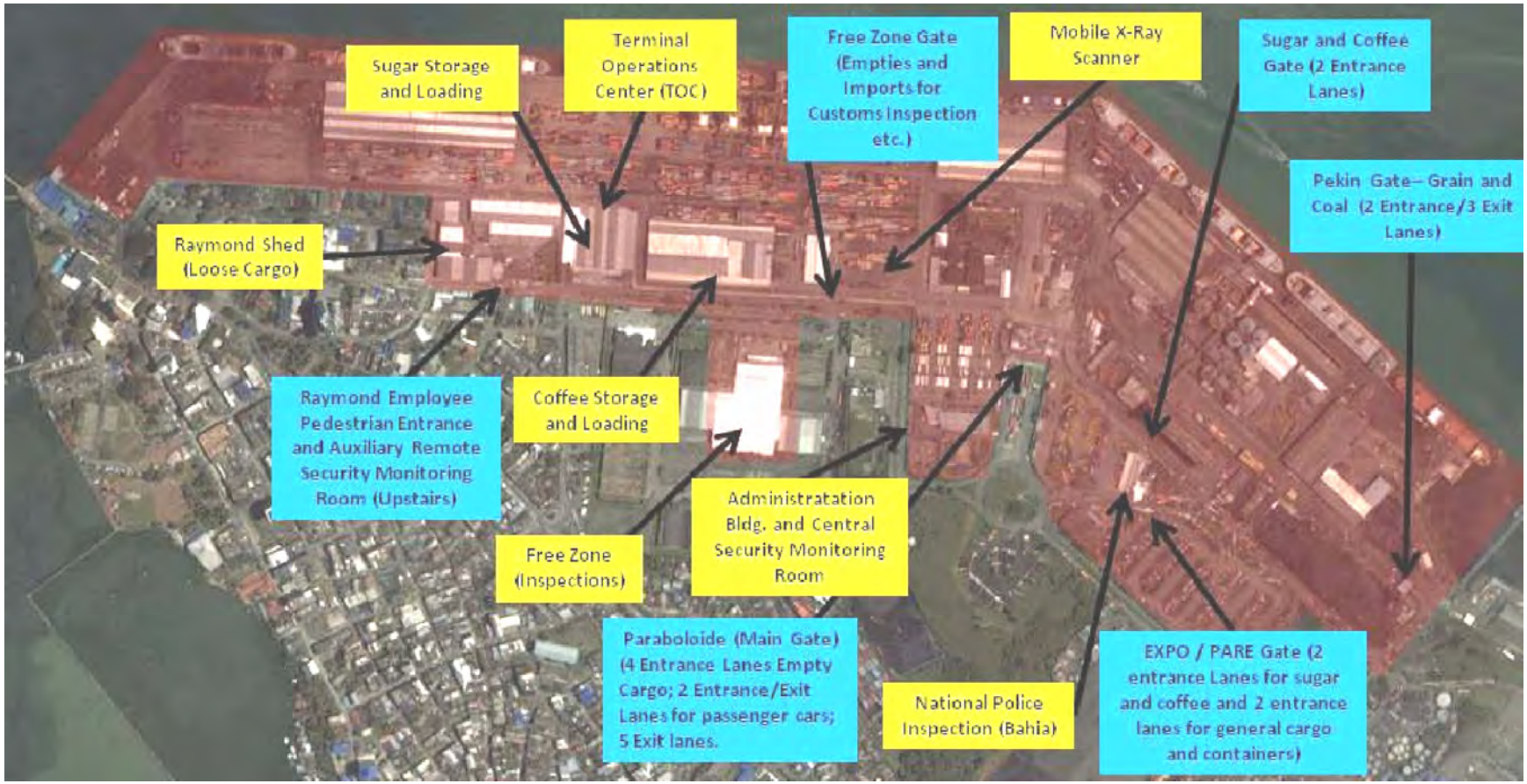
Objectives

- ***Increased Security*** by eliminating physical interaction between truck drivers and terminal personnel.
- ***Lower Operating Costs*** by reducing the number of personnel required for the terminal to operate the gate areas.
- ***Reduced Theft*** by preventing bribery through remote gate management without interaction with drivers.
- ***Increased Data Accuracy*** by reducing manual input errors.

Objectives - continued

- ***Higher Throughput Velocity*** by decreasing gate queue times at the entry and exit gates.
- ***Cleaner Environment*** by reducing the amount of exhaust from idling trucks in the entry and exit gates.
- ***Added Throughput Capacity*** by facilitating more transactions per hour.
- ***Increased Safety*** by ensuring personnel are not required in any gate lane.

Gates


Sugar Storage and Loading
Terminal Operations Center (TOC)
Free Zone Gate (Empties and Imports for Customs Inspection etc.)
Mobile X-Ray Scanner
Sugar and Coffee Gate (2 Entrance Lanes)
Pekin Gate– Grain and Coal (2 Entrance/3 Exit Lanes)
Raymond Shed (Loose Cargo)
Raymond Employee Pedestrian Entrance and Auxiliary Remote Security Monitoring Room (Upstairs)
Coffee Storage and Loading
Administratation Bldg. and Central Security Monitoring Room
Free Zone (Inspections)
Paraboloide (Main Gate) (4 Entrance Lanes Empty Cargo; 2 Entrance/Exit Lanes for passenger cars; 5 Exit lanes.
National Police Inspection (Bahia)
EXPO / PARE Gate (2 entrance Lanes for sugar and coffee and 2 entrance lanes for general cargo and containers)

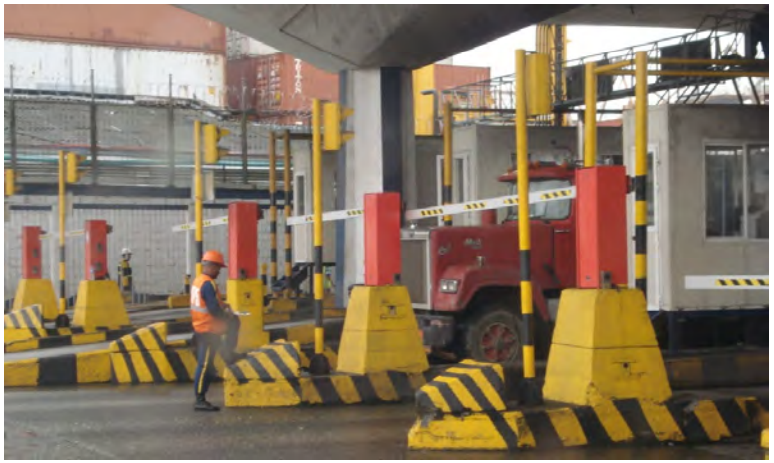
Use of Gates

Gate	Lanes	Direction	Type of Traffic
Paraboloide	4	Entrance	Empties
	2	Entrance / Exit	Passenger vehicles (not cargo)
	5	Exit	General cargo (breakbulk), empties, full containers
	2	Entry / Exit	Entry / Exit from PARE / EXPO / Bahia
PARE / EXPO	2	Entrance	Coffee and sugar
	2	Entrance	Export general cargo (breakbulk) y export containers
Free Zone	1	Entrance / Exit	Interchange of cargo from SPRBun with areas of old Free Zone for inspection and entry of empties
Pekin	3	Exit	Grains, oversize cargo, empties for local depots
	2	Entrance	Coal and empties
Raymond	NA	Entrance / Exit	Pedestrians - employees and workers

Main Gate

Main Gate (Paraboloide)

Main Gate – Exit lanes



Free Zone Gate

Gate between the Port and the public road

Gate between the former Free Zone and the public road

Physical barriers

Bollard-type security barrier

EXPO / PARE Gate

Container entrance

EXPO Gate and Bahía inspection area

Entrance lanes for coffee and sugar

Pekín Gate

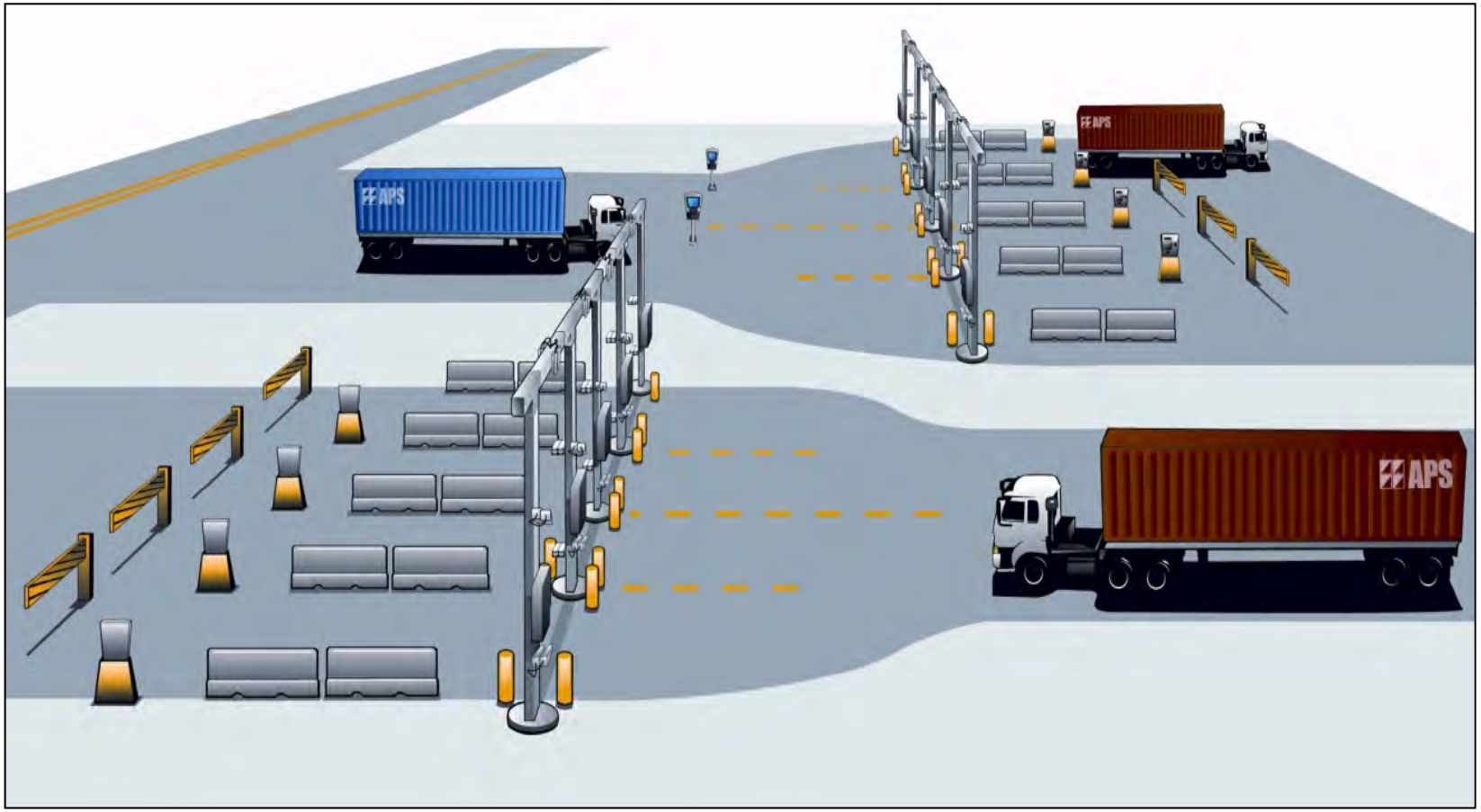
Pekin Gate
To Sugar and Coffee Gate
High Traffic Intersection

Raymond Gate

Port side

Street side

Automated Gate System (AGS) with OCR



Key functions of AGS

- Optical Character Recognition (OCR) of ISO containers and vehicle licence plates.
- Integration of weigh scale data at each OCR portal
- Driver Gate Kiosks to automate driver ID, printing and Voice over Internet Protocol (VoIP) communications
- Integrated high security access control using terminal identification cards

Key functions of AGS - continued

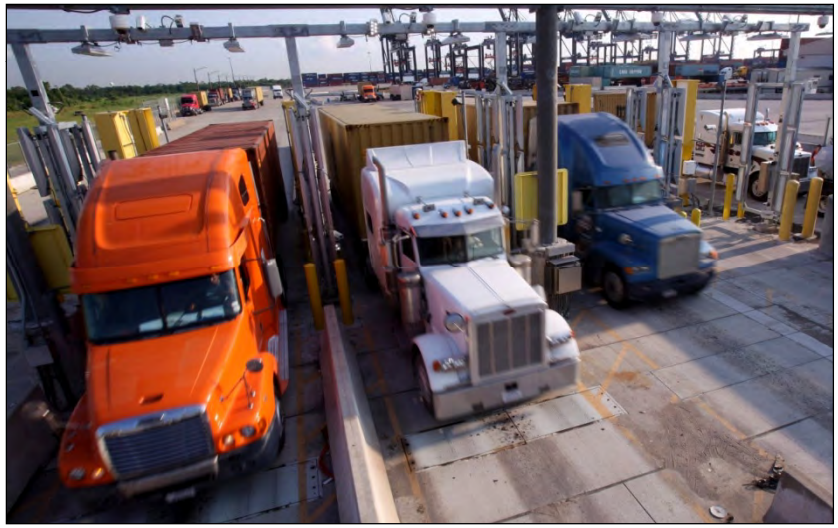
- Remote damage inspection of equipment using high resolution images
- Gate Clerk Software to remotely view images and communicate with drivers
- Real-time integration of data to host/Terminal Operating Systems (TOS)

Location of AGS equipment

Map Area	Gate Area	Description	Lane count	Kiosk count	Portal count	Portal setup
A	Paraboloides	Export Load entry(P-check)	2	0	0	0
B	Paraboloides	Empty trucks entry	4	4	4	LPR
C	Paraboloides	Full trucks Exit	5	5	5	LPR +CR + DII
D	Export inspection	Export Load entry(A-check)	2	1	1	LPR + CR + DII
E	Free Zone	Entry / exit for inspection	1	0	1	LPR + CR
F	Pekin gate	Empty Container entry (2)/exit (3)	5	5	5	LPR + CR
G	Coffee and Sugar	Coffee and Sugar Entry	2	1	1	LPR

License Plate Recognition - LPR Container Recognition - CR
Damage Inspection Imaging - DII and
Driver interface kiosks

AGS components



Recommended AGS components

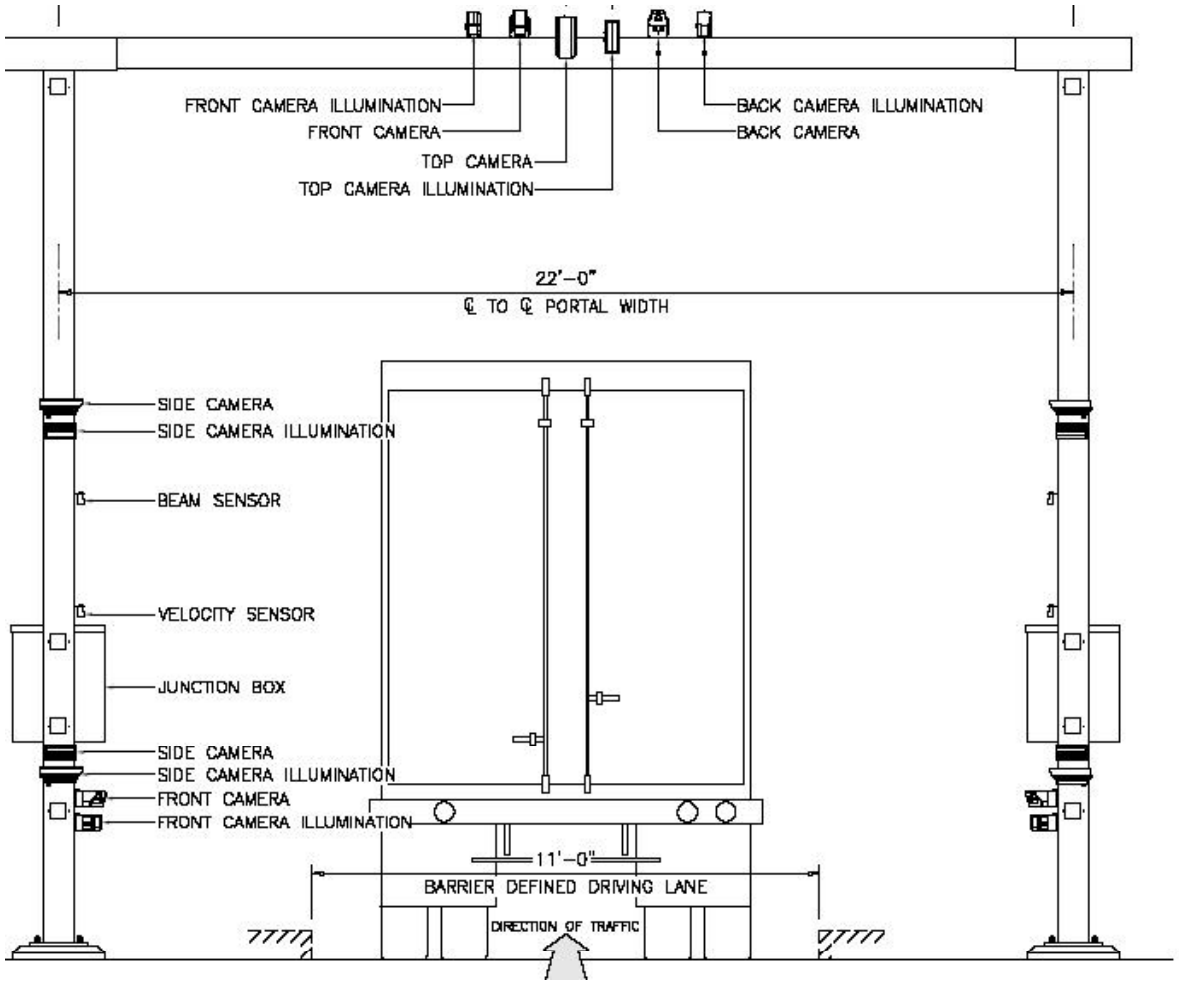
- 12 drive-through OCR portals
- Includes subsystems to automatically identify:

  - the container number;

  -the size, type code and license plate number of equipment passing through the portal (depending on location);

- 6 of the portals include high resolution cameras to capture damage inspection images, to detect container damage (front, back, side, top, bottom) using multiple cameras

Portal equipment



Portal equipment

Portal connection box

Cameras and LED illumination units

Servers

- 12 Portal OCR Servers (1 server per portal) to perform Container/Chassis OCR
- 2 LPR servers (1 server per three lanes) to perform OCR of license plates at the five (5) LPR lane locations
- 1 OCR Messaging Server to consolidate the transmission and receipt of all OCR messages between the lane servers and the Terminal Operating System (TOS).
- 1 Central Gate Control Server to consolidate the transmission and receipt of all messages between the kiosk servers and the TOS.
- 1 Image Archive Server- One (1) server to store picture receipts of all transactions

Portal Software

- The recommended AGS captures, identifies and records all transactions processed through the gates at SPRBun. Described herein are all of the different types of images that the recommended AGS will locate and capture.

ISO Code Reading

ISO Equipment Code

- Owner's Code – Consists of three capital letters that are unique. E.g., CCL.
- Equipment Category – Capital letter identifying the type of container, as follows:
- U for all freight containers
- J for detachable freight container-related equipment
- Z for trailers and chassis
- Serial Number – Six numerals (e.g., 123456)
- Check Digit follows the ISO standard rules and algorithm.

Vehicle license plate reading

OCR of Vehicle license plate

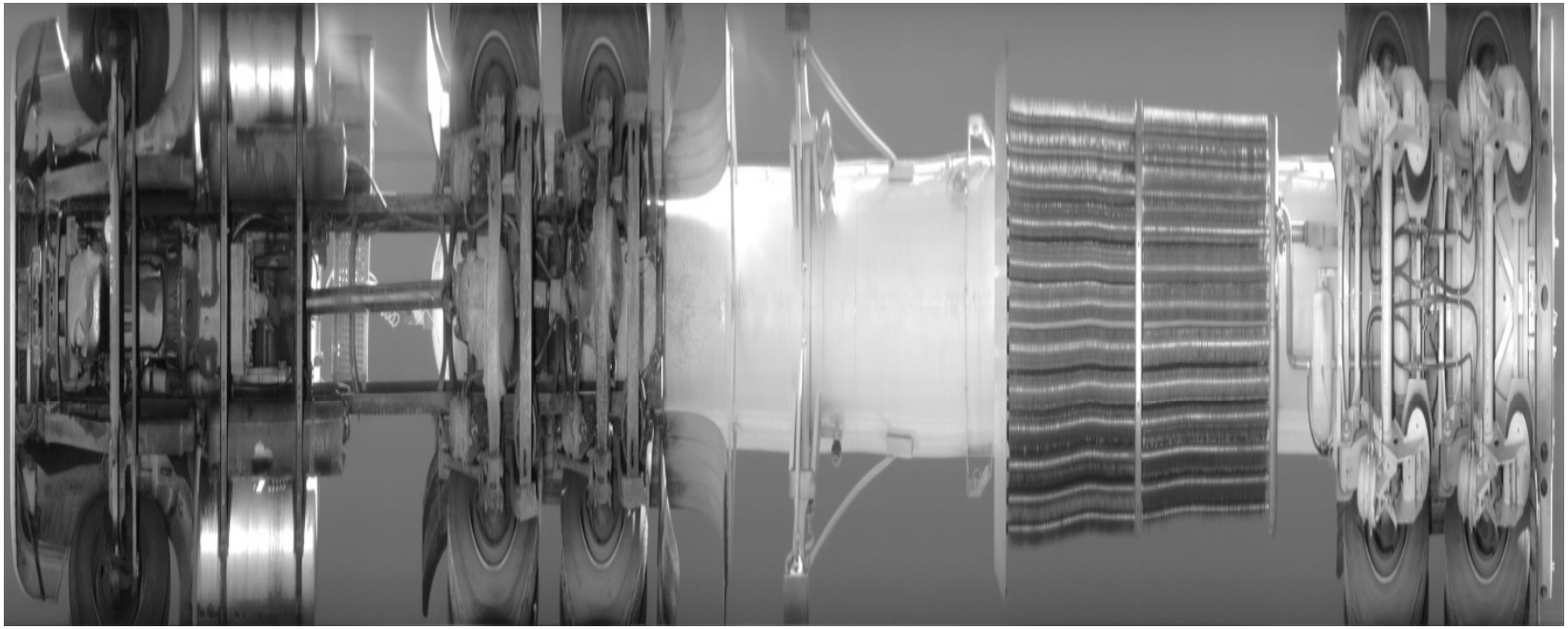
- License plate reading should include plates in the front and back of vehicles as well as plates on the side doors of commercial vehicles

Equipment Damage Inspection Images

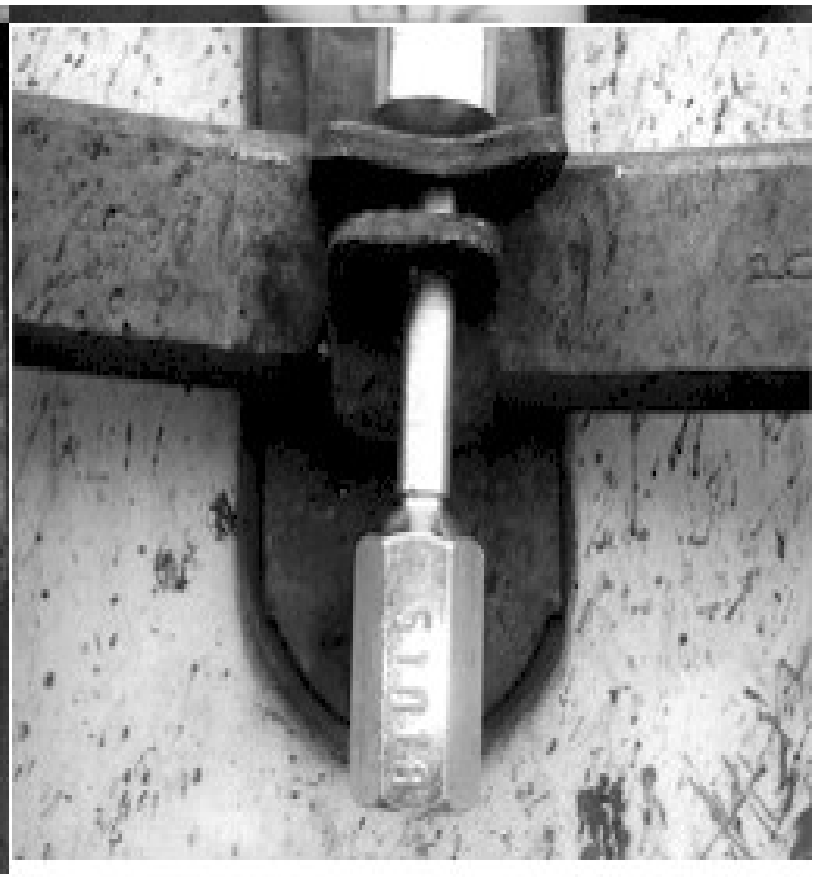
Verification of Empty Containers

- An empty container approaches the gate pedestal and is logged into the system as an empty.
- The driver is then instructed to open the rear container doors via the pedestal intercom.
- Empty/Non-empty status is verified using the rear-view PTZ camera.
- If validated against system data, ticket is printed and driver allowed into yard.

Under vehicle inspection



Inspection of seals by means of a high resolution PTZ camera



Communication with drivers through kiosks

Communication with drivers through kiosks

Available Kiosk Equipment:

- Voice/Intercom - Voice Over Intranet Protocol (VoIP) allows driver- clerk communication
- Call button - allows drivers to notify clerk of their presence
- Biometric fingerprint reader– facilitates driver identification
- ID Card Reader – facilitates driver identification
- Barcode scanner - provides verification of successful mission ticket or entry pass
- License Plate cameras/illuminators (some lanes) - certain kiosks need to be outfitted with LPR cameras and equipment to match portal-to-pedestal transactions.
- Thermal ticket printer - Prints mission tickets for driver

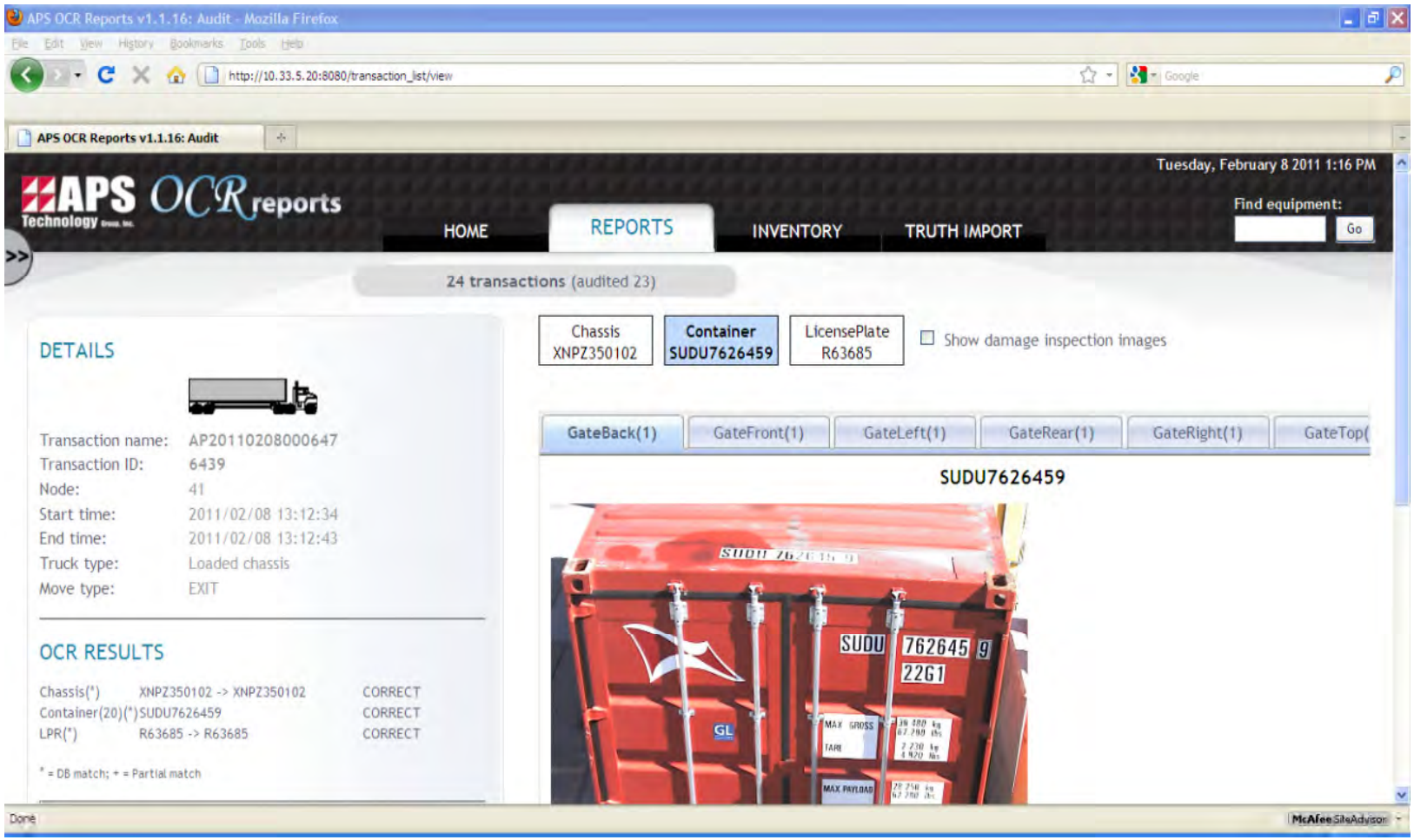
Communication with drivers through kiosks - continued

- Driver Face camera - allows clerk to verify driver's identification

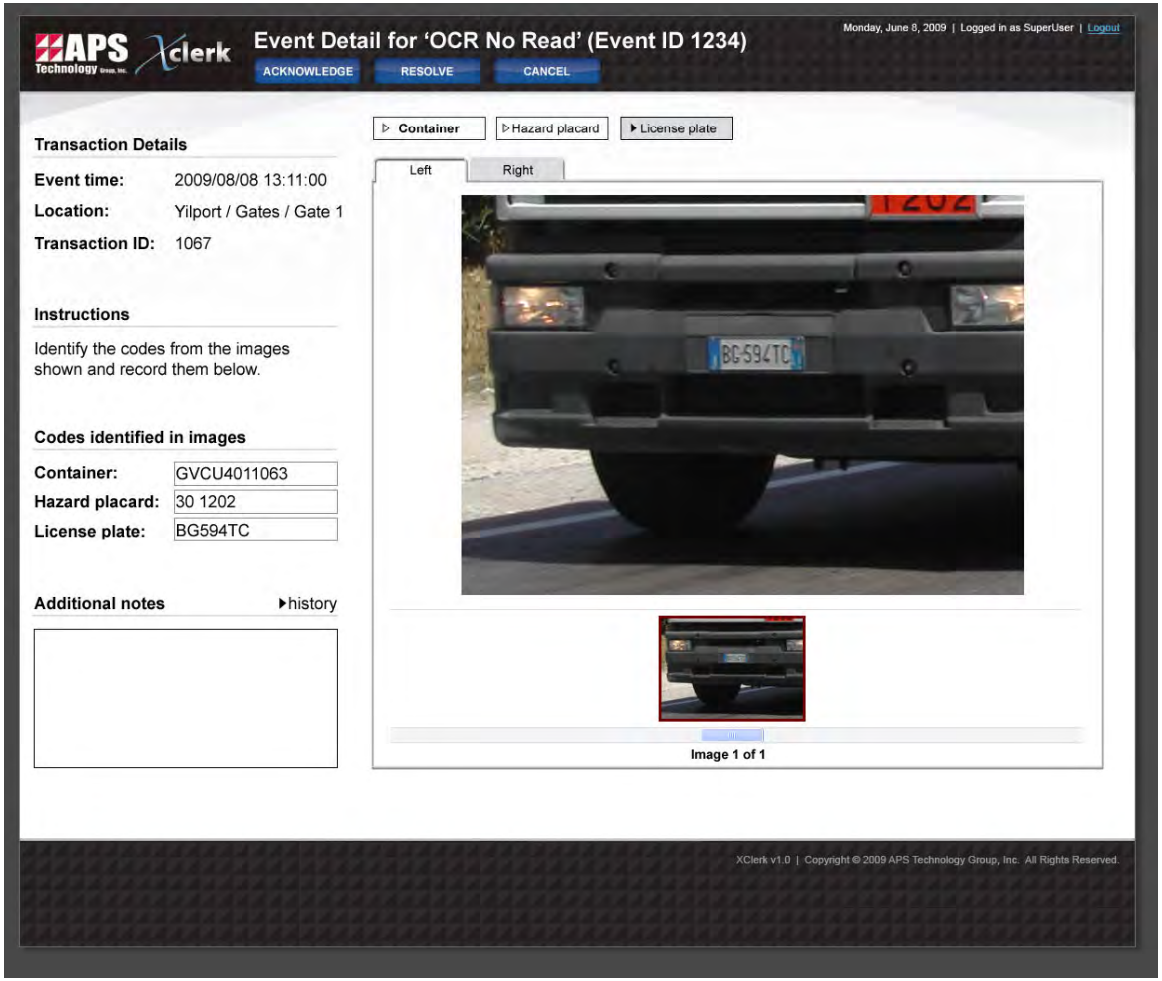
External part of kiosk:

- Rear PTZ camera - enables container/chassis views and verification of an empty container
- Barrier gate arm (some lanes) - allows driver to pass once transaction is verified and mission ticket is printed
- All cabling, power supplies, etc

Container search report



Application to Administer Access by Exception



Application to Administer Access by Exception - continued

The application provides the following functionality:

- Classification, queuing and notification of LPR, OCR and/or appointment exceptions (requires integration of TOS appointment data)
- Display of OCR portal images (to correct OCR misreads, review images, etc.)
- Display of live video from kiosk face camera
- 2 way VoIP communication to each kiosk

OCR report search page

APS OCR Reports v1.1.14 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://10.30.1.20:8080/

APS OCR Reports v1.1.14

APS Technology OCR reports

Tuesday, February 8 2011 10:58 AM

HOME | REPORTS | INVENTORY | TRUTH IMPORT

Find equipment: Go

Report filter

Transaction name: View transaction

Mode: Gate

Start: February 8 2011 12:00 AM

End: February 8 2011 10:58 AM

Nodes: IN1, IN2, IN3, IN4, IN5, IN6, IN7, IN8, IN9, IN10, OUT41, OUT42, OUT43, OUT44, OUT45, OUT46

Equipment: Container (with or without OCR), Chassis (with or without OCR)

Move type: Any

Validation: Unreviewed, Non-equipment, Own, Damaged, Correct, Hold for review, Incorrect, Auto-validated

Database matching: No match, Partial match, Full match

Damage images: On demand, Automatically download

Report type: Audit, Review, Statistics

Run report

Status

Connection to TOS:	Active as of 02/08 10:58:41
Active nodes:	14 / 17
Last OCR message to TOS:	APSG11020810584104618
Last expected inventory from TOS:	(none)

Statistics for Tuesday, February 8

#	Correct	Incorrect	Unknown	Damaged	Own	Non-equip	Autoval	Audited [% / acc.]	Performance (raw)	DB exact	DB partial
459	0 (0%)	0 (0%)	459 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0% / 0%	0%	0 (0%)	0 (0%)
504	0 (0%)	0 (0%)	504 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0% / 0%	0%	0 (0%)	0 (0%)

Done

McAfee SiteAdvisor

Alternatives for OCR and TOS systems

Alternatives for OCR Gate System

- APS Technology Group
- NASCENT Technology
- CAMCO Technologies
- SAIC Security and Transportation Technology

Alternatives for Terminal Operating System (TOS)

- NAVIS
- Tideworks Technology
- COSMOS

Hardware and Telecommunications Alternatives

Hardware Alternatives

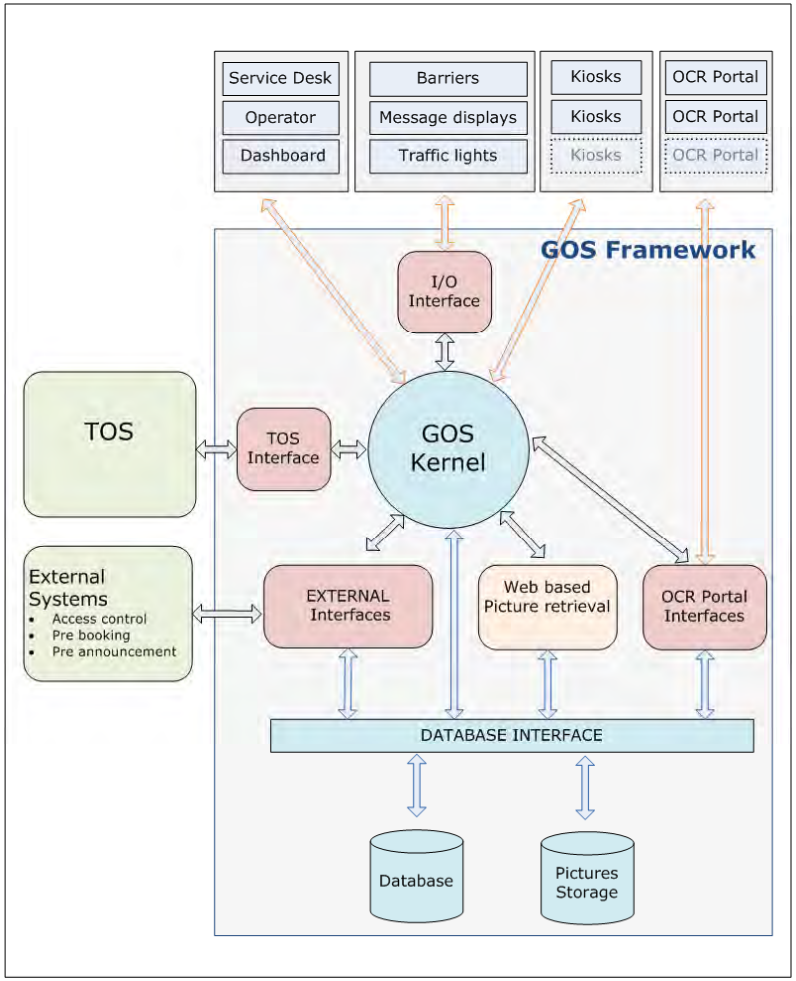
- IBM
- HP
- Psion
- Motorola - Symbol

Telecommunications

- Motorola Solutions
- Motorola Mobility

Interface between the Terminal Operating System (TOS) and the Automated Gate System (GOS)

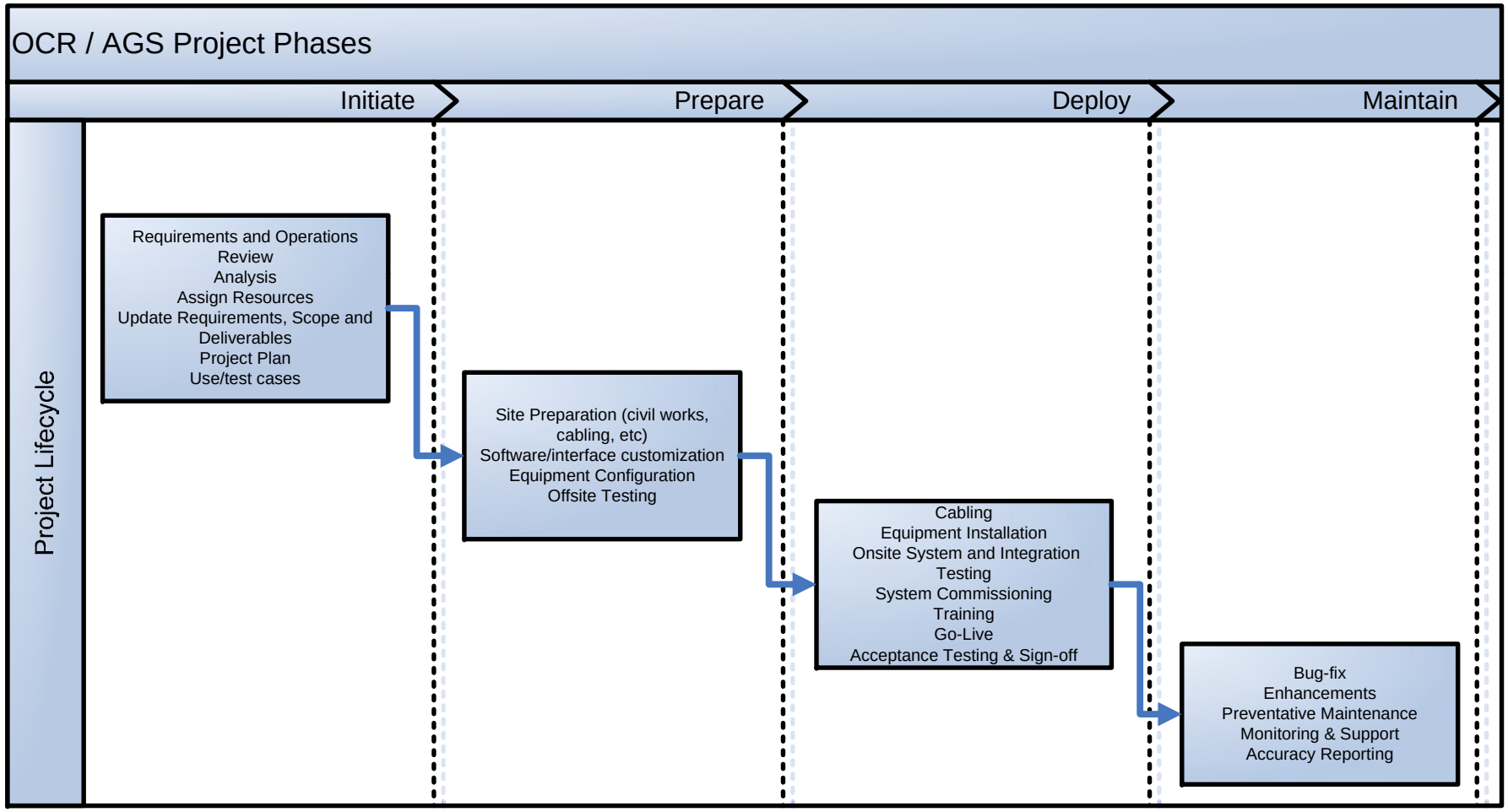
Cosmos interface



Cost Estimates for OCR system

Qty.	Component	Unit Cost (USD)	Amt. (USD)
12	Gate Portal OCR System for container, LPR	$125,000	$1,500,000
15	Driver Communication Kiosk System	25,300	379,500
5	License plate recognition stations (kiosk)	13,730	68,650
	Preparation, installation and start-up		228,600
	Site prep., civil works, cabling		N/A
	Data integration with COSMOS or equivalent TOS		22,110
	Travel and per diem		42,000
	Project management, staff training		88,600
	Total		2,329,460

OCR system implementation program

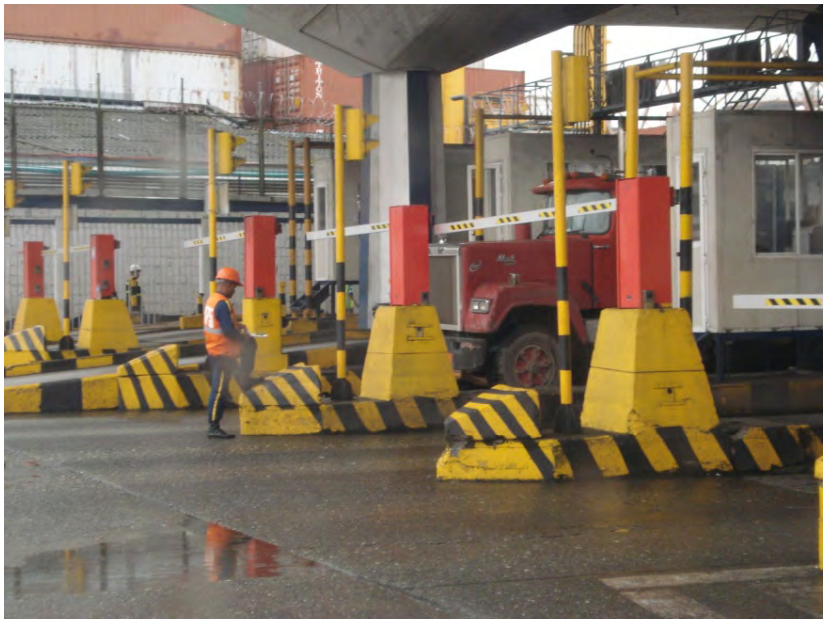


4. Development of Computer Monitoring Security System

Billy Vanderbur, Senior Port Security Expert

February 1, 2012

Computer Monitoring Security System (CMS)



Objective: *Integrate individual security subsystems under one platform to facilitate operator efficiency and allow the combined technologies to work together to better detect, prevent, observe and report suspicious activities in the Port of Buenaventura.*

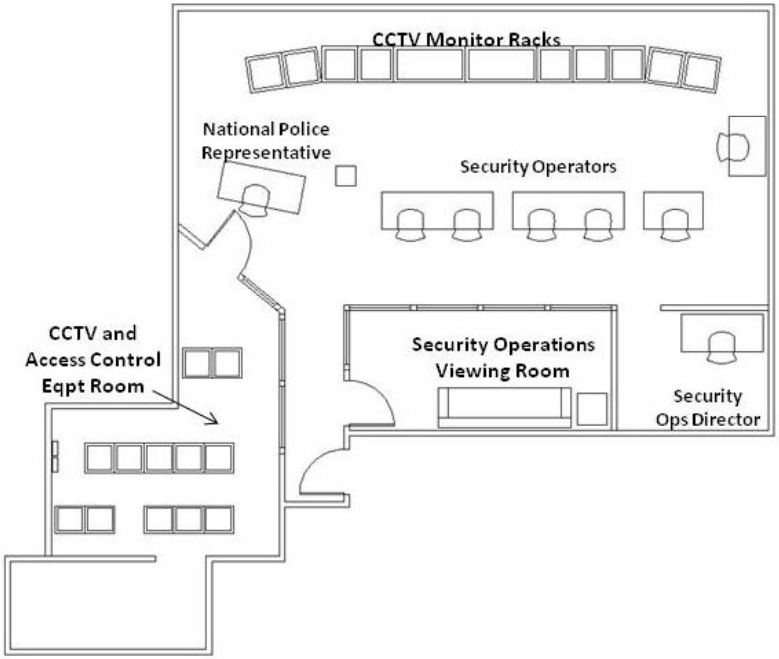
Integrated Electronic Security System

- At present the Port has an Integrated Electronic Security System (SISE) installed in 2 phases starting in 2004 at a cost of USD 4 million
- It includes 384 cameras, image processors, recorders, access control system, perimeter control system and radio frequency and fiber optic network links
- It is complemented by an armed physical security force comprised of 220 men

Security Operations Center

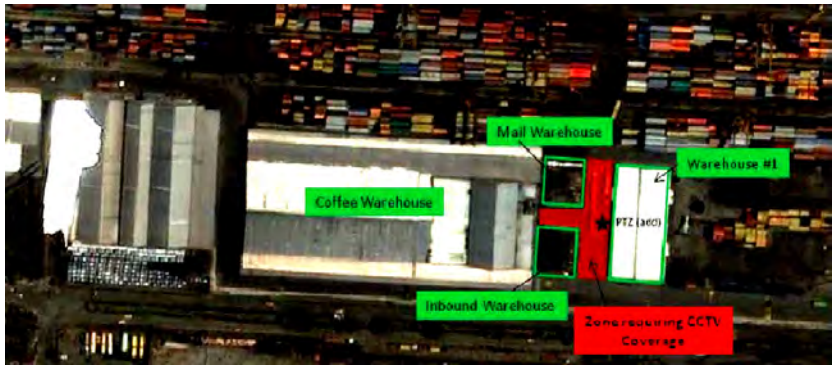
The center includes 35 monitors

It is operated 24/7/365 with 7 operators per shift



Status: Areas requiring additional CCTV cameras

Blind spot between Adpostal, Import and # 1 Warehouses

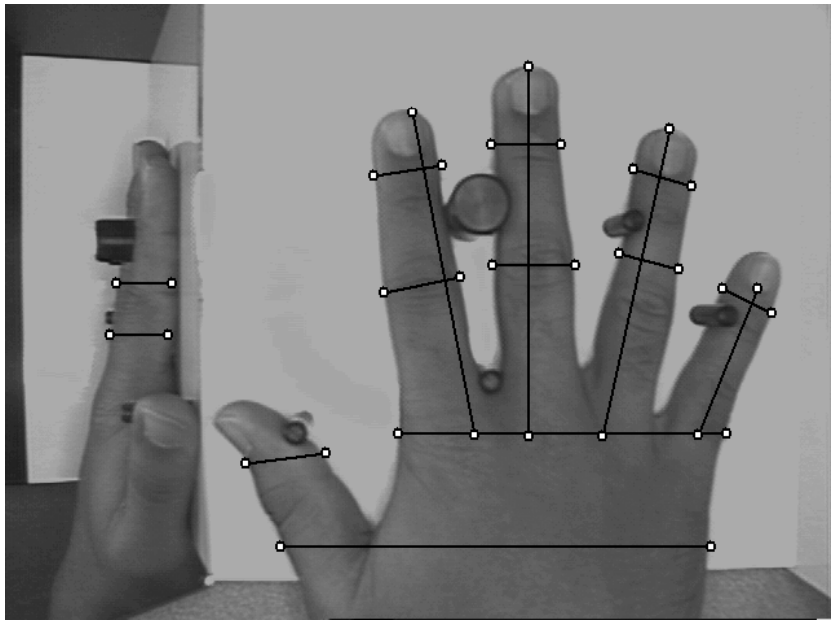


Inspection area in the former free zone

Status: Existing access control equipment

HandKey II reader

Hand geometry detection



Status: Existing boundary protection equipment

Equipment to detect fence intrusion

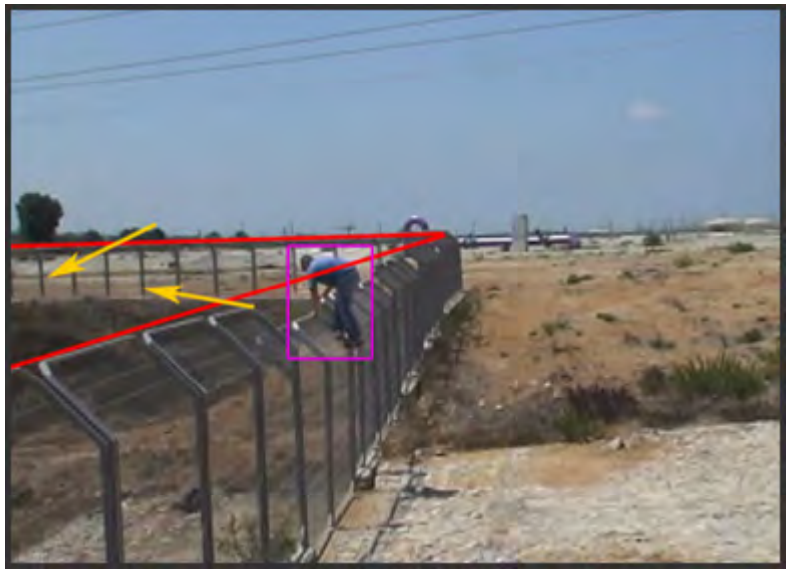
Cable sensors on the fence

Status: Protection of port facilities and ships

Location of the existing infrared camera

Recommendation: Video analytics

Integration of video analytics to monitoring of fence and port interior



Video analytics can detect:

- Movements outside of normal or lack of movements,
- People loitering,
- Vehicles speeding, or
- Remaining excessively in a restricted zone.
- Movements of restricted small craft
- Spaces between stacked containers
- Tailgating (following persons or vehicles through gates)

Status - Existing security subsystems

- Panasonic CCTV Matrix 850 Headend
- Panasonic CCTV cameras
- C-Cure access control system
- SenStar Stellar Fence Protection System

Status – Intrusion detection system

- Serves entire perimeter of Port and Free Zone Area
- Currently integrated with video management system
- No changes required as part of the computer monitoring system.
- Capable to integrate with new Situation Management System

Status – Access Control System

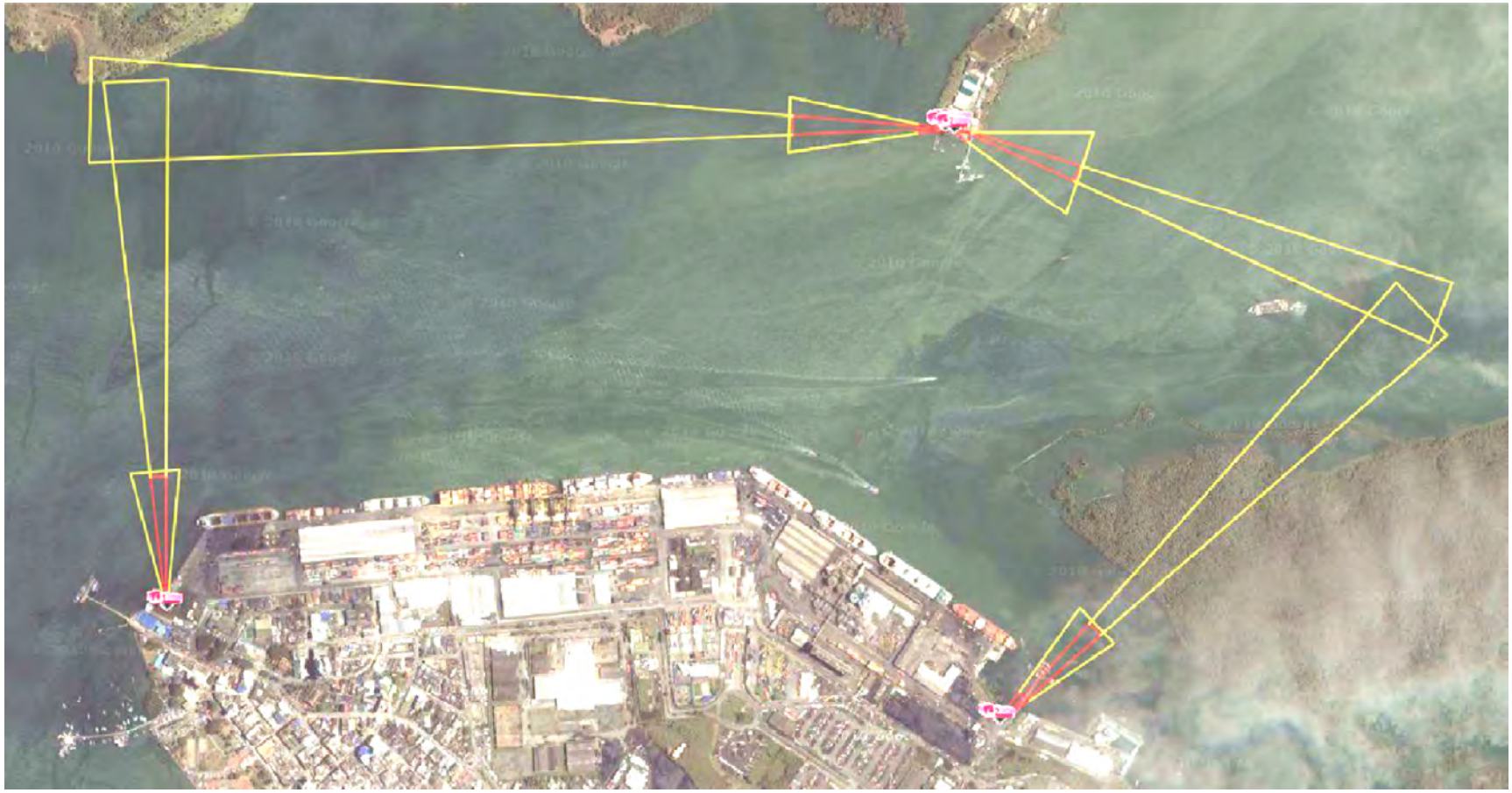
- Currently standalone system
- Altronix Controllers
- Schlage Hand Geometry Readers with Pin Pad
- Capable to integrate with new Situation Management System
- Out of date software version - requires latest update.

Status – CCTV Cameras

- Combination of Fixed/PTZ
- Extensive coverage of Port
- Several camera models discontinued but still operational
- Analog system

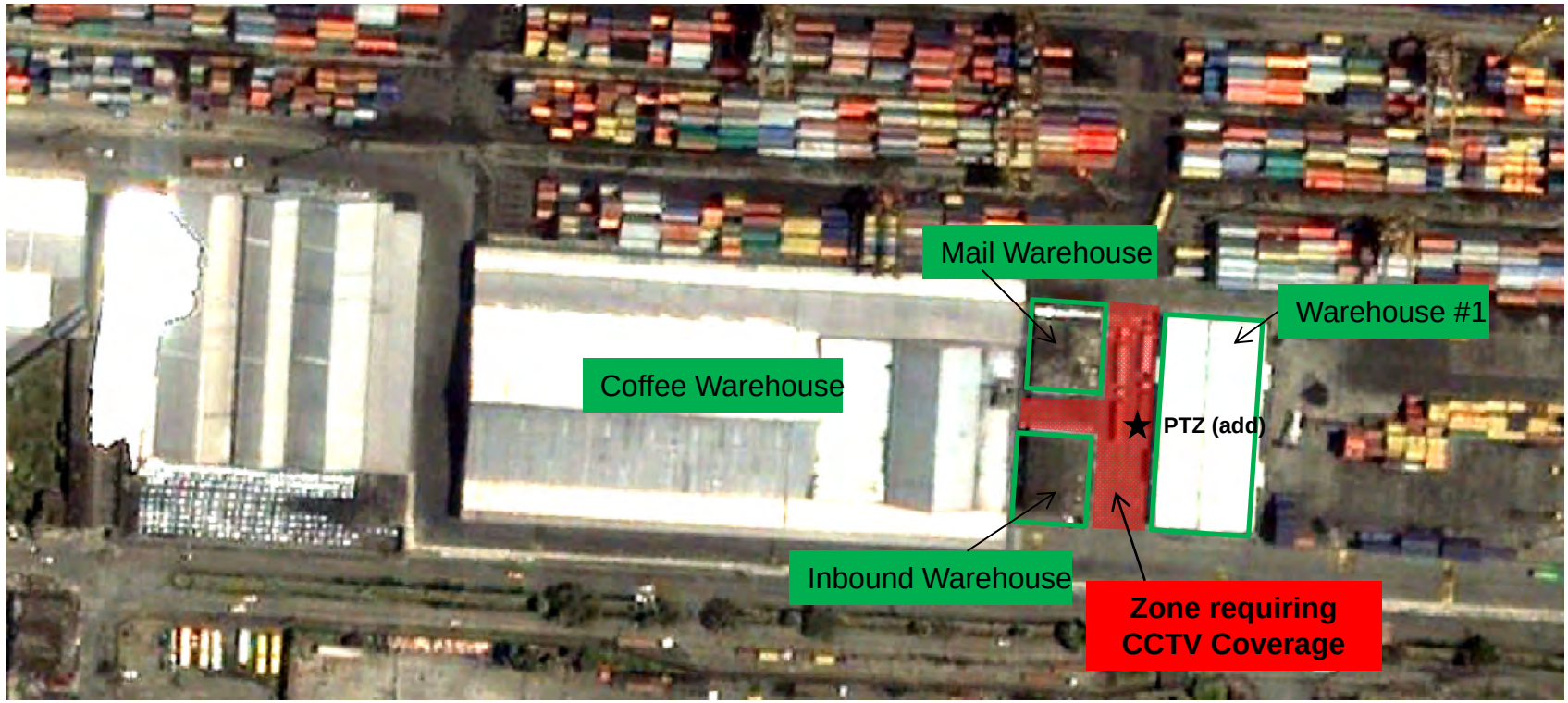
Recommendation – CCTV Cameras for Waterside Boundary

- Implement thermal IR camera system with object tracking to form waterside perimeter boundary.



Recommendation – CCTV Cameras

- Add new camera to cover known blind spot



Recommendation – Update CCTV Headend

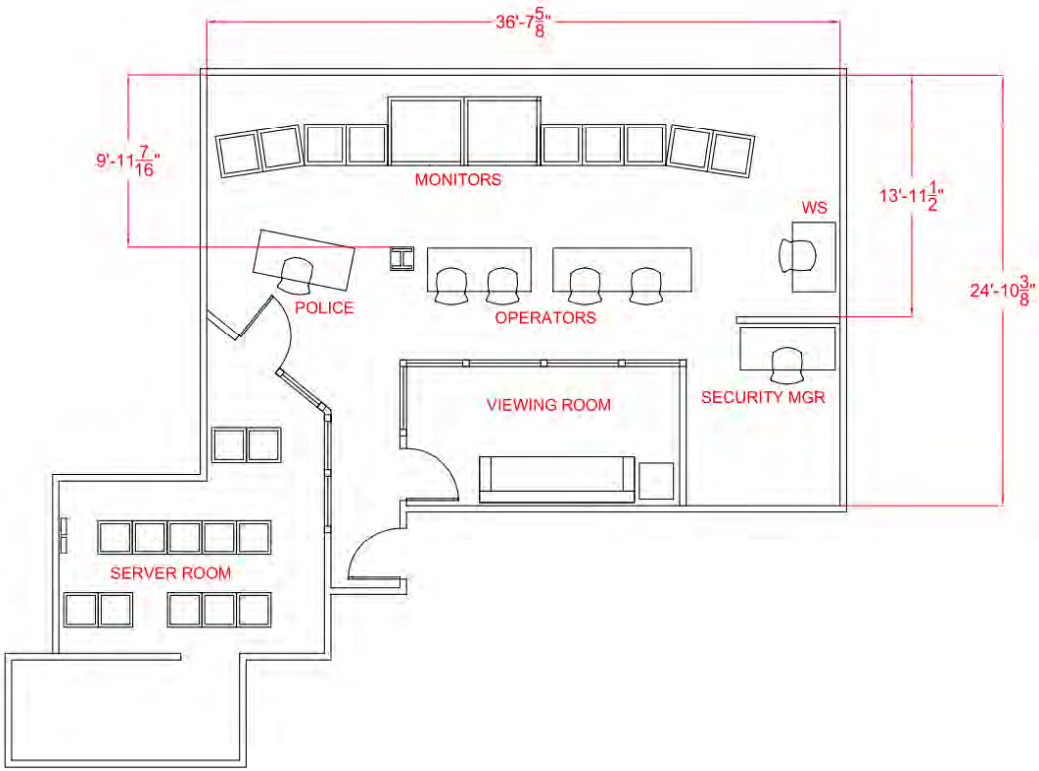
- Composed of Panasonic Matrix System850 DVR's, Switcher's, CPU's, and Controllers.
- Headend is considered out of date and requires wholesale replacement.
- Eqpt failures starting to occur.
- Recommend hybrid analog/digital solution.

Existing Security Operations Center

- Five Security Operators
- One National Police Representative
- One Security Manager
- Video Display Monitors
- Additional Security Operator above Raymond Entrance

Interim Solution – Existing Security Operations Center

- CRT monitor solution with two add'l 42" flatscreens.



Recommendation – Physical Security Information Management (PSIM) System

– Implement Physical Security Information Management (PSIM) system to provide Computer Monitoring function

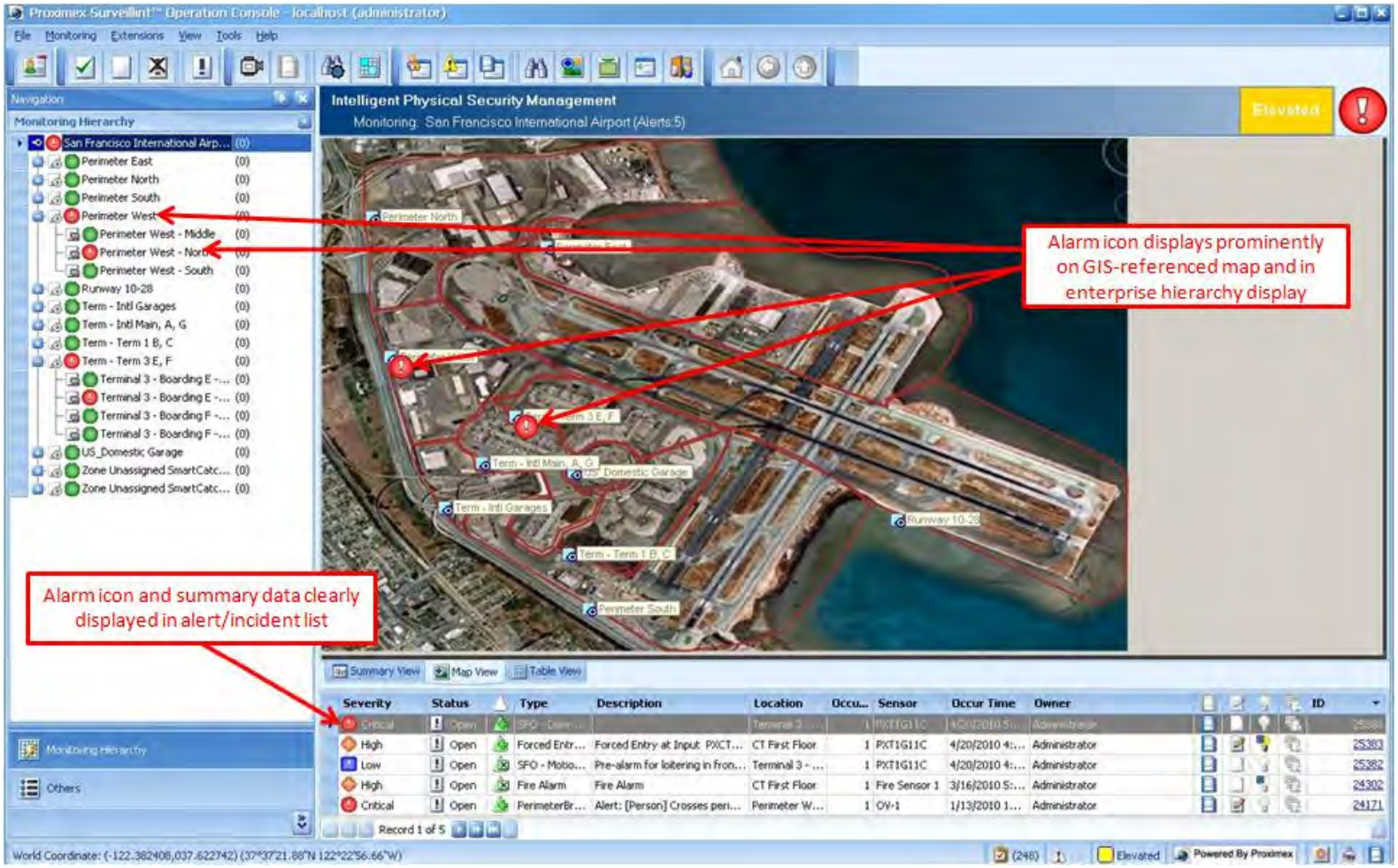
NICE Situator

Recommendation – Update Operator Consoles in the Security Operations Center

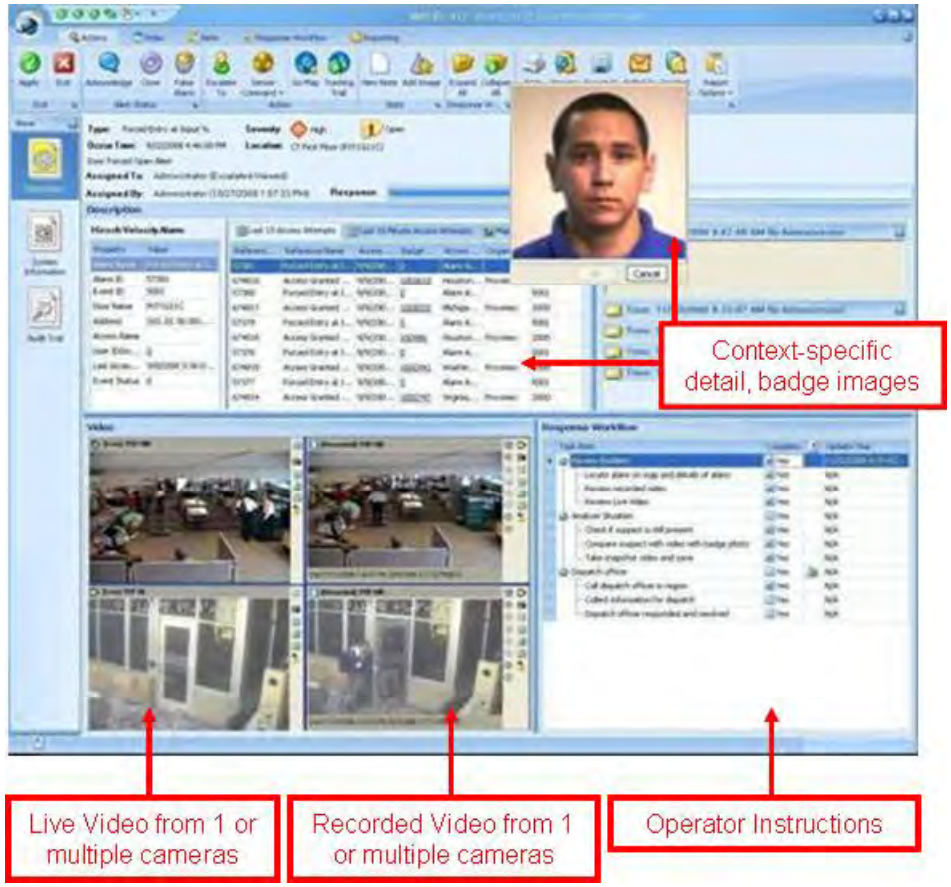
– Update operator workstations with consoles equipped with phone handset, radio, task lighting, power receptacles, multiple displays, ergonomic chairs, upgraded PC workstation, PTZ/Keyboard controller.

Wright-Line Profile Series

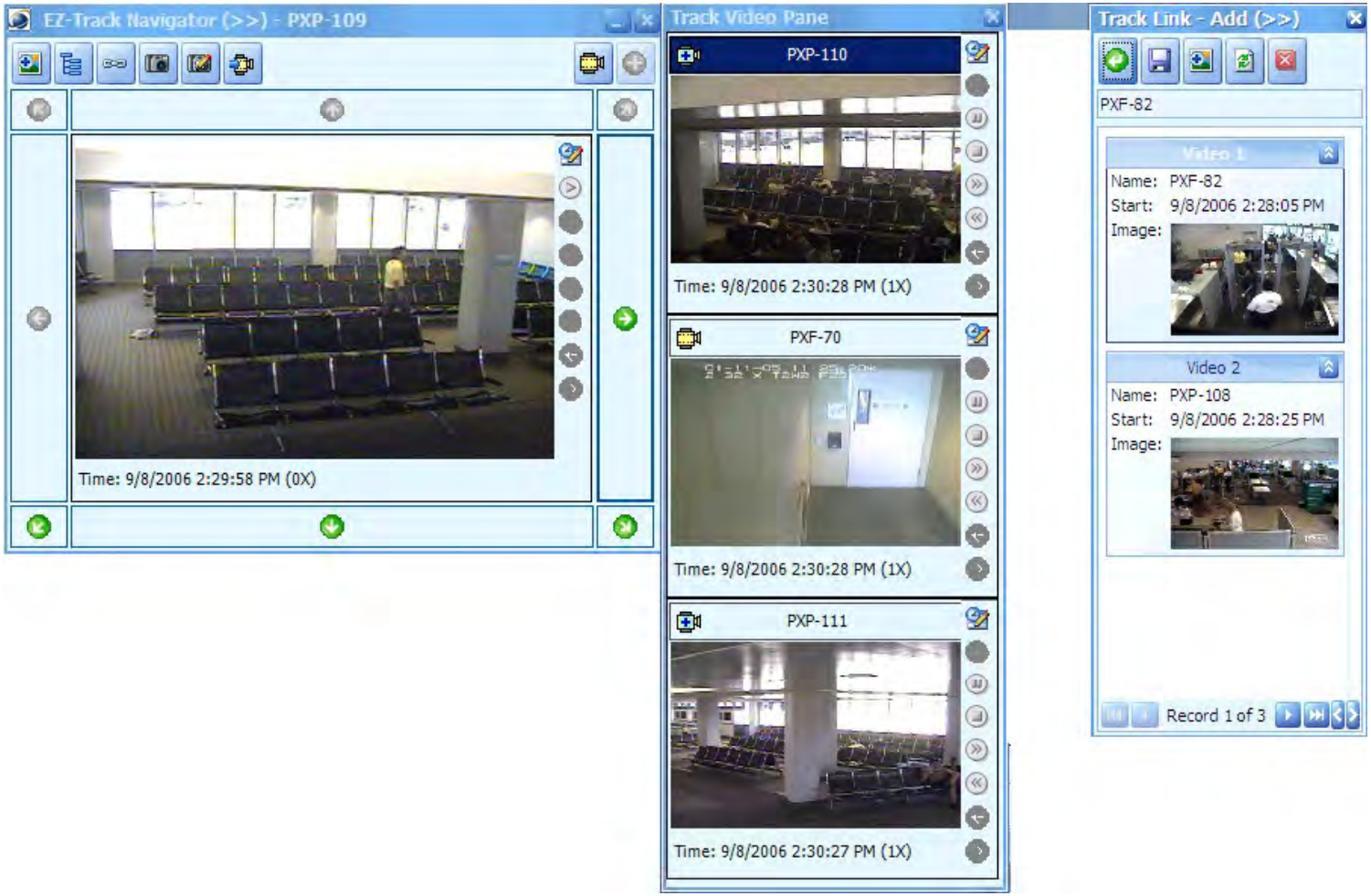
Proximex Surveillint™ – Incident Management – Incidents – Situation Awareness



Proximex Surveillint™ - On-screen integration of information and video in case of door blocked or forced



Proximex Surveillint™ - Tracking of recorded video on EZ-Track

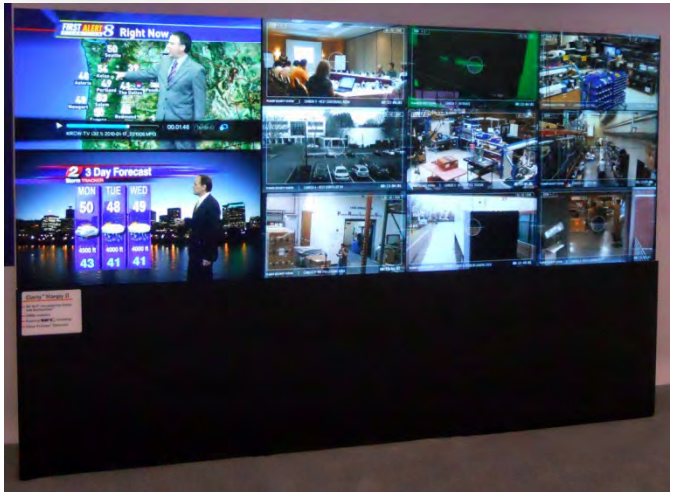


Recommendation: Video Display Wall in Security Operations Center

Planar Clarity Matrix

Recommendation: Video Display Wall in Security Operations Center -- continued

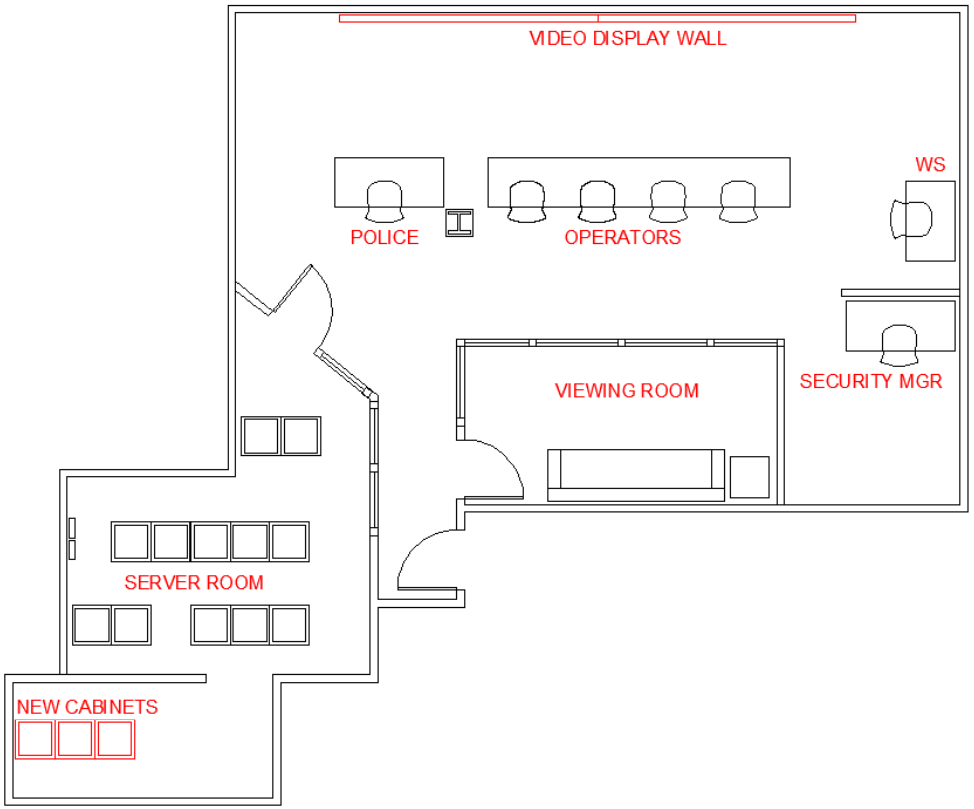
- Recommendations
  - Replace CRT monitors with thin profile video display wall
  - Provides more space for personnel
  - Images can be from most any source (CCTV, local TV programming, forms and spreadsheets, visual alarms, maps, etc.)



Planar Clarity Matrix

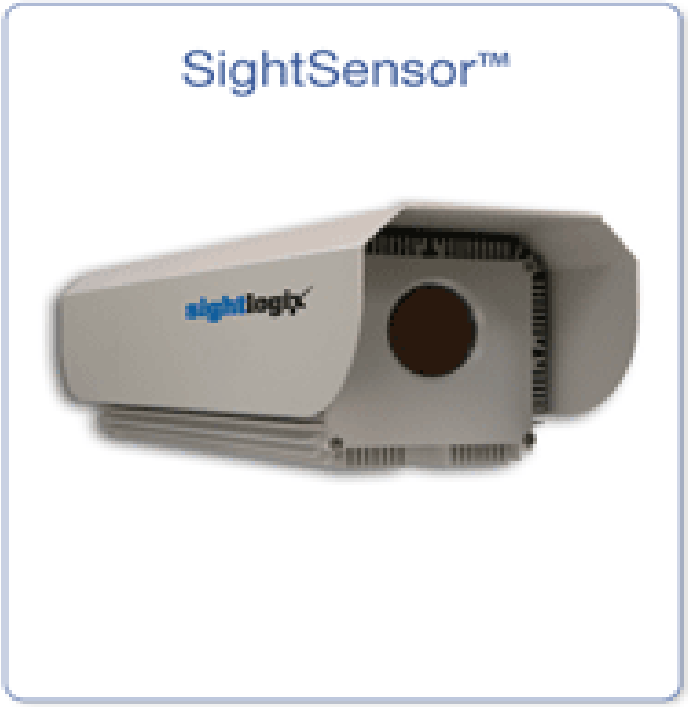
Proposed Layout – Updated Security Operations Center

- Thin profile display wall
- New operator consoles
- Additional racks for new equipment



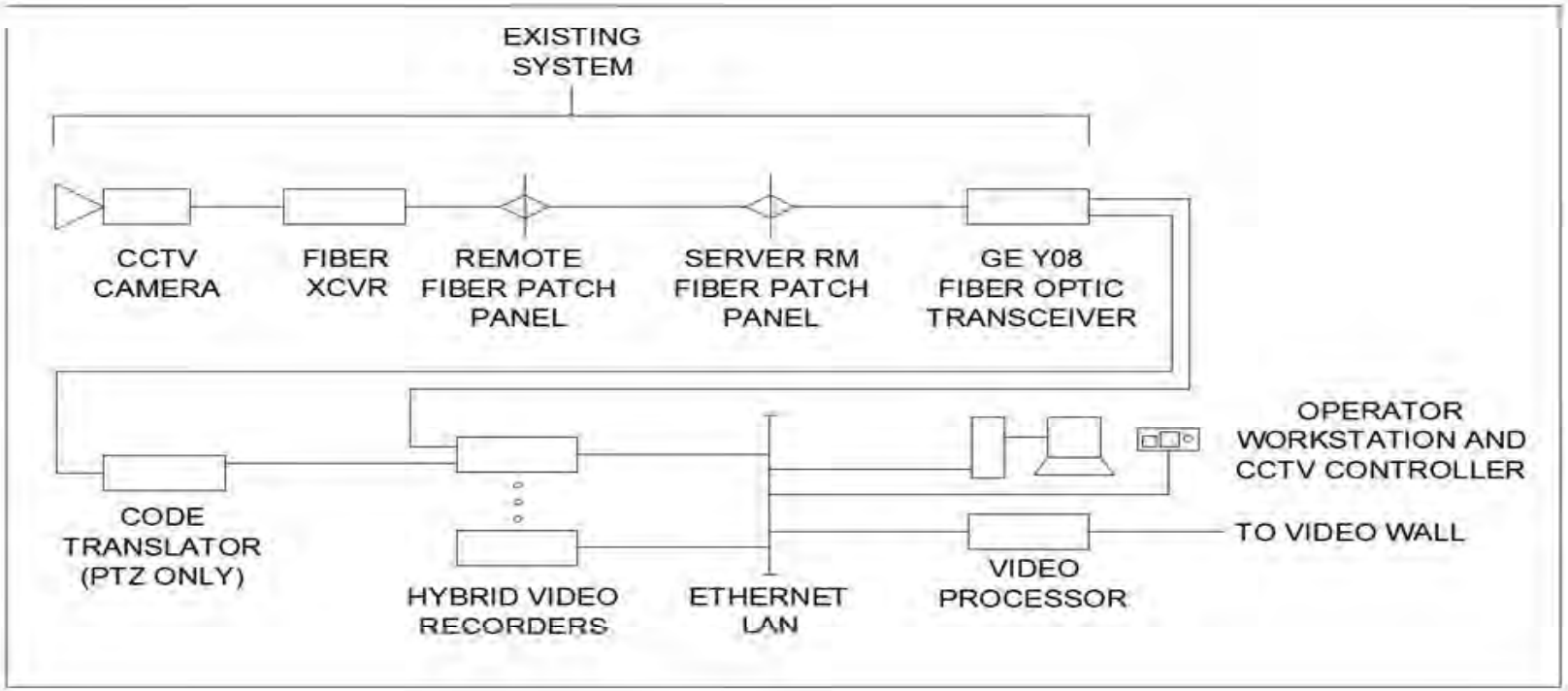
Recommendation: Long Range Thermal or Wide Range Visible Day / Night Camera

SightSensor by SightLogix

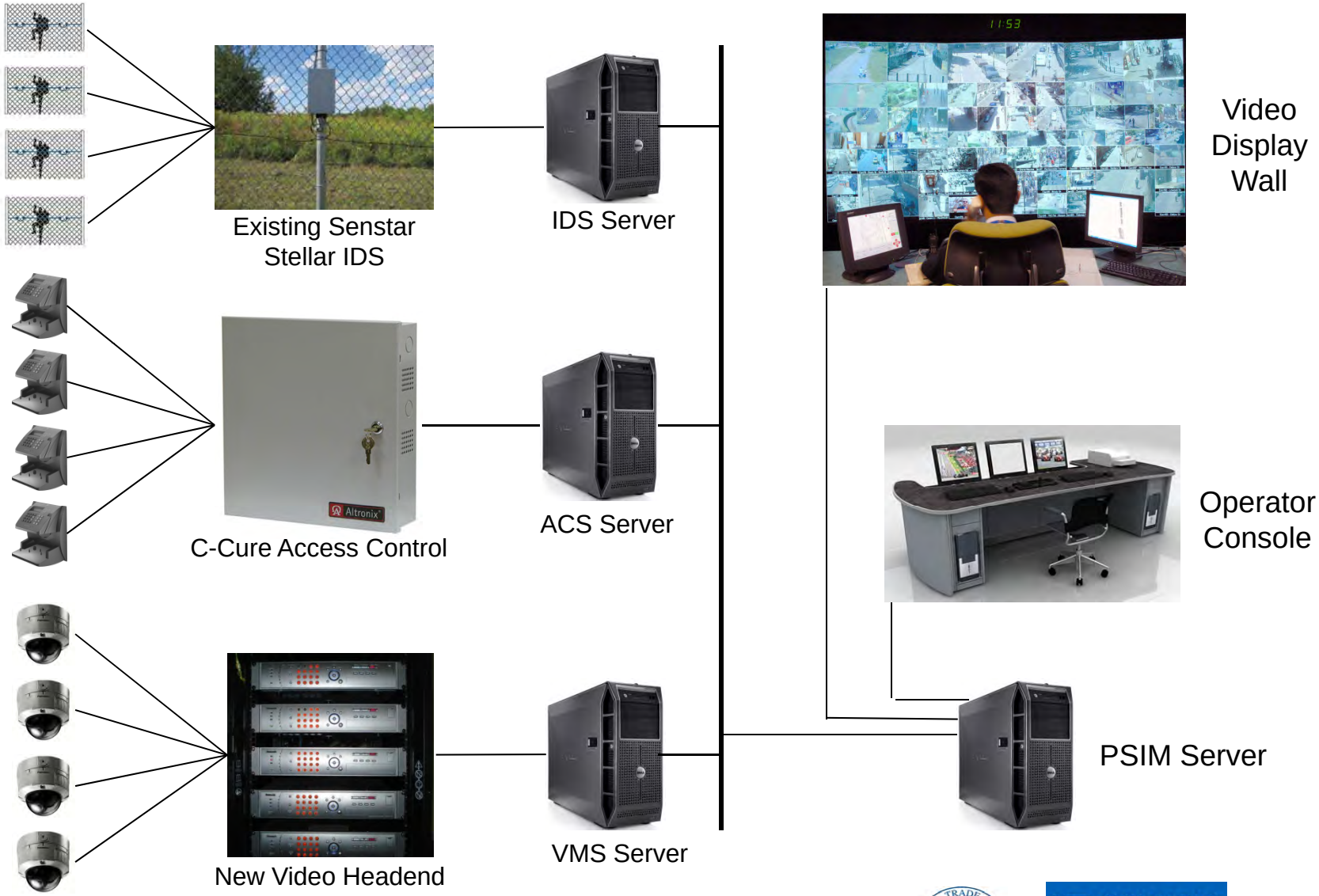


- Wide range intelligent camera
- Detects vehicles at 1,230 m and persons at 500 m
- Identifies GPS location of 64 targets simultaneously

Incorporation of new components to video system



Situation Management Integration with PSIM



Situation Management Integration with PSIM – continued

L3 Klein Ground Based Radar (GBR)

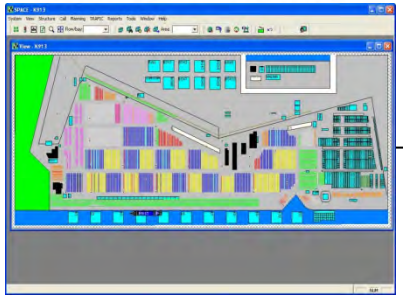
Radar Server

Future Option

Video Display Wall

Operator Console

COSMOS



Container Terminal System

CTS Server

Future Option

PSIM Server

Situation Management Integration with PSIM - continued

Configuration Requirements

- **Map development** – New maps of the Port will be created.
- **Sensor assignments** – Detailed list of sensors will be collected and designated with a unique identifier.
- **Sensor placement on maps** – Interactive icons will be placed on maps to represent sensor locations.
- **Sensor alarms** – Each sensor will be assigned a designated alarm feature. This feature will dictate how that alarm when activated will react (visual alarm, audible alarm, etc.).
- **Sensor collaboration** – Rules will be established to determine how specific alarms are to be responded to.

Situation Management Integration (Cont'd)
Configuration Requirements

- **Technology Collaboration** – When a sensor is activated, the different security subsystems will work together to:
  - **Ensure security staff are alerted** to the issue
  - **Instructions -** Provide staff with clear succinct instructions to be followed
  - **Document events -** Document the event from alarm to situation closeout
  - **Record events -** Log the event for future recall and review

- Port Security Staff Responsibilities:
  - Work with integrator to develop specific rules. The process starts by creating simple rules using pre-established templates.

Situation Management Integration (Continued)
Reaction to events

For example: If an intruder climbs a fence tripping the Senstar Stellar alarm system:

- the system focuses the tracks of CCTV on the point of alarm,
- a visual alarm is issued to the video display wall,
- operator instructions appear on the screen,
- the staff security are deployed to investigate the situation to confirm a resolution,
- the event is logged in the system, including all audio / video covering the event.

Situation Management Integration (Cont'd)

Time for configuration

- The development of the rules takes time. Expect minimum of 3-4 months for rollout of first tier rules.
- While all security subsystems are upgraded and made operational, alarm sensors and maps can be developed.
- Rules are then applied and sensor mapping and integration will commence.
- Commissioning of each set of rules should be conducted.
- Second tier rules can be developed which may include more intricate technology collaborations (Multiple camera views responding to an alarm, etc.)
- The integrator will train the Port to use the system.
- The Port will continue to develop and adjust the system for the life of the system.

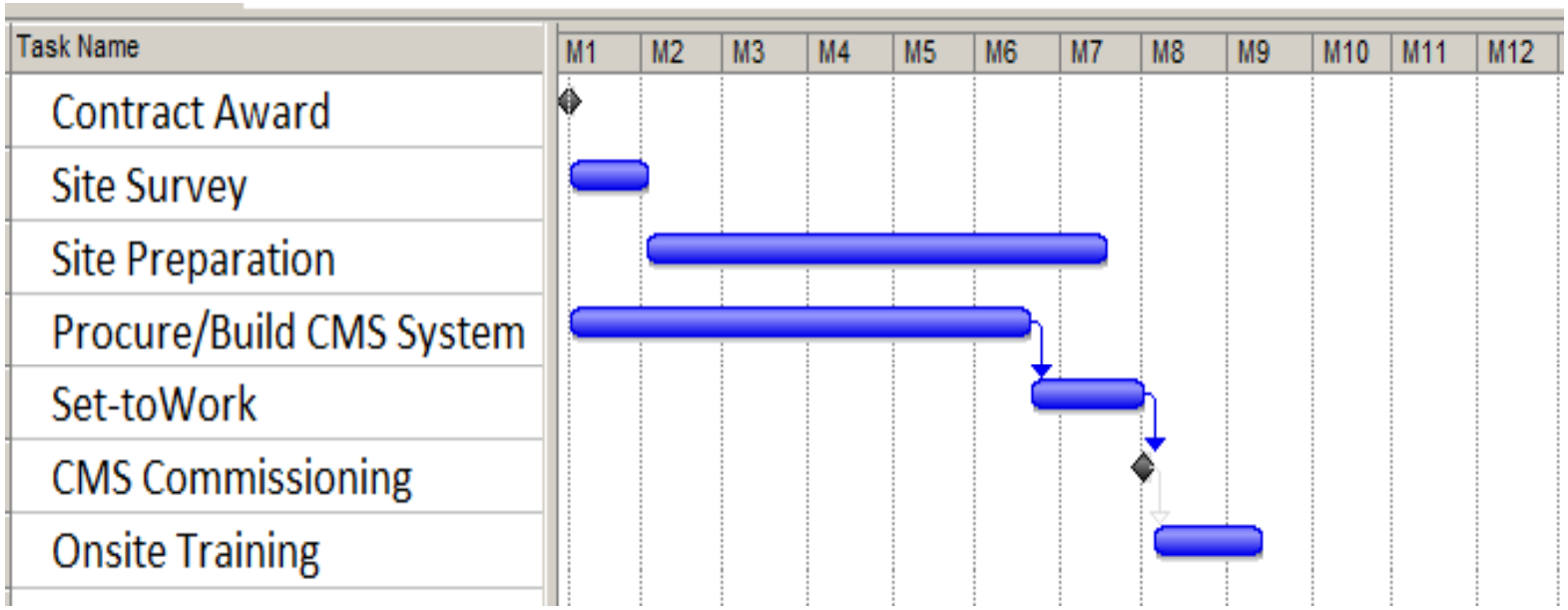
Cost Estimates for Computer Monitoring Security (CMS) System

Component	Amt. (USD)
Proximex Surveillint hardware and software	$536,555
Clarity Matrix MX46L 3 x 8 Video Wall (24 units)	202,104
8 Work Stations	20,939
Subtotal CMS	$759,598
Complementary Systems	
8 IR SightSensor cameras, 1 PTZ Pelco Spectra IV,	
Wireless link with Isla Guardacostas, Cabling	$377,403
Operator console upgrade Wright-Line Profile	$ 20,514

Cost Estimates - continued

CCTV headend update	
24 32-channel Pelco DSR324000 4TB video recorders, Pelco keyboard controllers	
and 16 Sennetech SCT1069, code translators, other	
Subtotal	$620,756
Total	$1,778,271

Implementation Schedule for CMS



5. Cargo inspection review

Larry Boorstein, Project Manager

Lisa Himber, Maritime Information Expert

Robert Johansen, Senior Marine Terminal Expert

Billy Vanderbur, Senior Port Security Expert

February 1, 2012

Lisa Himber, Maritime Information Expert, Maritime Exchange for the Delaware River and Bay

- Vice President of the Maritime Exchange for the Delaware River and Bay, responsible for identification, implementation of the computer network and Port information, communications and public relations.
- Previously served as Director of Operations and Manager of Computer Operations, responsible for design, development, implementation, operation and user support for the port automation programs, including:
- TRACS electronic cargo manifest system,
- 24-hour ship reporting network linked to Coast Guard and Customs,
- Electronic advance notice of vessel arrival for Coast Guard,
- PORTS tides and meteorological system, and
- Identification system.

Robert Johansen, P.E., Marine Terminal Expert, AECOM

- 45 years of planning and engineering experience for marine container terminals.
- Projects:
- Port of Oakland, Berth 21-24, Automated Terminal Conversion, Project Manager.
- Outer Harbor Automated Intermodal Terminal, Project Manager.
- Berths 55-56, Port of Oakland, Project Manager.
- Extensive experience with APL in container terminals and with PACECO in installation design of container cranes.
- Professional engineer in California and Texas, Bachelor's in Architecture from the University of California, Berkeley.

Objectives

- **Speed up** the movement of containers entering and leaving the port
- **Improve the control** of contraband
- **Facilitate the collection** of duties and taxes
- **Improve security** of the port, personnel and vessels
- **Increase efficiency** of the inspection process and movements of containers and cargo

Review of current inspection

Inspection zone for imports

Review of current inspection - continued

Inspection area in the coffee warehouse

Bahía (bay) inspection area

Recommendations for cargo inspection

Prior notification of data on imports and exports

Nonintrusive inspection of import and export cargo

Profiling to select cargo for physical inspection, inspection of documents and additional scans

Recommendations for cargo inspection -- continued

Scan with high energy high throughput portal X ray systems, and integration of X ray systems for packaged and bulk products and use of IMS and canine detectors

Integration of an inspection zone inside the Port perimeter incorporating the scanners and adequate space for inspection

Integration of OCR, LPR, TOS system and CCTV into the process of documents review, scanning and physical inspection

Recommendations for cargo inspection - continued

- Acquisition or development of better software and data bases for cargo profiling for the involved entities
- Integration of information systems to facilitate pre-selection of cargo
- Non-intrusive inspection of cargo, both import and export, together with the incorporation of an adequate number of container scanners
- Use of fixed portal high energy high throughput container scanners instead of mobile scanners

X-ray portal scanners

SAIC VACIS IP6500 Full Scan integrated full scan cargo inspection system

High energy – High throughput

- 150 vehicles per hour up to 300 per hour with larger controlled access area
- 6.5 MeV - Penetration of more than one foot (304 mm) of steel
- Discrimination of organic and inorganic material
- Spectroscopic radiation detection
- Integrated OCR system
- Scans vehicles with cabin from bumper to bumper and roof nearly to pavement while they drive though the portal without stopping
- Operating footprint of 7 x 9 m including exclusion zone

X-ray gantry scanners

ASE&E Omniview high energy multiview inspection system

High energy

- 28 trucks per hour
- 6 MeV penetrates 400 mm of steel
- Optional Z backscatter scanning to detect organic material with top, left, right vies and to extend the field of view from the ground up
- Operates on rails scanning stationary trucks
- With 60 m of length, can scan 2 trucks the same time

X-ray portal scanner

AS&E Sentry Portal High energy high throughput inspection system

High energy – High throughput

- 150 trucks per hour
- 7.5 MeV
- Penetrates 300 mm of steel
- Can integrate radiation detection
- Can be combined with backscatter technology creating Z Sentry version to discriminate organic contraband material

X-ray scanner

Smiths Heimann HCVG high energy gantry detection system

High energy

- 3.5 to 6 MeV, with penetration of 280 to 400 mm of steel
- Up to 23 trucks per hour
- Scanning of 1 to 2 vehicles
- Optional viZual technology to discriminate organic and inorganic material based on atomic number
- Optional ARD detection of radioactive material

X-ray portal scanner

Smiths Detection HCVP high energy detection

High energy – High throughput

- 4 MeV to 5 MeV with penetration of 230 to 300 mm steel
- Up to 195 trucks per hour with a speed of 7 kph
- Optional viZual technology to distinguish organic and inorganic material based on atomic number
- Optional ARD detection of radioactive material

SOCIEDAD PORTUARIA REGIONAL DE BUENAVENTURA S.A.

AECOM

X-ray gantry scanner

L-3 CX Gantry

High energy

- Full target coverage with the highest penetration and resolution for the ultimate in image quality.
- With optional dual energy material discrimination that illustrates organics from inorganic materials and metals, operators can work more efficiently and effectively.
- Highly configurable with a range of energy levels, networking capabilities and menu of optional features.
- Threats, contraband and falsification of goods can be identified in any part of the vehicle.

X-ray portal scanner

L-3 CX Portal

High energy – High throughput

- High throughput.
- high-energy cargo screening for security and customs applications.
- Minimizes impact on operations.
- Offers drive-through convenience with a multi-tier safety system that allows drivers to safely remain in the cab during scans.
- Space-efficient design and adjustable scan speed
- Eliminates bottlenecks
- Optional dual energy material discrimination that illustrates organics from inorganic materials and metals

X-ray portal scanner

Rapiscan P60

High energy – high throughput

- 6.0 MeV High throughput portal system
- 180 trucks per hour
- Penetration of 300 mm of steel
- 6.0 MeV dual energy linear accelerator required for material separation
- Low energy X-ray generator required for CabScan option to scan occupied cabin and occupants
- Gamma or gamma and neutron radiation detection available as options

Automobile scanners

SAIC VACIS XPL passenger vehicle scanning system

- Continuous scanning with requiring stopping or exiting vehicles
- Scanning from bumper to bumper and roof to pavement
- Identified metallic threats and organic contraband

Recommendations for cargo inspection - continued

Container scanners should include these features:

High energy High throughput X-ray

Drive through – to scan vehicles as they transit the scanner without stopping.

Material discrimination - organic vs. inorganic with color display.

Full vehicle scanning – including cabin and occupants.

Radiation detection.

Integrated OCR – to positively identify containers when they are scanned.

Safety – with a small footprint and exclusion zone.

- *Package, pallet and bulk scanners should be integrated to inspect products inside the containers.*

Dual mobility ion spectrometer

Smiths Detection Ionscan 500DT

- Dual ion mobility spectrometry (IMS) identifies more than 40 substances in 8 seconds
- Narcotics and explosives detection
- 10.4” color touch screen
- Integrated printer
- 19 kg

Hand-held ion trap mobility spectrometer

Safran Morpho Detection Mobile Trace

- Detects explosives and narcotics in seconds

Palletized cargo scanners

Rapiscan Eagle 1000 palletized cargo scanners

- Various models with tunnels up to 1800 mm x 1800 mm

Palletized cargo scanner

L-3 CX Pallet

- Accelerate screening of consolidated cargo in pallets, crates and ULDs by eliminating the need to unpack cargo for inspection. With optional dual energy material discrimination that illustrates organics from inorganic materials and metals, operators can work more efficiently and effectively.
- Highly configurable with a range of energy levels, networking capabilities and menu of optional features that include a choice of single-view or dual-view imaging and multiple door and tunnel size options.

Breakbulk cargo scanner

AS&E Gemini 100100 Breakbulk cargo scanner

- Dual energy Z Backscatter, for better detection of organic materials
- Penetration of 34 mm of steel

Recommendations for cargo inspection - continued

- The addition of space dedicated to scanning sufficient to allow the waiting of the containers in line in front of scanners, as in a gate;
- The integration of an inspection area within the perimeter of the Port to better handle the cargo that is currently moving between the Port and the inspection area in the former Zone;
- The placement of scanners that can sequentially check a container when the container is identified in a gate with the optical character recognition system (OCR) and license plate readers (LPR); use of scanners with integrated OCR capability

Recommendations for cargo inspection - continued

- The integration of CCTV and its monitoring by operators and video analytics in conjunction with the OCR system to remotely observe the containers trucks and containers which are transferred to the scanners and the inspection area, passing through the gates and scanners.

- The integration to the aforementioned systems with the terminal operating system (TOS) to ensure control of the container yards and gates, and its efficient coordination with the inspection process.

Recommendations for cargo inspection - continued

- A program to allow 24 hour a day operation with the equipment that facilitates it.
- An integrated centralized commercial data management system for both imports and exports should be developed to capture information on cargoes.
- The system should be designed to accept incoming manifest/bill of lading/container information and outbound shipment data as well as transmit information to others with a need or a right to have access to it

Recommendations for cargo inspection - continued

- The system should also capture incoming information from the importer (broker) or exporter with specific declaration, invoice, and other appropriate data, and thus provide an early tariff/tax calculation function.
- To populate the manifest component of the system, the government could require that ocean carriers provide import cargo manifest in electronic format in advance of vessel arrival.
- The Port could also require that trucks schedule appointments for cargo pickup.

Recommendations for cargo inspection- continued

- Information contained in the letter of responsibility for export cargo should be transmitted in advance via the data management system.
- All personnel with access to the cargo should be included in the port and transportation worker identification data base, and their movements in and out of the Port and within the port area should be monitored using the HandKey, PIN codes and a worker identification card system.

Inspection concept of the Port of Rotterdam

Recommendations for cargo inspection- continued

- The containers and vehicles waiting to be inspected as well as the inspection process itself, both for imports and exports, should be monitored using closed circuit TV (CCTV) to provide ongoing verification regarding the introduction or removal of contraband and this should be integrated with the optical character recognition (OCR) system, license plate readers (LPR) and the terminal operating system (TOS) to ensure that all containers and equipment are properly identified during the entire inspection process.

6. Interim Report and Presentation

Larry Boorstein, Project Manager

Richard Wechsler, Project Quality Representative

February 1, 2012

Participation in the Interim Presentation

- **SOCIEDAD PORTUARIA REGIONAL DE BUENAVENTURA (SPRBun) (PORT OF BUENAVENTURA)**

• Ing. Domingo Chinea Barrera	General Manager
• My (r) Gilberto Ocampo,	Director of Security
• Edison Diaz,	Operations Manager
• Ana Mercedes Cano R.,	Human Talent Manager
• Yolima Martínez,	Legal Director
• Julio César Orobio Obando,	Maintenance and Equipment Manager
• Héctor Medina,	Commercial Manager and Service to the Client

Participation in the Interim Presentation - continued

- Patricia Salgado, Information Technology Manager
- Norberto Castañeda, Port Facilities Protection Officer (OPIP)
- Alexander Micolta Sabid, Assistant to the General Management
- Carlos A. Rodríguez G., Attorney Legal Directorate
- Jorge Meneses, Systems Analyst

- **TERMINAL ESPECIALIZADA DE CONTENEDORES DE BUENAVENTURA, S.A. (TECSA): (CONTAINER TERMINAL)**
- Juan C. Cedilla, Manager
- Edgar Estupian

Participation in the Interim Presentation - continued

- **POLICÍA NACIONAL ANTINARCÓTICOS (ANTI-NARCOTICS POLICE):**
- Cte. Juan Quiroga, Commander, Anti-Narcotics
- **DIRECCIÓN GENERAL MARÍTIMA (DIMAR) (General Maritime Directorate):**
- CF Juan Carlos Roa Cubaque, Frigate Captain, Captain of the Port of de Buenaventura.
- CN Marco Olier Mendoza, Ship Captain, Chief of the Division of Captaincies
- Diana Garavito, Maritime Traffic Control

Interim Presentation

- The AECOM project team presented the results of the following study tasks:
- 1. Data Collection and Review of Existing Conditions
- 2. Development of a Vessel Traffic System (VTS)
- 3. Development of an Optical Character Recognition System (OCR)
- 4. Development of a Computer Security Monitoring System
- 5. Review of Cargo Inspection

Comments at the Interim Presentation

- The General Manager commented that the port needs more intelligence and less inspection. He expressed concern with delays in case inspection is increased.
- The Captain of the Port commented that the vessel traffic control and surveillance system of Buenaventura is being developed as a pilot project. The military high command has decided to optimize resources, in that DIMAR will be responsible for the buildings and the Coast Guard for the equipment.
- The Chief of the Division of Captaincies stated that the acquisition of the Vessel Traffic System will be the responsibility of Dirección de Telemática (Directorate of Telematics) (DITEL) of the Colombian Navy.

7. Review of Development and Environmental Impacts

Molly McKay, Senior Associate, Economics AECOM

Gustavo Gutiérrez Cerón, Environmental Specialist, AG Consultores Ambientales Ltda.

February 1, 2012

Molly McKay, Senior Economist, AECOM

- 18 years of professional experience as a project director and principal technical consultant in a broad range of national and international real estate and economic development projects.
- Master of Arts (with honors), International Policy and Economics, University of Exeter, Bachelor or Arts (with honors), French and Spanish, University of Kansas

Gustavo Gutierrez Ceron, Environmental Management Specialist, Health and Industrial Safety, Marine Biologist

- Specialist in Port Environmental Management with more than 15 years of experience in the port sector of Buenaventura and Tumaco. Director of Environmental supervision of the construction project and start up of operations of the multipurpose terminal and dredging of the maneuvering basin TCBUEN S.A.

- Director of environmental oversight of the construction project and start up of operations of the port terminal and dredging of the maneuvering basin of CEMAS S.A.

- Environmental audits and preparation of the Environmental Management Plans for enterprises located in the Sociedad Portuaria Regional de Buenaventura (Port of Buenaventura) of the bulk sector - corn, soy, wheat, etc.

Economic Impacts

- A cost savings for importers and exporters, bringing the Port to the level of international security norms, and thus opening the port up to greater commerce on valuable trade routes.
- 25 full time equivalent jobs and an annual potential for creating of some 74 direct and indirect jobs.
- Training for personnel retrained, retained or re-situated in new positions, as well as new personnel for another 37 positions required to completely maintain and operate the technological advances of the Project.

Environmental Impacts

- VTS – reduction in the risks of vessel collisions and the potential for spills in the waterways
- OCR – reduction in the emission of atmospheric contaminants from waiting lines of trucks at the gates
- Computer monitoring security system – does not present negative environmental impacts
- Cargo inspection – optimization and speeding up of the inspection of heavy vehicles and cargo, with a reduction in traffic for physical inspections on implementing a program of non-intrusive inspection at the gates

8. Final Report and Presentation

Larry Boorstein, Project Manager

Fernando Buitrago, Adviser, Ports and Logistics

February 1, 2012

Participation in the final presentation

- **Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBUN) (PORT OF BUENAVENTURA)**

• Ing. Domingo Chinea Barrera	General Manager
• My(r) Gilberto Ocampo	Director of Security
• Norberto Castañeda	Port Facilities Protection Official (OPIP)
• Alexander Micolta S.	Assistant to General Management
• Jorge A. Gallegos C.	Commercial Manager and Service to the Client
• Tomás F. Quiñones	Deputy Operations Manager
• Edison Díaz García	Operations Manager

Participation in the final presentation - continued

- **Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBUN) – (Port of Buenaventura) continued**
- Ana Mercedes Cano — Management Committee
- Lewis Guette S. — Information Technology Manager
- Alejandro J. Echeverry — Planning Director
- Sergio H. Velásquez R. — Engineering Manager
- **Terminal Especializada de Contenedores de Buenaventura, S.A. (TECSA) (Container Terminal)**
- Héctor Medina C. — General Manager of TECSA

Participation in the final presentation - continued

- **Dirección de Impuestos y Aduanas Nacionales (DIAN) (Directorate of National Taxes and Customs)**
- Dra. María Constanza Dussán B. — Chief of the Management of Operations Division DIAN
- **Instituto de Vigilancia de Medicamentos y Alimentos (INVIMA) (Institute for Surveillance of Medicines and Foods)**
- Alba Liliana Bocanegra H. — Administrative Technician
- **Instituto Colombiano Agropuecuario (ICA) (Colombian Agricultural Institute)**
- Sigifredo Salgado G. — Office Chief

Participation in the final presentation - continued

- **Dirección General Marítima (DIMAR) (General Maritime Directorate)**
- CF Juan Carlos Roa C. Port Captain Buenaventura
- **Coast Guard Buenaventura**
- Pablo A. Perafan Commander Coast Guard Station
- **Colombian Navy**
- Tk. María Antonia Garcés T. Chief Operations Department GAPO
- **Marine Infantry River Battalion Nº 80**
- Alberto García D. Commander, BAFLIM80

Participation in the final presentation - continued

- **Pacific Maritime Signalization**
- Germán A. Rojas Hernández — Chief Maritime Signalization
- **National Anti-Narcotics Police**
- Cte. Alexander Pulido Guzmán — Company Commander
- TE Jeison Andrea Varga Acevedo — Chief Analysis Room

Object of the final presentation

- The meeting was opened by Ing. Domingo Chinea, General Manager and My (r) Gilberto Ocampo, Director of Security of Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun).
- The AECOM team presented the study findings, conclusions and recommendations for the Vessel Traffic System (VTS) and Automated Identification System (AIS), Optical Character Recognition (OCR), Computer Monitoring Security (CMS) system, Cargo Inspection and Scanners, Economic and Environmental Impacts. Comments were obtained from the stakeholders.

Comments on the final presentation

- Frigate Captain Juan Carlos Roa of DIMAR informed the group that the Ministry of Defense is implementing Vessel Traffic Systems (VTS) in the Caribbean and Pacific regions of Colombia. The systems will also include the Global Maritime Distress Signaling System (GMDSS). The General Maritime Directorate (DIMAR) expects to complete the structure of the marine traffic control tower at Buenaventura in one and a half months. Furniture and cabling will be completed in 2 or 3 months, around April or May 2012. The tower has been delayed but is expected to be completed in 12 months, in the coming year.

Sources of funding

- Inter-American Development Bank (IDB)
- Export-Import Bank of the United States (Ex-Im Bank)
- International Finance Corporation (IFC)
- Overseas Private Investment Corporation (OPIC)
- Corporación Andina de Fomento (Andean Development Corporation) (CAF)
- Private entities / project sponsors
- SPRBun own funds or other involves entities
- Government of Colombia
- Bancoldex
- Private banks (JPMorgan Chase, Citibank, Wells Fargo, HSBC)
- Bancolombia

U.S. vendors

VTS

- Lockheed Martin
- Northrop Grumman
- SSR Engineering
- Unisys
- L-3 Communications Klein Associates
- Raytheon
- Raymarine

AIS

- Shine Micro
- Automatic Power
- Maritime Exchange
- Harbor Lights Greater Houston Port Bureau Inc. and Mare Liberum L.P.

- **FLIR cameras**
- FLIR Systems, Inc.

U.S. vendors

OCR

- APS Technology Group
- Nascent Technology Group LLC
- REMPREX
- SAIC Security and Transportation Technology

TOS

- NAVIS
- Tideworks Technology

U.S. vendors

IT

- Hewlett Packard Company
- IBM Corporation

Telecommunications

- Motorola Mobility, Inc.
- Motorola Solutions, Inc.

U.S. vendors

Computer security monitoring systems

- Proximex Corporation
- NICE Systems, Inc.
- VidSys, Inc.
- Kaplogic Corporation
- SAIC Security and Transportation Technology
- Johnson Controls, Inc.
- Siemens Building Technologies
- Ciber Inc.
- Diebold Inc.
- Lenel Systems International
- Northrop Grumman

U.S. vendors

Video wall

- Planar Systems
- Barco, Inc.

U.S. vendors

Cameras and control

- Pelco
- Sennetech

Video analytics

- SightLogix
- iOmniscient
- Duos Technologies, Inc.
- Vigilant Video
- Intelli-Vision
- Mango DSP
- Mate Intelligent Video, Inc.

U.S. vendors

Video management

- Pelco
- Milestone Systems, Inc.
- Keri Systems, Inc.

- **Access Control**
- Digital Horizon Solutions
- Keri Systems, Inc.
- Honeywell Security Group
- Ingersoll Rand Security Technologies

U.S. vendors

Scanners

- American Science & Engineering, Inc.
- L-3 Communications Security and Detection Systems
- Rapiscan
- SAIC Security and Transportation Technology
- Smiths Detection Heimann

Ion and vapor detectors

- Morpho Detection
- Control Screening
- Smiths Detection, Inc.

U.S. vendors

Maritime and port security consulting

- ABS Consulting
- AECOM
- BERGER ABAM
- CH2M Hill
- Guernsey
- Halcrow
- McRoberts Maritime Security
- Moffatt & Nichol
- Parsons
- URS
- Unisys

Customs and trade modernization consulting

- Sandler Travis Trade Advisory Services

Thank you

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February 1, 2012

0.0 Executive Summary

Sociedad Portuaria Regional Buenaventura (SPRBun) engaged AECOM to carry out the preparation of a Feasibility Study for the Security and Operations Enhancement Project for the Port of Buenaventura in Colombia. The United States Trade and Development Agency (USTDA) has awarded a grant to SPRBun to carry out the study. The study will enable the Sociedad Portuaria to implement operational and security improvements at the port of Buenaventura. AECOM engaged L3 Communications Klein Associates, Inc., experts in VTS systems and radar, APS Technology Group, experts in OCR systems and Ports and Logistics, a Colombian firm with expertise in marine terminals and logistics, AG Consultores Ambientales Ltda., Colombian specialists in environmental impact assessment, and Seguridad Atlas, Ltda., which provided protection services for personnel.

The Feasibility Study has the following objectives:

- Develop a Vessel Traffic System (VTS) to improve navigational safety and monitoring of all vessels off the coast of Buenaventura and in the main channel of Buenaventura, due to the expanding capacity of SPRBun facilities and planned new terminals ;
- Develop an Optical Character Recognition (OCR) system to record the designations of trucks and markings on the containers and to improve the efficiency of container gates. SPRBun plans to integrate this information into the Terminal Operating System (TOS) and install OCR equipment in all gates for entry and exit of containers; and
- Review cargo inspection procedures, practices, facilities, equipment and reporting systems;
- Develop a Computer Monitoring Security System for monitoring of the network of Closed Circuit Television (CCTV) and access control and intrusion detection systems (covering the fence on the perimeter of the port and waterfront area). The Computer Monitoring Security System aims to supplement the procedures and visual programs and detect, on a real time basis, inappropriate intrusions or unauthorized access.

0.1 Port of Buenaventura

The Port of Buenaventura, located in the department of Valle de Cauca, is the public port of the greatest cargo movement in the Colombian Pacific and also the country's number one public port. Buenaventura is a key focus for Colombia's international maritime trade and with the rapid growth of the countries of the Pacific Rim. This position has been strengthened in recent decades. The Port of Buenaventura is composed of a set of docks, yards, warehouses and other multipurpose facilities handling containers, bulk cargo, breakbulk, vehicles and general cargo.

Figure 0-1 Location of Port of Buenaventura, Colombia

The Port managed by the Sociedad Portuaria Regional de Buenaventura, SA (SPRBUN) covers the following terminals: Terminal Especializada de Contenedores de Buenaventura, S.A. (Specialized Container Terminal of Buenaventura) (TECSA) Comercializadora Internacional de Azúcar y Mieles, S.A. (International Trading Sugar and Molasses) (CIAMSA and the Federación Nacional de Cafeteros de Colombia (National Federation of Coffee Growers of Colombia). A separate wharf, not part of SPRBUN, is operated by Portuaria de Cementos Asociados, S.A. (Associated Cement Port) (CEMAS).

Figure 0-1 Port of Buenaventura (SPRBun)

The Port of Buenaventura serves a variety of ships, including container ships, bulk carriers and tankers, among others, and manages a variety of cargoes, including containers, bulk cargo and liquid, break bulk, vehicles and general cargo. The Port of Buenaventura (SPRBUN) served 1,047 ships served in 2011. The cargo handled through the Port of Buenaventura in 2011 totaled 9,771,272 tons of import and export cargo, in addition to 11,585 tons of cabotage cargo and 152,845 tons of transit cargo. Containers handled were 341,995, of which 168,332 were of import, 162,639 were export and the rest of transshipment and re-stow.

Figure 0-3 Buenaventura Container Terminal (TC Buen)

The Buenaventura Container Terminal (TC Buen), operated by the Sociedad Portuaria Terminal de Contenedores de Buenaventura SA, began operations in February 2011 and officially opened in May 2011. The first phase of Container Terminal project includes a 440 m long quay and two gantry cranes for loading / unloading of ships, seven rubber-tired gantry cranes (RTG) and ancillary facilities. These facilities will allow TC Buen initially to handle 268,000 TEU per year. The overall project will cost an estimated US$ 224 million.

The new terminal of Aguadulce, developed by the Sociedad Puerto Industrial Aguadulce S.A. (SPIA), will have a dock length of 2,000 m docks with a capacity in the first phase of about 400,000 20 and 40 foot containers and 1,000,000 tons of dry bulk, and an eventual capacity of 1,200,000 containers. The construction cost is estimated at US$ 400 million. Its construction was started in 2008 and it is expected to be operational in 2013.

Figure 0-4 New terminal of Aguadulce – in the distance on the right the current port of Buenaventura can be seen, in the distance on the left TC Buen site

0.2 Developing a Vessel Traffic System

This study identifies alternatives for the implementation of a Vessel Traffic Service (VTS) for the Port of Buenaventura. The system is to be developed by the Directorate of Telematics (DITEL) of the Colombian Navy, the General Maritime Directorate (DIMAR) and Colombian Coast Guard. The purpose of the VTS is to provide improved navigation and monitoring of all vessels near Buenaventura's coastline, main shipping channel, vessel anchorages and waterways adjacent to the port terminals and facilities with the following objectives:

Objectives

The objectives of the development of vessel traffic system (VTS) are to:

- Improve monitoring of shipping in the port of Buenaventura, the access channel and off the coast
- Improve the safety of ships and meet international standards for the protection of life at sea
- Increase control and surveillance of small boats

The VTS system will provide situational awareness of the ships sailing from the coast, ships at anchor at sea and at the pilot station, the ships in the main navigation channel and at protected anchorages and ships along the docks and terminal facilities of SPRBUN. The VTS radar system will serve as the principal system for detection and provide adequate levels of performance to detect, track and display the ship targets throughout the primary coverage area.

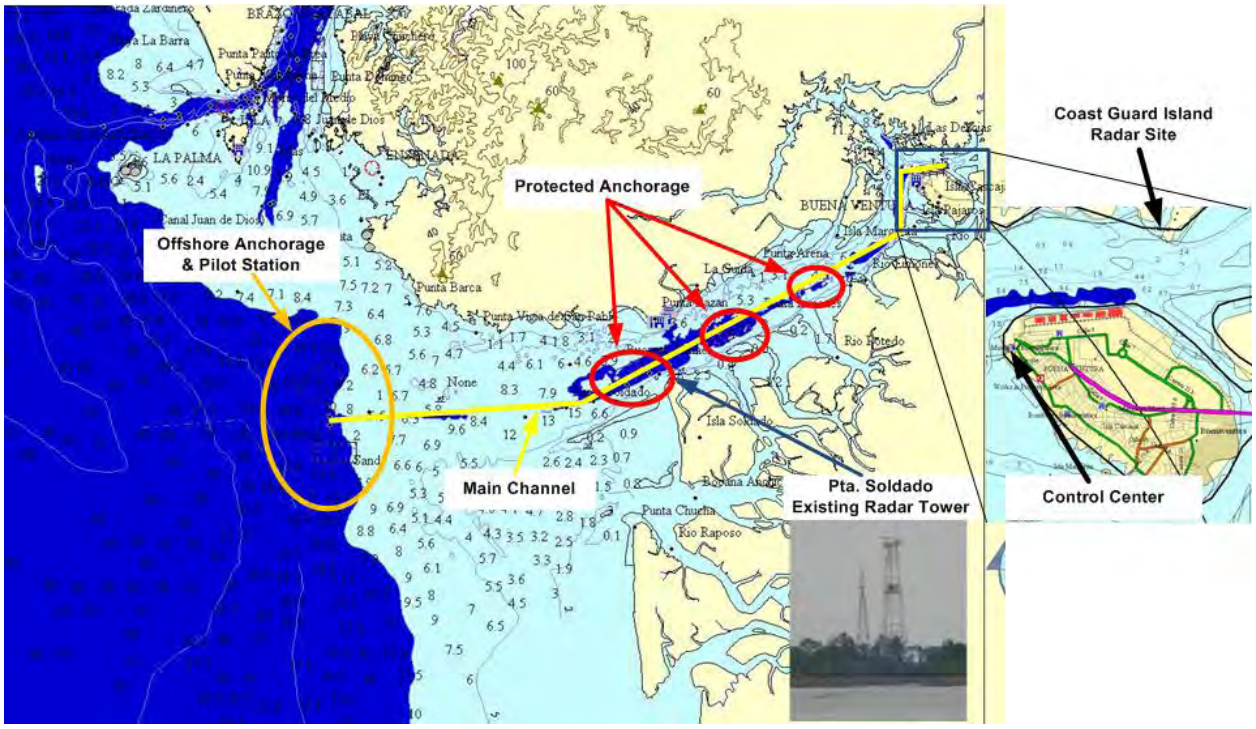

Figure 0-5 Layout of the VTS Coverage Area

The installation of a vessel traffic system (VTS) incorporating an automatic identification system (AIS) is recommended. The VTS system will use high-resolution radar to identify the location, route, speed and other parameters of the ships in the port of Buenaventura and its channels. The AIS system uses GPS and VHF communications to define the identity of the ships. After an evaluation of alternative sites, 3 sites have been identified for the installation of equipment and antenna systems:

- The new Maritime Traffic Control Station in Buenaventura, in the northeast of Cascajal Island, currently under construction by the General Maritime Directorate (DIMAR);
- The existing radar tower at Punta Soldado, at the entrance of the access channel, and
- The existing radar site on Coast Guard Island, opposite the port.

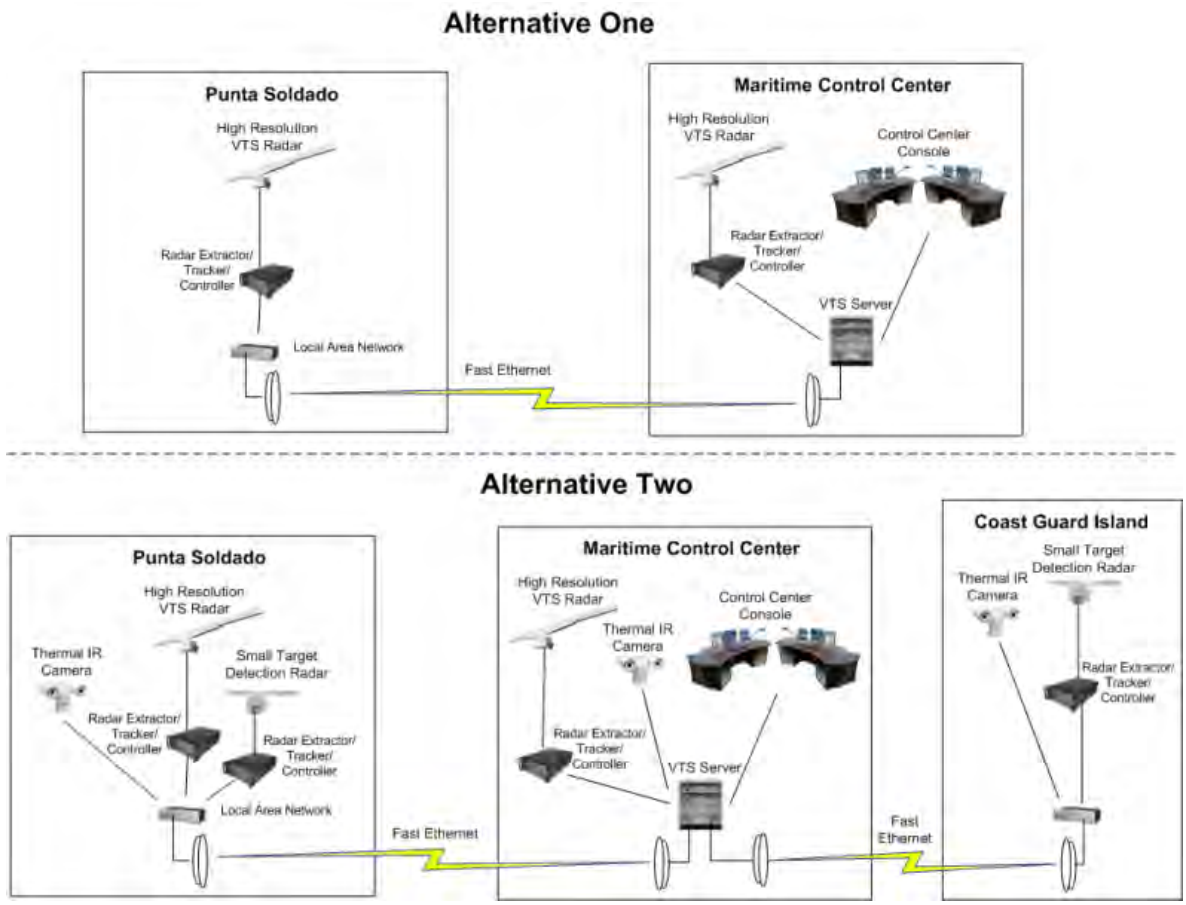

Figure 0-6 VTS system alternatives

Two alternatives for the VTS system were evaluated, a radar in Punta Soldado and Maritime Control Center, and the another alternative with radars in Punta Soldado and Control Center, plus a small target detection radar in Coast Guard Island . The second option is recommended as it provides the advantage of allowing the identification of small boats in the harbor, thus helping to prevent smuggling and terrorism in the port.

The VTS system should incorporate the following components:

High-resolution VTS radar
Small target detection radar
Extractors / Trackers / Radar Controllers
Thermal Infrared Cameras
Local area networks (LAN)
Control Center components
VTS Server Rack
VTS Server

Administrator / Network Video Server
IP Server Security Center
Router / Switch Network
UPS
Control Center Console
Monitors and Keyboards
Microwave data link
Global Maritime Distress and Safety System (GMDSS) Marine Communications System
System for Meteorology and Hydrology

The high resolution VTS radar shall provide surface surveillance out to the radar horizon for detection and tracking of vessels ranging from small motorized vessels up to large oceangoing ships with an expected operating range of 12 nautical miles and better. Since the operating environment is a tropical region, the radar system design shall incorporate measures that mitigate the effects on radar system performance of fog, high humidity and heavy rains. It is recommended that X-Band radar is the best choice that meets the performance recommendations of IALA Recommendation V-128 for “Standard” system capability.

The radar extractor/tracker/controller connects to the radar and down-converts the necessary raw data and signals for the extraction of detected radar targets. In addition, it provides the interface for asserting remote control functions and status monitoring.

The VTS Server rack shall contain the necessary server platforms that host the primary and supporting VTS software as well as necessary storage devices (i.e. digital video recorders --DVR) for logging and recording. The VTS software communicates with the remote VTS Sensors including the remote radars, Thermal IR cameras and Automatic Identification System (AIS) subsystem. VTS client applications at the Control Center Console present the common operating picture (COP) to the VTS operators.

The VTS server provides the data fusion of multiple radar site and Automatic Identification System (AIS) data as a layer of Geographic Information System (GIS as an acronym in English) for presentation.

Client display applications on the Control Center console will connect to the VTS server applications and present a Geographical Information System (GIS) display of all relevant VTS information and allow control, monitoring and status of all VTS functions and remote sensors using simple to use graphic user interface (GUI).

The Administrator / Network Video Server (VMS, according to the acronym) is comprehensive video management software for monitoring, recording, playback and event management.

The IP Security Center server integrates with VTS Server to provide overall command and control functionality.

The IP Security Center server provides Web access to external users with proper credentials, where special reports, data and information sources are available for viewing on browser-based user-friendly displays.

The Control Center console includes two operator workstations and supervisor workstation.

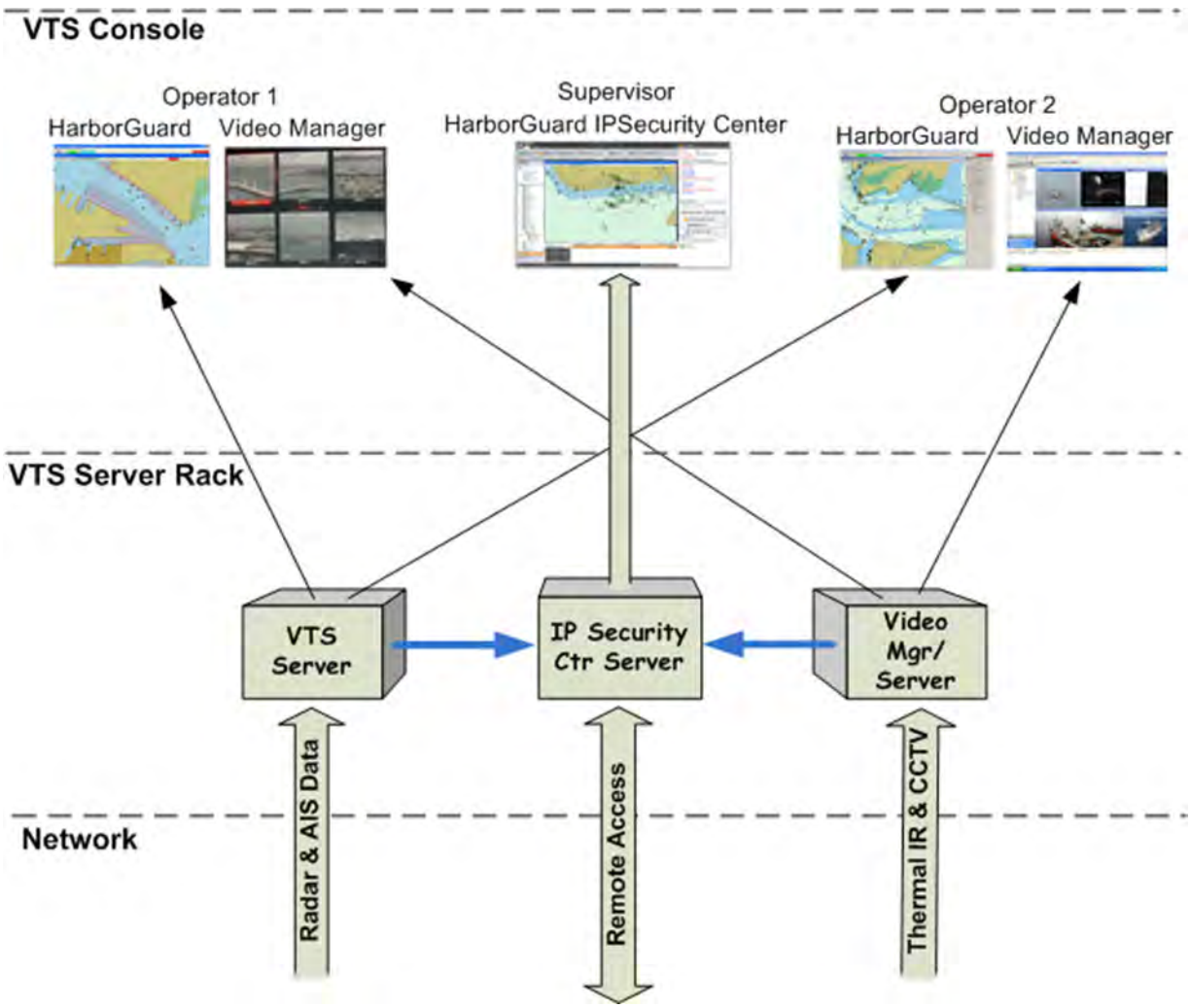

Figure 0-7 Functional block diagram of VTS control center

The illustration provides a functional block diagram of the VTS Control Center components. All system components communicate via a fast Ethernet Local Area Network (LAN). In addition, the LAN is

connected to a network bridge which allows external users (with appropriate credentials) access to System information.

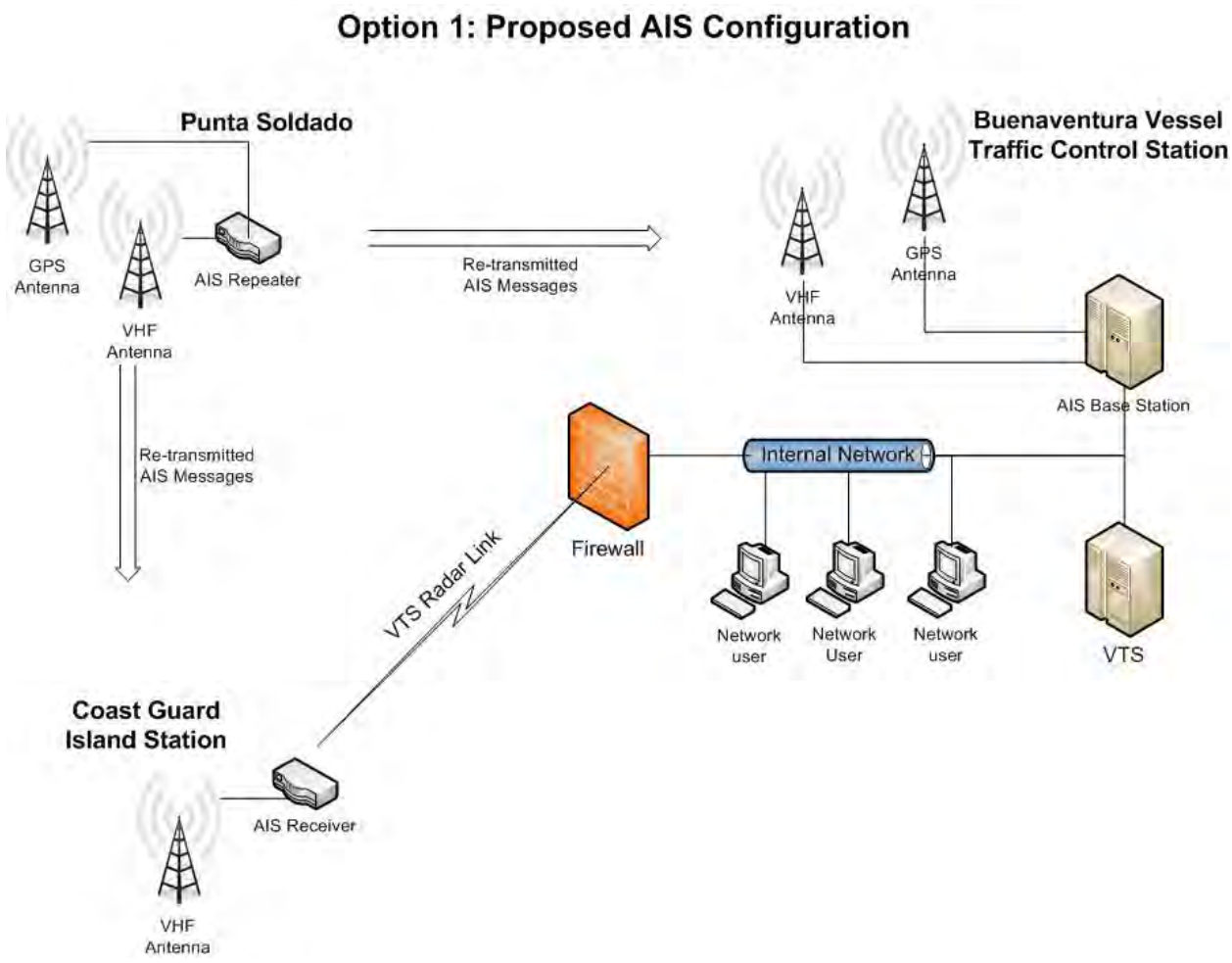

Figure 0-8 Proposed AIS Configuration: Option 1

Two options for AIS were evaluated. The first includes access to the internal network by the Coast Guard, DIMAR and the Port. The second adds external access via the Internet for marine terminals and other authorized users. The second option is recommended, because it facilitates the use and data entry by users. Typical ranges offshore will extend from 30 to 50 miles.

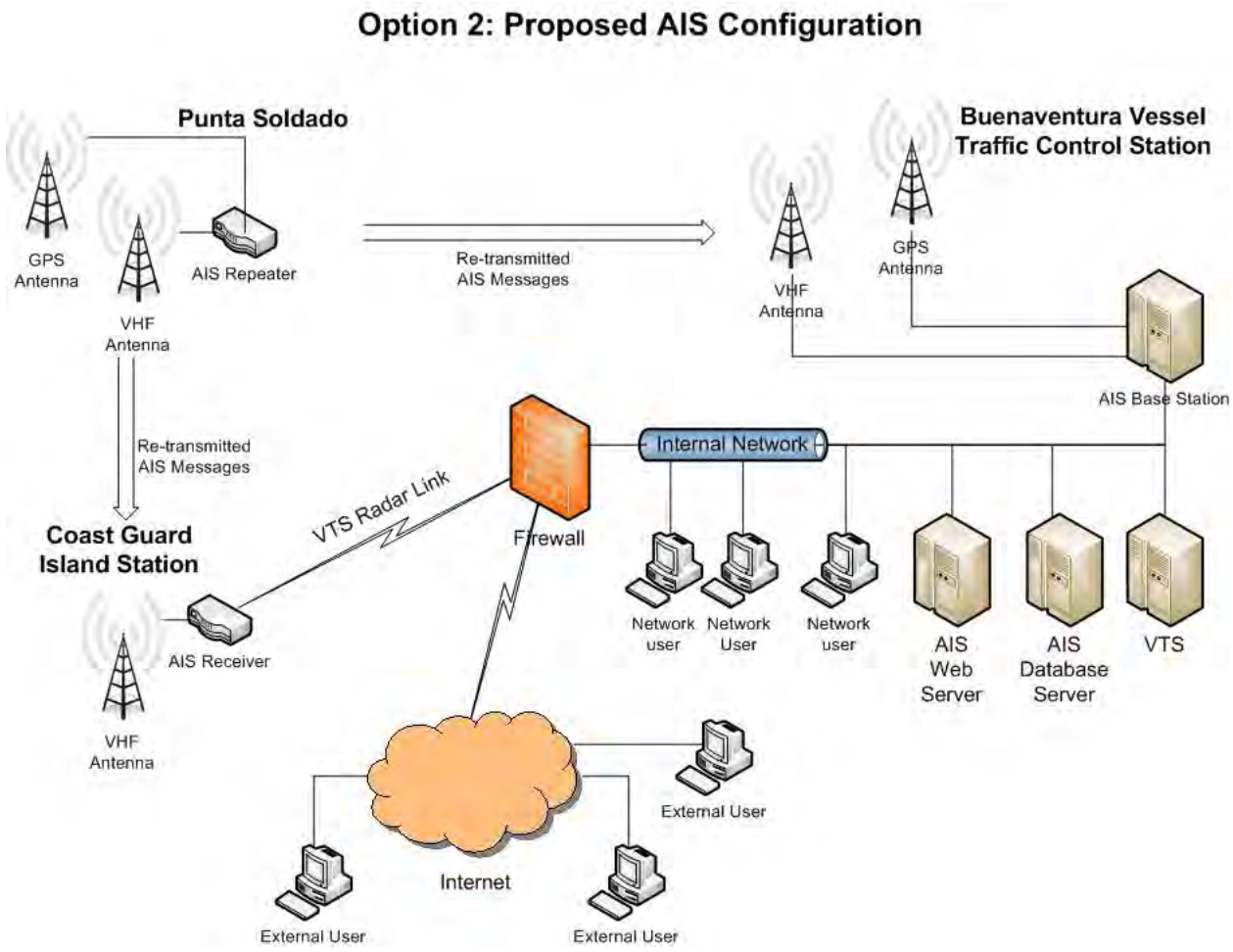

Figure 0-9 Proposed AIS configuration: Option 2

The AIS system should incorporate the following components:

- Primary VHF Receiver at the Buenaventura Vessel Traffic Control Station
- Secondary VHF receiver at Punta Soldado
- Punta Soldado Repeater
- Backup VHF receiver at Coast Guard Island
- GPS antennas at Punta Soldado and Buenaventura
- AIS base station
- AIS software

Table 0-1 Estimated Costs of VTS and AIS system

Capital Cost Estimates for Vessel Traffic System			
Qty.	**Component**	**Unit Cost**	**Amount**
	VTS System		
	VTS Server Hardware/Software		USD 64,400
	IT Security Center Hardware/Software		USD 143,900
	Video Management Hardware/Software		USD 11,800
	VTS Client Hardware/Software		USD 58,500
2	VTS 18X Radar	USD 85,500	USD 171,000
	Small target detection radar		USD 38,800
3	Advanced radar procesor	USD 68,400	USD 205,200
3	FLIR PTZ multisensor camera	USD 51,900	USD 155,700
	VHF/DSC communications		USD 21,000
	Training		USD 55,506
	Other		USD 193,800
	Subtotal		USD 1,119,606
	General and administrative costs, integration, program management, installation and spares		USD 1,400,000
	Subtotal VTS		USD 2,519,606
	AIS system		
	AIS Web software		USD 240,000
	Other AIS		USD 115,800
	Subtotal AIS		USD 355,800
	Total		USD 2,875,406

The cost of VTS and AIS systems is estimated to total of $ 2.9 million. The estimated period to develop the VTS system is about 12 months and the period for the AIS is about 4 months.

0.3 Development of Optical Character Recognition System

The development of an Optical Character Recognition (OCR) system in Sociedad Portuaria Regional de Buenaventura (SPRBUN) is an important component of the operational and security improvement of the port. Optical Character Recognition (OCR) technology alone will enable only the automatic recognition of containers and other equipment (trucks) at SPRBun. To gain operational benefit from the technology, it must be integrated into a larger Automated Gate System (AGS) that can identify drivers and their purposes for arriving at the terminal, as well as control traffic during entry and exit. The implementation of OCR technology, within an integrated AGS, should enable automation and allow SPRBun to maximize gate throughput velocity as well as improve security, safety and cost efficiency of the operation.

The implementation of an AGS should provide SPRBun considerable benefits, including:

Increased Security by eliminating physical interaction between truck drivers and terminal personnel.

Lower Operating Costs by reducing the number of personnel required for the terminal to operate the gate areas.

Reduced Theft by prohibiting bribery through remote gate management and driver interaction.

Increased Data Accuracy by reducing manual input errors.

Higher Throughput Velocity by decreasing gate queue times at the entry and exit gates.

Cleaner Environment by reducing the amount of exhaust from idling trucks in the entry and exit gates.

Added Throughput Capacity by facilitating more transactions per hour.

Increased Safety by ensuring personnel are not required in any gate lane.

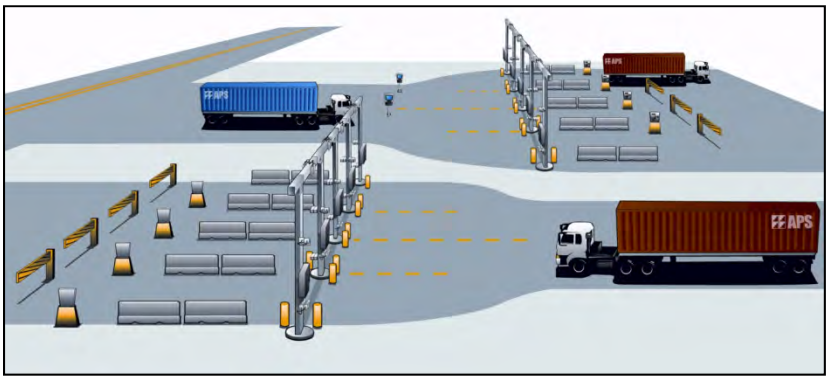

Figure 0-10 – Automated Gate System (AGS) concept

Key AGS functions available to SPRBun

- Optical Character Recognition (OCR) of ISO containers and vehicle licence plates.
- Integration of weigh scale data at each OCR portal

- Driver Gate Kiosks to automate driver ID, printing and Voice over Internet Protocol (VoIP) communications
- Integrated high security access control using terminal identification cards
- Remote damage inspection of equipment using high resolution images
- Gate Clerk Software to remotely view images and communicate with drivers
- Real-time integration of data to host/Terminal Operating Systems (TOS)

0.3.1 Preparation of layout of OCR system at each gate

The Automated Gate System (AGS) approach focuses on the automated identification and verification of both truck drivers and their equipment as they enter and exit the terminal. The information collected is then integrated through software interface to the TOS (COSMOS) for validation. The table below shows the areas where OCR "checkpoints" are recommended. At the recommended "checkpoints" a mix of OCR portals to automate license plate recognition (LPR) and/or container recognition (CR), and equipment damage inspection images (DII))and driver interface Kiosks (outfitted with equipment to allow clerk-to-driver communications in the lanes, seal verification, driver identification, etc.) is recommended.

Map Area	Gate Area	Description	Lane count	Kiosk count	Portal count	Portal setup
A	Paraboloides	Export Load entry(P-check)	2	0	0	0
B	Paraboloides	Empty trucks entry	4	4	4	LPR
C	Paraboloides	Full trucks Exit	5	5	5	LPR +CR + DII
D	Export inspection	Export Load entry(A-check)	2	1	1	LPR + CR + DII
E	Free Zone	Entry / exit for inspection	1	0	1	LPR + CR
F	Pekin gate	Empty Container entry (2)/exit (3)	5	5	5	LPR + CR
G	Coffee and Sugar	Coffee and Sugar Entry	2	1	1	LPR

Table 0-2 – AGS Equipment Locations for container recognition (CR), license plate recognition (LPR) and damage inspection imaging (DII)

System Overview

The recommended AGS for SPRBun would integrate OCR checkpoints and driver kiosks to automatically identify and validate drivers and equipment during facility entry and exit. The equipment locations, identified above are mapped below.

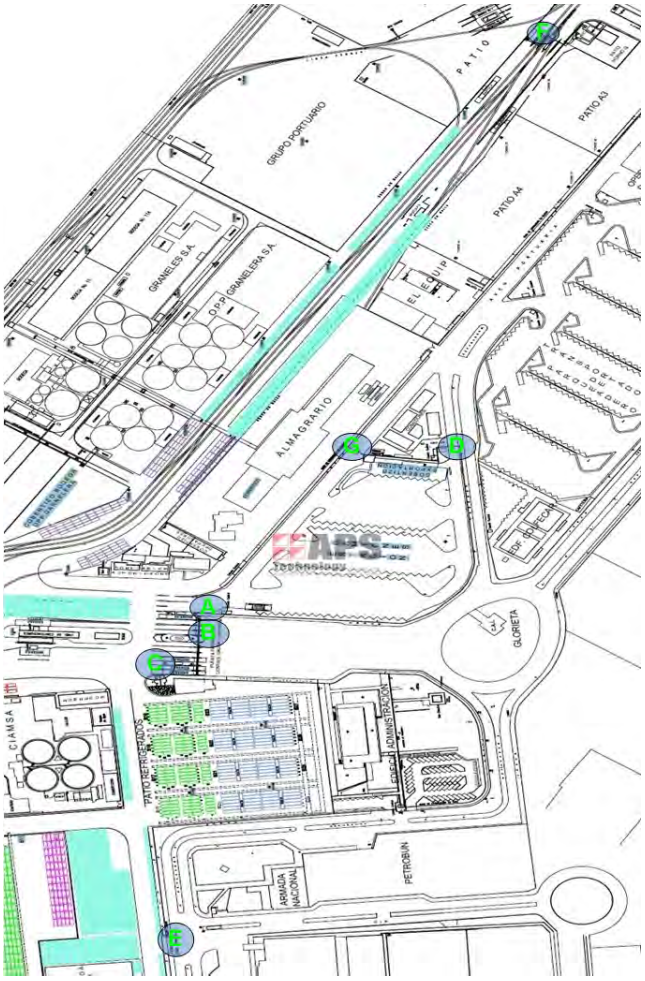

Figure 0-11 - SPRBun AGS locations

0.3.2 Preparation of illustrative description and technological recommendation of components needed for OCR system

0.3.2.1 Portal Overview

The recommended AGS consists of twelve (12) drive-through OCR portals. The portals include subsystems to automatically identify container number, container size/type code, and/or license plate number of passing equipment (depending on location). Additionally, six (6) of the portals include high resolution damage inspection cameras to capture images of the container (back, front, sides, top, and bottom) using one array of cameras.

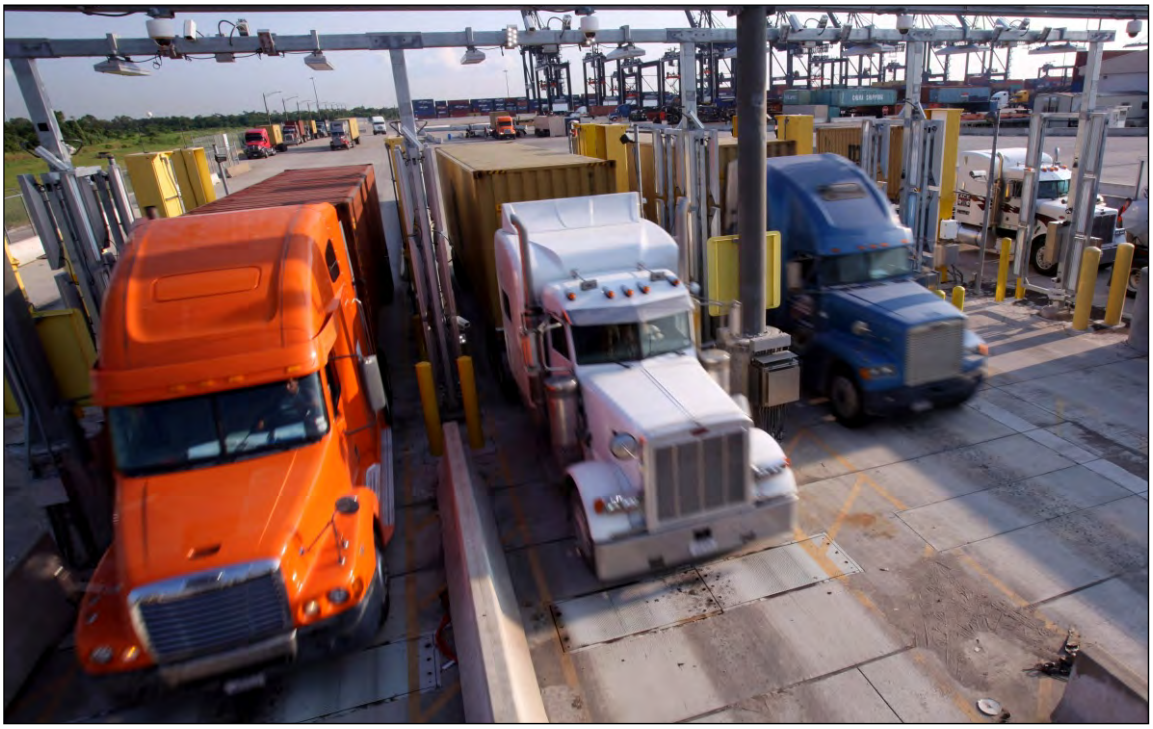

Figure 0-12 - OCR Portals at Port of Houston, USA

0.3.2.2 Portal Equipment

The following equipment is recommended to completely outfit each portal:

- Equipment enclosures
- Cameras
- Illumination
- Sensors

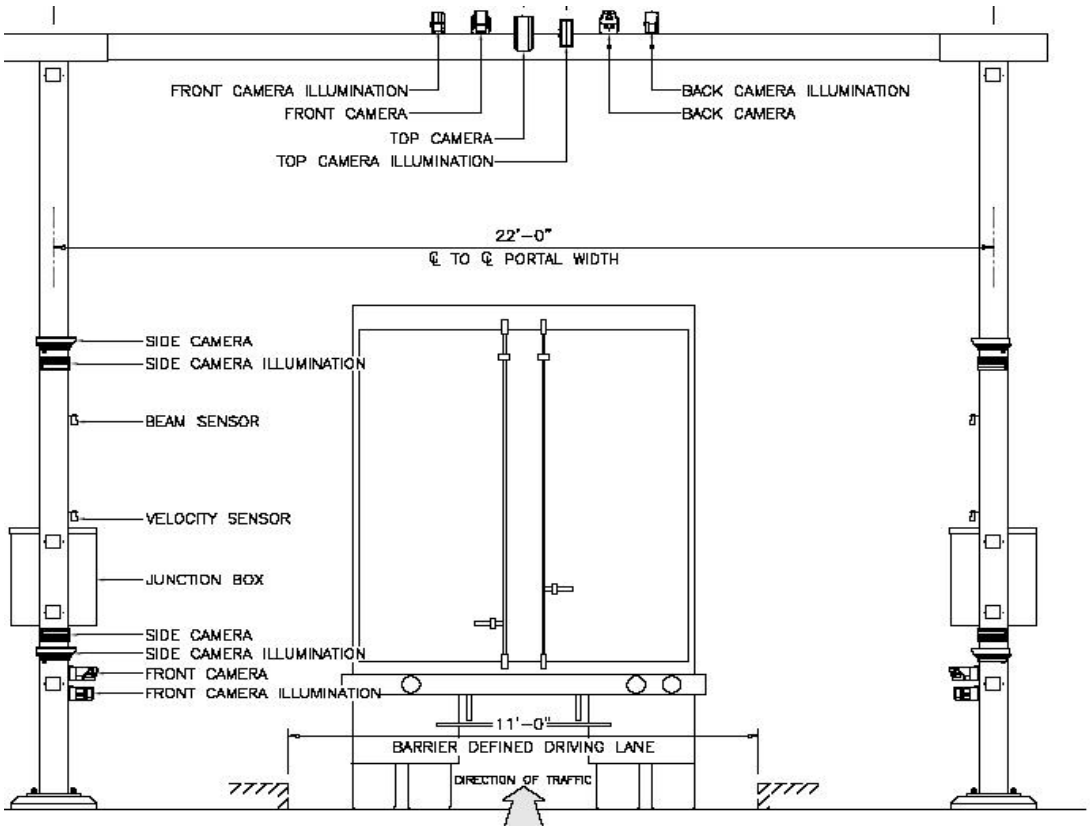

Figure 0-13 - Sample OCR Portal design

0.3.2.3 Centralized Equipment

Servers

The recommended AGS requires seventeen (17) commercially available servers that provide the following functions:

- 1 Portal OCR Server per portal
- 1 LPR server for every three lanes
- 1 OCR Messaging Server
- 1 access control server
- 1 image archive server

0.3.2.4 Gate software

The recommended AGS captures, identifies and records all transactions processed through the gates at SPRBun. Described herein are all of the different types of images that the recommended AGS will locate and capture.

Container OCR

The recommended base system records five separate numbers to provide maximum OCR accuracy (Left side, Right side, Top-Front, Top-Rear, and Rear Door). The system extracts the equipment ID and ISO equipment code from each image within a few seconds, day or night, and in the most extreme weather conditions (fog, rain, salt exposure, wind, any vehicle vibrations or ambient light).

License Plate OCR

Each portal includes two cameras and illuminators to capture truck license plate images. An OCR application will control all cameras and extract the equipment number as with the container process. This data will be sent within a transaction to the Central OCR server for further processing. License plate images should be captured at front and rear of vehicles and on the side doors of commercial vehicles.

Equipment Damage Inspection Imaging

Six of the recommended portals should include one upgraded, high-resolution camera capable of capturing both OCR and inspection images.

Empty Container Verification

Pan-tilt-zoom (PTZ) cameras are recommended to accelerate the process of checking empty containers. PTZ cameras should be mounted behind certain gate lanes to validate the condition of the opened container.

Under vehicle imaging

International Ship Port Facility Security code (ISPS) regulations may require terminals complete an under-vehicle inspection. If so, capturing under-vehicle images or video of passing equipment is recommended to ensure compliance of the requirements.

Container Security Seals

ISPS may require verification of security seal numbers as part of the future gate process. Minimum compliance with this requirement requires a high resolution image of the security seal to verify integrity. If this is a requirement high resolution cameras on the portals as well as in-lane PTZ cameras (at the kiosks) to obtain high resolution images of the seal are recommended.

0.3.2.5 Driver Communication

Driver Kiosks

It is recommended that certain gate lanes noted herein be equipped with an elevated pedestal and driver kiosk located some distance ahead of the portal with interactive communication functions. Kiosk functions should include:

Available Kiosk Equipment

- Voice/Intercom - Voice Over Intranet Protocol (VoIP) allows driver- clerk communication
- Call button - allows driver to notify clerk of their presence
- Biometric fingerprint reader– facilitates driver identification

- ID Card Reader – facilitates driver identification
- Barcode scanner - provides verification of successful mission ticket or entry pass
- License Plate cameras/illuminators (some lanes) - certain kiosks need to be outfitted with LPR cameras and equipment to match portal-to-pedestal transactions.
- Thermal ticket printer - Prints mission tickets for driver
- Driver Face camera - allows clerk to verify driver's identification

External of kiosk

- Rear PTZ camera - enable container/chassis views and verification of an empty container
- Barrier gate arm (some lanes) - allows driver to pass once transaction is verified and mission ticket is printed
- All cabling, power supplies, etc

0.3.2.6 AGS System Software

Gate Control System

It is advised to implement Gate Control System which allows the administration and setup and control of gate users, lanes and areas. A web-enabled exception handling application allows remote clerks (on terminal) to resolve errors and control gate transactions that are not processed automatically. Given that all gate traffic should be required to register their container, LPR and Driver information prior to arrival, we expect more than 75% of all gate traffic will not require human interaction via the Exception software.

Figure 0-14 - Gate Exception Handling Application

Gate Handling Exception Application

The application provides for image review, live video (from lane/kiosk cameras), and VoIP driver communication to the lane kiosk intercom. The application works in conjunction with a TOS gate module and provides no data update capability.

System Reporting

A reporting application for all OCR transactions and images is recommended. This will entail a web-based tool designed to allow local or remote users the ability to query and review images captured during gate transactions (no data update capabilities are included at this time).

A host of system and transactional reports are available with the system. Users will need only access an IP-address from a standard web browser to query and review reports and associated images. Data is searchable using one or more parameters including Container number and/or transaction ID, date and time, lane of interest, etc. (see Container Trace Report Example below). Access to report functions will be controlled via password protection ensuring the security of the OCR data access.

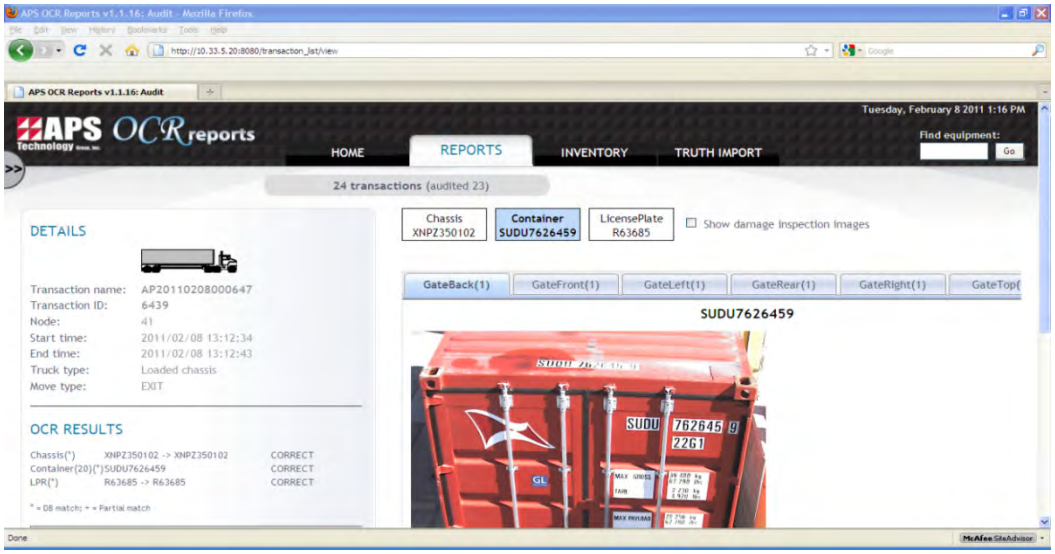

Figure 0-15 - Container Trace Report Example

0.3.3 Description of requirements to integrate OCR system to the Terminal Operating System

The AGS provider must have extensive experience in integrating data created / required by your system with host systems / TOS. It is recommended that provides real-time electronic transfer of all data AGS system that has the SPRB TOS using XML, using a transmission control protocol (TCP) / Internet Protocol (IP) socket interface. The TOS provides an interface document to describe this approach.

It is necessary to purchase thee AGS (Automated Gate System) system module for the current TOS or purchase a TOS system that incorporates this module. The Automated Gate System - AGS is the TOS

software interface required between the OCR (COSMOS software OCR calls this "GOS" or the "Gate Operating System") for the access gate and the TOS.

The GOS initiates data entry and its recovery through the AGS to the TOS. All communications between the GOS and the TOS are transmitted between the GOS and the TOS via XML messages, sent over a dedicated communications channel.
The communication with the client can be done with WebSphere MQ or TCP/IP sockets.

0.3.4 Alternatives for the Gate OCR System

It is recommended that the OCR system be installed for the gates as indicated. An alternative would be to reduce the number of gates. This could be accomplished due to the increase in throughput productivity which is anticipated using OCR and an automated gate system (AGS), instead of manual key entry and paperwork, which could reduce the average gate processing time to 1 minute (including customs oversight).

An additional alternative is to include OCR on the quay and RTG cranes in addition to the gates. While this was not included in the scope of this study, OCR at these locations would provide location and identification information to the terminal operating system (TOS) when containers are loaded or unloaded to or from vessels, stacked or transported to or from the yard, or retrieved for customs inspection. This alternative is recommended to provide greater control of movements in our out of the port, not only by road, but also by ship, as well as movements within the port and between the port and customs.

0.3.5 Preparation of final capital cost estimates for OCR system

Table 0-3 – Cost estimates for OCR and AGS system

Rough Order of Magnitude (ROM) Automated Gate System Pricing for SPRBun			
QTY	**Description**	**Unit Cost**	**Total Amount**
Hardware/Software Systems			
12	Gate Portal OCR System for container, LPR	$ 125,000	US $ 1,500,000
15	Driver Communication Kiosk System	$ 25,300	$ 379,500
5	License plate recognition stations(kiosk)	$ 13,730	$ 68,650
		Sub Total System	**US$ 1,948,150**
Associated Services			
1	System prep, install & commissioning	$ 228,600	$ 228,600
1	Site Preparation, civil works, cabling	N/A	N/A
1	Data Integration with COSMOS or equivalent TOS	$ 22,110	$ 22,110
1	Travel and per diem	$ 42,000	$ 42,000
1	Project management, personnel training	$ 88,600	$ 88,600
		Sub Total Services	**US$ 381,310**
		Grand Total	**US$ 2,329,460**

The estimated capital cost for the OCR system is US$2,329,460. The time to implement the OCR system following contract award is estimated at 12 months.

0.4 Development of Computer Monitoring Security System

To provide the services applicable for computer security monitoring, AECOM recommends that SPRBun utilize a Physical Security Information Management (PSIM) software application. A PSIM software application enables the end user to integrate disparate physical security devices and systems; enable the correlation of data from multiple sensor systems; apply analytics and intelligence through a series of robust engines; and help filter out irrelevant information such as false alarms. PSIM software platforms are more commonly used within a Command and Control environment and consist of commercial-off-the-shelf (COTS) software technology, which provides the ability to view and manage all alarms and incidents. The software is typically web-based and allows for seamless integration with numerous end devices and security subsystems including video (cameras, recorders, analytics), sensors, access control, Fire, Radio Frequency Identification (RFID), Chemical Biological Radiation Nuclear (CBRN), Computer Aided Dispatch (CAD), Radar, Sonar, Heating Ventilation Air Conditioning (HVAC), Building Management System (BMS), etc., while maintaining a unified operations console and practices. The functionality on the user interface can be customized, configured and modified according to varying operational needs.

Currently, the Port of Buenaventura has an Integrated Electronic Security System, installed in 2004 at a cost of US$ 4 million. This system integrates the Access Control System, Perimeter Control System using a fence protection system, a CCTV system consisting of about 384 cameras, image processors, network recorders and an RF link and fiber optics with a physical security force, composed of 220 men. The PSIM system will provide an update of the system, integrating existing systems with upgraded and additional components, to a new control system.

The PSIM provides a common user interface or “Dashboard” application that graphically displays alarm related notifications, video, and data on a single/multiple display format required for the management of all the access control and video subsystems. In addition, the SPRBun Security Operations Center (SOC) operator must have a means of responding to the situation through the Dashboard. It is recommended that as a requirement by SPRBun to include single “button” automated alerts for different emergency scenarios such as weather related announcements (i.e. hurricane, etc.), hazardous spill, and intruders. The automated alerts will initiate the specific dashboard subsystems in conjunction with administrative policies. The graphical interface or “Dashboard” will give the operator enhanced situational awareness. Operators and supervisors will be able to view system resources from various locations, allowing for the remote viewing and monitoring of multiple systems simultaneously.

0.4.1 Integration of existing subsystems of closed circuit television (CCTV), network access control and intrusion detection devices

The Closed Circuit Television (CCTV), Access Control and Intrusion Detection security subsystems currently installed are adaptable to almost all computer monitoring platforms through open architecture

systems used by each system. Currently, three systems are segregated for their own servers and are installed in the server room of the Security Operations Center (SOC). The interface to these servers is done via a network connection in the existing Local Area Network (LAN). The PSIM server is configured to locate other servers and perform a search of all installed devices. Each device ("sensor") such as hand-held scanner, camera, etc.., has a unique ID and is added to the PSIM database.

Video Display Wall

The video display wall will facilitate all the capabilities of an integrated solution. Today, the Security Operations Center (SOC) utilizes cathode ray tube (CRT) monitors and a couple of flat screens as the display system. The recommendation is to implement the video wall to provide a high quality, dynamic graphical display that will provide the required imagery including: Graphical User Interface – Port-wide Overview; CCTV images, and alarm notifications. The large-scale maps can be configured automatically to show the alarm conditions, weather-related problems, etc. The video display wall consists of a matrix of flat screens and an image processor array. This enables the wall screens to show individual images on a single screen or multiple.

Figure 0-16 Video display wall

Event Notifications

The PSIM system provides the ability to notify operators of events, to show the relevant information on the display wall and indicate to operators the steps to respond to events according to policies programmed in advance. For example, when the intrusion detection system sensor detects an intruder Stellar scaling the perimeter fence, it triggers an integrated CCTV camera attached to the "zone" and

providing an on-screen visual alarm on the "dashboard" of the PSIM. Other events to be monitored may include, for example, loitering or vehicles or persons remaining in storage areas or on the docks, spaces or blind spots in the stacks of containers in the yard, vehicles driving the wrong way, ships transiting the river / bay during night hours, multiple faults in entry and in the hand geometry reader, speeding in the harbor, and so on.

Incident Management - Situational Awareness

When an incident is detected, operators see a visual indication of the incident on a map referenced to the Geographic Information System (GIS) and hear audio alerts of the incident.

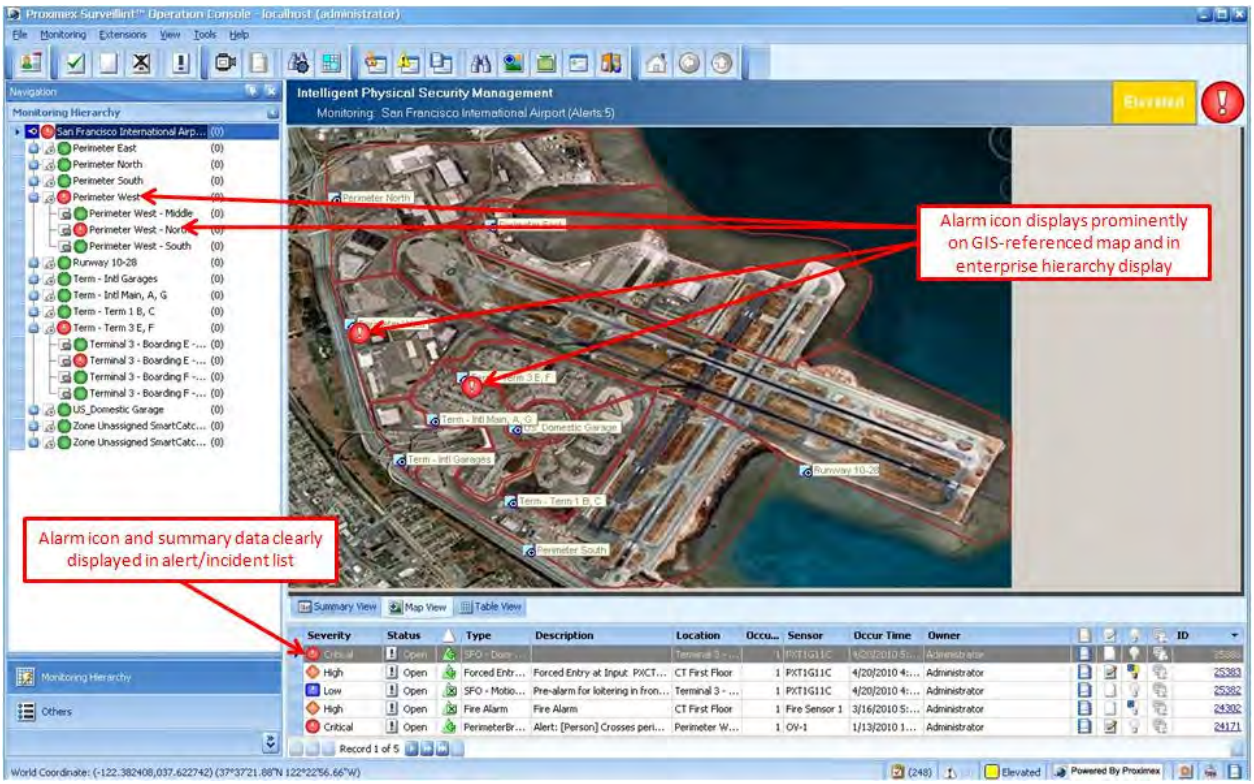

Figure 0-17 PSIM operations console display with alarm event

An example of operation of the PSIM system is described below:

Door Forced or Held Open:

- Live video of the incident reporting area from one or more cameras (enables the operator to determine if there is an immediate danger in the area)
- Recorded video starting seconds (time is configurable) prior to the alarm from one or more cameras (enables the operator to determine what/who caused the alarm)

- Contextual information from the appropriate access control system
    - The last "n" (number is configurable) accesses and events for the affected door/gate (enables the operator to determine whether the same person has been going through the door/gate repeatedly leading up to the incident, who the last person was to be granted access through the door/gate, and/or whether the last valid access was within of the alert/incident
    - The accesses and events for the affected door/gate over the last "n" (time is configurable) minutes, which provides similar benefit to the last "n" accesses.
    - For access control alerts - a link to badge database (enables the operator to compare the badge image of people who have been granted access through the door/gate with the image of the individual(s) present at the door/gate at the time of the alert/incident)
- Instructions for steps the operator must take to respond to and clear a priority alarm (ensures the operator is using the most up-to-date response procedures). Following the Operator Task List ensures that the Operator is acting based on the Port's specific Concept of Operations for the incident based on:
    - Incident Type
    - Day/Time of Incident
    - Location of Incident
    - Correlation with Other Incidents
    - Current Port Threat Level
    - Other Port specific criteria
- A mini-map of the location of the alarm in the alarm detail as well as an icon that will shift the focus of the main map to the alarm area.
- Notes page (enables the operator to capture his/her observations with the alarm) – this is a free-form field that is inherent in the Surveillint alarm details
    - The Operator will also be able to add video "snapshots" from either the live or recorded video to his/her notes through the click of a single button.
- Command access to lock down an area or perform on-demand business logic policies that have been drafted for the specific type of alert

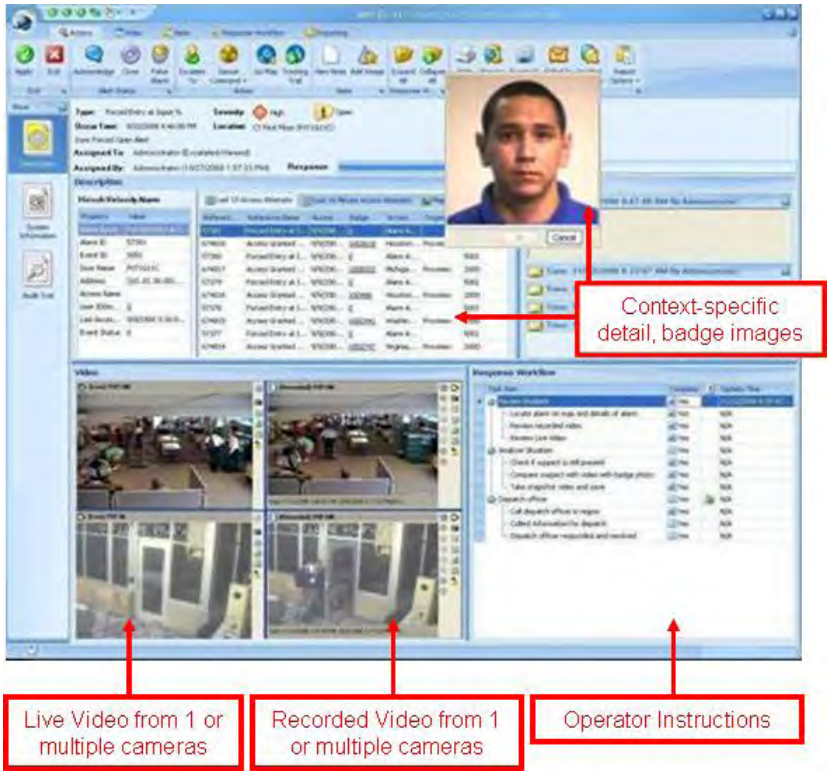

Figure 0-18 PSIM operations display with identification, video and instructions to be followed

For complete situational awareness, the Operator is then able to track the subject from either the live or recorded video (forward or backward in recorded video with EZ Track) to vector first responders to the subject and to visually verify the subject's activities from his last known location to his current location.

For communication with response personnel, operators will be able to utilize Simple Mail Transfer Protocol (SMTP) mail, phone/radio communications through other 3rd-party applications, or notification through a computer aided dispatch (CAD) system.

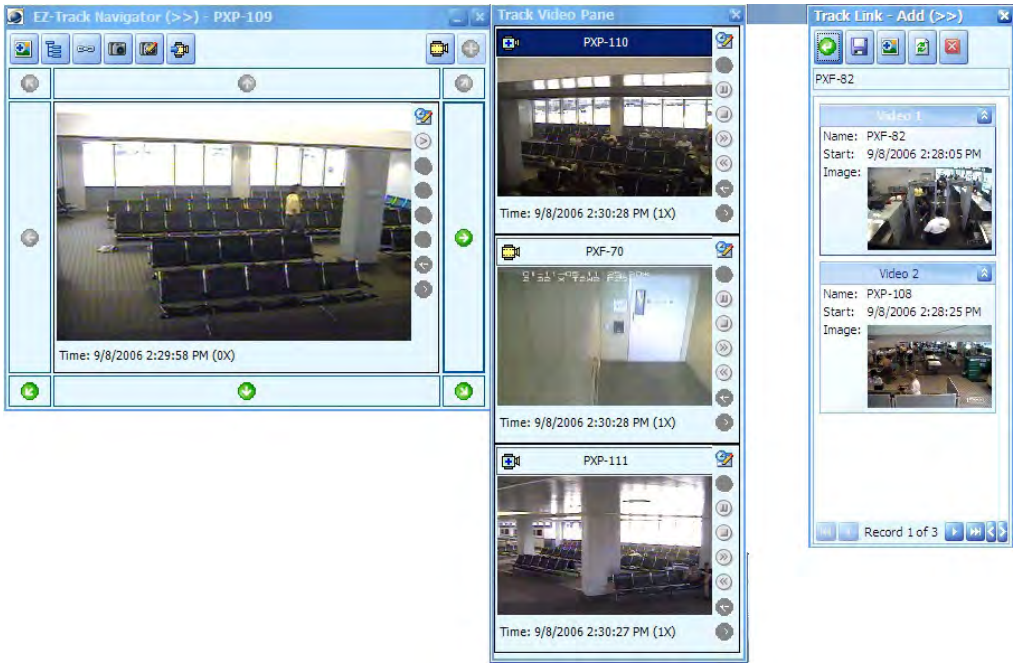

Figure 0-19 Display of recorded video onscreen after an event

Infrared cameras and radar

As described previously, as part of the VTS system, VTS radar and small target detection radar should be installed, in order to detect the location and track the movements of ships and small boats. The system also incorporates an AIS, GPS antennas, and FLIR infrared cameras.

The current CCTV coverage is comprehensive at the Port capturing images of operations in progress and general surveillance activities. The one area that is lacking adequate coverage is the waterside. There is a single FLIR camera installed at the Coast Guard base across the bay from the Port. The camera is set on a “patrol” mode where the camera scans the wharf side from North to South and back again. The vulnerability is recognized as the area to the North, East and South which is the “zone” where smaller vessels could access the vessels or Port property unimpeded. The recommendation is to provide coverage of this zone by creating a boundary that would detect vessels as small as 4m x 3m as far away as 2000m. The boundary is shown graphically below.

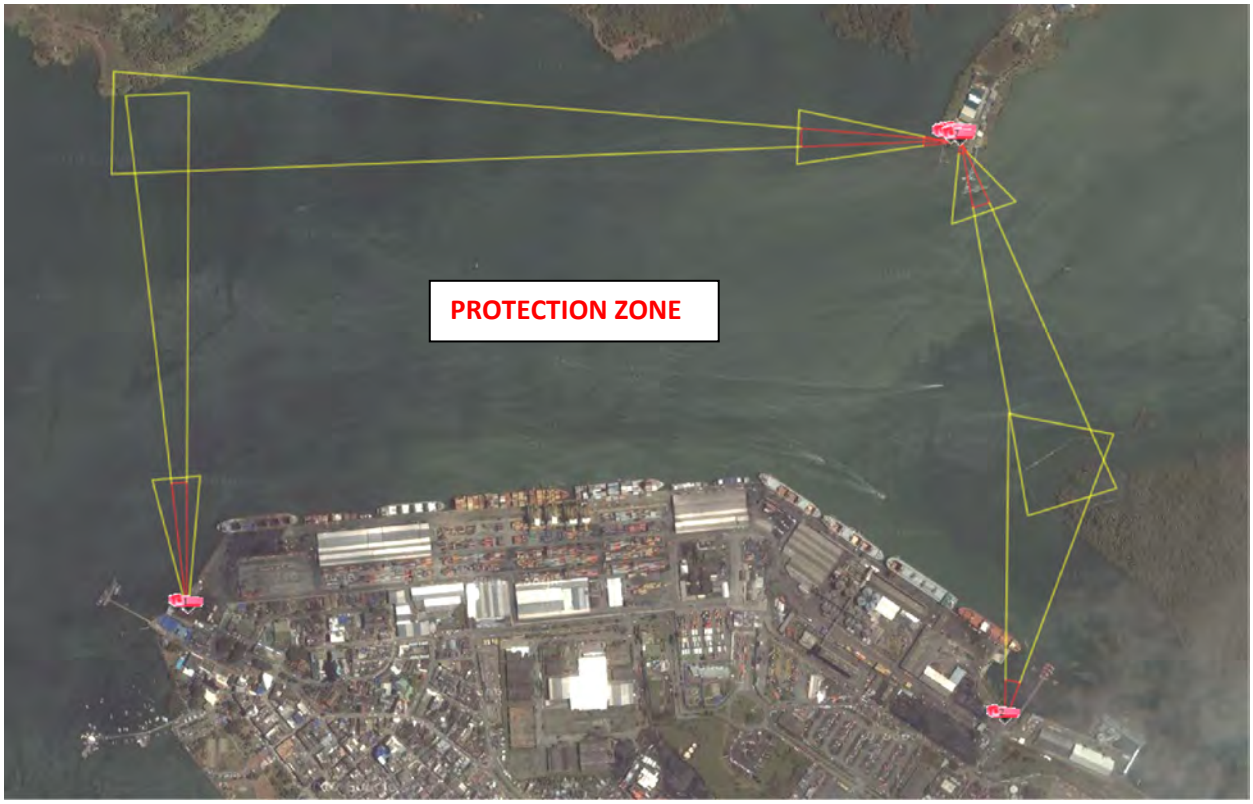

Figure 0-20 Limits of protection zone with cameras

Once the zone has been intruded, the existing FLIR PTZ camera can track the vessel as long as the operator chooses to. This is of particular interest at night to know if a small vessel is on the water when it shouldn't be based on the understanding that there are no boats allowed on the water after dark. The combination of using thermal IR cameras with video analytics will play a large part protecting the water side of the Port.

Video analytics

Video analytics boosts security by automatically alerting personnel to take action when a security event occurs. The analytics comes into play when predetermined events trigger an alert such as a boat moving at a high rate of speed or a boundary zone has been penetrated. The analytics determine when these certain criteria are met. Video tracking occurs when a target has been selected through the analytics decision tree and the target is tracked as it progresses and can be handed off from camera to camera along a waterway, for example.

Additional opportunities exist for the application of this technology, either in static areas as fences or static areas according to schedule, as at night or when not working, for example freight yards or containers when cargo is not being handled. Furthermore, video analysis can be used for analysis of

unusual movements or lack of movement, both for static and dynamic areas, such as people loitering, excessive speed of a vehicle or overstaying in a restricted area such as a truck standing too long beside a warehouse. These events can be programmed as indicators of criminal activity, including theft, the introduction of contraband and sabotage.

0.4.2 Replacement of CCTV Headend Equipment

The current headend of Panasonic brand CCTV is comprised of equipment that is discontinued and which is not currently available. It is recommended to replace the header with new components that provide additional capabilities and facilitate new technologies such as Internet Protocol Cameras (IP), which are an essential part of the migration plan of the port security. Below is a simple line diagram of the new system.

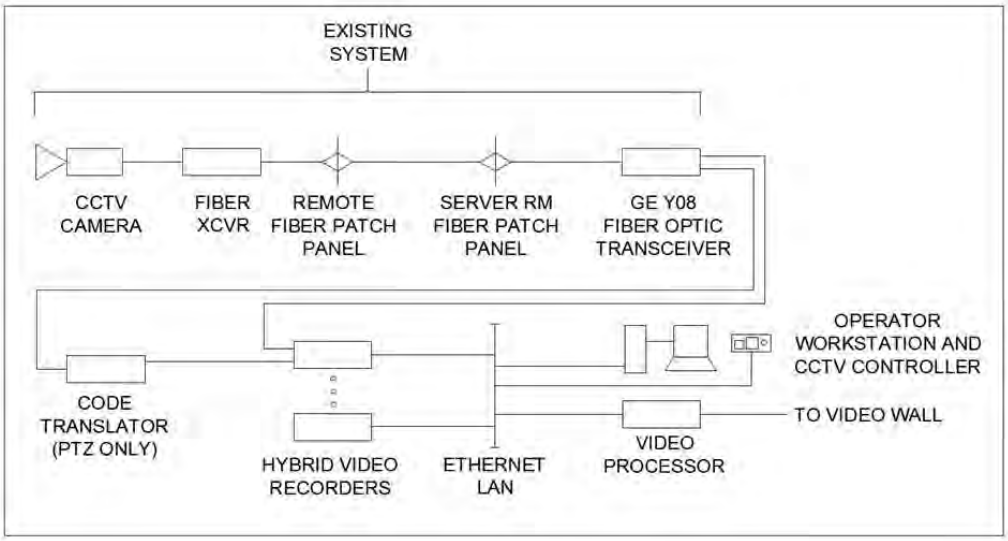

Figure 0-21 Connectivity diagram of new video system

0.4.3 Preparation of Final Capital Cost Estimate for Computer Monitoring Security System and Additional Systems

Table 0-4 Capital Cost Estimate for CMS

Component	Amount
PSIM	USD 536,555
Video Wall	USD 202,104
Operator Workstations	USD 20,939
Subtotal: CMS	USD 759,598
Ancillary - Cameras	USD 377,403
Operator Consoles	USD 20,514
CCTV Headend Upgrade	USD 620,756
Total	USD 1,778,271

The priced equipment list summarizes estimates based on catalog prices for each sub-system. This estimate used mid-range equipment prices. The very high prices may be 20-30% higher and the low prices may be 10-20% lower. The costs shown are estimated turn-key costs (An Integrator or Prime Contractor who would bid this project would include General and Administrative costs, Systems Integration costs, Program Management costs, Installation costs, spares and overall fee). The total costs of the project would be in the $1.6-2.0M range to include all the work shown. There would also be some local content which would add to the total overall costs. The use of in-county qualified contractors could reduce the overall labor costs to the project.

CMS Implementation Schedule

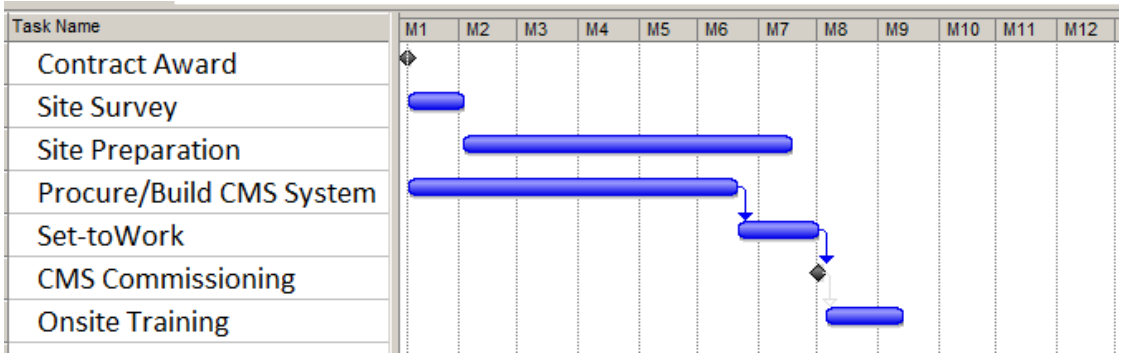

Figure 0-22 Implementation Schedule for Computer Monitoring Security System (CMS)

0.5 Review of Cargo Inspection

There are several keys to optimizing efficiency in port operations while at the same time minimizing security risks. Foremost among these is the ability of the various partners in the supply and transportation chains, including government agencies, to share early, accurate electronic information about the cargoes moving through the ports.

For imported cargoes, the government agencies, port/terminal operators, and importers need to know what shipments are arriving on which vessel and the estimated date that ship is going to arrive at its port of cargo discharge. The steamship operator or local ship agent will be the primary source of that information. For exports, the process is reversed: exporters need to provide information to the terminal operator and ocean carriers, as well as government inspectors, on which shipments will arrive at the port for loading onto an outbound vessel and when.

When automation of information flow is maximized, there is greater visibility into the supply chain. In addition, each partner in the transportation chain can more effectively schedule resources, and the terminal operator can more efficiently stage cargo, when cargo information is provided as early in the process as possible.

Based on a review of the procedures currently in place, following are a series of recommendations for inspecting cargoes moving through the Port of Buenaventura.

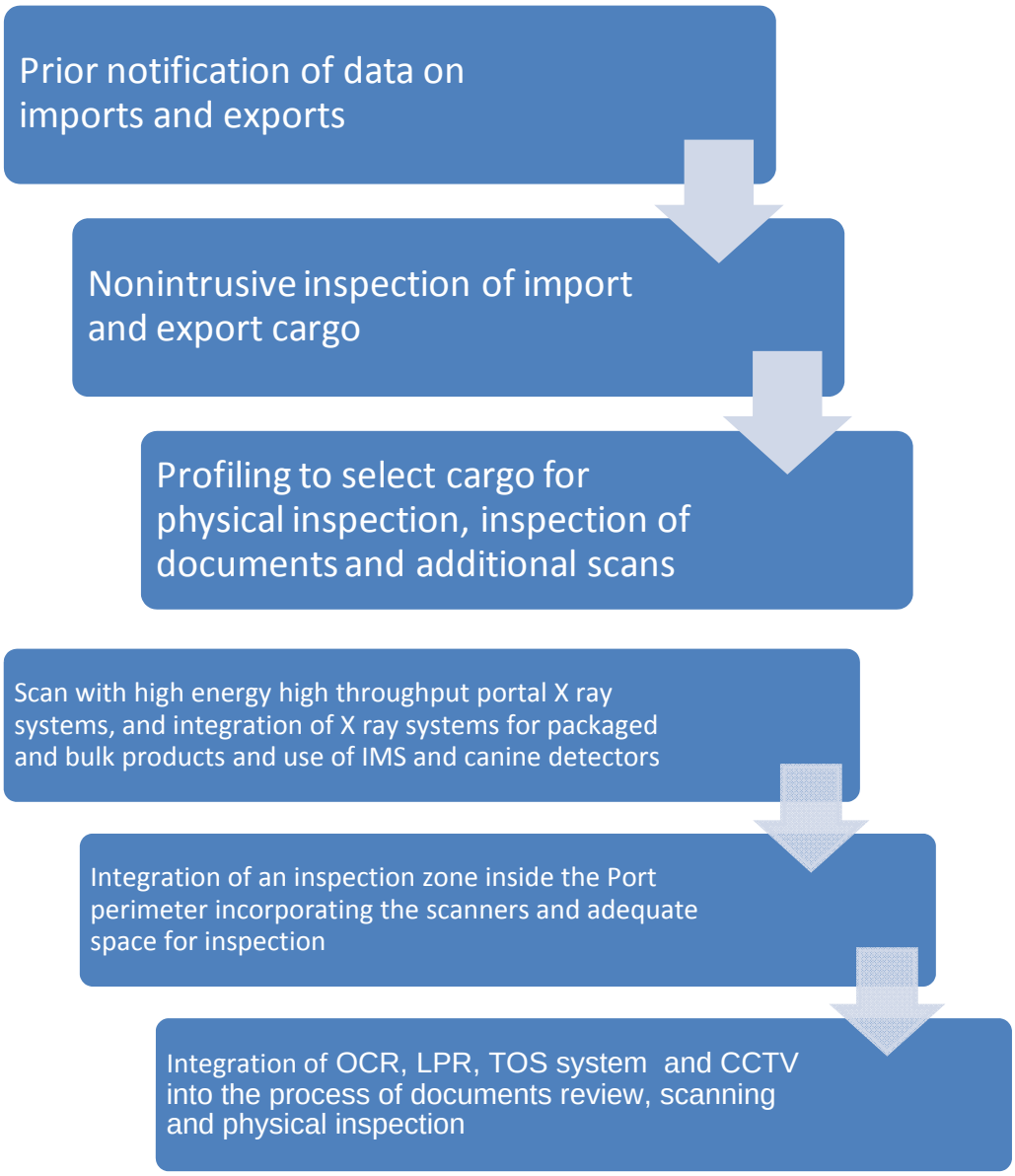

Figure 0-23 Recommendations for cargo inspection

The inspection process and the operation of the terminal can be improved by:

1 The acquisition or development of better software and databases for the cargo profiling for the entities involved in order to select the cargoes for inspection of documents, non-intrusive inspection or physical inspection;

2 The integration of information systems to facilitate pre-screening of cargo, either import or export to be inspected before their arrival at the port;

3 The non-intrusive inspection of cargo, both import and export, together with the integration of a number of suitable container scanners to allow non-intrusive inspection of the cargo and use of non-intrusive inspection to select cargoes for inspection using scanners, physical inspection or inspection of documents. The scan should include vehicles, including trucks, tractors, automobiles and chassis, as well as containers.

Figure 0-24 SAIC VACIS IP6500 Full Scan Integrated full scan cargo inspection system

This differs from the current practice of selecting cargo using software based on documents and databases for physical inspection, non-intrusive inspection or inspection of documents only. The non-intrusive inspection is used for full and empty containers both in and out of the Port to review content before deciding the need for further inspection.

4 The use of fixed portal scanners, which can provide a much higher throughput, of 150 to 195 vehicles per hour. Mobile scanners provide a throughput of 20 to 25 vehicles per hour, and gantry-type fixed scanners' throughput is about the same. Fixed scanners can be provided in buildings with adequate shielding, increasing personnel safety, reducing the time to set up a scan by clearing personnel from the area, and increasing throughput and productivity. X-ray scanners with sufficient penetration are an essential tool for scanning. Greater penetration is facilitated by having adequate shielding in a fixed housing and structure.

Figure 0-25 ASE&E Omniview high energy multiple view inspection system

Figure 0-26 AS&E Sentry Portal High energy high throughput cargo inspection system

Figure 0-27 SAIC VACIS XPL Automobile scanning system

Fig. 0-28 Z Backscatter Van (ZBV) from American Science & Engineering (AS&E)

AS&E's Z Backscatter Van™ (ZBV) is a low-cost, extremely maneuverable screening system built into a commercially available delivery van. The ZBV allows for immediate deployment in response to security threats, and its high throughput capability facilitates rapid inspections. The system's unique "drive-by" capability allows one or two operators to conduct X-ray imaging of suspect vehicles and objects while the ZBV drives past.

The ZBV Reveals Contraband and Threats Undetected by Other Systems:

- Car and truck bombs
- Explosives, plastic weapons, and other organic threats
- Radioactive threats, including nuclear devices and dirty bombs
- Illegal drugs
- Stowaways, such as illegal immigrants and terrorists
- Trade fraud items, such as alcohol, tobacco, and other legal goods smuggled to evade duties

5 Additional technologies should be incorporated in the inspection process. X ray technology is available to provide material discrimination, organic and inorganic, but is limited in its ability to detect the specific contents of drums or other containers, and discern the difference between innocuous substances and narcotics or explosives. The technologies may include:

Dual Ion Mobility Spectrometry (IMS) technology, such as in an Ionscan 500 DT, which utilizes a sample wand which is wiped over the surface to be inspected and then placed in a chamber for analysis. The equipment can detect chemicals and powders, including explosives in the picogram range and narcotics in the sub-nanogram range. Explosives which can be detected include RDX, PETN, NG, TNT, HMX, TATP and others. Narcotics which can be detected include cocaine, heroin, amphetamine, methamphetamine, MDA, THC and others.

Figure 0-29 Smiths Detection IONSCAN 500 DT narcotics and explosives detector

Detection dogs, which can sniff drugs or explosives.

X-Ray Systems for packaged products or bulk product inspection which are able to scan materials such as bagged or bulk coffee, to detect the presence of contraband. These systems are able to inspect products for correct weight, metal or other foreign objects.

Figure 0-30 Rapiscan Eagle 1000 Palletized cargo scanner

Figure 0-31 AS&E Gemini 100100 breakbulk cargo inspection system

6 Package and pallet scanners should be integrated to inspect bags and packages within the containers. Palletized cargo scanners can be used after unloading the cargo of a container in which suspicious areas are seen with the container scanners or if the cargo is too much dense to properly scan with a container scanner. For export containers, for example, the container should be scanned and also each of the bags contained within the container, in the case of palletized cargo. Package scanners work with a conveyor to allow efficient scanning of all bags of coffee, sugar and other products for the presence of contraband such as panels.

7 The availability of more space in inspection areas to facilitate the logistics of waiting, unloading, inspection and re-stow;

8 The addition of space dedicated to scanning sufficient to allow containers to waiting in line in front of scanners, as in a gate;

9 The integration of an inspection area within the perimeter of the Port to better handle the cargo that is currently moving between the Port and the inspection area in the former Free Zone;

10 The placement of scanners that can check a container in a sequential manner when the container is identified in a gate with the optical character recognition system (OCR). Systems can be also that integrate OCR scanners to read the identification of each container or vehicle scanned. License plate reader (LPR) systems should also be incorporated. This will facilitate positive identification of the containers or vehicles which are scanned.

0.6 Interim presentation

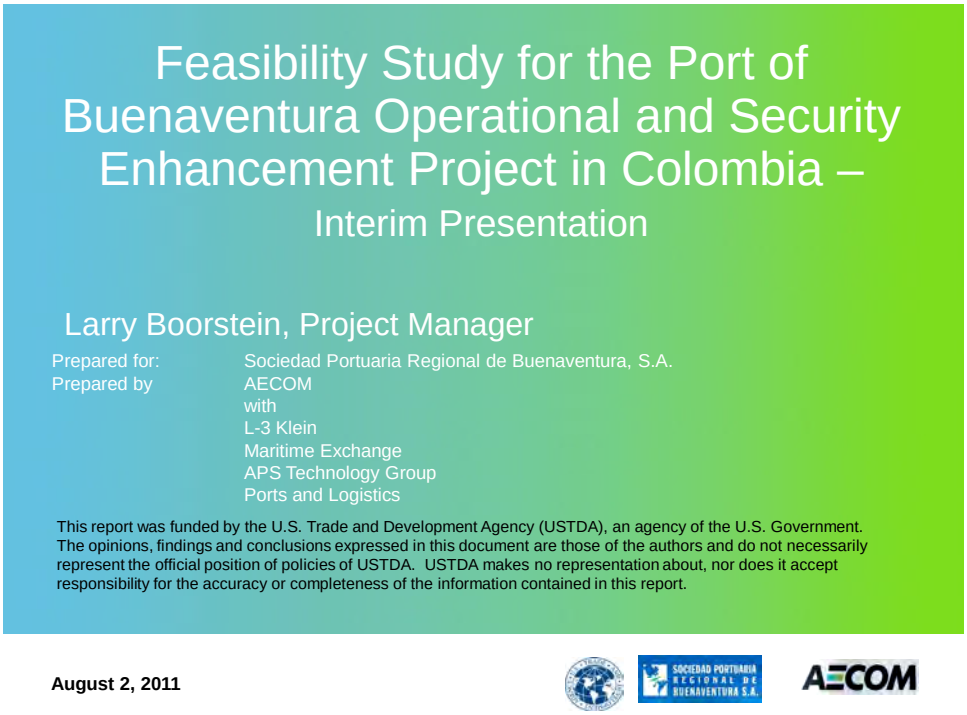

Figure 0-32 Interim presentation

On August 2, Larry Boorstein, Project Manager, Richard Wechsler, Security Specialist and Project Quality Representative and Fernando Buitrago, Marine Terminal Specialist conducted the interim presentation of the study. The meeting was opened by My (r) Gilberto Ocampo, Director of Security of the Port of Buenaventura. The meeting was attended by staff of the Port of Buenaventura (SPRBUN), Terminal

Especializada de Contenedores de Buenaventura SA (Specialized Container Terminal TECSA), National Police, Colombian Coast Guard, Directorate of the Marine (DIMAR), Directorate of National Taxes and Customs of Colombia (DIAN) and National Institute of Food and Drug Surveillance (INVIMA).

The interim presentation covered the following tasks:

1. Data Collection and Review of Existing Conditions
2. Development of a Vessel Traffic System (VTS)
3. Development of an Optical Character Recognition System (OCR)
4. Development of a Computer Security Monitoring System
5. Review of Cargo Inspection
6. Interim Presentation

Subsequently, a meeting was conducted with the General Manager, Ing. Domingo Chinea, and the Director of Security of the Port. The consultants also met with the Captain of the Port, Frigate Captain Juan Carlos Roa Cubaque, and with the Chief of the Division of Captaincies of DIMAR, Ship Captain Marcos Olier Mendoza and with Diana Garavito, Maritime Traffic Control.

0.7 Development and Environmental Impacts

0.7.1 Development Impacts

AECOM analyzed the potential development impacts that could result if the Project is fully implemented and concluded the following:

- **Infrastructure Improvements:** To fully implement the proposed technological upgrades, the total required capital investment is estimated to be US$7.1 million. In addition, incremental annual operating costs are estimated to be US$2.0 million (or a cumulative value of US$9.9 million over the five year operating timeframe analyzed). To estimate the economic benefits retained in Colombia, assumptions regarding the sourcing of materials and labor were applied to capital costs and operating expenditures. Based on these assumptions, total direct and indirect spending in Colombia on capital costs could reach **US$0.5 million**. Total direct and indirect wages earned by Colombian residents associated with the construction and installation activities are estimated to be approximately **US$ 11.9 million** (cumulative value over five years, excluding inflation). In total, the Security and Operations Enhancement Project could generate up to

US$12.4 million in direct and indirect economic benefits within the Colombian national economy over five years.

- **Market Oriented Reform:** The proposed investment in improved port operations will serve to serve to spur a number of market-oriented reforms that will bring the Port of Buenaventura up to the security standards of the United States Government, thereby opening the port to valuable trade routes linking Colombia directly to US markets.
- **Job Creation Benefits:** The estimated one-time capital expenditures and ongoing annual operating expenditures are expected to generate approximately 49 average annual direct full time employments (FTEs) over a five year operating timeframe. The wage spending associated with the direct jobs are expected to generate additional indirect jobs. Assuming an economic multiplier of 1.5 times the direct economic benefits, the Project is expected to create an additional 25 FTEs, or a total annual direct and indirect job creation potential of 74 FTEs.
- **Training Benefits:** Improvements in technology inherently require job training. It is estimated that a total of US $215,810 will be expended on training activities for Operators, Supervisors and Maintainers to fully implement the Vessel Traffic, Optical Character Recognition, and Computer Monitoring Security Systems. It is estimated that this level of funding will benefit the existing employees, some of which will be retrained and reassigned to staff the 37 new positions required to fully maintain and operate the Project's technological upgrades.
- **Technology Transfer and Productivity Enhancements:** The proposed investment in Vessel Traffic System (VTS), Optical Character Recognition (OCR) System, and Computer Monitoring Security System (CMS) will result in key technological advancements that will serve to facilitate international foreign trade between Colombia and key international markets.

Other: The current system used to calculate duties and taxes relies on a foundation of manual data entry to the computerized system. By implementing the OCR technology (OCR), the Government of Colombia will have a more accurate inventory of trade cargo in real time. The non-intrusive inspection (NII) with scanners, cargo control with OCR, and monitoring of vessels with Vessel Traffic System (VTS) will help control the contraband, including explosives, narcotics and other restricted materials, and evasion of laws, taxes and tariffs.

In total, the Project is expected to yield substantial positive development impacts in Colombia.

0.7.2 Environmental Impacts

The preliminary review results were shown of the environmental impacts that may occur in the implementation of the recommendations drawn from the "Feasibility Study for the Operational and Security Enhancement Project for the Port of Buenaventura in Colombia."

The impacts were assessed according to the local requirements under the legal environmental standards in force in Colombia, specifically in the city of Buenaventura, where the Sociedad Portuaria Regional de Buenaventura (SPRBUN is located; as well as with reference to the Performance Standards issued by the International Finance Corporation (IFC), a World Bank affiliate.

This review allowed identification of the potential negative impacts as well as the required environmental impact mitigation measures in development of the subject matter projects.

Likewise, the review considered whether these projects required an environmental license and, if so, identified the procedures to file a request with the environmental authority.

The environmental impact assessment was based on the identification and clearing of the environmental impacts that may occur during the construction and operation of the four security systems at the SPRBUN.

0.7.2.1 Summary and results of environmental impact and measures to be taken

Based on the environmental impact assessment to the security systems that are to be implemented by SPRBUN, we conclude that the installation and operation of such systems do not generate adverse environmental impacts of great magnitude. Therefore, they may be managed taking into account the guidelines and actions contained in the SPRBUN Environmental Management Plan.

The most relevant environmental impact shall be the production of a minimum amount of solid waste for which we are proposing the following measures: production control, management, minimization and correct final disposal thereof, according to the actions established in SPRBUN's Environmental Management Plan for Civil Works.

The security and operational enhancements at the Port of Buenaventura are expected to result in significant environmental benefits. The Vessel Traffic Management System (VTS) is expected to result in a reduction in the risk of ship collisions, groundings and potential spills of fuels, lubricants and cargo in the waterways at Buenaventura. The Optical Character Recognition system (OCR) is expected to result in a reduction in truck waiting time, idling and diesel pollution at Port gates. The Computer Monitoring Security (CMS) system, infrared cameras and video analytics are expected to result in improved security, including monitoring and control of improper cargo handling, dumping and spills on ports wharves,

docks and water areas. Improved inspection procedures and increased used of X-ray scanners are expected to result in a reduction of truck waiting, idling, reduction of truck movements to and from off-site inspection stations and reduction in contraband such as prohibited chemicals.

Regarding the socioeconomic aspect, we conclude that it favors the inspection and security activities in the port, generating a better work environment quality at the port, thus diminishing theft, contraband and other criminal activities that may occur. Likewise, it promotes an economic and social development for Buenaventura.

In addition to the above, we confirm that the implementation of the four security systems is not within the ordinary development of the port activities, and therefore, does not require any environmental license or changes to an existing one.

During the development of the activities, it is necessary to comply with the national and local environmental legislation in force as well as with the parameters, programs and measures contained in SPRBUN's Environmental Management Plan.

SPRBUN's Environmental Management Plan has been approved through Res. 1419 of 2010, whereby the Environmental Management Plan for Civil Works and Deepening Dredging was approved.

The proposed projects for the enhancement of port operations and security shall be implemented inside the SPRBUN facilities, and therefore they are closely linked to the environmental aspects contained in the Environmental Management Plan approved by MADS and shall be executed under this environmental framework.

SPRBUN's Environmental Management Plan, provides for environmental measures for civil works that are considered in the environmental mitigation measures that must be followed for the implementation of the four security system projects:

Environmental Management Card No. 1. Installation of camps
Environmental Management Card No. 2. Reduction of the impact of greenhouse gas emissions during the building stage.
Environmental Management Card No. 3. Solid Waste Management
Environmental Management Card No. 4. Debris Management
Environmental Management Card No. 5. Design & Construction of Seismic Resistant Structures.
Environmental Management Card No. 6. Building Stage Checklist

0.8 Final Report and Presentation

0.8.1 Sources of Funding

Inter-American Development Bank (IDB)

A multilateral development institution, IDB lends on its own account ("A Loans") and syndicates loans to other, private investors who invest alongside of IDB ("B Loans").

U.S. Export Import Bank (Ex-Im Bank)

The Export-Import Bank of the United States (Ex-Im Bank) is the official export credit agency of the United States. Direct loans are extended to the foreign buyer, not to the U.S. exporter. Loan guarantees are provided to banks financing the export sales of a U.S. supplier.

International Finance Corporation (IFC)

International Finance Corporation (IFC), a member of the World Bank Group, is the largest global development institution focused on the private sector in developing countries. Like other multilateral lenders such as IADB, IFC loans on A/B structures combining their own money with syndicated loans from the private sector. In addition, IFC will take equity stakes in private sector companies. In addition, IFC will take equity stakes in private sector companies.

Overseas Private Investment Corporation (OPIC)

OPIC is the U.S. Government's development finance institution. OPIC Financing provides medium- to long-term funding through direct loans and loan guaranties to eligible investment projects in developing countries and emerging markets.

Equity Investments by Private or Public-Private Project Sponsors/Developers

Equity, in either cash or kind, can be contributed by: The port (SPRBUN); a private terminal development and operations company; Key shipping lines calling or potentially calling on the terminal; Contractors and engineers working on the project; Financial institution members of the project team; Institutional investors focused on Latin America and/or private infrastructure; Local partners; and other strategic team players with interests in the success of the project.

SPRBUN Investment

SPRBun has the authority to allocate its own funds to develop new facilities, as well as to undertake borrowing for the purpose of investment. In its audited consolidated financial statements, SPRBUN reported assets of COP 432,026,046,000 (equivalent to USD 215,571,000 at a rate of exchange of USD 0.0005 per USD as of December 31, 2010) and equity of COP 200,984,390,000 (equivalent to USD 100,287,000) as of December 31. 2010.

Corporación Andina de Fomento (CAF)

CAF is a development bank hat currently consists of eighteen countries in Latin America, the Caribbean and Europe, as well as fourteen private banks from the Andean region. . CAF products and services include: loans; Structured Finance; syndicated loans; financial advice; Bonds and Guarantees; Partial Guarantees; equity Investments; Treasury services; technical Cooperation; Lines of credit.

Government of Colombia

The Government of Colombia (GoC) may be willing to provide investment capital for infrastructure projects of national importance. The Port of Buenaventura Operational and Security Enhancement Project includes important projects which will improve security for Colombia as well as improving collection of Customs and tax revenues.

Private Debt Investors

Funding needs not met by equity investors, multilateral lenders and export assistance programs are usually met be private lenders. These lenders are often organized by one of the multilateral lenders (A/B loans) and involve guarantees on the part of the multilateral lender. Structured trade finance facilities are usually insured or guaranteed by the Export-Import Bank of the United States or one of a number of private sector credit insurers. Structured trade finance and other products are offered by major banks, such as:

Wells Fargo,

JP Morgan Chase;

Citibank;

Bank of America; and

HSBC USA.

Bladex – Foreign Trade Bank of Latin America, Inc. (Banco Latinoamericano de Comercio Exterior, S.A.)

Bladex is a supranational bank specialized in Latin American foreign trade.

Bancoldex

Bancóldex is the bank for business development and foreign trade. It is a credit institution supervised by the Superintendencia Financiera de Colombia, which operates on the second floor through the network of banks, financial corporations, finance companies, credit unions, financial NGOs and funds used to meet the needs of credit for all companies.

Bancolombia

Bancolombia or other Colombian Banks offer services to satisfy the demands for financial services of nation.

0.8.2 U.S. Sources of Supply

Potential U.S. sources of supply were identified for each of the project systems and components, see Section 8.

0.8.3 Final presentation

The final presentation was conducted on February 1, 2012 at the offices of Sociedad Portuaria Regional de Buenaventura, S.A., by Larry Boorstein, Project Manager, together with Fernando Buitrago, Ports and Logistics. The following officials attended the final presentation:

Company	Name	Title
Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBUN) **(Port of Buenaventura)**	Ing. Domingo Chinea Barrera	General Manager
	My(r) Gilberto Ocampo	Director of Security
	Norberto Castañeda	Port Facilities Protection Officer (OPIP)

Company	**Name**	**Title**
	Alexander Micolta S.	Assistant to General Manager
	Jorge A. Gallegos C.	Commercial Manager and Service to Clients (SAC)
	Tomás F. Quiñones	Deputy Manager of Operations
	Edison Diaz García	Manager of Operations
	Ana Mercedes Cano Rostupo	Management Committee
	Lewis Guette S.	Manager Information Technology
	Alejandro J. Echeverry	Director of Planning
	Sergio H. Velásquez R.	Manager of Engineering
Terminal Especializada de Contenedores de Buenaventura, S.A. (TECSA) **(Specialized Container Terminal of Buenaventura)**	Héctor Medina C.	General Manager of TECSA
Dirección de Impuestos y Aduanas Nacionales (DIAN) **(Directorate of National Taxes and Customs)**	Dra. María Constanza Dussán B.	Division Chief Operations Management, DIAN

Company	Name	Title
Instituto de Vigilancia de Medicamentos y Alimentos (INVIMA) **(Institute for Surveillance of Medications and Foods)**	Alba Liliana Bocanegra H.	Administrative Technician
Instituto Colombiano Agropecuario (ICA) **(Colombian Agricultural Institute)**	Sigifredo Salgado G.	Chief of Office
Dirección General Marítima (DIMAR) **(General Maritime Directorate)**	CF Juan Carlos Roa C.	Captain of the Port Buenaventura
Guardacostas Buenaventura **(Coast Guard)**	Pablo A. Perafan	Commander, Coast Guard Station
Armada **(Colombian Navy)**	Tk. María Antonia Garcés T.	Chief of Operations Department GAPO

Company	Name	Title
Batallón Fluvial de Infantería de Marina Nº 80 (BAFLIM80) **(Marine Infantry River Battalion 80)**	Alberto García D.	Commander, BAFLIM80 (marine infantry battalion)
Señalización Marítima Pacífico **(Pacific Marine Signalization)**	Germán A. Rojas Hernández	Chief of Marine Signalization
Policía Nacional Antinarcóticos **(National Anti-Narcotics Police)**	Cte. Alexander Pulido Guzmán	Company Commander
AECOM	Larry Boorstein	Project Manager
Ports and Logistics	Fernando Buitrago	Advisor, Ports and Logistics

The General Manager of the Port, Ing. Domingo Chinea, and the Director of Security, Maj. (r) Gilberto Ocampo opened the meeting. The AECOM team presented the study findings, conclusions and recommendations for the Vessel Traffic System (VTS) and Automated Identification System (AIS), Optical Character Recognition (OCR), Computer Monitoring Security (CMS) system, Cargo Inspection and Scanners, Economic and Environmental Impacts.

The Captain of the Port of Buenaventura, Frigate Captain Juan Carlos Roa of DIMAR informed the group that the Ministry of Defense is implementing Vessel Traffic Systems (VTS) in the Caribbean and Pacific

regions of Colombia. The systems will also include Global Maritime Distress Signaling System (GMDSS). The tower has been delayed but is expected to be completed in 12 months, in the coming year.

1.0 Data collection and review of existing conditions

Sociedad Portuaria Regional Buenaventura (SPRBun) engaged AECOM to carry out the preparation of a Feasibility Study for the Security and Operations Enhancement Project for the Port of Buenaventura in Colombia. The United States Trade and Development (USTDA) has awarded a grant to SPRBun to carry out the study. The study would enable the Sociedad Portuaria to implement operational and security improvements at the port of Buenaventura. AECOM has engaged L3 Communications Klein Associates, Inc., experts in VTS systems and radar, APS Technology Group, experts in OCR systems and Ports and Logistics, a Colombian firm with expertise in marine terminals and logistics, and Seguridad Atlas, Ltda., which is providing protection services for personnel.

The Feasibility Study has the following objectives:

- Develop a Vessel Traffic System (VTS) to improve navigational safety and monitoring of all vessels off the coast of Buenaventura and in the main channel of Buenaventura, due to the expanding capacity of SPRBun facilities and planned new terminals ;
- Develop an Optical Character Recognition (OCR) system to record the designations of trucks and markings on the containers and to improve the efficiency of container gates. SPRBun plans to integrate this information into the Terminal Operating System (TOS) and install OCR equipment in all entry and exit gates for containers; and
- Review cargo inspection procedures, practices, facilities, equipment and reporting systems;
- Develop a Computer Monitoring Security System for monitoring of the network of Closed Circuit Television (CCTV) and access control and intrusion detection systems (covering the fence on the perimeter of the port and waterfront area). The Computer Monitoring Security System aims to supplement the procedures and visual programs and detect, on a real time basis, inappropriate intrusions or unauthorized access.

The Port of Buenaventura, located in the province of Valle de Cauca, is the public port of the greatest cargo movement in the Colombian Pacific and also the country's number one public port. Buenaventura is a key focus for Colombia's international maritime trade and with the rapid growth of the countries of the Pacific Rim. This position has been strengthened in recent decades. The Port of Buenaventura is composed of a set of docks, patios, warehouses and other multipurpose facilities handling containers, bulk cargo, breakbulk, vehicles and general cargo. Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun) holds the concession for the port's main terminal. Sociedad Portuaria Regional Buenaventura S.A., established in 1991, is a public / private enterprise, governed by private law. 83% of its shares belong to private entrepreneurs made up of importers, exporters, port operators, shipping lines, unions, former port employees and individuals. 15% is in public hands made up of the City of Buenaventura and 2% for the Ministry of Transport. Within the SPRBun terminal, several operators run the terminals and

warehouses for containers and bulk.   The operators include the Terminal Especializada de Contenedores de Buenaventura, S.A. (Specialized Container Terminal of Buenaventura) (TECSA) Comercializadora Internacional de Azúcar y Mieles, S.A. (International Trading Sugar and Honey) (CIAMSA), Portuaria de Cementos Asociados, S.A. (Associated Port Cement) (CEMAS) and the Federación Nacional de Cafeteros de Colombia (National Federation of Coffee Growers of Colombia).

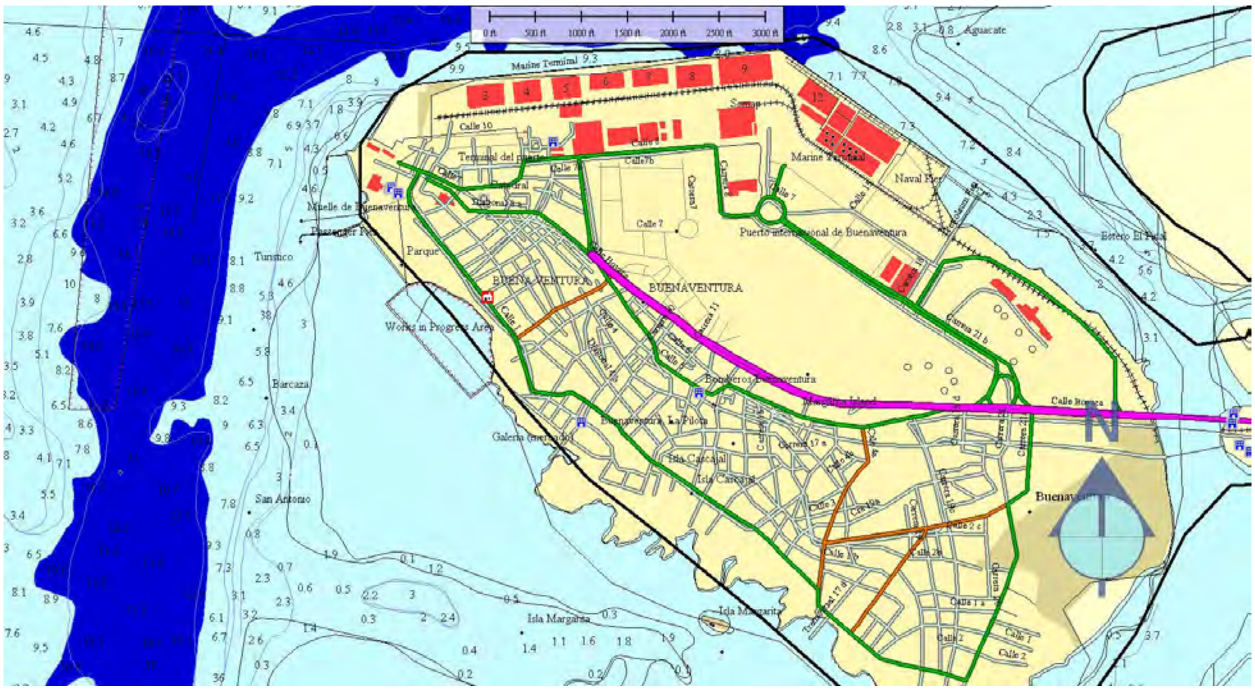

Figure 1-1 Navigation chart around the Port of Buenaventura

Figure 1-2 Port of Buenaventura (SPRBun)

Currently, the Port of Buenaventura has a total berth length of 2,000 m, of which almost 600 m are devoted to containers.

Sociedad Portuaria Regional de Buenaventura, SA (SPRBun) contemplates a modernization plan until 2034 with the aim of increasing the installed capacity from 13.5 million tons per year to 22.8 million tons. SPRBun plans to invest USD 449 million for projects in the master plan, including USD 215 million in infrastructure, USD 174 million in equipment, USD 54 million in dredging and another USD 5 million.

Several new terminals, including the Sociedad Portuaria Terminal de Contenedores de Buenaventura, S.A. (Container Terminal Port Society of Buenaventura) (TC Buen) and the Sociedad Portuaria Industrial Aguadulce, S.A. (Industrial Port Society of Aguadulce) (Aguadulce) are in different stages of development or construction outside the SPRBun concession.

The Sociedad Portuaria Terminal de Contenedores de Buenaventura, S.A. (Container Terminal Port Company of Buenaventura) (TC Buen) is finalizing a new terminal to start operating in February 2011. TC Buen is owned primarily by Grupo Marítimo Terminal de Contenedores de Barcelona, S.A. (GMTCB) and the Grupo Empresarial del Pacífico (GEPSA) based in Buenaventura. The project is funded by the International Finance Corporation (IFC) of the World Bank, WestLB and Banco Espiritu Santo. The first phase of container terminal project includes the construction of a 440 m long quay and the installation of two gantry cranes for loading and unloading of ships, seven rubber-tired gantry (RTG) cranes and ancillary facilities. These facilities will initially allow TCBuen to handle 268 000 TEUs per year. The project will cost an estimated overall value of USD 224 million.

Figure 1-3 Buenaventura Container Terminal (TC Buen)

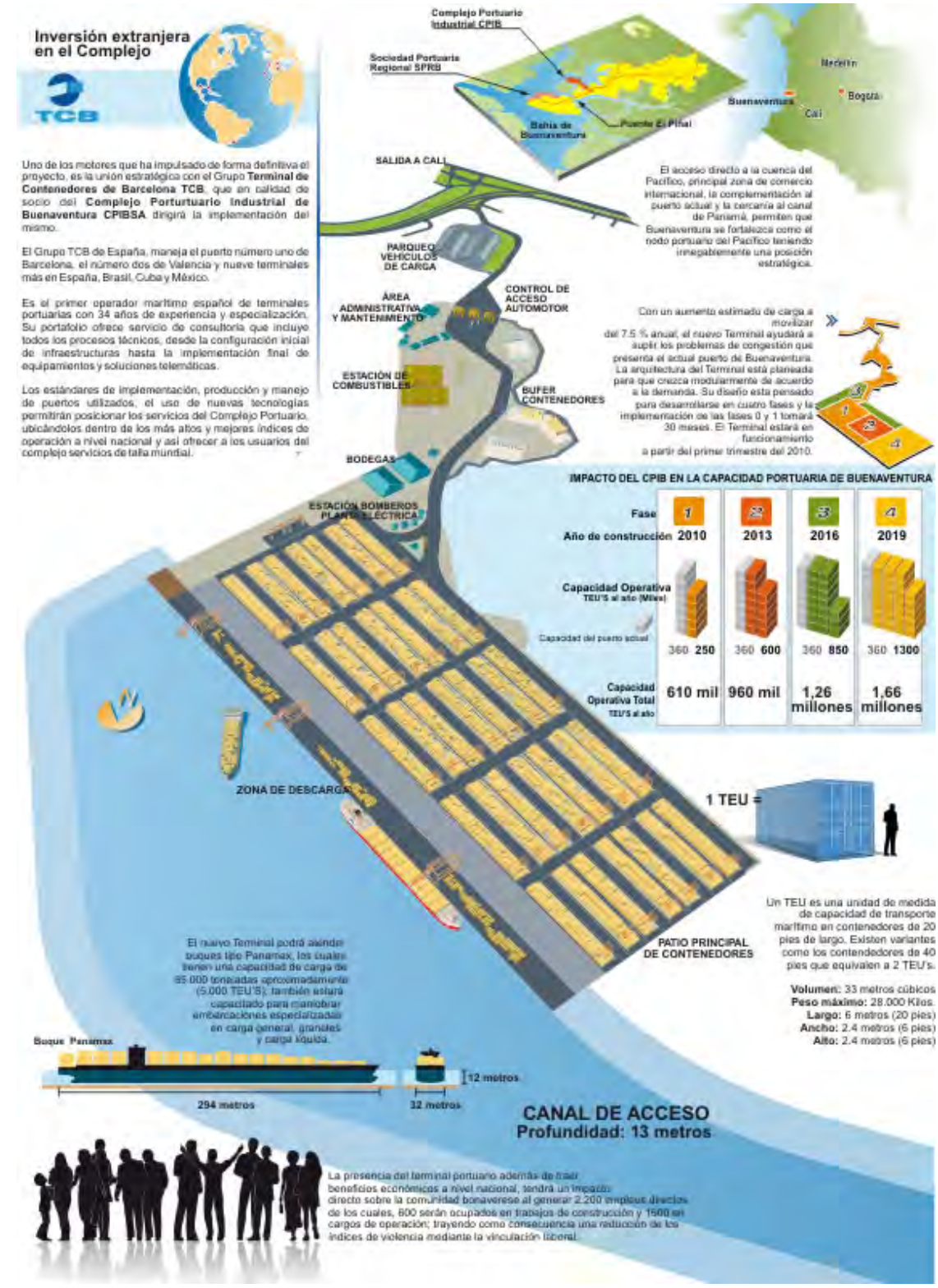

Figure 1-4 Buenaventura Container Terminal (TC Buen)

Figure 1-5 New terminal at Aguadulce – in the distance on the right the current port of Buenaventura can be seen, and in the distance on the left, the TC Buen site

The new terminal of Aguadulce will have a quay length of 2,000 m, with a capacity in the first phase of about 400,000 20 and 40-foot containers and 1,000,000 tons of dry bulk, and an eventual capacity of 1,200,000 containers. The construction cost is estimated at USD 400 million. According to the Philippine company International Container Terminal Services, Inc. (ICTSI), in July 2007, ICTSI, through ICTSI Ltd., entered into agreements to begin construction and development of a new container terminal for multiple users in the Port of Buenaventura in Colombia. ICTSI also acquired stakes in two companies in Panama to obtain effective control of the Sociedad Portuaria Industrial Aguadulce, S.A. (Industrial Port Company) (SPIA). SPIA has 250 hectares of land in the Aguadulce Peninsula in Buenaventura. SPIA was granted a 30-year concession by the Instituto Nacional de Concesiones (National Concessions Institute) (INCO) to develop, build and operate a terminal for containers and the service of handling coal and grain in Aguadulce. The new terminal will be located in Aguadulce Peninsula across the navigation channel from the current Port of Buenaventura. The concession area is 120 ha. The length of the docks will be 600 meters in the first phase, 900 meters in the second phase, and 250 meters for grain and coal, with 12.5 m low water in the first phase. Construction was started in 2008 and the terminal is expected to be operational in 2013.

The Port of Buenaventura handles a variety of ships, including container carriers, bulk carriers and tankers, among others, and handles a variety of cargo, including containers, bulk cargo and liquid, break bulk, vehicles and general cargo.

Type of Vessel	Vessels
Container carriers	517
Bulk	191
Ro-Ro	126
General Cargo	129
Tanker	84
Other	-
Total	1,047

Figure 1-6 Port of Buenaventura - Number of Vessels - 2011

The Port of Buenaventura (SPRBun) served 1,047 vessels in 2011.

Type of cargo	Tons
Containers	4,664,142
Coal in bulk	317,014
Dry bulk	3,458,470
Liquid bulk	434,086
General cargo	897,560
Total	9,771,272

Figure 1-7 Port of Buenaventura - Cargo by Type - 2011

The cargo handled through the Port of Buenaventura in 2010 totaled 9,771,272 tons in 2011, in addition to 11,585 tons of cabotage cargo and 152,845 tons of transit cargo.

Containers by Movement	Boxes
Import	168,332
Export	162,639
Transshipment	7,806
Restow	3,218
Total	341,995
Total	TEUs
	520,262

Figure 1-8 Port of Buenaventura – Containers Movements - 2011

341,995 containers were handled, of which 168,332 were import, 162,639 were export and the rest re-stow and transshipment.

Containers by type	Boxes
20-ft full	121,391
20-ft empties	41,557
40-ft full	122,108
40-ft empties	56,939
Total	341,995

Figure 1-9 Port of Buenaventura - Containers by Size - 2011

The breakdown of containers by size indicates that most were loaded containers.

Private docks

According to the Center for Oceanographic and Hydrographic Surveys (CIOH), there is "a small dock, there is a winery called Lizcano brothers, which has a covered area of 1,260 square meters and an open area of 320 square meters. There are no proper specialized docks for pleasure craft, except privately owned factories in the vicinity of fishing factories. In this same sector of the estuary there are three repair docks for coastal motor vessels and small fishing boats up to 150 tons. "

Yachting Areas

According CIOH, "on the left bank of the estuary San Antonio Buenaventura Bay Club is located Zabaletas which has space to hold about 50 mid-size sport boats. Also, several private clubs that offer ramp service for outboard motor boats. "

Shipyards

According to CIOH, "At the Port of Buenaventura in the area of Estero, there are three ship repair docks for motorboats and small coastal fishing vessel up to 150 tons and the following shipyards: Astivar, Emaus and Astilleros Buenaventura S.A."

1.1 Kickoff Meeting and Visit to the Terminal to Observe Operations and Procedures

The AECOM team visited Colombia between November 29 and December 4, 2010, to kick off the Feasibility Study for the Security and Operational Enhancement Project for the Port of Buenaventura. Participating in the visit were Larry Boorstein Project Manager, AECOM; Billy Vanderbur, Senior Security Expert, AECOM; Fernando Buitrago, Ports and Logistics Expert, Ports and Logistics; and Manuel Arango, Ports and Terminals Expert, Ports and Logistics.

SUMMARY OF THE KICKOFF AND DATA COLLECTION VISIT

Tuesday November 30, 2010

1030 am - Initial meeting between Mr. Domingo Chinea, General Manager, Maj. (r) Gilberto Ocampo, José Roosevelt Ortiz, Security Supervisor, Norberto Castañeda, ISPS Protection Officer, Alex McColtu, Management Assistant, all with SPRBun, Larry Boorstein, Project Manager, Billy Vanderbur, Senior Security Experts, both with AECOM, Fernando Buitrago, Ports and Logistics Expert and Manuel Arango, Ports and Terminals Expert, both of Ports and Logistics.

Mr. Domingo Chinea welcomed the group. Larry Boorstein presented the AECOM working group, the organization chart and the updated study program. Later, Larry Boorstein, Maj. (r) Ocampo and the group jointly prepared an agenda for the work of meetings, visits and data collection during the week.

200 pm - Presentation of the port by Hector Molina Carrillo, Commercial and Customer Service, SPRBun. The presentation covered the role of the Port of Buenaventura in Colombia's foreign trade, navigation channel, facilities, equipment, cargo, cargo inspection, physical and electronic security, access control and perimeter cameras, biometric readers, master plan, strategic challenges, and procedures for imports and exports.

300 pm - Visit to the port and review of its facilities.

Wednesday December 1, 2010

800 am to 1200 pm - Review of CCTV systems in the security control room with Jose Roosevelt Ortiz Quintero, Security Supervisor, SPRBun, Gilberto Clavijo, Maintenance Engineer, Alex Garcia, Maintenance Engineer, SPRBun, and Jimmy Ivan Preciado, Coordinator of Service, EMPREVI.

200 pm - Meeting with Mr. Osvaldo Molina Torrente, Pilot, SpilbunSA about navigation along the navigation channel to the port.

300 pm - Meeting regarding import cargo inspection procedures and requirements with Dr. Maria Constanza Dussán, Head of Customs Operations, Branch Director, Directorate of Revenue and Customs (DIAN), Americo Valencia Mosquera, Group Chief Imports, Foreign Trade Division Operations, Marcos Vivas, Control Coordinator, and increased Nestor Wuandurraga, Police Prosecutor Customs (POLFA).

500 pm - Meeting regarding export cargo inspection procedures and requirements with Lt. (TE) Jeison Vargas Acevedo, Chief Analysis Room, National Antinarcotics Police (Policía Nacional Antinarcóticos), Antinarcotics Directorate (Dirección Antinarcóticos - DIRAN).

Thursday December 2, 2010

800 am - Visit the to the inspection area with Américo Mosquera Valencia, Chief, Imports Group DIAN

900 am - Visit to the coffee warehouse with Superintendent (Foreman) Jose Verra, National Antinarcotics Police, DIRAN

100 am - Visit to the sugar warehouse of Comercializadora Internacional de Azúcar y Mieles, S.A. (International Trading Sugar and Honey) (CIAMSA)

1100 am - Visit to the Chinese scanner with Patrolman Pablo Cesar Ospina, Antinarcotics Police

200 pm - Meeting regarding Vessel Traffic System (VTS) with the Port Captain Frigate Captain (Commander) Jorge Enrique Sarmiento, Harbor Master (Capitanía del Puerto)

300 pm - Meeting about IT infrastructure with Miller Ortiz, Manager, Information Technology and Telecommunications SPRBun

400 pm - Tour of the Cosmos Container Terminal Control System (CTCS) Terminal Operating System (TOS) control room, with Jose Tello, Dispatcher and Astrid Carolina Mosquera Moreno, Storage Coordinator, both of SPRBun

Friday December 3, 2010

915 am - Inspection of the bay between Punta Soldado and the Port of Buenaventura Coast Guard boat.

200 pm – Summary Meeting.

The findings of the Task 1, the kickoff meeting, data collection and review of existing conditions,, are presented in subsections corresponding to each of the subsequent tasks. Specifically, Section 1.2 deals with the location of radars and other information relevant to the Vessel Traffic System (VTS) in Task 2. Section 1.3 presents information on the gates relevant to the optical character recognition (OCR) system in Task 3. Section 1.4 presents information on existing closed circuit television (CCTV) systems and intrusion detectors relevant to the computer monitoring system in Task 4. Section 1.5 presents the

results of the visit on procedures and requirements of the various entities involved in the cargo inspection relevant to their review in Task 5.

1.2 Conduct a site survey to locate radars and other components of the Vessel Traffic System (VTS)

The development of a new Vessel Traffic System (VTS) is required to improve safety, control and surveillance of maritime traffic in the Port of Buenaventura and the access channel. The need for a control system arises from the growing traffic of larger and smaller vessels to the port, the development of two new terminals - TC Buen and Aguadulce, and the responsibility to comply with the rules established by the Convention for the Safety of Life at Sea (SOLAS).

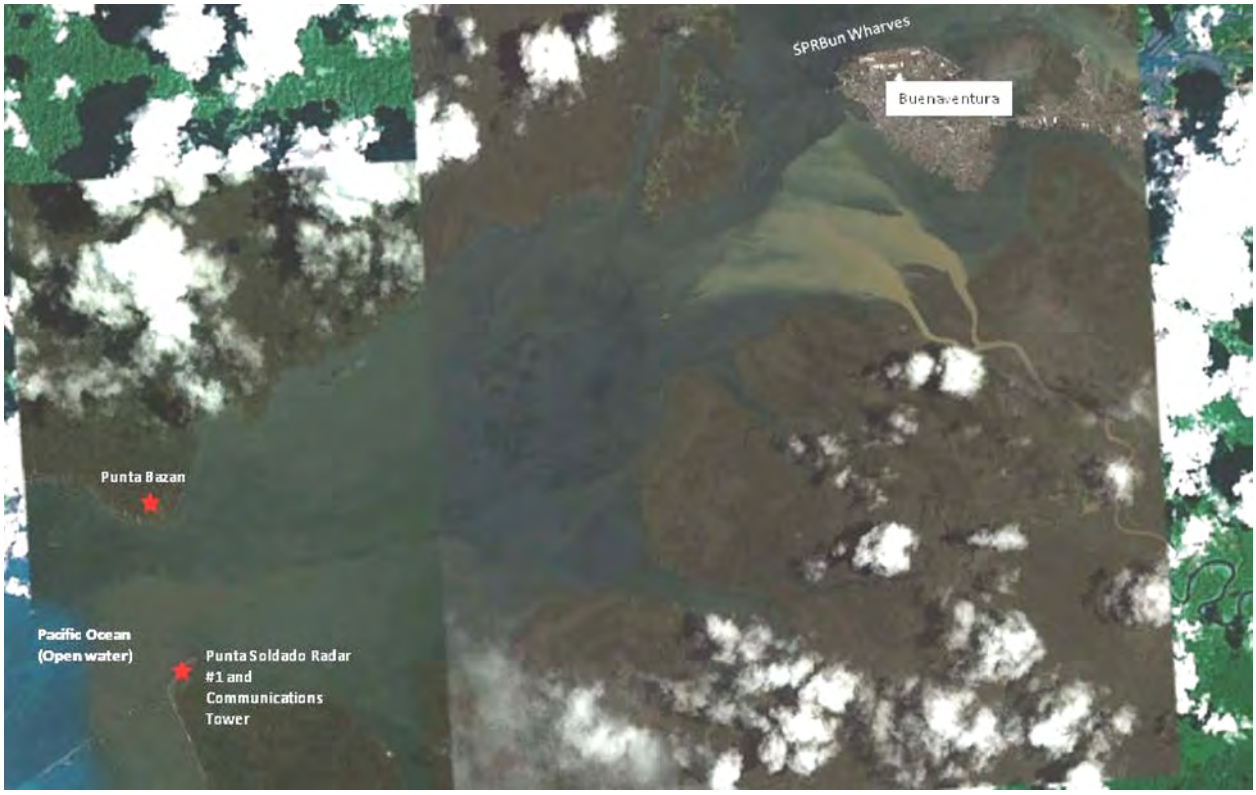

Figure 1-10 Satellite image of the access channel and docks of the Port of Buenaventura

For reference purposes, a satellite image of the port and proximity to the city of Buenaventura is provided in Figure 1-10.

The VTS should be able to do the following:

• Monitor vessels and improve the control of maritime traffic;

• Minimize the risk of collisions;

• Monitor of security zones, and ships carrying critical equipment and personnel;

• Monitor critical facilities, including terminals and bridges;

• Protect the safety of ships, crew, staff and other residents of the Port;

• Watch the boats and prevent the transfer of contraband;

• Prevent of acts of sabotage and terrorism;

• Monitor the offshore area;

• Support search and rescue efforts by providing situational awareness to responders;

• Control fishing vessels and pleasure craft;

• Pollution and law enforcement monitoring, and

• Provide navigation aids that facilitate port management.

AECOM consultants conducted a site visit and subsequently collected data available to establish the most appropriate locations for radars and other components of the Vessel Traffic System (VTS).

AECOM consultants conducted a site visit and subsequently collected available data to establish the most appropriate locations for radars and other components of the Vessel Traffic System (VTS). The visit began with a meeting with Osvaldo Molina Torrente, Pilot Spilbun, SA. The meeting was attended by Larry Boorstein, Project Manager and Billy Vanderbur, Senior Expert in Security, both of AECOM and Fernando Buitrago, an expert in Ports and Logistics, Ports and Logistics.

According to the Center for Oceanographic and Hydrographic (CIOH), "It is mandatory for all ships require services to use the pilots from the buoy at sea.

Notices calling for practical pilots must be made 48 hours before arrival or 4 hours before the departure of the ship. The request for a pilot request is made on Channel 16 or otherwise with a signal from

International Signal Code or even by whistle or horn signals, using 4 hoots for tankers and 3 for cargo and passengers.

The pilot station is located in Punta Bazán, belonging to the township instead of the entrance, which can only be reached by boat.

The pilot, Osvaldo Molina, presented a summary of the entrance to the port of Buenaventura. The pilot boarded the vessel at about 1 - 1-1/2 miles west of the buoy or northwest. The route between the sea buoy and buoy 14 was dredged to 10.3 m to sea under a year ago, but now is at 9.5 m. The channel in this area is 200 m wide. Between the buoy 15 and buoys 29/30, the channel is dredged to 12.5 m shallow sea. The channel in this area has 250 to 400 m wide. The tide goes out very strong. Between buoys 29/30 and the port, the channel is 200 m wide. Between buoys 33 and 34 the channel is 160 m wide. There are 4 rivers that enter and cause sedimentation: Dagua River, Lemons, and Cuicaya Podedo. By the buoy 36 is more sedimentation. The canal is 300 m off the port, allowing traffic in both directions. The boats reach up to 275 m in length. The MSC and Maersk ships reach to 294 m. There are two places where larger ships can cross. The turning basin off the port - Pier 2 to 9 - has a diameter of 330 m, whereas in front of Piers 10 to 13, there is 240 m. Ships can turn 90 m. It is mandatory under DIMAR the use of two tugs, even if the ship has a bow thruster.

Usually ships dock portside, but sometimes are docked to starboard. The ships tend to be up to 200 m in length. The depth alongside the quays varies between 12.5 and 20 m.

There is a channel 85 m wide and 12.5 m deep at Buenaventura Container Terminal (TC Buen). In front of the TC Buen docks, there is 50 m of width, 14 m depth in shallow sea. The turning basin in front TC Buen has 350 m diameter, 11.8 to 12 m deep.

The tidal range is 5 m. The maximum current in high sea is 6 knots.

There is radar in Punta Soldado. The base naval station is opposite the Port.

A satellite identifier is also used for coastal fisheries and coastal and passengers. Small boats do not have satellite identifier.

Afterwards, the AECOM experts met with Frigate Captain Jorge Enrique Sarmiento, Captain of the Port of Buenaventura. The next day, the team visited the port in a Coast Guard launch coordinated by the Captain of the Port. It should be mentioned that Captain Sarmiento was replaced as Captain of the Port of Buenaventura a few days after the visit by Frigate Captain Juan Carlos Roa Cubaque.

Figure 1-11 Buenaventura - Port and Maritime Traffic Control Station

Capitan Sarmiento reported that construction had begun of a 7-story station building for maritime traffic control (5 floors plus 2 additional floors.) The control station would be in the 2 upper floors. He said that the facility was expected to be operational in August / September 2011. . The site for the control center is the General Maritime Directorate (DIMAR) facility next to Hotel Estación, opposite the Wharf of Lights and Buoys. The development of the traffic control center is the responsibility of DIMAR. The official in charge is Ship Captain Marco Olier Mendoza, Chief of the Division of Captaincies, and Frigate Captain Juan Jimenez Beltrán at DIMAR. The consultants communicated by e-mail with the officials and spoke by phone with Diana Garavito, Maritime Traffic Control, DIMAR in early February 2011. In February 2012, it was noted that the 5-story building had been completed, but the control tower atop the building, mechanical and electrical systems remained to be completed, in addition to installation of the VTS equipment.

Figure 1-12 Maritime Traffic Control Station

Figure 1-13 Site of the Maritime Traffic Control Station (other side of the fence) seen from the Hotel Estacion

According to previously published information, the site for the traffic control station consists of an area of 1243.4 m2, adjacent to the Hotel Estacion. In a presentation before the visit, Captain Sarmiento said they "will build a seven-story building. The station will cover Cape Corrientes, the mouth of the Naya River, with emphasis on the estuary of San Antonio, the Port area and the containers area. Cargo, cabotage, fishing and tourist vessels will be monitored. "

In the Port Authority, there is an Automated Identification System (AIS), developed with input from the American government.

According to Captain Sarmiento, computer / telecommunications equipment is Portatel, Panasonic F-30, and uses Windows XP running on an Intel Centrino Duo processor with 1 GB RAM, wireless, 80 GB HD.

Captain Sarmiento noted the existence of the current radar in Punta Soldado, at the entrance to the channel to the port of Buenaventura. He also reported that on that site, there is a marine infantry company and a generator. The signals are transmitted between Punta Soldado and Buenaventura by VHF.

The Captain arranged a visit to the Port, the bay and the entrance channel between Punta Soldado and Buenaventura on a Coast Guard boat. Larry Boorstein, Project Manager, Billy Vanderbur, Senior Security Expert, both of AECOM, Fernando Buitrago, Ports and Logistics Expert, and Manuel Arango, Ports and Terminals Expert, both of Ports and Logistics, Seguridad Atlas Ltda. staff, accompanied by five Colombian Coast Guard crew members armed with assault rifles.

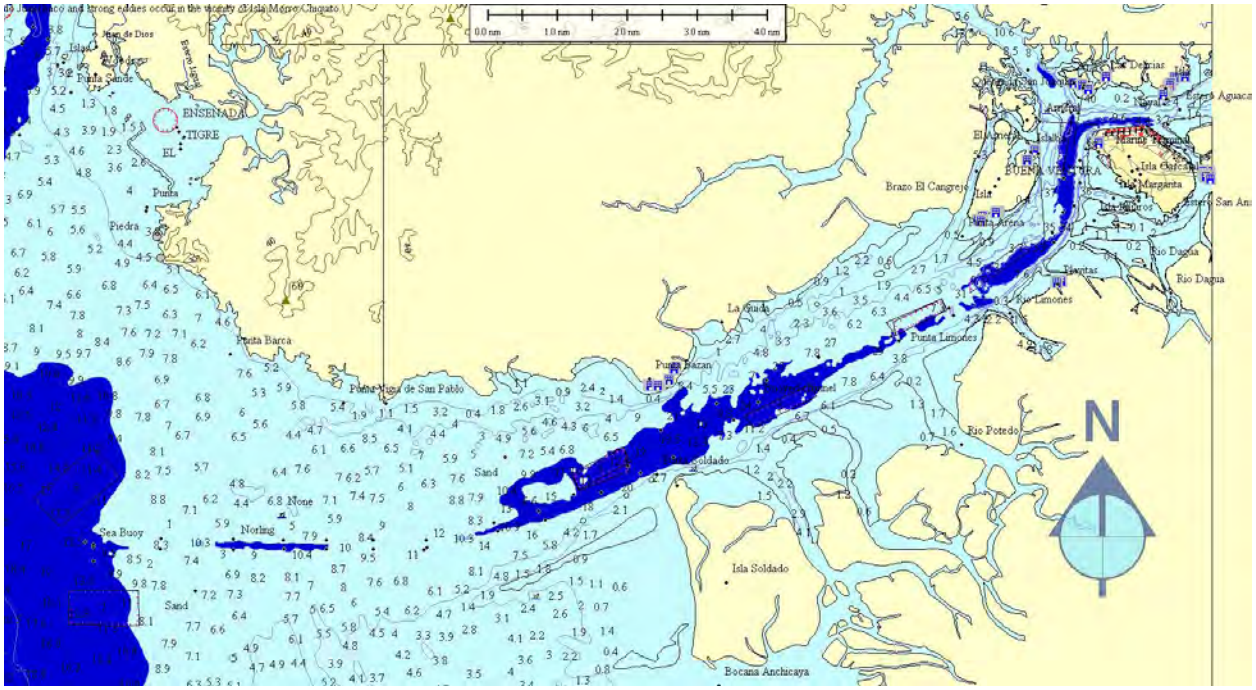

Figure 1-14 Navigation chart of the entrance to the Port of Buenaventura – The approach extends from the Sea Buoy at left to the Buenaventura marine terminal at right. Isla Soldado, site of the present radar installation can be seen

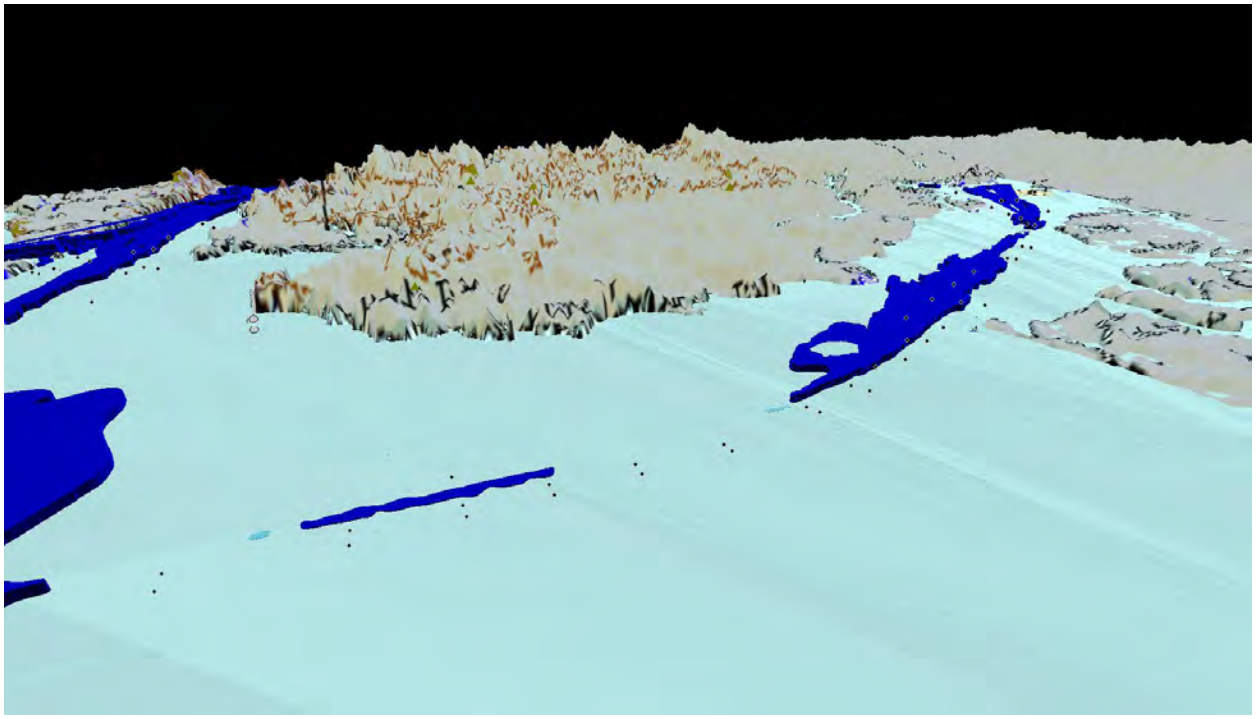

Figure 1-15 Nautical and topographic view of entrance channel to the Port of Buenaventura The hills can be seen around the channel

Figure 1-16 Punta Soldado - The building, radar tower and radio tower can be seen.

Punta Soldado is on the bank to the left (south) side of the harbor entrance. Buildings were noted, and 2 towers, 1 radio and 1 radar, according to a Coast Guard crew. The radar transmits radio to Buenaventura. There is an electric generator operated by the General Maritime Directorate (DIMAR).

There is a marine infantry company. There is no road. There is no microwave transceiver on Punta Soldado. Microwaves are transmitted directly from the boats to the hills.

Figure 1-17 Punta Soldado - Radar Tower

Figure 1-18 Punta Bocano - Cell Tower

In Punta Bocano, in the right estuary (north) of the harbor entrance, an indigenous area with some houses, there are 2 cell towers (according to a Coast Guard crewmember). There is no road, but there is a power line.

Figure 1-19 Isla Guardacostas (Coast Guard Island) – There are 4 towers for military radio, telecommunication to boats, link with Punta Soldado and infrared images of the Port

Coast Guard Island is the other side (north) of the river port of Buenaventura. 4 towers were noted, a military radio, telecommunications to boats, a link to the radar station in Punta Soldado, and one for infrared thermal imaging (IR) port, according to a Coast Guard crewmember.

The visit in the Coast Guard boat also reached the sites of the new terminal of TC Buen, the Aguadulce terminal and Aguacate, near Coast Guard Island. At TC Buen the pier, gantry cranes and yard cranes were noted. At Aguadulce, where there is a planned site for a new container and bulk terminal, there is a road under construction, according to a crewmember.

Figure 1-20 San Antonio Estuary - site used for small fishing boats.

The San Antonio Estuary is south of the island where the port is located. Fishing boats were noted in this estuary moored along the estuaries and marine infantry stations according to a crew member.

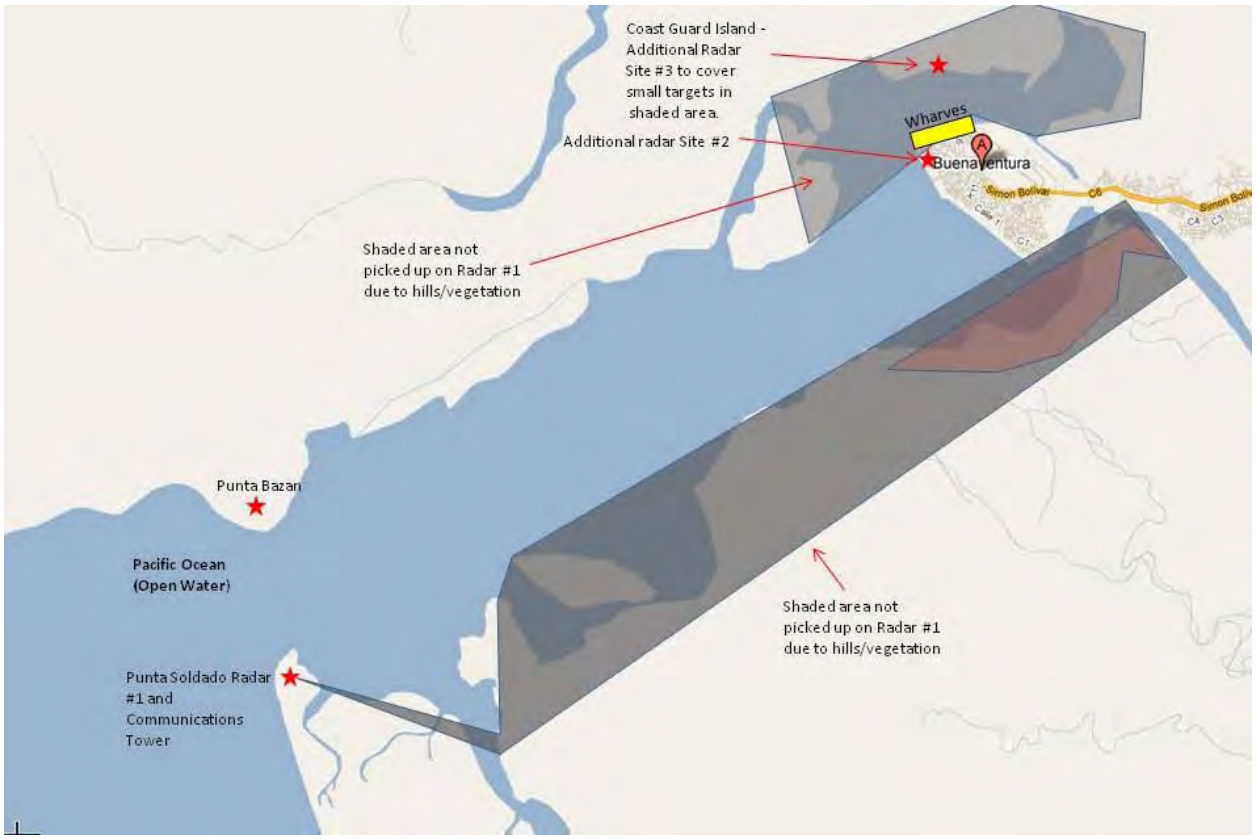

Figure 1-21 Existing and proposed sites for VTS radar system

Existing and potential sites for radar included in the VTS system is shown in the figure. A radar is located at Punta Soldado. Another radar would be located in Buenaventura. A third radar would be located in the Coast Guard Island across from the docks of the Port. The last radar would have the ability to monitor smaller targets near the port. Between the two main radars, it would be possible to cover the entrance channel and the waterfront area of SPRBun, as well as routes to the new terminals of TC Buen and Aguadulce. The radar would observe the ships transiting the shipping channel between the sea, the Port and the new terminals.

The graph shows the areas that would not be sufficiently visible to a single radar at Punta Soldado, due to the impacts of vegetation and the elevation of the land along the waterway. Any small boat in estuaries will be below the elevation of local terrain and could not be detected. To mitigate this, a radar (or radars) are needed on the opposite side (north) of the channel across the estuaries of the south, for example in Punta port entrance, a tall tower for the radar line of sight to look out the mouth of each river or stream. However, this location is considered to be impractical because of the remoteness of the sites needed, and the lack of infrastructure and means of protecting the facilities. However, the view of the navigation channel offered by the proposed radar, would provide detection and tracking of any boat that comes out of the estuaries into the main channel.

Concepts of the VTS System

International standards, specifically the International Ship and Port Facility Code (ISPS) and the Safety of Life at Sea Convention of the International Maritime Organization (SOLAS V), mandate Automatic Identification of Ships (AIS). The International Maritime Organization's Resolution A.837 and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation V-128 establish guidelines and technical requirements for Vessel Traffic Services (VTS). A VTS is "a service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with vessel traffic and respond to traffic situations developing in VTS areas."
The VTS combines and incorporates several historically proven techniques, procedures, technologies, practices and standards. The radar, AIS vessel tracking, features, frequency and power of radiotelephone equipment must respond to the specific operation and technical conditions. Ship routing involves a complex series of measures to reduce the risk of accident, including traffic separation schemes, two-way routes, roads, areas to be avoided, inshore traffic zones and deep water routes.

In general, the VTS begins with the acceptance of users. Participation will result in a high level of efficiency, so that voluntary participation is the preferred approach. Other factors, such as transportation requirements, international agreements, and user acceptance of low participation may require regulatory action. The state authority establishes mandatory regulations, in consultation with established groups of industry representatives and maritime users.

In areas where a VTS has been established, restrictions and control of movement of ships in emergency situations are coordinated through the Vessel Traffic Center (VTC) to the extent possible. The VTS can have specific regulatory authority for maritime traffic control if necessary. Where the VTS specific regulatory authority has not been established, the controlling state authority must ensure instructions allow VTS shift staff to give instructions when necessary to control and monitor ship traffic congestion

conditions, weather conditions, reduced visibility, or other hazardous conditions, and to specify the times when ships can enter, move within or through, or leave the VTS area.

The operators of the VTS must have the authority to direct a vessel in an emergency to slow, stop, anchor, or to take steps to avoid a dangerous situation. However, the operator of the vessel at all times remains responsible for the safe and prudent maneuver of the vessel. The operator can choose to ignore an order to the extent necessary to avoid endangering persons, property or the environment, and must report all actions promptly to the VTS.

Following the development of automatic identification system (AIS), a vessel movement reporting system (VMRS) is the cornerstone of any VTS. It is generally a VHF-FM radio communications network which allows contact with the vessels in the VTS area. Participating ships provide the Vessel Traffic Center (VTC) with information on location, expected movements, dimensions, loads and conditions that may adversely affect safety of navigation (such as discrepancies in aids to navigation and obstructions in the routes). The VTC supervisor ensures that the absolute minimum amount of time is required to provide the necessary exchange of information between the VTC and users. This encourages high voluntary participation as vessel operators need a minimum of communication, or attempts to communicate with the VTS. Vessels participating in a mandatory VTS must maintain a continuing radio track on the designated VTS radio frequency while transiting the VTS area. Vessels participating in a voluntary VTS should be encouraged to continuously monitor the designated VTS frequency.

The VTS has the capability to perform various tasks related to security and maritime domain awareness. Each VTS is equipped with surveillance capabilities, including radar and low light level closed circuit television (CCTV), an extensive communications system and a command center.

The Vessel Traffic System (VTS) as proposed would facilitate the operations of the port by providing current information on where all the inbound, outbound, anchored or moored ships are, and would track the movements of ships. VTS systems are employing the use of ground radar to provide real-time tracking of all objects in the water, from larger vessels to smaller vessels, such as fishing vessels, or a single person floating on a raft.

These systems have historically used various technologies including radar, geographic positioning systems (GPS) and Automatic Identification System (AIS). Using AIS, it is possible to identify and track a vessel with the receivers that communicate through AIS transponders fitted on board the ship. The radar allows the identification of the ship's location by determining the direction and distance of the radar using radio waves. The signal can be assigned to a specific location by using GPS satellites and the vessel is tracked on a map of the bay, river, lake or ocean. The AIS system is a proven technology that prevails throughout the world and system reliability is very high. The AIS system transmits relevant data of the vessel, including vessel name, owner, location, etc.., which is then received by the VTS and tracking system within the capacity of the antenna. Usually signals used for AIS are very high frequency (VHF). Therefore, the placement of the antenna (or antennas) is essential to ensure the maximum range of the system (usually a communications tower construction or at the top of a hill).

The system can integrate information on the location of the ship from the VTS radar with identifying information from the AIS system and display it on a screen together. This integration compensates for

the inability of the AIS to identify the many smaller vessels that do not have AIS and are essentially invisible to the AIS but that can be seen on radar. A limitation of the radar system is that it is not able to penetrate through objects such as hills. This is mitigated by placing multiple ground radar installations to provide greater coverage.

This water level radar system can also be integrated with closed circuit cameras (CCTV) to provide real-time tracking of any object in the water.

The CCTV images, such as thermal infrared images, can be integrated with the system of vessel traffic control VTS, automatic identification systems (AIS) and advanced radar plotting aid (ARPA). A ship or event (for example, speeding in a ship, boat lower in the water or entering a restricted area or moving at night after curfew, etc.) can automatically trigger a CCTV system to send a visual alert to operators over a local or wide area network with an image of a PTZ camera that the operator can control and zoom as needed. If a particular ship is "labeled" for the supervision of an agent, a series of CCTV cameras can be programmed to keep the vessel in view by transferring the vessel between the cameras to allow monitoring of a vessel from one camera to another along its route. A well designed CCTV system with appropriate cameras with zoom lenses is able to see and even recognize the identification numbers (through OCR) on the side or stern of a vessel to verify the information transmitted through the AIS or to enable the software to determine the identity of a vessel that lacks an AIS.

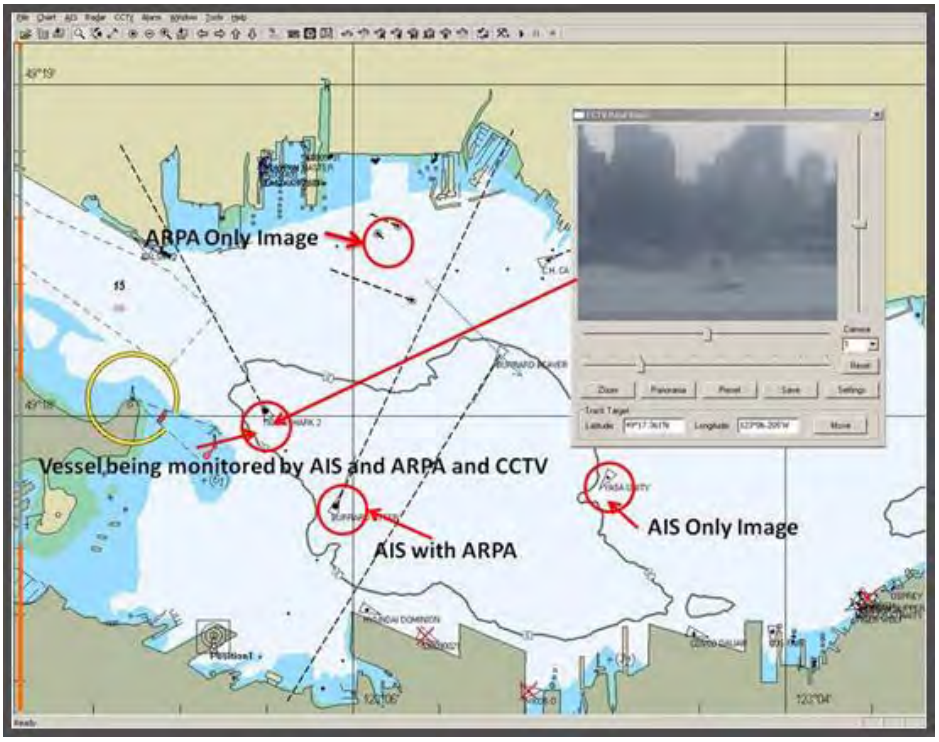

Figure 1-22 Integration of CCTV with VTS and AIS

1.3 Conduct detailed observation of the entrance and exit gates

There are five gates, including four entry / exit cargo gates and a pedestrian, identified in Figure 1-23.

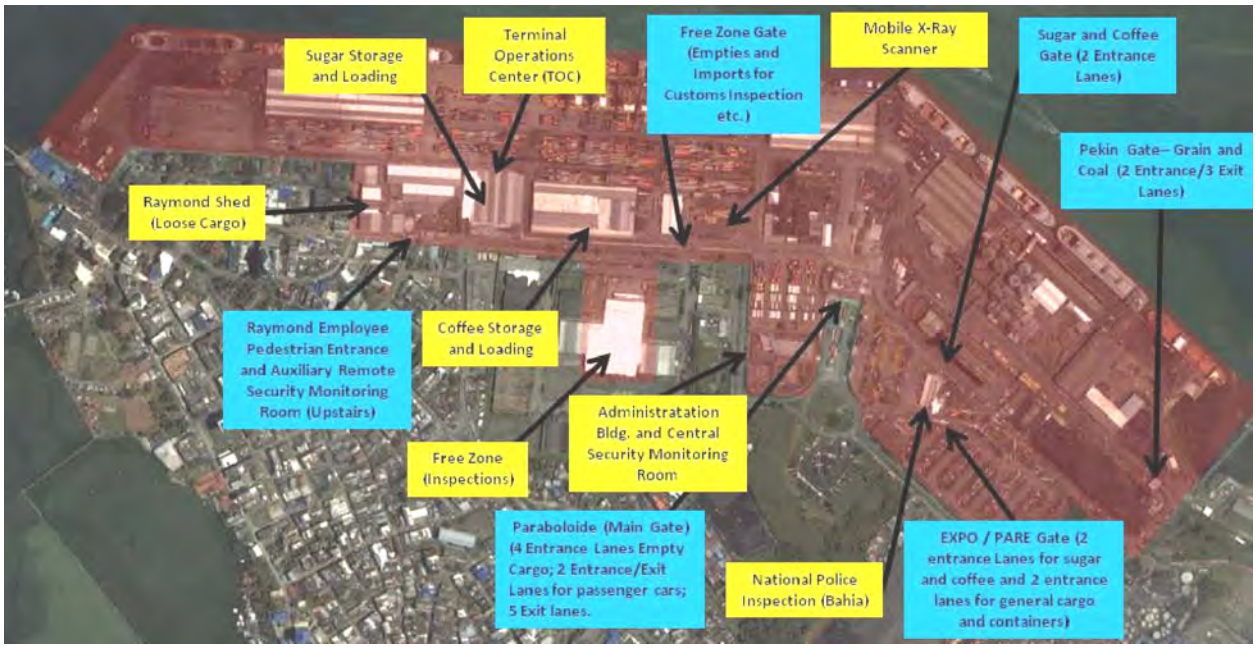

Figure 1-23 Port of Buenaventura - Location of gates and other elements

The purposes of the various gates are summarized in the table below.

Gate	Lanes	Direction	Type of Traffic
Paraboloide	4	Entrance	Empties
	2	Entrance / Exit	Passenger vehicles (not cargo)
	5	Exit	General cargo (breakbulk), empties, full containers
	2	Entry / Exit	Entry / Exit from PARE / EXPO / Bahia
PARE / EXPO	2	Entrance	Coffee and sugar
	2	Entrance	Export general cargo (breakbulk) y export containers
Free Zone	1	Entrance / Exit	Interchange of cargo from SPRBun with areas of old Free Zone for inspection and entry of empties
Pekin	3	Exit	Grains, oversize cargo, empties for local depots
	2	Entrance	Coal and empties
Raymond	NA	Entrance / Exit	Pedestrians - employees and workers

Figure 1-24 Entry and Exit Gates for Cargo, Vehicles and Pedestrians in the Port of Buenaventura (SPRBun)

1.3.1 Paraboloide Gate

The Main Gate, also known as Paraboloide or Paraguas (umbrella) Gate (due to the shape of the structure) is the entrance gate for empty containers, and the exit gate for full containers, general cargo (loose or breakbulk) and empties. The Paraboloide Gate has four (4) entry lanes and (5) five exit lanes, each with a barrier gate arm and a traffic signal as a sign to stop / proceed. In addition to the 9 lanes for commercial vehicles, the gate has two (2) entry and exit lanes for passenger vehicles. Vehicles entering the port to stop at the barrier arm and wait for the process of validating the driver, vehicle and cargo. Once all checks have been carried out, the Port staff must use an Ingersoll Rand Schlage Recognition Systems HandKey biometric reader with PIN code found on each lane to open the gate and let the vehicle pass through the lane next destination.

Figure 1-25 Main Gate - Entry Lanes

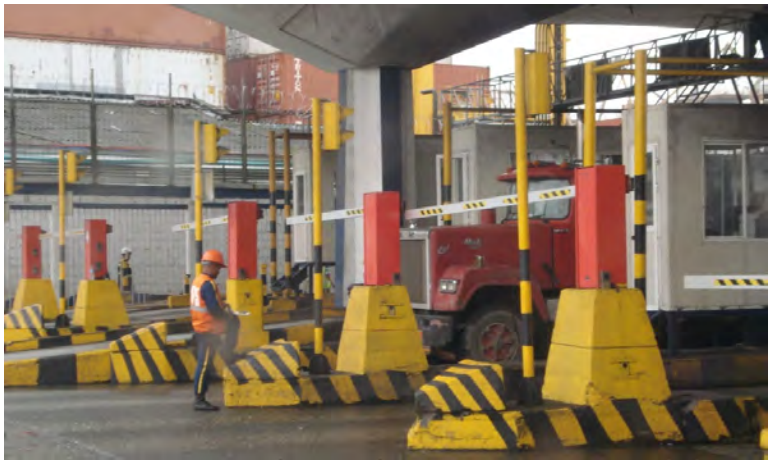

Figure 1-26 Main Gate - Exit Lanes

At the main gate, Paraboloide, there are 4 entrance lanes with 3 scales, one without a scale but within, there are. Empty containers and general cargo enter. There are 5 exit lanes, 3 with a scale and 2 without a scale.

1.3.2 Zona Franca (Free Zone) Gate

The Free Zone Gate is used for entry and exit of containers proceeding for inspection in the former zone across the street and for the entry of empty containers. The driver must open the doors of the container in the back of the truck before entering the secure area of the port. The guard conducts a thorough check of the documentation relating to the container, inspects the driver's documentation, verifies delivery according to the daily schedule, and then allows the driver to have access to the facility, directing the driver to the delivery site.

Figure 1-27 Free Zone Gate from Public Road towards the Port

Figure 1-28 Free Zone Gate from the Port to the Public Road - In the background is the entrance to the old Free Zone

There is a physical sliding gate, but it was observed throughout the week of the visit to be left open. Normally there are two guards at the door at all times. The presence of the guards helps ensure that pedestrians or vehicles do not enter or leave without permission. However, a vehicle can easily penetrate the wide opening with no means to stop the vehicle. Moreover, once the vehicle gets inside, the occupants could exit at any point and be undetectable, at least for a while.

As can be seen in the photo, there is another gate on the street side of the former free zone across the street, across the street from the Port. It was reported that the gate is not monitored, as it is now a public area. The inspection area is in an area within the former zone. The containers come directly through this door to and from the inspection area.

If it is necessary to leave the gate open, it is recommended that "pop-up" bollards be installed that can be raised or lowered when needed. When entry or exit of containers through the gate is not anticipated during a period of time, the bollards should be in the up position. This will prevent a vehicle from the entering the port from the public road deliberately or accidentally. It could also potentially save the lives of Port staff working in the operation of the gate.

Figure 1-29 Bollard type security barrier

Due to the lack of a lane structure and the gates on both sides of the street (one of which is a port gate and the other the former free zone gate), the gate requires additional consideration regarding the potential installation of barriers or optical character recognition (OCR) systems to monitor and identify trucks and containers proceeding between the port and the inspection zone. It is important to ensure that containers come directly across the street, and not turn onto the public road that runs between the Port and the Free Zone where cargo is inspected.

1.3.3 EXPO (PARE) Gate

The EXPO (PARE) gate is dedicated to vehicles transporting goods for export except grain and coal. There are two (2) inbound lanes dedicated to sugar and coffee and two (2) lanes for containers and other general cargo exports. Vehicles approach the gate, which is kept closed, except to allow vehicles to pass, and is closed immediately after their entry. There are two barrier arms that define the inspection area. One arm is raised to allow the vehicle to enter the inspection area and closed behind it. The arm in front remains closed until a vehicle is permitted to proceed.

The container comes with several seals, including seals on the doors that were installed by the shipper. When the vehicle enters, the police from the National Antinarcotics Police compares the of 2 to 3 or 4 seals on the container with the letter of responsibility from the exporter, which gives assurance that the cargo does not contain contraband or prohibited material. Port staff receive paperwork from drivers and validate the information contained in the documents. They make a schedule to the Customs agents. The Antinarcotics Police make a profile, which determines whether the container will be subject to physical inspection or inspection of documents. The seal is removed and a new seal is installed by the Antinarcotics Police and the unique number of the seal is also entered in the database.

Figure 1-30 EXPO Gate - Container Entry Lanes

The exterior inspection of the vehicle at this gate is quite complete. This includes a visual inspection of the entire vehicle and may include observation from a catwalk above the vehicle. Once all checks have been carried out, Port staff must use the HandKey biometric hand reader found in each lane and enter their PIN code to open the gate and allow the vehicle to pass through the entrance lane to the next destination.

The National Police make the decision on whether the container can proceed directly to the container yard or requires an additional inspection at the Bahía (Bay) Inspection facility. If additional inspection is required, the vehicle is driven to the inspection bay. Containers are also brought back from the yard for inspection. The container inspection requires the presence of the National Police, while the container is unloaded with all the elements completely unwrapped, counted and repacked in the container. The staff of the agent performs the unpacking and packing of the container under police observation.

Some of the containers are subject to joint inspection by the Antinarcotics Police and other entities, which include the Directorate of National Taxes and Customs (DIAN), the Colombian Institute for Monitoring of Foods and Medicines (INVIMA) and the Colombian Agricultural Institute (ICA). Cargo is inspected in specific areas, depending on the agency and type of cargo.

Figure 1-31 EXPO Gate and Bahia

Figure 1-32 EXPO Gate - Sugar and Coffee Lanes

1.3.4 Pekin Gate

Pekin Gate is located at the eastern end of the port. It has three (3) inbound lanes for coal and empties, and two (2) exit lanes for grains, oversize cargo and empties for depots. There is a large volume of traffic at the intersection where vehicles enter and leave this gate. There are other concessionaires on the opposite side of the road, which also receive a high volume of traffic. Overall, this intersection can be very problematic, causing delays in the entry and exit of this area.

The operation pattern of entry and exit is similar to that carried out at the Paraboloide or Main Gate. Once all checks have been carried out, Port staff must use the biometric hand reader with PIN code in each lane to open the gate and allow the vehicle to pass through to enter or exit and proceed to the next destination.

Figure 1-33 Pekin Gate

1.3.5 Raymond Gate:

Raymond gate is used for entry and exit of pedestrians, employees and workers. Personal vehicles are prohibited in the port. Therefore, employees and workers have to park their vehicles outside the port or arrive on transit and enter the site through the Raymond pedestrian entrance. The gate is well covered by fixed CCTV cameras in the entry and exit. There are HandKey biometric hand scanners with PIN codes on both sides of the entrance to monitor staff both entering and exiting. The entry has three (3) security turnstiles and is complemented by the security guard staff both at the entrance and at the exit. The current security level in the Port is well posted in this entry.

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Figure 1-34 Raymond Gate - Port side

Figure 1-35 Raymond Gate – street side

There is a security monitoring center located high above the entrance where there is a single operator with 6 CCTV monitors.

1.3.6 Cargo Flow in the Marine Terminal

In a meeting with AECOM experts, Mr. Hector Medina Carrillo, Commercial and Customers Service, Sociedad Portuaria de Buenaventura, explained the process for imports and exports. Larry Boorstein, Project Manager and Billy Vanderbur, Senior Security Expert, both of AECOM and Fernando Buitrago, Ports and Logistics Expert and Manuel Arango, Terminals and Logistics Expert, both of Ports and Logistics. The presentation covered the items below:

Imports process

The procedures for import trucks are:
1. Cargo agents pay the bill and request removal of containers;
2. With the "bill of lading," they obtain the release of the cargo by DIAN and pay tariffs to SPRBun.
3. They present a FOT (Free on Truck) order;
3. Cargo ticket;
5. The truck makes an appointment to enter the port;
6. They present documents at the gate;
7. They receive the P-Check (the Cosmos Terminal Operating System (TOS) document) with the number of the container;
8. The rubber tired gantry crane (RTG) recovers the container from the yard;
9. The truck returns to scale for weighing;
10. The truck goes to the exit and presents the P-check with the weight;
11. Hands in 2 documents at the exit door.
12. Gets an Equipment Interchange Receipt (EIR). The EIR includes the number of the container, the plate of the truck and ship voyage. The EIR is prepared in 3 copies: one for SPRBun, one for the client and one for security.

Export process:

For exports the process begins with the order of BKG ("Booking") as follows:
1. The BKG order is reviewed in two lines, containers and coffee and sugar;
2. Cargoes are assigned to the inspection area;
3. 20 percent of export cargo is inspected. Exports to Peru and Chile are not inspected. Exports to the United States and Europe are inspected.

New exporters are considered suspects and are inspected more intensively.

1.3.7 Terminal Control System

The agents have access to the Cosmos, Container Terminal Control System (CTCS). Cosmos is a system developed by Cosmos, NV, a Belgian company based in Antwerp.

The AECOM team carried out a visit to the Terminal Control Room and a meeting with personnel in charge, Astrid Carolina Mosquera Moreno, Coordinator of Storage and Jose Tello, Dispatcher, Sociedad Portuaria Regional de Buenaventura. Larry Boorstein, Project Manager, Billy Vanderbur, Senior Security

Expert, both of AECOM, and Fernando Buitrago, Ports and Logistics Expert and Manuel Arango, Terminal and Logistics Expert, both from Ports and Logistics.

Mr. Tello explained the process of terminal management with Cosmos. The terminal is managed by the contractor, Terminal Especializada de Contenedores de Buenaventura, S.A. (Specialized Container Terminal of Buenaventura, SA) (TECSA). The process is as follows: P-check confirms the entry of the container, when it is grounded, leaves position where it is to be unloaded, the RTG leaves, transfers to the yard, monitored via sea, and enters by land.

Data is entered to the Container Terminal Control System (CTCS) using a Psion Teklogix handheld radio frequency terminal (RFT).

The Directorate of National Taxes and Customs (DIAN) gives an ISP list with the order to move the load to an inspection area. There may be a pre-inspection (PRE) on request. In addition to DIAN, there are inspections by the Colombian Agricultural Institute (Instituto Colombiano Agropecuario) (ICA), National Institute of Food and Drug Monitoring (Instituto Nacional de Vigilancia de Medicamentos y Alimentos) (INVIMA) and National Antinarcotics Police (Policía Nacional Antinarcóticos) (PNA).

In the control room, operators are seated in front of 42-inch CCTV screens showing the areas of docks and container yards. There is currently 1 CCTV HD screen, but there will be 3. Each of the operators has 2 Lenovo monitors, keyboard, mouse and Motorola trunking telecommunications equipment.

The operators present in front of the control room are:
1. TECSA responsible for taking containers for inspection
2. TECSA, responsible for bringing back from inspection
3. TECSA responsible for import
3. SPRBun, responsible for land entry and exit
5. TECSA, responsible for maritime exit and export
Two posts in the back of the room (6 and 7) TECSA, plan shipments.
Three additional posts in back were empty at the time of the visit.
SPRBun handles entries / exits from ground transportation. All other operators are TECSA.

The control room operates 24 hours a day with 3 shifts: 0600-1400 hours, 1400-2200 hours and from 2200 to 0600 hours.

The system uses a combination of microwave and narrow-band transmission for real-time tracking of all containers for loading / unloading / storage operations.

Figure 1-36 Site of the Container Terminal Operations Center

Communications with the RTG crane is through the Operations Center operators.

The terminals are separated from the rest of the port operations by a wire mesh fence. There are signs on the fence stating that it is forbidden to enter. The terminal area is monitored with color PTZ cameras. CCTV cameras are mounted below the light towers about 30 m, which represents an observation point with a very good view.

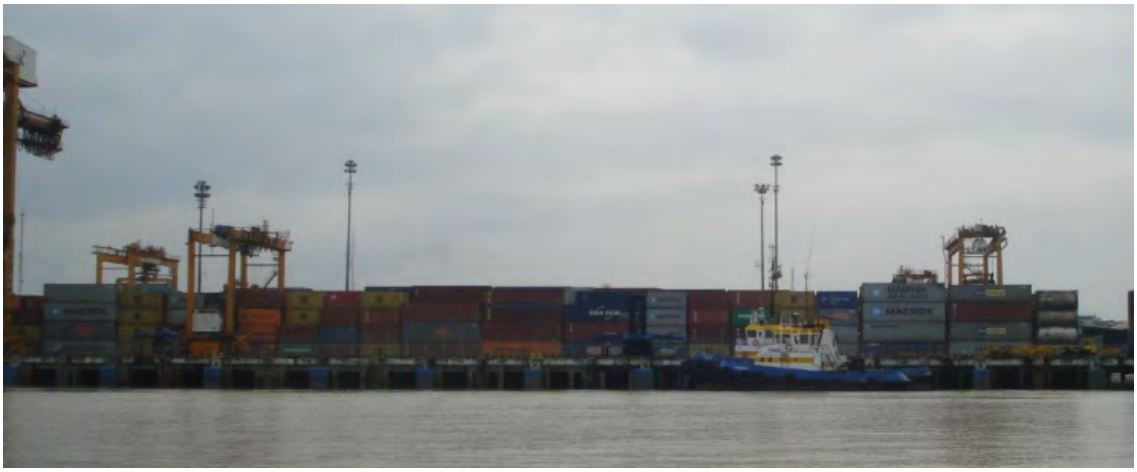

Figure 1-37 Container Terminal

1.3.8 IT and Telecommunications Infrastructure

The AECOM working group held a meeting with Mr. Miller Ortiz, Manager of Information Technology and Telecommunications, SPRBun. Larry Boorstein, Project Manager and Billy Vanderbur, Senior Security Expert, both of AECOM, Fernando Buitrago and Manuel Arango of Ports and Logistics.

The Department of Information Technology is responsible for the computer infrastructure which supports the terminal operating system, finance, human resources. The Engineering Department is responsible for CCTV, fiber optics, software, networks, logic, routers and perimeter security team, not the Department of Information Technology and Telecommunications.

SPRBun uses Cosmos as its terminal operating system. The system integrates with OCR Cosmos. TC Buen uses Argus TCB. Cosmos is capable of a graphical interface. Mr. Ortiz said that Cosmos has its rigidity.

According to Mr. Ortiz, the gates are handled manually. The keyboard is used for entries and exits. Mobile equipment is from Psion Teklogix. The radio network is "narrow band." The system generates an Equipment Interchange Receipt (EIR), the document for vehicle exit.

Internal electronic seals which are monitored are used. Container doors can be removed without breaking external seals. Export seals are used inside containers. Bottle seals are used.

The following equipment was noted in the computer room:

Makes and Models

IBM System i5 4 GB Ram 1 TB disk
IBM System Storage
IBM Server p5
2 x IBM e server
HP DVD
- Finance
- Human resources
- Windows
- Firewall

Cisco 800 series
Cisco 800 series telecom
Infogate 3010
2 x Dexson
Alcatel Lucent
OmniSwitch 6850-24
2 x RF Controller Teklogix 9400 P com
Cisco 2800
5 x AMD Netcomm
Optical fiber
3com
Raisecom RC512-Fe-SX3
Dexsan

1.4 Identification of the location and coverage of the present closed circuit television and intrusion detectors

At the time of the visit, the security control was provided by the Port Security Department, through contractors, Emprevi and Internacional de Seguridad (now Fortox) and the National Police. Emprevi focused on electronic surveillance of the Port. Internacional de Seguridad provides physical security. The National Police reviews and revises export cargo aboard ships. Emprevi and the Police use the closed circuit television (CCTV) system for monitoring. Subsequently, the contract of Emprevi expired December 31 2010 and the GS4 contract entered into force January 1, 2011, so that GS4 became responsible for electronic security.

The Port has CCTV systems as part of the Integrated Electronic Security System (SISE) covering the items listed below.

CCTV: The aim of the system is to monitor and record the operations and activities of the maritime terminal. According to Hector Medina Carrillo, Sales and Customer Service, the system has 363 fixed and mobile cameras distributed throughout the terminal. The system includes 300 fixed cameras (180 from SISE 1 and 120 from SISE 2) and 69 mobile cameras (57 of SISE 1 and 12 SISE 2) and 21 digital recorders to store security events 24 hours a day. The system includes special equipment for monitoring the internal navigation channel under any visibility condition. Likewise, the port has recording for 75 days. The Port has a force of 180 men provided by Internacional de Seguridad to ensure the physical security of facilities. Security personnel can respond to situations observed by alarms and the CCTV system.

The AECOM team reviewed the camera system and central control and intrusion detectors in order to assess the effectiveness of its coverage and the potential for computer monitoring or other upgrades. Computer monitoring of the CCTV network and access control system along the perimeter fence can improve the effectiveness of the existing visual procedures and programs. Computer monitoring can include centralized computer evaluation of signals from existing cameras and sensors or the incorporation of intelligent cameras to provide computerized visual analytics coupled with the existing fence intrusion protection system, as well as utilization of Physical Security Information Management (PSIM) systems to enhance situational awareness and the ability to respond effectively to events.

1.4.1 Security Operations Center Port

The Department of Security of the Port is located in the Administration Building. The building sits on land the Port, but outside the main gate. The building is protected by a fence and a guardhouse manned

by security guards of the contractor, Internacional de Seguridad. The Port Security Operations Center is located in the area of Port Security office in the Administration Building.

The AECOM team was accompanied on the visit by TE José Roosevelt Ortiz Quintero, Security Supervisor, Mr. Gilbert Clavijo and Alex Garcia, Maintenance Engineers and Jimmy Ivan Preciado, Service Coordinator with Emprevi, the company responsible for surveillance at the Port at the time of the visit.

The approximate design of the Security Operations Center is shown in Figure 1-38.

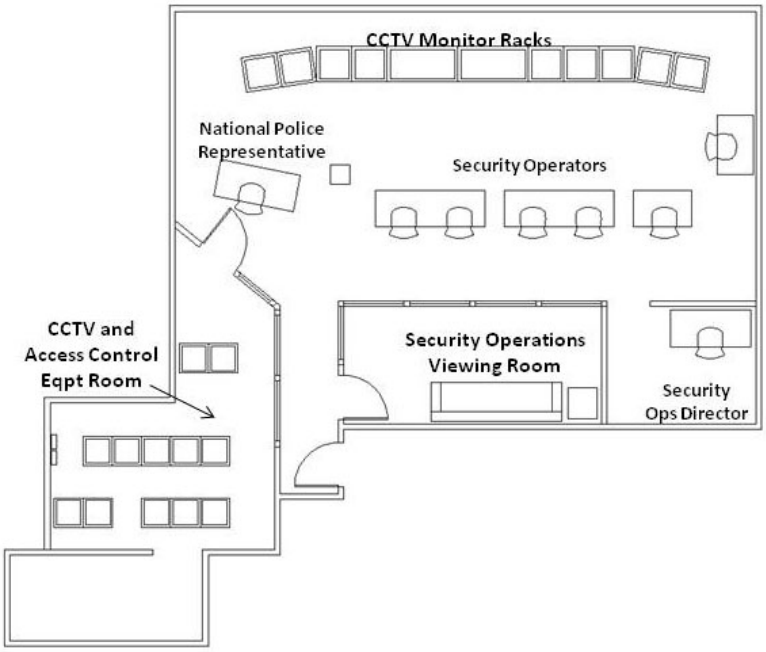

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Figure 1-38 Layout of the Security Control Center

The security office is open 24/7/365. There are 7 operators per shift. There are 5 positions assigned to the security agents who are watching the CCTV images, a coordinator of security services and one for a representative of the National Police. Security operators and the security supervisor are provided by the contractor, Emprevi.

The 5 operators from the contractor monitor, respectively, 30 cameras, 30 cameras, 20 cameras, 67 cameras and 33 cameras. The first four are camera controllers. They have keyboards to control cameras and communication devices. The cameras include fixed and mobile cameras. The security system includes "pre-set" camera positioning to show the relevant cameras on the screen of an operator when an intrusion detector detects and intrusion event interpreted as such by the fence protection system, and to scan the site with a mobile camera. Operators can also select the camera with the keyboard.

The operators use Avantel as the communications system. The fifth operator controls the access to the Port. The fifth operator monitors, in addition to the cameras, HandKey biometric sensors used in the Port. The operator has the ability to see via CCTV the images of persons seeking entry at the gates with the HandKey terminal. Besides the Avantel system, the latter operator has Motorola radio and cell phone. In addition to the security agents that monitor the images, there is 1 permanent editor per shift and one video editor that handles the input database.

Operators use Motorola radios, Motorola Avantel equipment and cell phones to communicate with field staff. The digital technology of the Integrated Digital Enhanced Network (IDEN) of Avantel, developed by Motorola, integrates in single piece of equipment four digital mobile communication services: digital trunking (Immediate Communication); Telephone access (Telephone connection), alphanumeric messaging (text messaging) and access to the Internet and / or corporate networks (Data transmission). Avantel provides digital trunking services in Colombia.

According to Mr. Gilberto Clavijo, Maintenance Engineer, SPRBun, images come through microwave and fiber to the tower next to the Administration Building, where they enter through a fiber network. Then they are converted in an interface to go through coaxial cable to the monitoring room.

The cameras provide 100% coverage of the main gate and 10% in total of the port.

The CCTV monitor wall consists of (32) Panasonic WV-CK2020A 17 "LCD color monitors, (1) which display the image from the camera and a 37-inch LCD color screen which displays the image from the FLIR thermal infrared camera located on Coast Guard Island across the from the docks of the port, and a 42 "LCD used for the specific camera called up by the operators.

Figure 1-39 Security Control Center

A second monitoring site is located near the entrance to the employees in Raymond. This is a position of a sole operator looking at 6 video monitors.

1.4.2 Closed Circuit Television (CCTV)

The closed circuit television (CCTV) system is composed of about 363 Panasonic cameras, including both fixed and PTZ and both black and white and color. The cameras are connected via coaxial cable to select interface locations throughout the port. The signal is converted from coaxial cable (analog) to the fiber (digital) with rack mounted GE Security card cage transceivers and fiber is routed to the CCTV and Access Control Center of the Security Office. Here, the fiber is converted back to coax and is routed to the rack of the Administration Patch Facility, where they cross connect the wires to the racks containing the Digital Video Recorders (DVR).

The DVR includes Panasonic WJ-RT416 with 16 video channels and 3 TB of storage for standard cameras and Panasonic WJ-HD500B Digital Disk Recorders. “The WJ-HD500B Digital Disk Recorder (DDR) is a combination of a Hard Disk Recorder with a Video Multiplexer; it is able to record the images of up to sixteen sequentially controlled video inputs on the built-in hard disk” (Panasonic Installation Manual). The CCTV cameras, DVRs and DDRs are managed and controlled with a Panasonic WJ-SX850 Video Switch and Panasonic WJMPU850 CPU for processing and distribution of video recorders and monitors. As part of the Panasonic 850 solution that is installed, the Panasonic WV-CU850 Ethernet System Controller is used for security operators to control the selection of the image from the camera and PTZ control. The CPU 850 system, switches and controllers that are currently installed are discontinued and are no longer available from Panasonic.
The model numbers of closed circuit camera are as follows. The quantities of each model of each model are not known.

Fixed Cameras:

WV-CP470 (discontinued)
WV-CP480
WV-CP500

PTZ cameras:

WV-CS854 24x (discontinued)
WV-CW864 24X (discontinued)
WV-CW964 30X

The equipment in the equipment room of the security control center includes the following:

Access control server:

Dell Power Vault MD 3000
Dell Power Edge 2850
Dell Power Edge 2950
Video matrix
Panasonic MP 850
Redundant CPU
2 x CPU switch MPC 850S
Panasonic WJ-MPU850 CPU
CPU Switch
CPU Processing
WJ-SX850 Matrix Switcher
2 x Digital Disk Recorder WJ-RT416
WJ-HD616 Recorder
15 x WJ-HD500 Recorder

Mr. Garcia said that they want to acquire 7 model HD716 recorders. WJ-HD716 is a 16channel Real-time H.264 Digital Disk Recorder, compared to the WJ-HD616 16 channel H.264 Digital Disk Recorder. Various models are available from 1 to 8 TB of storage.

Currently they have 386 cameras, but the modular capacity would be for 512 cameras.

GE Security 704-4 fixed cameras
GE Security 708-8 fixed cameras
GE Security 739-R 1 mobile camera phone
2 x uninterruptible power supplier Tripp-Lite 40 kVA UPS

The infrared camera on the other side of the bay is not specifically identified. However, it is a PTZ camera equipped with infrared technology, FLIR (Forward Looking Infra-Red). The use of FLIR technology is common in security installations due to the ease of identifying objects that emit heat on a dark background. This technology should be used more prominently in the port of Buenaventura on the perimeter and new sites around the bay.

Figure 1-40 Infrared image

The images seen in the Port Security Center were clear. None of the images appeared blurred, grainy or otherwise unusable. An operator was asked to lift a series of images from the camera. All pictures were good.

Stored video was observed in both models of DVR. The Port is

currently recording 1CIF at two frames per second (fps) in the older WJ-RT416. Given the low rate of frames per second recording, the picture was understandably "crushed", but the image was easy to recover quite easily by the operator. An image was also recovered from the WJ-HD500 unit. These units are set to record 2CIF resolution at 7.5 fps (frames per second). The image was very clear and the movement was much better, given the higher frame rate.

The system of closed circuit television provides fixed viewing angles of the static cameras which are complemented by the PTZ cameras automatically programmed to patrol specific viewing angles in and around the port. In general, the coverage is comprehensive. Sociedad Portuaria is generally satisfied with the coverage. However, there are several sites identified where additional coverage is desired. These sites are described below in more detail.

In the central area of the port, there is an area where there is no specific coverage. This is located at the intersection of three small buildings called Mail Warehouse (Bodega Adpostal), Import Warehouse (Bodega de Importación) and Warehouse (Bodega) # 1. There is a space between the Bodega Adpostal and Bodega de Importación that requires monitoring. There is another site that requires monitoring in the space between Adpostal Bodega / Bodega de Importación and Bodega # 1. The placement of a PTZ camera in a short patrol pattern at this intersection may be all that is necessary. This can be seen in Figure 1-41.

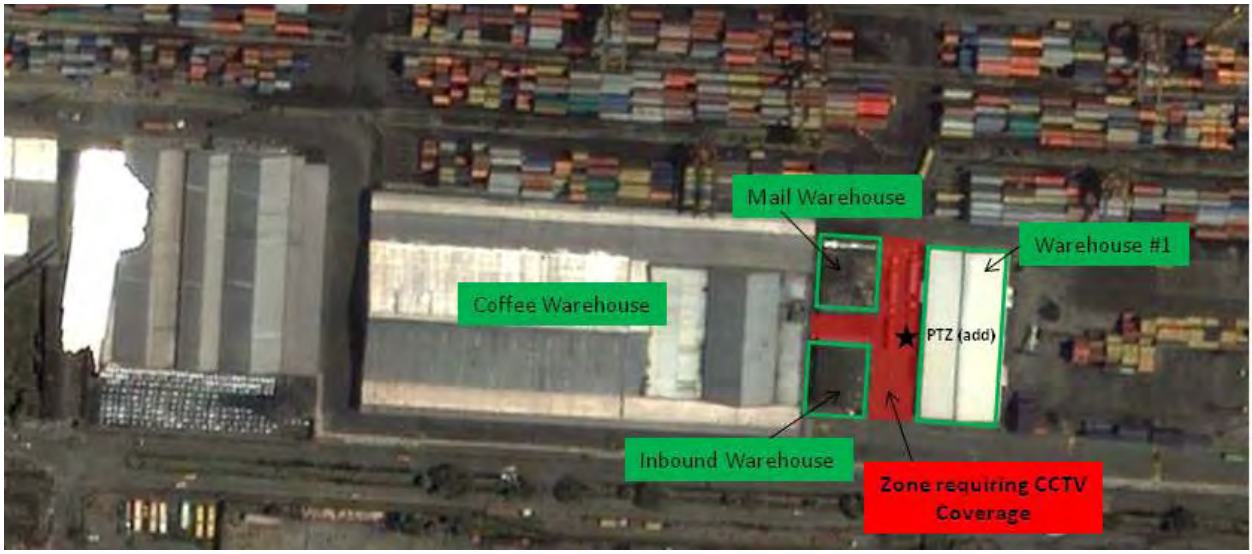

Figure 1-41 Blind spot between Adpostal, Import and # 1 Warehouses

The inspection area in the former Free Zone should also have additional closed circuit television (CCTV) cameras, especially in the area looking the south. Currently, there is approximately one camera to cover every 4 to 5 containers. It is recommended to maintain coverage of no more than 2 to 3 containers per camera to provide a narrow viewing angle. It is recommended that the cameras be placed on opposite

sides of the area. There is a wide range of activities in these areas with a large number of people, trucks, and workers.

Figure 1-42 Inspection area in the former free zone

The bay and river are not being monitored with CCTV on an exclusive basis. PTZ cameras are able to observe these areas, but these are not their main areas of coverage, nor are the types of camera appropriate or recommended to do this.

The best observation point of the water areas is the opposite shore on the island facing the Coast Guard Port. Currently there is a long-range camera equipped with infrared technology, FLIR (Forward Looking Infrared) which is on a pattern of automatic patrol that runs along the waterfront. It is recommended to add additional cameras with infrared technology on the existing tower currently used for the FLIR camera. This would provide the best view of certain areas. The new cameras could focus on shorter patrol patterns, increasing the overall coverage and facilitating assessment. Once the VTS system is installed, these same cameras can be integrated to work with the monitoring of certain ships through the VTS software.

Figure 1-43 Coast Guard Island (Isla Guardacostas) – Location of infrared camera

1.4.3 Access Control System

The access control system is implemented to ensure that people entering the marine terminal are fully identified and deny entry to unauthorized personnel. According to Hector Medina Carrillo, Sales and Customer Service, the Port has 72 biometric readers. Other control equipment includes 18 whole and half body turnstiles, 23 barrier arms for vehicular access. The equipment is controlled by a server that contains the detailed database of the port population.

The port uses Schlage Recognition Systems HandKey II hand geometry equipment and Tyco Software House C-Cure 9000 version 1.18 access control software system for the access control system installed in the port. The Port depends exclusively on the use of hand geometry and PIN to control access in and out of different places.

Figure 1-44 HandKey II hand geometry readier

Databases are maintained by authorized persons, with different codes that determine what areas they are allowed to enter, and a description of the codes. Very few people have full access everywhere. A thorough investigation is performed before granting access to the port. When a person no longer works at the Port, the Port Security Department immediately terminate their access to the Port.

During a demonstration by the SPRBun Maintenance Engineer Alex Garcia, a fictitious person was created and assigned the specific access privileges that have been predetermined and stored in the

database. It was unclear whether or not an updated backup copy is made of the system to cover the case of a catastrophic failure.

The use of biometrics in the port environment is quite common.

"The main advantage of the technology of hand geometry compared to other biometric solutions for access control is its ability to be deployed in harsh environments such as construction or entry doors to high security facilities, such as nuclear facilities. Most systems can withstand temperatures between 0 ° C to 45 ° C, and rough or dirty hands do not affect the reading of images. Another advantage is its non-threatening approach for registration and verification. The hand geometry scanner takes measurements of length, width, thickness and surface of the hand and fingers and then records a three-dimensional shape to a template.

When a person uses the scanner, which compares the shape of the user's hand to the registered template and if the template and hand match, the scanner produces an output to unlock a door, the transmission of data to a computer or simply verifies identification."[1]

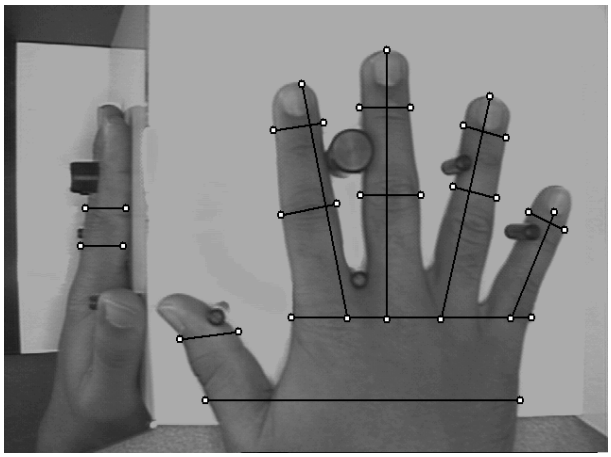

Figure 1-45 Detection of hand geometry

There may be places where additional security is desired (armory, testing rooms, etc.). The use of a biometric fingerprint reader with the reinforcement of a Personal Identification Number (PIN) provides a stronger level of security. Usually, a minimum of 12 minutiae points are required for positive identification in a criminal case, but the biometric fingerprint reader can record more than 40 of these points.

The size of the database containing the analysis of images of the hand can vary depending on the detail parameters of the enrollment scan. The database can become very large and take longer to prove if it is scanned with a high level of detail and be compared against thousands of scans. It was noted that the inspection operation at the Port of biometrics is fast and efficient.

1.4.4 Intrusion Detection System

The Port has a perimeter monitoring system, implemented in order to prevent unauthorized access by intruders through the outer perimeter of the marine terminal facilities. The system includes 4800 meters of sensor cable, controlled by 23 processors. The processor interprets the signals received and

[1] Article by Cynthia Freschi, President of North American Video, Inc.

transmits information to the central control system, which immediately complements the intruder detection with video equipment available in the area alerting and making the information readily available to security personnel. The system complements the cameras.

The system was identified as the Magal Senstar-Stellar Fence Protection System (FPS). The FPS processor is connected to two sensor transducer cables, and is at or near the fence between two detection zones (left and right). Mechanical shocks detected by the sensor cable are sent to the FPS processor. The processor contains the circuitry that analyzes the alterations detected. The electronics are designed to suit the characteristics of the inputs originating in the sensor cable. Only those signals that are similar to the disturbances caused by climbing, cutting or removal of the fence mesh are reported.

Alarms are sent to the Security Operations Center for the operator to review the relevant images from cameras via closed circuit television. If an event is identified as a security risk, the operator notifies the mobile security patrol or the National Police to respond.

Figure 1-46 Fence mounted intrusion detection equipment

A sample of the installed system is visible along the fence line in the free zone, as shown in the figure. Facilities at the port are similar.

The intrusion detection system is quite extensive and includes the entire line where a wall or fence exists. There is no need for additional coverage.

Figure 1-47 Sensor cables on the fence

1.4.5 List and map of the locations of the closed circuit cameras television (CCTV)

The Port provided a well-documented drawing (1) entitled "General Plan of Equipment of the Maritime Terminal," which provides all the locations of existing CCTV cameras. This provides coverage for closed circuit television throughout the port area, with the exception of the Free Zone inspection area which is documented in a separate drawing (2) titled "Bodega Tecnobell - Plant Security Cameras."

In addition to these drawings, AECOM was provided with additional documents that include: 3) A full breakdown of all camera locations to match the design of the main terminal and also includes specific information indicating the association between cameras and digital recorders video recorders (DVR) and the type of camera, 4) a graphical presentation of the parameters of the matrix, 5) distribution of the cameras to the DVR, and 6) a project to migrate to IP and intermediate expansion of the existing Panasonic analog CCTV system.

1.4.6 Suitability of the CCTV for 24 hour a day operations

The Security Operations Center is open 24/7/365. The head-end equipment of the closed-circuit television (CCTV) system is connected to a UPS backup power system using UPS Tripp-Lite Model SU20KX SmartOnline modular 3 phase redundant systems. The actual runtime operation of the UPS was not available at the time of site inspection. UPS units are placed with the head-end closed-circuit

television (CCTV) in the equipment room security operations. There is a generator for the building. The UPS system is connected to the backup power generator. The generator is located on the east side of the property.

The closed circuit television (CCTV) cameras are day / night and can automatically switch between color and black and white depending on the current light source. This allows operation 24 hours a day and in night lighting conditions.

Figure 1-48 Uninterruptible Power Supply

1.4.7 Potential impact of the incorporation of technologies for computer monitoring of the security system

Monitoring software technologies are defined as integrated systems that enhance the installed physical security systems. The integration of computer monitoring technologies involves providing an interface between two or more systems to achieve desired operation. Existing systems include CCTV, access control and intrusion detection. These systems are now integrated into the Integrated Electronic Security System (SISE), for example, when an intrusion alarm is triggered, the screen displays the camera image for the operator.

A common integration scheme is to tie a specific camera to a specific door, for example. Each time the door is opened, the dedicated camera is set to record for a specified period of time. This can be accomplished using the door contact switches where there are no door access control reader systems installed, or once the access control reader is activated by inserting a hand into the reader for a camera records period of time. This is a standard scheme that is used to integrate CCTV with access control systems. The CCTV camera is either a fixed version for a particular scene or a PTZ camera that takes a regular patrol pattern and changes only when a signal access control system replaces the regular pattern of the patrol and make the camera focus (zoom) and fixed on a particular scene. In the event that several scenes are protected by a PTZ camera, the system is configured to give priority to the scene which takes priority. A door in particular may be more important than another, hence the need to prioritize. The alternative is to add additional cameras to reduce the number of scenes per camera.

Another common integration scheme is to link the CCTV to the intrusion detection system. If the sensor detects an intruder, the system of closed circuit television can be programmed to look at the area where the alert was generated. Operators should receive a visual alert on the monitors that indicate a zone has been fired and at least one image of the area should appear on the screen.

According to information obtained during the visit to the control room, the current system, Integrated Electronic Security System (SISE) already includes integration of this type, so that the system displays appropriate camera to the operators when an alarm fires. It was also mentioned that a map of port facilities can show the area in which an alarm is triggered, but this part of the system is not often used.

Incorporating intelligent video analysis (analysis of video content) as part of closed circuit television is another option. Video analysis has applications in intrusion detection, monitoring of buildings and facilities, counting people and vehicles, smoke and fire detection and detection of loss of container and sabotage.

The technology is best used in specific cases. Examples include: fuel lines, perimeter fences, static security areas (areas where the movement is very limited), areas critical to the usefulness of the site (transformer yards, generator yards, communications shacks, water tanks, etc.). However, the case of the port presents opportunities for the application of this technology, either in static areas such as fences or areas which are static according to schedule, such as at night or when not working, for example, freight or container yards when cargo is not being handled. Video analytics can also be used for the analysis of unusual movements or lack of movements, such as people loitering, vehicles speeding or remaining excessively in a restricted area like a truck staying too long alongside of a warehouse, anti-tailgating, abnormal small boat movements and intrusion detection. These events can be programmed as indicators of criminal activity, including theft, introduction of contraband and sabotage. This technology has already been used in various ports

Implementation of video analytics requires careful design and attention to the concept of operations to ensure appropriate algorithms are selected and properly deployed for the proposed application.

Additionally, it requires the selection of concept between distributed analysis on intelligent cameras or local processors and central analysis on a host computer. Properly designed, this evolving technology can supplement the existing CCTV system, access control system and intrusion detection system to improve overall reliability and probability of detection while reducing false and nuisance alarms.

Figure 1-49 Integration of video analytics to the fence monitoring system

The impact of adding tracking information technologies significantly improves the operator's ability to effectively monitor the safety of port operations by incorporating automatic features to monitor operations that could not otherwise be adequately supervised by human observation. This automation would provide immediate alerts of potential security breaches or other predefined events.

Currently, security operators have to monitor between 20 and 67 cameras each. This means that an operator can see a camera on average 1 to 3 minutes per hour on average. The current system includes devices to focus and show specific cameras when an alarm triggers in one area. This element of automation improves operator performance. However, there may be a higher level of automation incorporating computer monitoring systems, including video analytics to track what operators are currently watching.

The recording system is also limited by the need to record all the details of many cameras without prior analysis and then retrieve records of interest within the high volumes of information on file for 75 days. Computer monitoring presents an opportunity to assess the images in real time to make them stand out for operators should human intervention be required, and select the most relevant information for files.

1.5 Review of operations and procedures of DIAN and other entities

The following entities are involved in the review and clearance of cargo at the Port of Buenaventura:

Directorate of National Taxes and Customs of Colombia (DIAN);

National Institute of Food and Drug Monitoring (INVIMA);

Colombian Agricultural Institute (ICA);

Fiscal Customs Police (POLFA); and

National Antinarcotics Police, Narcotics Directorate (DIRAN).

DIAN has among its functions the administration of customs duties and other taxes on foreign trade, including the collection, control, settlement, dispute, collection, enforcement and all other aspects related to compliance with customs requirements.

INVIMA exercises its function of inspection, monitoring and control of food for human consumption and verifying the sanitary conditions in which they are processed.

ICA is responsible for monitoring and issuing sanitary and food safety policies for the pork, poultry, cattle and agricultural industries.

POLFA, in relation to the direction and administration of the armed apparatus that supports the tasks associated with control and customs control, tax and exchange, has as its functions, among others, planning, organizing, monitoring and supporting the customs control to prevent smuggling, billing as determined by DIAN , tax and customs control, transfer and delivery of goods seized by DIAN, and directing in collaboration with DIAN intelligence work.

The National Antinarcotics Police's functions include monitoring the export cargo to ensure that no narcotics have been introduced.

According to the policy established by the Ministry of Commerce y Tourism, DIAN INVIMA and ICA performed joint inspections at the Port. The Antinarcotics Police conducts inspections of exports in other locations separate from the imports.

1.5.1 Imports

In order to review the procedures of the DIAN, a meeting was held with: Dr. Maria Constanza Dussán, Chief Customs Operations, Section Director, DIAN; Marcos Vivas, Coordinator Posterior Control Group, Americo Valencia Mosquera, Chief Imports Group, Foreign Commerce Operating Division, and Major Nestor Wuandurraga, Fiscal Customs Police (POLFA). Larry Boorstein, Project Manager and Billy Vanderbur, Senior Security Expert, both of AECOM, Fernando Buitrago, Ports and logistics Expert and Manuel Arango, Ports and Terminals, both of Ports and Logistics, attended the meeting. The next day, a visit was carried out to the inspection area of DIAN with Mr. Mosquera and Major Wuandurraga.

The DIAN procedure consists of the following steps:

1) The Sociedad Portuaria (SPRBun) enters data on on-the cargo;

2) The customs broker presents imports declarations;

3) The customs broker pays taxes in the bank;

4) DIAN perform cargo profiling, using the system based on various factors, including type of merchandise, country of origin and importer. Based on this profile, the container or cargo is selected for:

- Physical inspection;

- Non-intrusive inspection with scanners, or

- Inspection of documents only or automatic clearance.

> The merchandise is selected by SIGA system. MUISCA feeds SIGA. SIGA is Integrated Customs Management System. MUISCA is Unique Model of Entry and Automated Control Service. DIAN does not have MUISCA to inspect. The factors taken into account are: Importers, Accounting, Finance, Number of imports, and number of declarations. Information is sent weekly to profile risks. Between 10 and 14 percent of the cargo is selected for inspection. Export cargo is also systemized. Transit cargo is consigned to free zone. The selection is made before 7:00 pm and the containers are brought to be inspected before 7:00 am the next day. According to Dr. Dussán, DIAN has proposed working 24 hours.

5) DIAN informs the Customs agents of its choices for physical inspection;

6) The importers or agents bring the cargo to the yards of the inspection area before 7:00 am;

7) Starting at 7:00 am, DIAN starts the inspection process. . The inspector receives the declaration, the purchase invoice and the import record. The stevedores unpack the cargo as required by the inspectors of DIAN. DIAN inspectors review the numbers and descriptions of the cargo on the documents to ensure they are compliant with the products inside the containers. Usually, they examine a sample of the cargo inside the container;

8) INVIMA and ICA inspect the cargo. The norm is simultaneous inspection by ICA and DIAN. The Ministry of Commerce, Industry and Tourism has established unique inspection as the norm to follow;

9) They finish their inspection within a few hours and usually before midday.

10) The customs agent are involved to the nationalization of goods. Goods pay tariffs and taxes according their tariff heading. The tariff code has 10 digits. DIAN uses the harmonized code. The system issues how much to pay according to value. The agent goes to the bank that gives him a physical seal and the bank keys in to the SIGA system when the agent pays the duty.

Up to 3 years, the additional bill can be reviewed by a study of value of cargo.

It is proposed to purchase additional scanners. The Ministries of Finance, Foreign Trade and Transportation have agreed on the characteristics of the scanners.

Dr. Dussán expressed the view that the Port is stagnant and must make itself adequate with parallel routes to unbottle the cargo, strategically located logistics platforms, space for refrigerated cargo, scanners, and space and logistic conditions for a greater number of inspections.

Inspection in the former Free Zone

Outside the perimeter wall of the port, there is located adjacent property known as "Free Zone", which is largely leased to other carriers. The old Free Zone includes the area of inspection of cargo containers. Containers are selected by various entities, DIAN, ICA and INVIMA. All containers to be inspected must be delivered and unloaded in the inspection area by 7:00 am each morning.

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Figure 1-50 Inspection area of DIAN, ICA and INVIMA

The opening of each container should be attended by a representative of the owner of containers and DIAN. The manifest is verified with the identification numbers of containers for transport to ensure the proper container is delivered.

After opening the container, the DIAN inspector oversees a team of workers (all wearing the same color shirt and one team per container), as they unload the goods inside the container. Once the products to be inspected have been removed from the container, the content is checked against the declaration, invoice and import record. Once the initial inspection is made, the team opens closed boxes or wrapped articles to verify the contents and quantity of contents (number of plates, cups, toys, etc.). The manifest is checked to verify the actual number of content. Once the count is completed, workers re-pack the goods inside the container. After the cargo is packed again inside, the container is sealed again and ready for transport to the yard for transport to the consignee, once the customs broker has made the payments in the bank. In general, inspection begins at 8:00 am, takes 4 to 6 hours and usually ends by noon.

The inspection operation conducted in the Free Zone was observed during its maximum operation at 8:00 am. The area was severely congested with forklift operations, manual loading of the cargo, the inspectors, the National Police and port personnel. The crews were often waiting for an inspector to be available to answer questions or to conduct their inspection.

The CCTV coverage is considered less than adequate for this operation. It is advisable that additional cameras be placed strategically in the areas of inspection.

The main entrance to the inspection area is staffed by security and the egress uses a security turnstile which make it difficult for the taking or introduction of contraband items smuggled over the property.

Apart from the DIAN, the other bodies responsible for inspection of containers (INVIMA, ICA, etc.) require different levels of control in regard to basic consumer products, ensuring that products are shipped in accordance with the manifest or other declarations, the product is not expired, or that shipment of the product meets the requirements (refrigerated, etc.).

1.5.2 Exports

A meeting was held with Lt. Jeison Vargas Acevedo, Chief of Section, National Antinarcotics Police in order to determine the cargo inspection procedures of the agency. The next day, a visit was made to the inspection area for coffee with the Superintendent (Foreman) Jose Verra, National Antinarcotics Police DIRAN and a visit to the scanner with Pablo Cesar Ospina Patrol, Narcotics Police. Larry Boorstein, Project Manager and Billy Vanderbur, Senior Security Expert, both of AECOM, Fernando Buitrago, Ports and logistics Expert and Manuel Arango, Ports and Terminals, both of Ports and Logistics, attended the meeting.

According to Lt. Vargas, 200 loaded containers enter per day. The process of the National Police for containers comprises the following steps:

1) The exporter delivers a letter of responsibility of the exporter attesting that the cargo does not include narcotics, explosives, illicit items, prohibited items, munitions, war materials and their components or other items and that they are prepared in adequate conditions of security and protected from unlawful intervention. The signer is authorized in the Chamber of Commerce.

2) The police do a review of the seals as the export container enters the Port. Seals are compared with the letter of the exporter.

3) A schedule is made with the Customs brokers.

4) A profiling is made, which determines whether the container will be subject to physical inspection or inspection of documents. The profiling factors included: type of cargo, destination, exporter, customs agent and operator. Based on a study or risk profile, it is determined the option to follow:

- If the risks are classified as low, the documents only can be reviewed;

- If the risks are greater, a physical inspection can be performed, or

- If the containers are of less risk, non-intrusive inspection with a scanner can be performed.

5) The cargo is inspected in several areas:

- Containers Bay (Bahía) - 18 containers per day

- Containers scanner - 8 per day

- Shed - 14 per day - Cargo is inspected in the shed including cargo carried within the port, loose cargo, consolidated in the port.

- Chatarra (Scrap) - 2 per day. Chemicals are inspected in the area known as Chatarra.

- INVIMA - 4 a day - This includes only those that are inspected jointly with the National Police.

- DIAN - 6 per day - In conjunction with the National Police.

- ICA - 1 day - In conjunction with the National Police.

1.5.3 Inspection of Coffee

According to Lt. Vargas, the coffee gets a 100% inspection. The process for coffee is carried out in the coffee warehouse. There are cameras in the shed. The coffee arrives at Port bagged on pallets. The coffee is exported in bags on pallets in containers or in bulk in containers. In both cases, the review is done at the time of filling the container. The coffee comes packaged in bags of 70 kg. The trucks bring in sacks and the coffee bags are stacked on pallets. Each pallet is weighed and recorded and then stored based on quality, destination or exporter.

In the case of coffee exported in bags on pallets, inspection is carried out with rods introduced into the sacks of coffee. With the rod, the presence of solid objects such as panels of cocaine is noted. The rod has markings to see how far it penetrates. Also, the powder adheres to the rod. The stevedores stay inside the container to place the pallets of bags of coffee, while another stevedore operates a forklift with the pallets. A policeman checks the bags when the forklift puts them in the ground using a stick to penetrate a percentage of the bags. Random tests are carried of several bags on different pallets.

In the case of coffee exported in bulk, visual inspection is conducted of the coffee on conveyors to note any panel or other object. The stevedores empty bags in hoppers over two conveyors belts, which fill a container through a flexible duct. Before filling the container, stevedores put paper around its interior. They place a plastic "super sack" inside the container and fill the super-sack. Forklifts bring the pallets of bags of coffee stored equipment for bulk cargo. The lift up the bags to a pallet. The bags are opened by the workers and poured into a hopper onto a conveyor belt. The beans are then loaded to supersacks inside the container. This process continues until the bag is filled to a certain level. The policeman keeps looking at the coffee as it is transported by the belt to note any panel or other object. The bag is then sealed with the supervision of the Police and transport information is attached to the container.

Figure 1-51 Loading and inspection area of the coffee warehouse

The police also observe the workers to ensure that no product can be introduced into the cargo.

The inspection of cargo by the police is daily, 7 am to 7 or 8 pm

This area is monitored by security cameras with the supervision of the National Police at all points of entry / exit of the facility. This is not a 24-hour operation. The AECOM team visited the Coffee Warehouse while an operation was underway.

The presence and quantity of the National Police aims to ensure that there are no drugs and other banned substances in the cargo. There is enough CCTV coverage of key areas.

1.5.4 Packaging and Inspection of sugar

The AECOM team visited the area for storage, loading and inspection of sugar. The loading and inspection operations were not functioning at the time of the visit.

The packaging area and the facility is closely controlled and monitored by the CCTV cameras at strategic locations around the facility. CCTV coverage on the outside of the facility is provided by the Port with the coverage of closed circuit television (CCTV) including inside (by the concessionaire under SPRBun).

At the time of the inspection, the operation was stopped due to the impact on the shipment of sugar of the rain in the production areas. The transaction was not perceived as a 24/7/365 operation since no activity occurred during the inspection.

Trucks carrying sugar arrive and are processed through the Gate of sugar and coffee. After approval, proceed to unloading machines, which weighing and palletize bags of sugar. Once palletized, the bags of sugar are transported in the hold and staged for shipping. The operation is performed under the supervision of the National Police.

The packaging area and the installation is closely controlled and monitored by closed circuit television (CCTV) cameras at strategic locations around the facility. CCTV coverage on the outside of the facility is provided by the Port with the CCTV coverage inside provided by the concessionaire in agreement with SPRBun.

Figure 1-52 Sugar loading and inspection area

1.5.5 Scanners

The import or export cargo can be scanned after being selected for non-intrusive inspection by the responsible authorities. The X-ray scanner, operated by the Antinarcotics Police, requires about 30 m away around to prevent radiation effects people. Due to lack of space, the police have to communicate with staff outside the equipment to control people around it and have them move far enough away. After causing the people to move away, the operator turns the key in the machine and scans the container in a minute.

Figure 1-53 Mobile X-ray scanner

The port is equipped with a mobile Nuctech X-ray vehicle scanner made in China for suspicious containers and containers randomly selected by the instruction of the National Police or at the request of DIAN or other agencies. Patrolman Pablo Cesar Ospina, Antinarcotics Police, demonstrated scanner operation to Larry Boorstein, Project Manager and Billy Vanderbur, Senior Security Expert, both of AECOM. The Nuctech mobile unit was donated by the Chinese government to SPRBun. The scanner is capable of scanning up to 25 containers per hour, but performance varies. The mobile unit is driven to a specific area that includes clearances as required by the manufacturer to minimize exposure to radiation.

The Government is currently reviewing new analysis systems for use in all Colombian Ports. The current system is a low power unit with limited resolution scanning and limited capacities.

According to information from the National Institute of Concessions (INCO), it was agreed after conferences between DIAN, the Narcotics Police, the Ministry of Transportation and the Office of the President that the scanner must meet the following minimum characteristics:

X-ray scanners

Penetration level of 12 to 13 inches;

Performance or scan time of two minutes or less per container;

Resolution images of 5 to 50%;

Voltage of 3 to 4 megavolts;

Stations for the analysis of images, and

Have software that can transmit the images to the automated systems of DIAN.

2.0 Development of a Vessel Traffic System and Automated Identification System

This study identifies two (2) alternatives for the implementation of a Vessel Traffic Service (VTS) for the Port of Buenaventura. The system is to be developed by the Directorate of Telematics (DITEL) of the Colombian Navy, the General Maritime Directorate (DIMAR) and Colombian Coast Guard. The purpose of the VTS is to provide improved navigation and monitoring of all vessels near Buenaventura's coastline, main shipping channel, vessel anchorages and waterways adjacent to the port terminals and facilities with the following objectives:

Objectives

The objectives of the development of vessel traffic system (VTS) are:

- Improve monitoring of shipping in the port of Buenaventura, the access channel and off the coast
- Improve the safety of ships and meet international standards for the protection of life at sea
- Increase control and surveillance of small boats

The primary coverage area for the VTS is illustrated in Figure 2-1.

In addition, this document provides an overview of available options and provides recommendations for an Automatic Identification System (AIS) for the General Maritime Directorate (DIMAR) and Coast Guard which can be used to guide the implementation of operational and security improvements for vessel traffic at the Port of Buenaventura. This document includes layouts, performance specifications and procurement documentation for the recommended AIS.

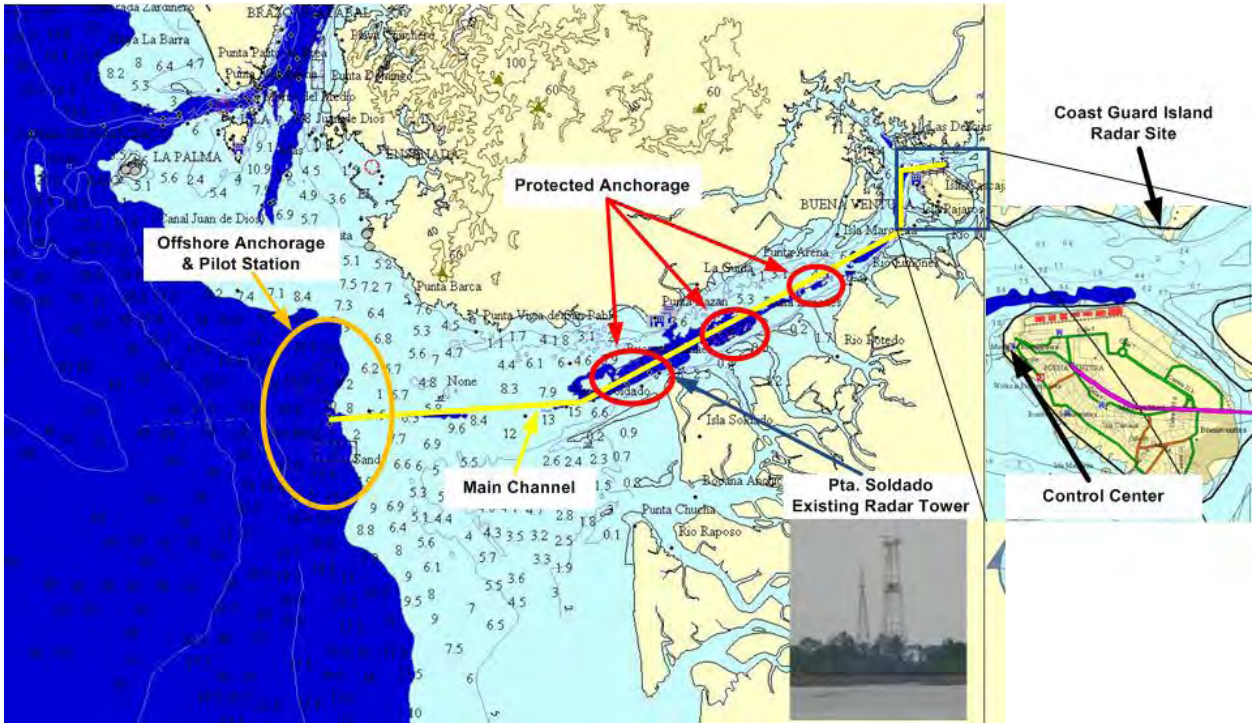


Figure 2-1 - Layout of the Coverage Area

2.1 Preparation of Layouts for Location of Vessel Traffic System and Automated Identification System Components

2.1.1 Layouts for Location of VTS Components

Based on the data collected during the site visit in December 2010, it was determined that there are a number of sites with existing or planned facilities suitable for the implementation of the VTS Radar and associated systems. The use of these existing sites takes advantage the infrastructure already in place, thus eliminating the costly preparation and construction at undeveloped sites.

The candidate sites include:

- New General Maritime Directorate (DIMAR) / Colombian Coast Guard maritime traffic control station (under construction) in Buenaventura
    - This building will house the VTS control center equipment

  - The roof of this 7-story building is an ideal site for VTS radar antenna, surveillance camera(s) and Automated Identification System (AIS antenna. The roof would also serve as an antenna site for microwave links to other remote sub-systems
- Punta Soldado Radar tower
  - The existing tower would be suitable for new, replacement high performance VTS radar antenna
  - The existing equipment shelter on the tower would house radar extractor/tracker and control hardware/software
- Punta Soldado Communication tower
  - This existing tower is suitable for microwave link antenna (connect radar to maritime traffic center)
- Coast Guard Island
  - An additional 15 m (50 ft) tower is required for a high performance small target detection radar and surveillance camera

A viewshed analysis of each radar site shows that adequate visibility of the entire coverage area can be achieved using radars located at the existing and planned site facilities. The figures illustrate the coverage area for each radar (in green). This analysis is based on a 56 m (184 ft) Radar antenna height above ground level for Punta Soldado radar, 30 m (100 ft) above sea level for Control Center radar and 15 m (50 ft) Radar antenna height for Coast Guard Island Radar. The analysis assumes the visibility for a surface radar target that is 1m above the sea surface.

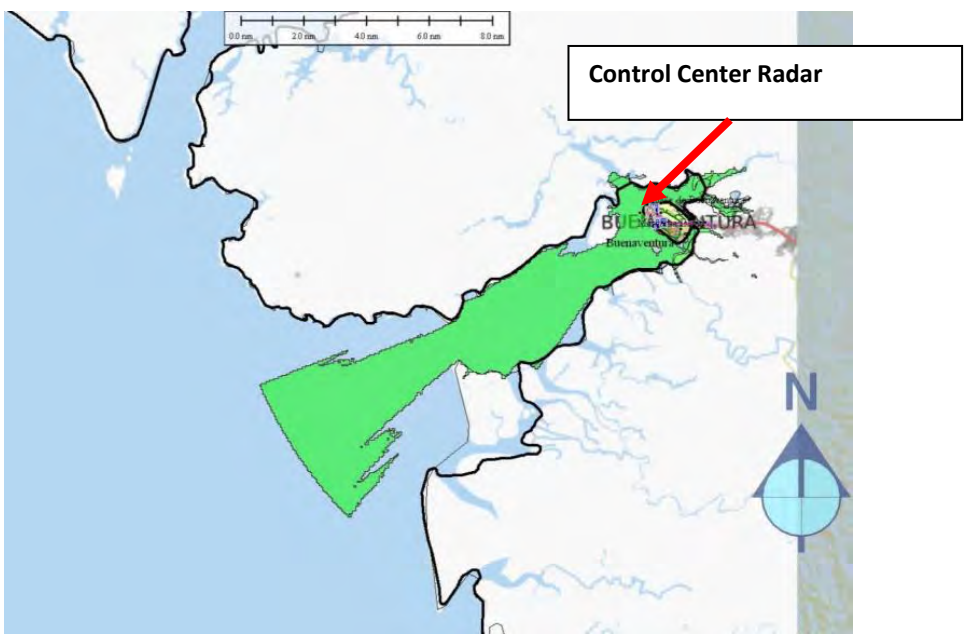


Figure 2-2 - Control Center Radar Visibility Analysis

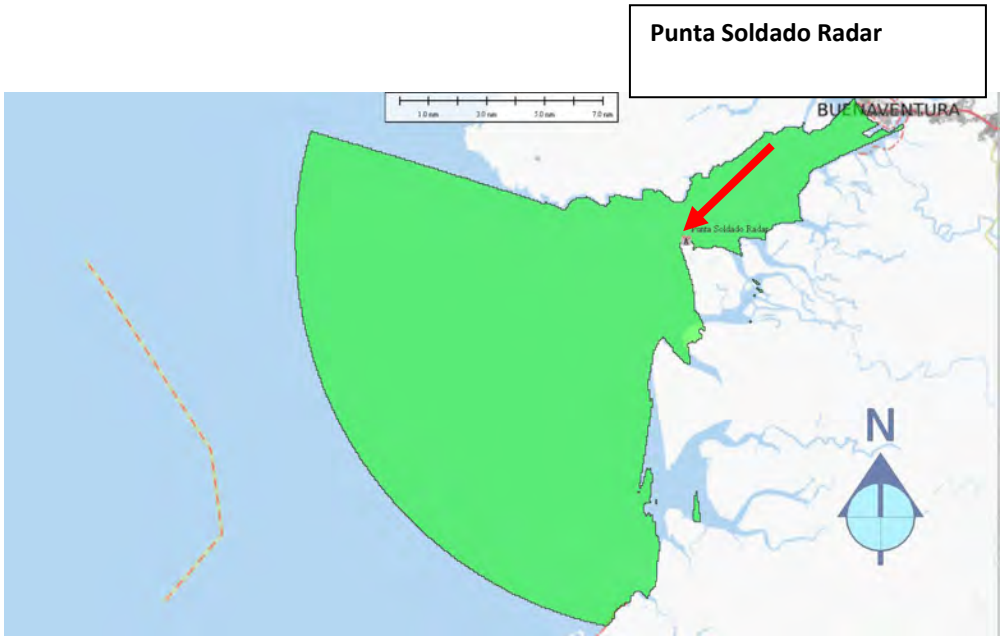


Figure 2-3 - Punta Soldado Radar Visibility Analysis

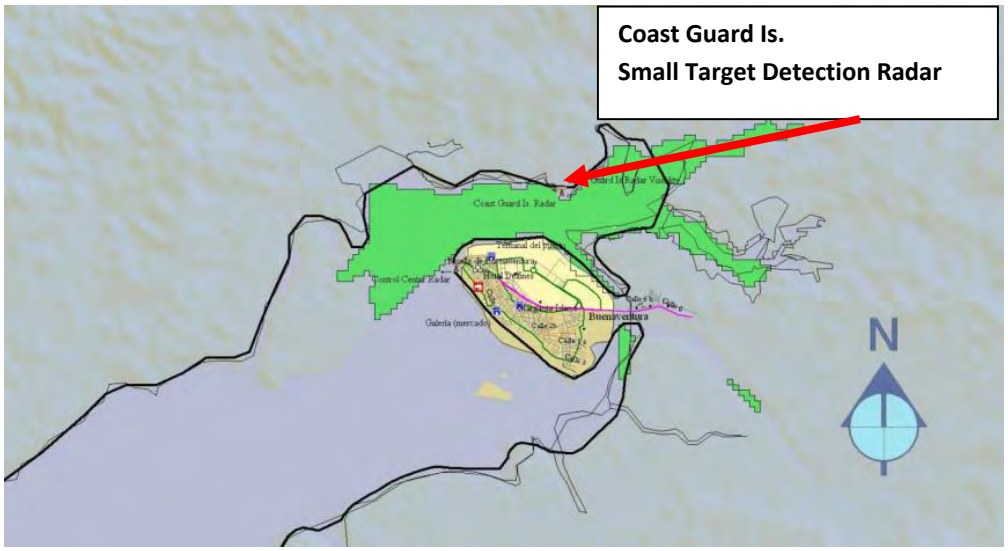


Figure 2-4 - Coast Guard Is. Radar Visibility Analysis

2.1.2 Layouts for Location of AIS Components

AIS transponders on vessels automatically broadcast information at regular intervals via a Very High Frequency (VHF) transmitter built into the transponder (transponder responder). Typical ranges for shipboard transponders vary based on the shipboard equipment, current weather conditions, radio interference, and other factors, but receipt of AIS broadcasts of 30 to 50 miles is common using standard AIS receiver equipment. Range needed is determined by the geography of the area to be covered; this will drive the antenna placement.

The location of the AIS antenna is the major factor in determining range, in particular the height at which the antenna is installed. The higher the antenna is placed with an unobstructed view, the further the AIS range will be extended.

The actual coverage area may vary based on the following:

1. Obstructions: AIS, which is a VHF radio signal, is a line-of-sight technology. While the VHF signal can reach around some obstructions, higher landmasses or buildings will block the signal.

2. Signal strength of the shipboard equipment: Vessels equipped with Class A transponders have a typical range of approximately 30 miles. Class B transponders (pleasure craft and smaller vessels) generally broadcast to an area of between 5 and 10 miles.

3. Weather conditions: Various weather conditions may extend or shorten AIS ranges. Some examples are:

a. Heavy rain can weaken radio signals because the raindrops absorb power from the radio waves and cause it to scatter, shortening the realized AIS range.

b. Temperature Inversion, a condition where ducts of warmer air reside above the cooler surface air can vastly increase AIS range (normally the warmest air is nearest the surface of the earth). In a temperature inversion, signals may be propagated far beyond normal line of sight. When radio waves enter the warm air above, a duct causes the wave to be bounced back toward Earth. The wave then hits the ground or a warm layer below the duct and it gets bounced back up again. Under the right conditions this effect can be repeated, extending the AIS range dramatically.

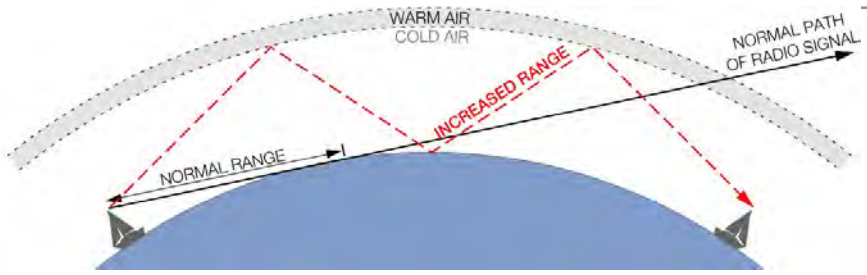


Figure 2-5 – Increased Range of AIS with Temperature Inversion

The recommendations contained herein are based on the requirements to track real-time vessel positions at the Port of Buenaventura, the channel from the ocean to the port, and the offshore approach to the channel. Given the location of the Port, the surrounding landscape, and the relatively straight geography of the channel, there is a need for two general AIS receiver locations. The first general receiver will be located at the Port of Buenaventura and will include two separate sites. The second general AIS receiver will be located at the entrance to the shipping channel and will include a single installation.

2.1.2.1 Port of Buenaventura receiver locations

Primary Receiver at Maritime Traffic Control Station

The primary AIS receiver and antenna location should be on the roof of the General Maritime Directorate (DIMAR)'s and Colombian Coast Guard's planned Maritime Traffic Control Station (MTCS). The planned MTCS site places the building at or near the waterfront with an unobstructed view of the channel. The height of the building is estimated at 87.5 feet; based on available information estimates the building at seven stories, which at an average 12.5 feet per story, would allow for the place of the equipment at approximately 90 feet. This should provide ample coverage for the port complex, main approach channel, and an additional 15-20 miles offshore coverage.

Backup Receiver at Coast Guard Station

A secondary AIS receiver for the Port of Buenaventura should be placed at the Coast Guard station. This receiver is expected to have approximately the same coverage as the primary receiver, and will serve as a backup to the primary AIS receiver located on the Maritime Traffic Control Station in the event of equipment failure at the Maritime Traffic Control Station. Based on available information, it is assumed the Coast Guard will be agreeable to hosting the equipment.

The following diagram illustrates the anticipated coverage area.

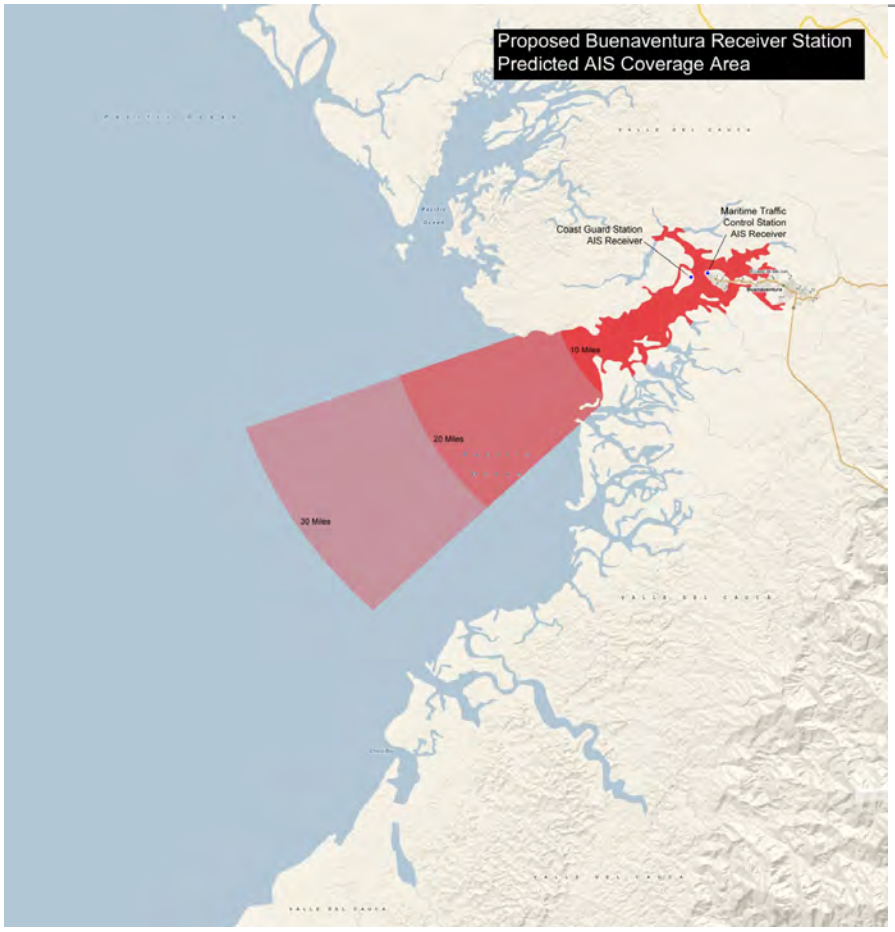


Figure 2-6: Buenaventura Receiver AIS Coverage Area

Secondary Receiver at Punta Soldado

A secondary AIS receiver and antenna should be located at the Punta Soldado site. This will provide duplicate coverage for the port complex and main approach channel, and provide additional offshore coverage.

The height of the radio tower at Punta Soldado is 56 m (184 ft). Provided that an AIS antenna can be located on either the radio or radar tower at a substantial height on one of the structures, typical ranges offshore will extend from 30 to 50 miles. Greater ranges may be realized based on weather conditions and signal strength of the shipboard equipment.

It is noted that the general area opposite Punta Soldado may contain elevated land masses which may interfere with close-to-shore AIS coverage north of the approach channel.

The following diagram illustrates the anticipated coverage area.

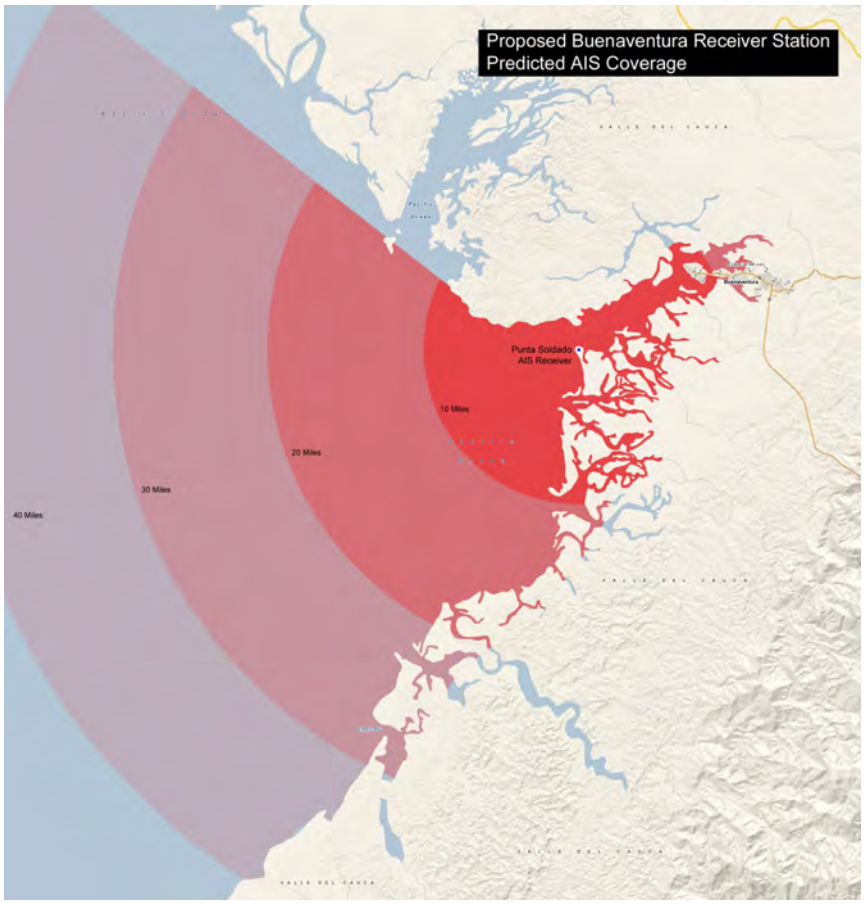


Figure 2-7: Punta Soldado Receiver AIS Coverage Area

2.2 Illustrative Description and Technological Recommendation for Vessel Traffic System and Automated Identification System Components

2.2.1 Description and Recommendation for VTS

The VTS system shall provide situational awareness of vessels approaching the coastline, vessels at the offshore anchorage and pilot station, vessels in the main navigation channel and protected anchorage and vessels along the waterfront terminals and facilities of SPRBun. The VTS Radar shall be the principal detection system and shall provide adequate levels of performance to detect, track and display vessel targets throughout the primary coverage area.

General VTS Selection Criteria

To determine the general requirements and makeup of the VTS radar and other system elements the IALA Recommendation V-128[1] was used as a reference. IALA V-128 identifies three types of capability: Basic VTS, Standard VTS and Advanced VTS. It was determined that using the Standard capability as the general guideline for selection of VTS performance and functionality provided the best choice. A comparison of the advantages and disadvantages of the three capabilities as they relate to the implementation of VTS radar coverage for the Port of Buenaventura VTS follows:

VTS Type	Advantage	Disadvantage
• ***Basic***	Low cost	Minimum performance capability Would require many remote sites for overlapping coverage
• ***Standard***	Cost effective Performance levels can achieve overlapping coverage for limited sites Wide selection of vendors	No significant disadvantages
• ***Advanced***	Higher levels of performance	High cost, fewer competitive selections Radar antenna systems are large, heavy requiring stronger tower structures

Table 2-1: Comparison of Levels of VTS System

An illustrative description of each VTS component is as follows:

2.2.1.1 High Resolution VTS Radar

The high resolution VTS radar shall provide surface surveillance out to the radar horizon for detection and tracking of vessels ranging from small motorized vessels up to large ocean going ships with an expected operating range of 12 nautical miles and better. Since the operating environment is a tropical region the radar system design shall incorporate measures that mitigate the effects on radar system performance of fog, high humidity and heavy rains. It is recommended that X-Band radar is the best choice that meets the performance recommendations of IALA Recommendation V-128[2] for "Standard" system capability.

[1] International Association of Marine Aids to Navigation and Lighthouse Authorities – IALA Recommendation V-128, On Operational and Technical Performance Requirements for VTS Equipment, Edition 3.0, June 2007

[2] IALA Recommendation V-128 on Operational & Technical Performance Requirements for VTS Equipment, Edition 3.0

X-Band Radar vs. S-Band Radar

The climate at the Port of Buenaventura is warm and humid. Buenaventura is the rainiest inhabited location, with an annual average rainfall of 674.3 cm (265.5 inches). One important factor in the selection and design of VTS radar elements is the ability of the system to perform in heavy, tropical rainfall. The operating frequency bands for VTS and maritime surveillance radar systems are X-Band (8-12GHz) and S-Band (2-4GHz). The X-Band version is the most widely used in VTS applications due to cost as well as the flexibility in antenna choices. The use of S-Band in VTS applications is not as common as X-Band. In many cases where S-Band is used, it is typically deployed as a backup to a primary X-Band system. The theoretical advantages of S-Band over X-Band include:

- Propagation in Rain: The absorption or attenuation of radar energy at the longer wavelength of S-Band (10cm) is less than at the shorter X-Band wavelength (3.2cm)

	One way Attenuation based on 16mm/hour rain-rate
o S-Band	Approx 0.01dB/km
o X-Band	Approx 0.40dB/km

- Backscatter caused by rain: The backscatter or rain clutter is when the radar illuminates the surface volume (defined by the radar antenna beam width and height, and the radar pulse length) of rain. This backscatter energy is dependent on the rain-rate and competes with the reflected energy from targets that are in the same area. With strong rain, important targets of interest can be masked by the rain clutter and go undetected. The rain backscatter is less for unit volume at lower wavelengths, so the S-Band system will have less rain clutter than X-Band

The above describes the theoretical propagation differences between S-Band and X-Band when rain is taken into account. When comparing two systems and the assumption is made that both the S-Band and the X-Band systems will have the same technical specifications (i.e. equal output power and receiver sensitivity, equal antenna gain, and the same system gains/losses), then the S-Band would far outperform an X-Band solution in rain-fall conditions.

However, the market availability of products and systems is such that the most common S-Band products for VTS application are modified shipboard navigation radars that have low gain antenna units. If one compares the overall performance of this choice with the high gain 18X system recommended here, there is a dramatic performance difference. While there are military grade high gain, high powered S-Band systems that would have overall performance levels equal or exceeding the recommended X-Band solution, it must be understood that the cost of these system is not deemed practical for this VTS application. These military grade S-Band units use large, high gain antenna systems (1-2kg weight, 2kw AC power) which would require a significant radar tower design and supporting infrastructure and extensive life-cycle maintenance plan and training.

A hypothetical S-Band that has exactly the same performance characteristics as the 18X (i.e. apples to apples comparison) would probably perform better in rain, but the only S-Band systems that we are aware of that have these high levels of performance are military grade coastal surveillance systems and the only sources are Israel and European (possibly China). In addition, this S-band unit would be a multi-million dollar radar sensor, weigh several thousand pounds and requiring extensive tower construction and there may be some sensitive military export issues.

If we consider the lower performance VTS type S-Band units, we would need to consider an additional site between Buenaventura city and Punta Soldado because an S-Band only at those two sites would not provide overlapping, continuous coverage of the channel.

One additional technical advantage of the recommended X-Band solution is the use of a Circular polarized antenna (instead of the typical linear polarized version), which reduces the effects of rain backscatter on the radar, thus mitigating the rain-backscatter advantage of S-Band.

Table 2-1a: Detection Range Comparison of Recommended X-Band solution vs. S-Band choices (CARPET[3] Analysis)

Condition	Recommended 18X High Resolution X-Band Radar w/ circular polarized antenna	Typical S-Band VTS radar with low gain 12-15ft antenna, 30kW transmitter
Small Boat (RCS=1m2@X-band, 0.4m2 @ S-Band) Clear weather	6.9 nautical miles	4.0 nautical miles
Small Boat (RCS=1m2@X-band, 0.4m2 @ S-Band) 25mm/hr rain-rate	5.4 nautical miles	2.4 nautical miles

The high resolution VTS radar shall comprise:

- a high resolution antenna with turning unit
- X-Band Receiver-Transmitter (RT) unit
- Control/Interface

There are a variety of VTS radar choices available, each offering adequate performance and functionality necessary to meet or exceed the IALA "Standard" capability recommendations and more importantly, DITEL requirements. The selection criteria for the high resolution VTS radar is as follows:

- ✓ Radar performance, accuracy and discrimination per IALA V-128 "Standard" capability
  - 25 Kilowatts or equal X-Band transmitter
  - Antenna horizontal beam equal or better than 0.45 degrees
  - Detection of small ships, fishing vessels and the like in up to sea state 4 conditions
  - Minimize performance degradation in moderate rain (up to 10mm/hr rain rate)

[3] Computer Aided Radar Performance Analysis Tool, Version 2.13

- ✓ Compact antenna system size and low weight
- ✓ Low maintenance requirements
- ✓ Best value

The most common radar technology used in maritime applications (ships and VTS) employs the use of the fixed pulse Magnetron as the transmitting element. The advantages of systems using this technology are that it: a) is a proven, reliable technology, b) is low cost, and c) provides excellent detection capabilities. The principal disadvantage is that the Magnetron has a finite operating life and must be replaced periodically resulting in annual maintenance cost and down time.

In recent years new, solid state radar systems have been introduced as a replacement for Magnetron based radars. These systems use much lower peak output power levels than traditional Magnetron system but, by the use of pulse compression, Doppler processing and other detection processing techniques, these technologies offer comparable performance. The advantages of solid state radar technologies are: a) low power, light weight components, and b) low maintenance. Some disadvantages include: a) Doppler processing is blind to small slow/non-moving targets; b) they are new first generation technologies, no proven track record.

A radar system with antenna size of at least 5.5 m (18 ft) in length would be required to meet the horizontal beam and target detection/discrimination requirements. Because of the frequent rainfall in the operating area, a Circular Polarized antenna system is recommended which will enhance the detection of small targets in rain-clutter.

Candidate radar systems include:

- **Series 1000 Coastal Surveillance Radar**
  - Maker: L-3 Klein
  - Origin: USA
  - Advantages
    - Simple design, Magnetron based system
    - Transmitter-receiver integrated into turning unit, no external waveguide requiring less maintenance
    - Light weight, 136 kg: No structural modifications are needed on the existing tower or planned roof
    - 18ft Circular polarized antenna array, mitigates performance degradation due to rainfall
    - Minimum AC power

Figure 2-8: - Series 1000 Coastal Surveillance Radar

requirements, simplifies emergency back-up power design

- Disadvantages
  - Magnetron requires annual replacement

- **Scanter 2001 with 18' High Gain X-Band SWG Antenna**
  - Maker: Terma
  - Origin: Denmark
  - Advantages
    - High Performance Magnetron based system
    - 18ft Circular polarized antenna array, mitigates performance degradation due to rainfall
  - Disadvantages
    - Transmitter-receiver (TR) unit separate from antenna turning unit requires waveguide run and TR unit must be mounted in environmentally protected shelter near antenna
    - Antenna unit weight 400kg. The existing tower structures may require substantial engineering modifications
    - Antenna requires heavy duty, three phase AC power
- **SharpEye VTS Radar**
  - Maker: Kelvin Hughes
  - Origin: UK
  - Advantages
    - Solid State Transmitter design (no Magnetron), lower annual maintenance requirements
    - Transmitter-receiver integrated into antenna turning unit, no external waveguide required
  - Disadvantages
    - Horizontal polarized antenna, not ideal for performance in heavy rainfall
    - Antenna weight 300kg: The, existing tower structures may require substantial engineering modifications

Based on the above comparisons the Series 1000 Coastal Surveillance Radar would provide the best value for the DIMAR / Coast Guard VTS radar.

2.2.1.2 Radar Extractor/Tracker/Controller

The radar extractor/tracker/controller connects to the radar and down-converts the necessary raw data and signals for the extraction of detected radar targets. In addition, it provides the interface for asserting remote control functions and status monitoring.

Radar targets are extracted from the raw radar data based on programmable detection threshold parameters. The tracker function analyzes each detection against past detections (history) to determine if a radar target is consistent and also predicts the target's future position. Track data (location, velocity, size) is exported over the system network for presentation on the VTS display system.

The selection of the radar extractor/tracker/controller is based on the following criteria: a) Minimum performance functions of IALA "Standard" system, b) Additional functionality to support DIMAR requirements, and c) scalability for future growth.

Candidate systems are:

- **RadarPro Advanced Radar Processor**
  - Maker: L-3 Klein
  - Origin: USA
  - Functionality
    - Meets IALA recommendations
    - Tracker Capacity: 1000 targets
    - Plot Extractor Capacity: 10,000 plots per scan or greater
    - Land mask, unlimited polygons
    - Automatic acquisition
    - TCP/IP Client-Server interface to VTS software
  - Discriminators
    - Multiple signal processing stages for enhanced performance in clutter (rain and sea)
    - Small Target Detection processing
    - Dual channel tracker
- **PC-RP**
  - Maker: SSR Engineering
  - Origin: USA
  - Functionality
    - Tracker Capacity: 800 targets
    - Network interface to VTS software
    - Automatic Gain/Clutter control
    - Land mask
    - Automatic acquisition
- **VET5070**
  - Maker: Kongsberg - Norcontrol
  - Origin: Norway
  - Functionality
    - Meets IALA recommendations

- Tracker Capacity: 500 targets
- Automatic and manual acquisition
- TCP/IP or UDP/IP interface to VTS software

The RadarPro Advanced Radar Processor is recommended as being the most capable system to provide both the VTS radar functionality and the small target detection functionality for security operations.

2.2.1.3 Control Center Components

The Control Center components comprise the VTS server rack and Control Center Display console. The following paragraphs provide illustrative descriptions of the Control Center components as well as functionality descriptions.

2.2.1.3.1 VTS Server Rack

The VTS Server rack shall contain the necessary server platforms that host the primary and supporting VTS software as well as necessary storage devices (i.e. digital video recorders --DVR) for logging and recording. The VTS software communicates with the remote VTS Sensors including the remote radars, Thermal IR cameras and Automatic Identification System (AIS subsystem. VTS client applications at the Control Center Console present the common operating picture (COP) to the VTS operators.

The VTS Server provides fusion of multiple radar site data and Automatic Identification System (AIS) data as a GIS layer for presentation. Client display applications on the Control Center console will connect to the VTS server applications and present a Geographical Information System (GIS) display of all relevant VTS information and allow control, monitoring and status of all VTS functions and remote sensors using simple to use graphic user interface (GUI).

The Video Manager/Server provides control and display functionality for all the system cameras (FLIR IR and visible closed circuit television CCTV camera). Video Manager Client applications at the operator workstations will present the video streams from all system cameras. A digital video recording (DVR) capability is included as part of the Video Manager/Server along with removable RAID (Redundant Array of Independent Disks) drive for storage of DVR recordings. The Video Manager application is the Axis Camera Station product.

The IP Security Center Server integrates with the VTS Server to provide overall command and control functionality. It provides overall supervisory tools to assist the VTS operations team in managing all subsystems and the data that is generated. Action and response plans are created, and then can be generated based on system alerts or alarms. The VTS Supervisor will have primary access to the IP Security Center client application.

External clients and stakeholders shall have access to VTS data and information. The VTS server shall support secure client/server connectivity by remote clients so that law enforcement or defense entities have access to the COP. In addition, web access shall allow less sensitive information (i.e. ships movement) to be made available to authorized stakeholders (pilots, ship agents, terminal operators, etc).

The typical layout of the VTS Server Rack is shown in the adjacent illustration.

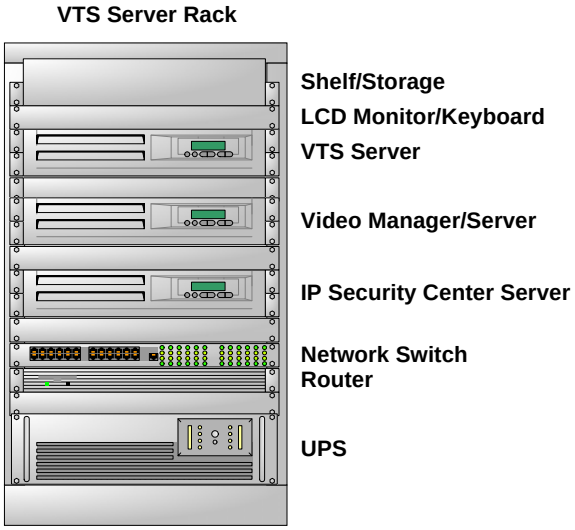


Figure 2-9: - VTS server rack

2.2.1.3.2 Control Center Console

The Control Center Console includes two operator workstations and a supervisor's workstation. The operator workstations include the VTS client applications that will display the COP and each operator display will be configured to provide coverage of selected geographic sectors. The supervisor's workstation shall have the ability to view any sector, plus will have access and control of the various sensors and AIS software. The console design shall be based on the Emcor Enclosures FP2 modular desktop workstation product line.

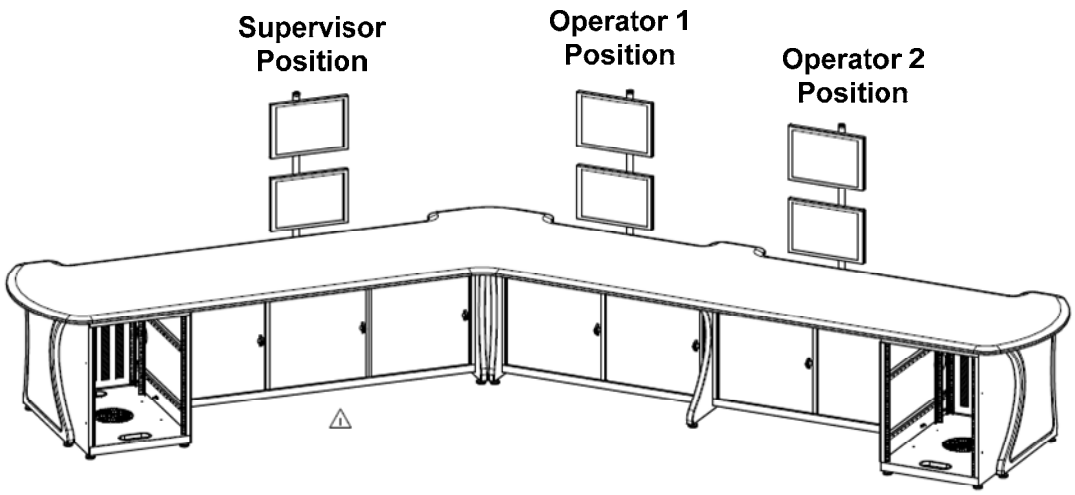


Figure 2-10: Proposed Control Center Operator Console Layout

2.2.1.4 VTS Control Center Functionality

The illustration that follows provides a functional block diagram of the VTS Control Center components. All system components communicate via a fast Ethernet Local Area Network (LAN)... In addition, the LAN is connected to a network bridge which allows external users (with appropriate credentials) access to System information.

The VTS Server interfaces with the VTS Radar sensors to process all radar track data to provide a real-time view of all surface vessel targets within the coverage range of the System. AIS data from the AIS subsystem is also processed by the VTS Server and fused with radar track data to provide comprehensive view of all identified and unknown targets to the Operator workstation client displays.

The HarborGuard user interface is the client application to the VTS Server and presents the radar and AIS picture on a GIS display. The GIS database is a C-Map Professional digital nautical chart, which is derived from S-57 international chart data. The HarborGuard also includes graphic user interface (GUI) controls for the operation of the remote Radar sensors and controls for the System's Thermal IR cameras.

The Video Manager/Server (VMS) is comprehensive video management software for monitoring, recording, playback and event management and is based on the AXIS Camera Station software. The VMS integrates with the VTS and IP Security Center servers to provide event driven video recordings of critical scenarios. Examples of the event driven video recording would include recording of vessels that violate security zones. The user client at each operator workstation provides live views of all system cameras. The VMS is expandable to support up to 50 cameras for future VTS growth.

The IP Security Center provides an integrated control center environment by presenting the Supervisor and Operators with a unified, homogeneous view on the entire execution of VTS operational and security policy. As a management software, the IP Security Center addresses the integration of systems, both hardware and software, in a manner that is transparent to the end user. It also provides integration of the human and machine processes used to execute the VTS policies. Finally, timely and effective reports and statistics on the execution of VTS policies are provided by the IP Security Center.

The IP Security Center server provides Web access to properly credentialed external users, where custom reports, data and information feeds are available for viewing in simple to use browser based screens.

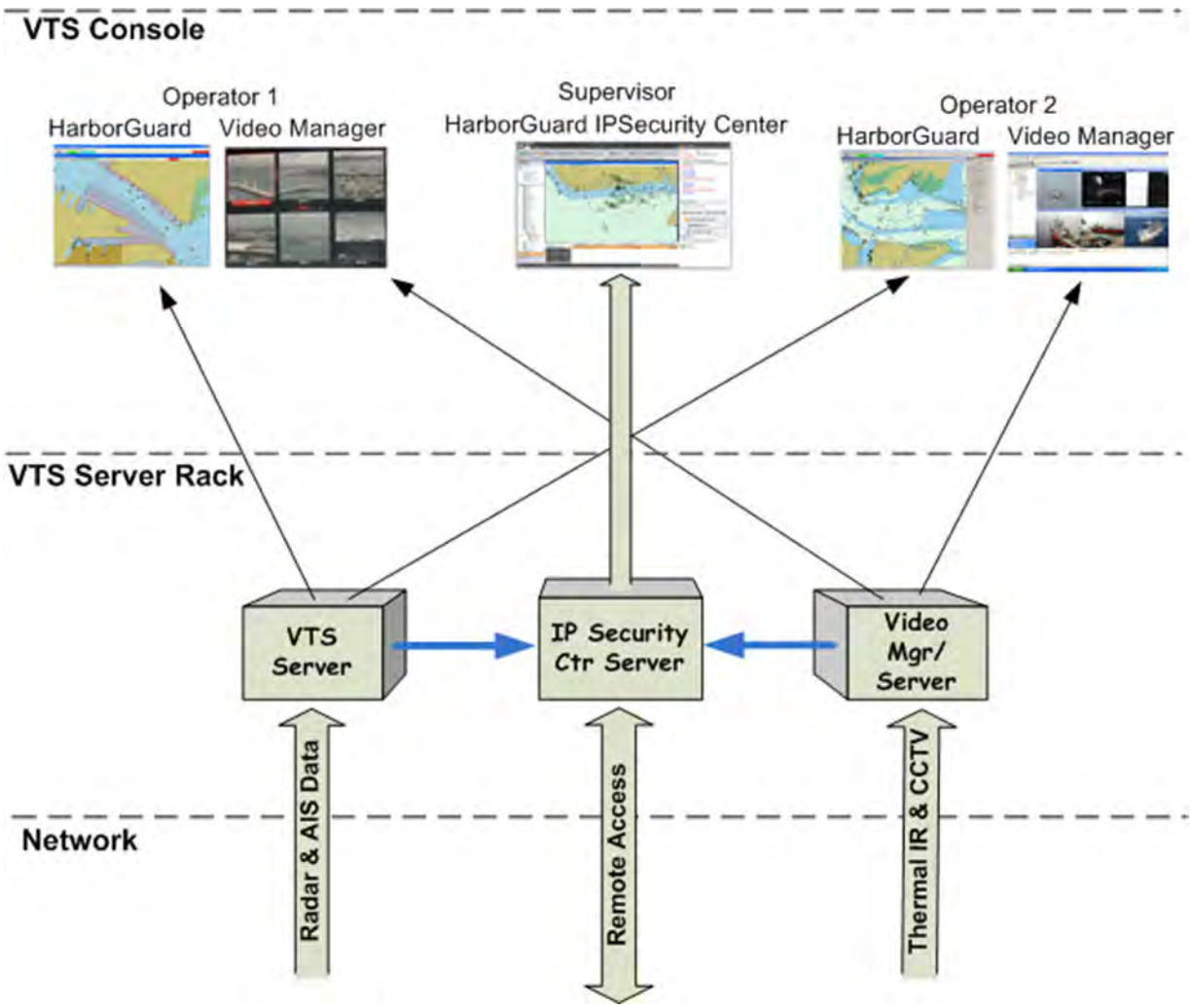


Figure 2-11: VTS Control Center components

VTS Software Comparison			
	Model/Brand		
	HarborGuard IP Security Center	Navi-Monitor	VTMIS5060
Maker	L-3 Klein	Transas	Kongsberg-Norcontrol
Country of Origin	USA	Russia	Norway
Client/Server based system	✓	✓	✓
Open Architecture	✓	✓	✓
Multiple Secure Clients	✓	✓	✓
Radar Track Processing/Display	✓	✓	✓
Accepts AIS track inputs	✓	✓	✓
Fuses Radar and AIS Data	✓	✓	✓
Small Target Detection Radar processing	✓	✓	
Integrated CCTV camera slew-to-track and slew-to-cue capability	✓	✓	
Target Closest point of approach (CPA) and Time to closest point of approach (TCPA)	✓	✓	✓
Target Vector display	✓	✓	✓
Target Identity label	✓	✓	✓
Target Data Query	✓	✓	✓
Collision Alerts	✓	✓	✓
User generated alarm and warning zones	✓	✓	✓
Target Intercept Calculator tool	✓		
Digital Navigational Chart background map	✓	✓	✓
User created map layers	✓	✓	✓
Spanish language Graphical User Interface	✓		
Event and Alarm recording/log	✓	✓	✓
Target History recording/log	✓	✓	✓
Target history trails graphic display	✓	✓	✓
Preset Display Views	✓	✓	✓
Automatic Camera Handoff for tracked targets	✓		
Programmable Response Plans for Events	✓		
Web Access	✓	✓	
Generate email, SMS alerts	✓		

Table 2-2 Comparison of VTS software

2.2.1.5 Small Target Detection Radar

The Small Target Detection Radar provides advanced capability for detection and tracking of small, threat targets. The system provides a very rapid radar scan update rate to effectively track and monitor many high speed targets simultaneously as well as provide real-time “slew-to-track” for the Thermal IR cameras.

The addition of the Small Target Detection Radar will expand the capability of the VTS to allow the effective monitoring of illegal activities along the Buenaventura waterways.

A Small Target Detection Radar mounted on a tower at the Coast Guard base will provide clear line-of-site coverage of the waterside approaches to vessels docked at Buenaventura port terminals.

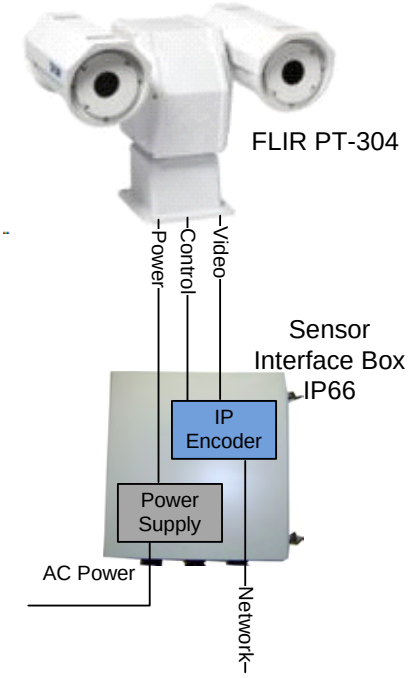
A second system, installed on the Punta Soldado radar tower will provide small target detection in the channel anchorage as well as along the shoreline and approaching estuaries. In addition, this second radar can serve as a backup to the Punta Soldado VTS radar.

The system selected for this role is the L-3 Klein Series 1000 Small Target Detection Radar with RadarPro Advanced Radar Processor. The selection is based on its unmatched, proven capability used in many critical security applications where small target threats are encountered.

2.2.1.6 Thermal IR Camera

The thermal IR camera integrates with the VTS system to provide the VTS operators a means of real-time assessment, observation, classification and identification radar and AIS targets. Control of the thermal IR camera functionality shall be from the VTS operators display using onscreen Graphical User Interface (GUI) controls as well as physical joystick. Each Thermal IR camera shall include pan/tilt assembly with un-cooled Thermal IR camera/sensor and low light color camera/sensor. The Thermal IR camera shall integrate to the VTS network providing connectivity to all credentialed VTS operator display client applications.

The technology chosen for the Thermal IR component is the FLIR (USA) PT-304 Multisensor network enabled pan/tilt thermal security camera system. The PT-304



2-12: FLIR PT-304 Figure Thermal IR Camera

uses a highly reliable un-cooled, mid-wave thermal sensor with 100mm lens and the advanced electron multiplied charged coupled device (EMCCD) Color Night Vision camera.

To connect the remote thermal IP camera to the VTS network, the Sensor Interface Box provides the IP Encoder and supporting power supply that converts the camera video and control signals into TCP/IP compatible protocols. The Sensor Interface Box is rated for external mounting (IP66).

2.2.1.7 Microwave Data Link

The microwave data link equipment shall provide network connectivity of the remote sites (Punta Soldado and Coast Guard Base) to the Control Center. The system recommended is the Motorola wireless broadband PTP 48600 point-to-point bridge. This system operates in the 4.8 GHz radio band with data rates up to 300 Mbps. The proven track record of this product in similar applications requiring over-water transmission is the principal reason for this selection.

2.2.1.8 Ancillary Equipment

AC Power Requirements

The AC power budget for the VTS components is as follows:

- Punta Soldado Remote Radar Site Equipment 90-250VAC 2,500 Watts
- Coast Guard Island Remote Radar Site Equipment 90-250VAC 1,600 Watts
- Control Station Equipment 90-250VAC 4,200 Watts

The VTS is considered mission critical equipment and emergency backup power shall be included as part of the implementation plan. The use of online uninterruptable power supplies (UPS) will insure that the critical, processor based components have a steady, filtered power source that will withstand short duration impulses and interruptions. The UPS capability will keep VTS processor and network equipment in operation in cases of primary power loss for periods up to 15 minutes to allow startup and switchover to emergency power source.

It is understood that the power system for the existing facility at Punta Soldado is derived from a local generator set. Unless an existing emergency backup or change-over system exists and this capability is adequate for the VTS equipment components, such a system will be required.

The new Maritime Control Station should include supply by an emergency back-up power system outside the building to support the VTS equipment as well as for the maintenance of adequate conditions for personnel and equipment (lighting, air conditioning).

The emergency backup power system for the Coast Guard Island remote VTS site equipment will be provided by a diesel or LP gas powered generator. An AC generator capacity of no less than 6000 Watts will provide adequate power for the VTS equipment as well as for a small air-conditioning unit needed to

cool the indoor equipment. The generator shall have automatic start and changeover switch and shall operate up to 12-hours without re-fueling.

Standby Emergency Generator manufacturers:

Supplier	Origin
• Cummins Onan	USA
• Kohler	USA
• Caterpillar	USA
• Ingersoll Rand	USA / Ireland
• Honda	Japan

Communications Requirements

The Vessel Traffic Control Station shall have the ability to communicate with vessels operating within the operational area of the Port of Buenaventura VTS. The VTS shall use VHF/DSC communications equipment operating in the Marine VHF band. The VTS Control Center shall have the ability to monitor VHF Channel 16, DSC Watch Channel 70 and the appropriate VTS working channel (local regulation). Each VTS operator position shall have a VHF controller and microphone/speaker/headset. The primary VHF transceiver shall be located in the Control Center building, VTS equipment space, with a high gain VHF antenna located on the roof. A secondary remote controlled VHF transceiver shall be located with the VTS equipment at Punta Soldado with a high gain antenna located on the Punta Soldado Radar tower.

VHF Coast Station Equipment Suppliers:

Supplier	Origin
• Tait Radio	New Zealand
• Jotron	Norway
• Thrane & Thrane	Denmark

Other communications services necessary for the Maritime Traffic Control Station operations would include Internet/Web access, email service and telephone service. It is assumed that these public carrier services are currently available and not required to be supplied as part of the VTS implementation.

Radar Tower Coast Guard Island

The Small Target Detect Radar installation at Coast Guard Island will require a suitable tower structure for the radar antenna unit, Thermal IR camera and Data Link microwave antenna. The tower shall be 15 meters (50-ft) in height, self-supporting and have appropriate climbing and service platform features. The tower shall meet all local grounding and lightning protection requirements.

The tower shall be designed to operate in wind speeds up to 137 km/hr (38 m/s). With a fast rotating radar antenna, the tower design shall take into consideration the dynamic wind-loads minimizing the effects of sway and twisting moment.

Tower Suppliers:

Supplier	Origin
• Rohn	USA
• Sabre Towers & Poles	USA
• Glen Martin	USA

Hydro/meteo

The VTS Control Center shall have access to meteorological and hydrographic data. Hydro/meteo data should include actual and predicted conditions of water level, wind speed and direction, wave height, current velocity, visibility relevant to vessel safety in channels and at port. It is assumed that existing sensors and data are available to the VTS operators from the appropriate national meteorological and hydrographic services and this information can be imported into the VTS using existing Web based or local network connections. Should additional hydro/meteo capability be required to support VTS operations, the appropriate sensors, data collection and monitor hardware/software can be added as part of the VTS scope of supply. This equipment shall meet the minimum performance standards outline in IALA Recommendation V-128.

Hydro/meteo Equipment Suppliers:

Supplier	Origin
• Sutron	USA
• High Sierra Electronics	USA

2.2.2 Description and Recommendations for AIS

The following components are necessary for the implementation of an AIS system at the Port of Buenaventura as recommended herein.

2.2.2.1 AIS Base Station:

The AIS Base Station is one of the primary components in the AIS solution. It is primarily used to transmit and receive AIS data to and from AIS equipped vessels, and collect AIS data from other sources such as other base stations, receivers, repeaters, and Aids to Navigation (AtoN).

The capabilities that should be included with the base station are:

- Compliant with standards:

International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation A-124

International Electrotechnical Commission (IEC) 62320-1

- Receive AIS type messages: Class A, Class B
- Receive and transmit AIS text messages in broadcast or address mode
- Local AIS storage capabilities
- AIS repeater functionality
- Separate receive and transmit antenna interfaces
- Ethernet connectivity
- Serial interface connectivity
- Redundant and/or hot swap capabilities
- Remote management capabilities
- Local Interface

For purposes of this project, one primary base station is recommended. A hot spare (preconfigured replacement equipment) is recommended in case of primary equipment failure.

2.2.2.2 AIS Receiver:

The AIS receiver component will be used to extend the range of the Port's AIS coverage beyond that of the AIS base station. An AIS receiver may be employed which will simply collect incoming AIS transmissions, or an AIS repeater may be installed which collects AIS transmissions and re-broadcasts the signals.

Connectivity to the base station and power availability is a driving factor in determining the type of AIS receiver (or repeater) configuration that should be employed.

1. Option 1: The AIS receiver is connected to the base station via an internal network connection, an Internet connection, or via microwave connection. Incoming AIS messages are transmitted to the base station over the available connection method.

2. Option 2: The AIS receiver is equipped with repeater functionality. Incoming AIS signals are received by the repeater and re-transmitted. Providing that the AIS base station is within the range of the AIS repeater, direct connectivity between the base station and receiver is not required.

The following diagram illustrates the concept:

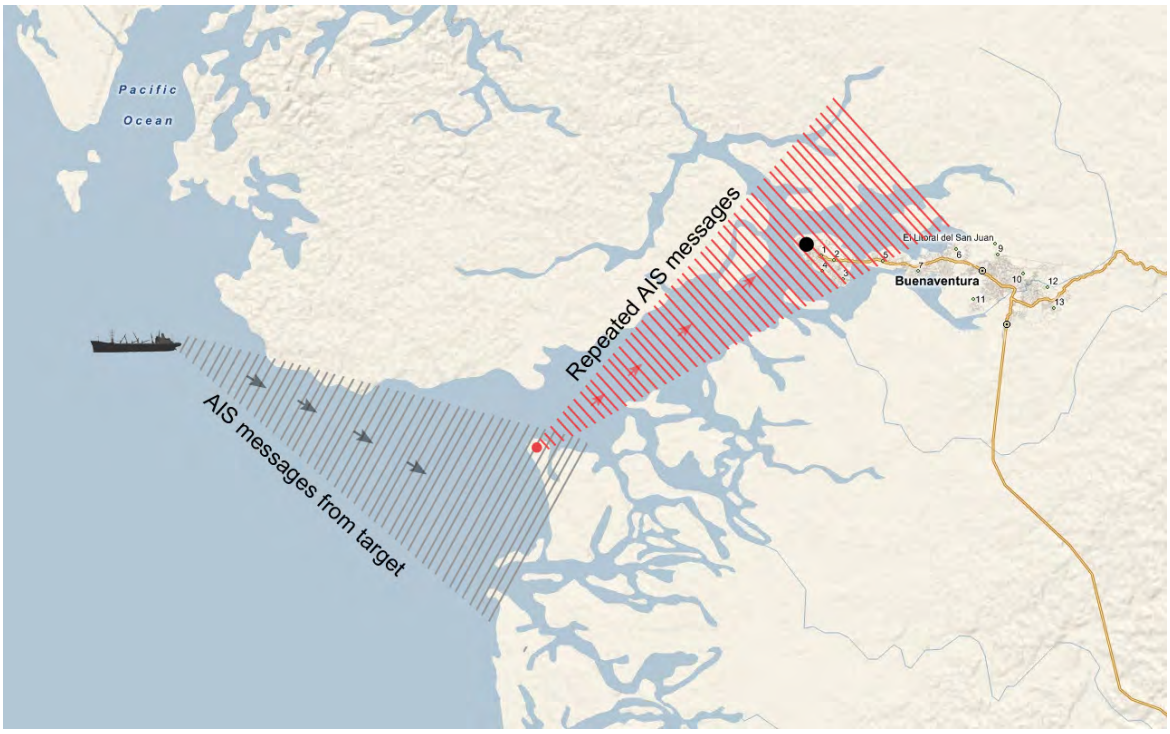


Figure 2-13: AIS with Repeater at Punta Soldado

For purposes of this project, both an AIS receiver and an AIS repeater will be recommended.

The capabilities that should be included with the AIS receiver are:

- Receive AIS type messages: Class A, Class B
- Ethernet connectivity
- Serial interface connectivity

The AIS repeater should have the following capabilities:

- Receive AIS type messages: Class A, Class B
- Repeat messages using Random Access Time Division Multiple Access (RATDMA) or Fixed Access Time Division Multiple Access (FATDMA) access scheme
- Serial interface connectivity

2.2.2.3 AIS Antenna:

The AIS antennas and cables provide the reception of AIS broadcasts from the vessels. Antennas can be omni-directional or directional. Directional antennas have a better range than omni-directional and are used primarily when mounted on the side of structures and when all AIS broadcasts originate from one direction. Omni-directional antennas have slightly less range, but can receive AIS traffic originating from any direction.

Due to the proposed locations of the AIS receivers and the geographic layout of the port complex, only omni-directional antennas should be considered as AIS targets may exist in any direction from the proposed receiver stations. The recommended antenna will be specifically designed to operate within the AIS bandwidth, 161.975 and 162.025 MHz, and be rated for extreme wind and weather conditions.

2.2.2.4 AIS Software / User Interface

The AIS software allows the user to view AIS targets on a map and provides ancillary information about the target. It may also include other useful features, as described below. Typically integrated with VTS, AIS is only one component of any system designed to enhance port operations and security. It serves as a single layer that is complemented by other sources of data. In an optimal Vessel Traffic System, AIS, radar, video, as well as static vessel information will be integrated into a single solution.

The minimum functionality of the AIS component of the VTS should include:

1. Target Display: The system must display AIS targets on a map using the following parameters/functionality

a. AIS A and B: The system must be capable of displaying both types of AIS messages.

b. Direction: Display the target showing clear delineation of the target's direction. This often takes the form of a triangle or ship-like icon. Systems that display a circle or other non-directional target should not be considered.

c. Target data: Display the target's AIS transmitted data in a clear and readily available format. This includes all relevant data transmitted by the target's AIS transponder such as target name, latitude, longitude, speed, course, direction, etc.

d. Static vessel information: Because some of the data transmitted via AIS is manually entered by ship personnel, the data displayed from the transponder may often be inaccurate or outdated. This could include non-navigational information such as vessel name, call sign, next location, and vessel dimensions. The Port's AIS system should be capable of storing and displaying static and detailed

information related to targets that complement the information received from the shipboard AIS transponders.

In addition to helping ensure data integrity, including additional vessel information will both maximize the Port's operational efficiency and enhance its security posture by increasing awareness of the maritime domain. The system should include a mechanism to capture and display information about each ship, such as its owner, previous names, type of cargo carried, local ship agent contact, last and next ports of call, etc.

With this information available for individual vessel calls, the system can then combine the information for every ship into a comprehensive overall port schedule.

2. Map Display: The underlying map upon which the targets are displayed should contain the following functionality and features:

a. Pan and Zoom: The AIS map layer should be easily controlled by the user with standard pan and zoom features. Systems that rely on static map images without zoom and pan capabilities should not be considered.

b. Latitude and Longitude: The map should include the capability to display the current latitude/longitude. This often takes the form of the latitude/longitude of the current mouse/cursor placement on the map.

c. Names: Display target names on map display for visible targets.

d. Target List: Comprehensive list of all AIS targets currently in the coverage area. Selecting the target from the list will automatically navigate the user to map showing the target.

3. Radar: The system should be capable of integrating radar feeds into the AIS display. It must combine the same AIS and radar feed from a single target into one integrated icon. The system should also be able to indicate which targets have both AIS and radar acquisition, AIS only, or radar only acquisition.

While AIS systems were originally implemented for use in ship-to-ship communications for the purpose of collision avoidance, receipt of signals by landside personnel provides a diverse array of commercial, operational and security benefits. Incorporating the AIS features listed here into the VTS will allow the Port of Buenaventura to maximize its investment in port infrastructure.

Most VTS systems are designed for use primarily by port security and operations personnel. They are not typically designed for port partners, such as local tug companies, pilots, local law enforcement, etc., who can derive significant benefit by having early, electronic access to the information provided through a VTS. Including the features and information described above will improve the overall security and

efficiency of the port business community, giving the Port of Buenaventura an edge over its competitor ports.

To address potential concerns with sharing any information from a VTS that may be considered "security sensitive," the Port can customize the AIS software to include filters which allow/prevent access to individual components of the system for individual users or groups of users.

Other Features: The following features are not required for AIS systems but are desirable when considering systems:

1. Location markers: The capability to show static location markers to the map display. This would allow users to add individual port names, berth locations, or other local identifiers to the map.

2. Geography-based alerts: User-defined logical areas or lines on the AIS map that generate alerts based on pre-defined events. These can be used to alert AIS users when a vessel has entered or exited a safety zone, or has exceeded a speed within a zone.

3. Replay: The system should allow for replay of the movement a single target or multiple targets over a specified time frame.

2.2.2.5. Product Comparison and Recommendations

The following provides a comparison of specific products that could be implemented as part of this project.

2.2.2.5.1 AIS Base Station

The following AIS Base Stations were compared using the criteria listed in 2.2.2.1 above.

1. Protec AIS Shore Station, L-3 AR Maritime
2. AIS BS500 AIS Base Station, Kongsberg Maritime
3. R40 AIS Base Station, SAAB AB

In all cases, the suppliers provide a robust and quality AIS base station solution with minor differences. All meet the recommended international standards for the industry level base station implementations. The L-3 AR Maritime system is recommended for its scalability, redundancy features, and compatibility with the recommended VTS solution.

Table 2-3: Base Station Comparison

	Base Station		
	Protec AIS Shore Station	AIS BS500 AIS Base Station	R40 AIS Base Station
Company	L-3	Kongsberg	Saab
Country of Origin	USA	Norway	Sweden
IALA Recommendation A-124 Compliant	✓	✓	✓
IEC 62320-1 Compliant	✓	✓	✓
Type A Messages	✓	✓	✓
Type B Messages	✓	✓	✓
AtoN Messages	✓	✓	✓
Receive AIS Text Messages	✓	✓	✓
Transmit AIS Text Messages	✓	✓	✓
Local AIS Storage	✓	✓	✓
AIS Repeater	✓		✓
Separate Transmit/Receive Antenna Interface	✓	✓	✓
Ethernet Connectivity	✓	✓	✓
Serial Interface Connectivity	✓	✓	
Redundant Configuration	✓	✓	✓
Hot Swap Capable	✓		✓
Remote Management	✓	✓	✓
Local Management Interface	✓	✓	
Rack Mountable	✓	✓	✓

2.2.2.5.2 AIS Receiver

As discussed in 2.2 2.2 AIS Components and Recommendations, an AIS receiver is recommended for the Coast Guard site.

The following AIS Receivers were compared using the criteria listed in 2.2.2.1 above.

1. RADARPLUS SM1610-2AN, Shine Micro
2. AIS-RX Pro Receiver, Automatic Power

The Shine Micro receiver is recommended due to its wide and successful use in the U.S. maritime industry, and its dual connectivity options (serial and Ethernet connectivity).

Table 2-4: AIS Receiver Comparison

	AIS Receiver	
	RADARPLUS SM1610-2AN	AIS-RX Pro Receiver
Company	Shine Micro	Automatic Power
Country of Origin	USA	USA
AIS A	✓	✓
AIS B	✓	✓
Ethernet Connectivity	✓	✓
Serial Interface Connectivity	✓	

2.2.2.5.3 AIS Repeater

As discussed in 2.2.2.2 AIS Components and Recommendations, due to the geography and potential limitations of connectivity to the base station, an AIS repeater is recommended for the Punta Soldado site.

The following AIS Repeaters were compared using the criteria listed in 2.2 above.

1. ATONIS-R, Automatic Power
2. Protec AIS ATON, L-3 AR Maritime

Both units adequately provide the required repeater functionality. The Protec AIS ATON repeater is recommended because of its capabilities to implement virtual Aids to Navigation (AtoN) broadcasts.

Table 2-5: **AIS Repeater Comparison**

	AIS Repeater	
	IS-R	Protec AIS ATON
Company	Automatic Power	L-3
Country of Origin	USA	USA
AIS A	✓	✓
AIS B	✓	✓
Ethernet Connectivity	✓	✓
Serial Interface Connectivity	✓	✓

2.2.2.5.4 AIS Software / User Interface

VTS - AIS

Since most enterprise level VTS systems come equipped with an integrated AIS component, this analysis will compare the AIS components of the VTS systems that have been included in the VTS analysis section to ensure base requirements are met.

Table 2-6: Comparison of Integration of AIS Software in VTS Base Stations

	Base Station		
	HarborGuard IP Security Center	Navi-Monitor	VTMIS5060
Company	L-3 Klein	Transas	Kongsberg-Norcontrol
Country of Origin	USA	Russia	Norway
Display AIS A	✓	✓	✓
Display AIS B	✓	✓	✓
Display target direction	✓	✓	✓
Display AIS transmitted data	✓	✓	✓
Target Names	✓	✓	✓
Radar Integration	✓	✓	✓
Geo-Based Alerts	✓	✓	✓
Replay	✓	✓	✓
Web Access	✓	✓	

In all cases, the AIS components included with the VTS systems met the base criteria and do not change the recommendations of the overall VTS proposal. This document recommends using the AIS system which is included among the selected VTS. However, none includes the integration of static vessel data which is recommended for the Port of Buenaventura.

As a result, an additional two systems were evaluated using the criteria listed in 2.2 above.

1. Maritime On-Line, Maritime Exchange
2. Titan Viewer, Xanatos Holdings

Table 2-7: Comparison of AIS Software

	AIS Software	
	Maritime On-Line	Titan Viewer
Company	Maritime Exchange	Xanatos
Country of Origin	USA	Canada
Display AIS A	✓	✓
Display AIS B	✓	✓
Display Target Direction	✓	✓
Display AIS Transmitted Data	✓	✓
Internal Map Source		✓
External Map Source	✓	
Pan and Zoom	✓	
Display Lat. And Long.	✓	✓
Display Target Names	✓	✓
Display Target List	✓	✓
Vessel Schedule Integration	✓	
Supporting Vessel Database	✓	✓
User-Defined Location Markers	✓	
Geo-Based Alerts	✓	
Replay	✓	
Web Access	✓	✓

The Maritime On-Line® system is recommended because of the additional vessel data/schedule module, and superior map features and functionality.

2.3 Comparison of Alternate Vessel Traffic Systems and Automated Identification Systems and Recommendations for Implementation

2.3.1 Comparison of Alternatives and Recommendations for VTS

The typical implementation of a VTS is to improve the maritime safety and efficiency of navigation, safety of life at sea and protection of the marine environment[4] and for this, Alternative 1 will describe the baseline VTS that will meet these objectives. It is recognized that in addition to the maritime navigation and safety aspects of a VTS implementation, the waterways and coastlines within DIMAR's / Colombian Coast Guard's area of coverage are subject to narcotrafficking, smuggling and other illegal activities where one of the modes of transportation is small, difficult to detect boats. This security aspect leads to the need for additional capabilities that would enhance the VTS in the areas of small threat target detection, identification and intervention, which will be proposed as Alternative 2.

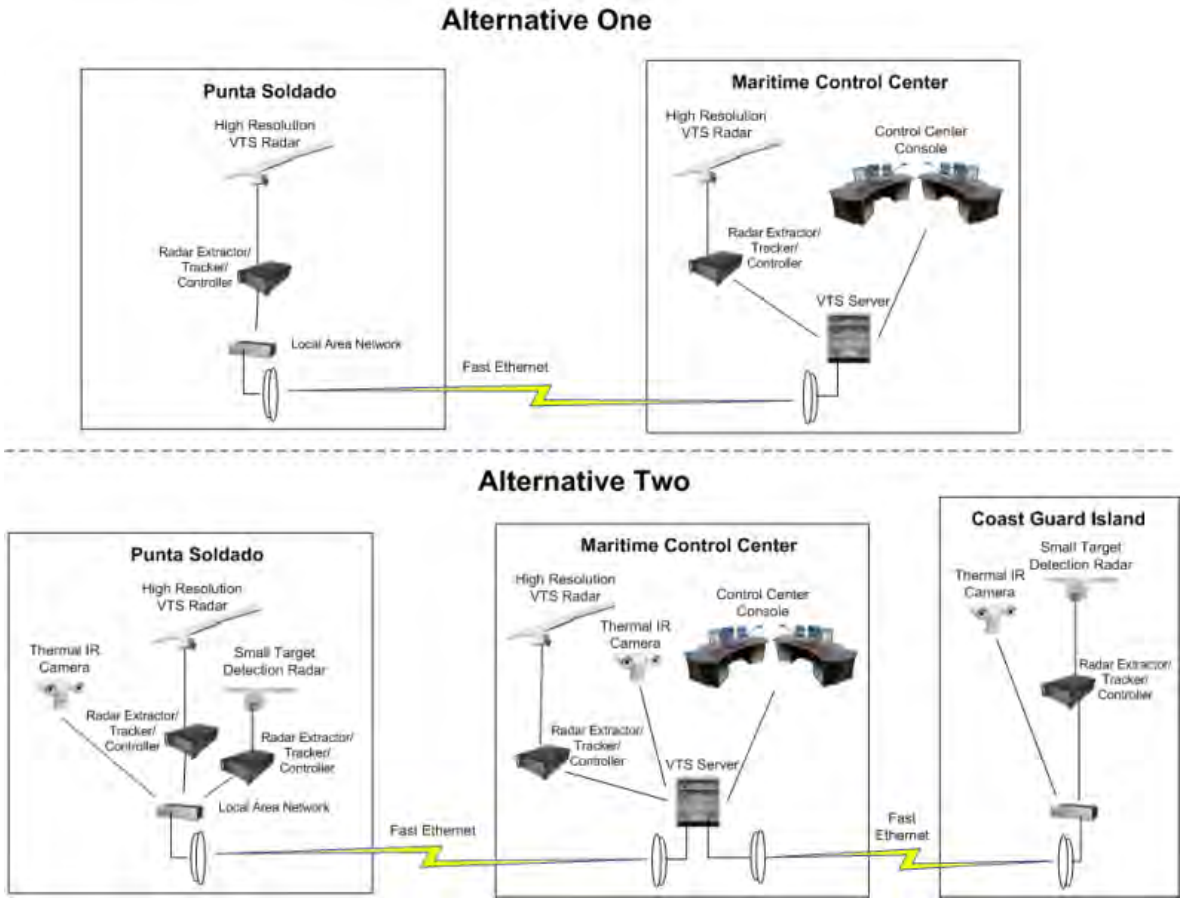


Figure 2-14: - VTS Alternative One and Two Layout Diagrams

[4] IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) Recommendation V-119, Sept 2000 – Recommendation on the Implementation of Vessel Traffic Services

In the following table the two VTS Alternatives will be compared against the VTS selection criteria.

Selection Criteria	Alternative 1	Alternative 2
Meets recognized International standards or recommendations for VTS implementation (IALA V-128)	✓	✓
Provides improved navigation and monitoring of all vessels near Buenaventura's coastline, main shipping channel, vessel anchorages and waterways adjacent o the SPRBun port terminals and facilities.	✓	✓
Incorporates current, state-of-the-art technologies	✓	✓
Suitable for installation and operation in hot, humid and rainy environment	✓	✓
Integrate with AIS subsystem	✓	✓
Provide all weather coverage	✓	✓
Expandable for future system growth	✓	✓
Ease of operation	✓	✓
Remote Stakeholder access	✓	✓
Thermal infrared camera		✓
Backup Radar coverage		✓
Special security/surveillance enhancements for defense and law enforcement		✓
Estimated equipment cost	US$700,000	US$1,117,506

Table 2-8: Comparison of VTS Selection Alternatives according to criteria

Alternative 2 would provide the most effective solution for the Port of Buenaventura Vessel Traffic System. While Alternative 1 would meet basic vessel traffic system functionality at an economical cost, the addition of small target detection and Thermal IR imaging in Alternative 2would provide superior security and surveillance capabilities, with the benefit to national security as well as maritime traffic management and safety.

2.3.2 Comparison of Alternatives and Recommendations for AIS

The following compares two AIS system configurations for deployment at the Port.

2.3.2.1 Option 1

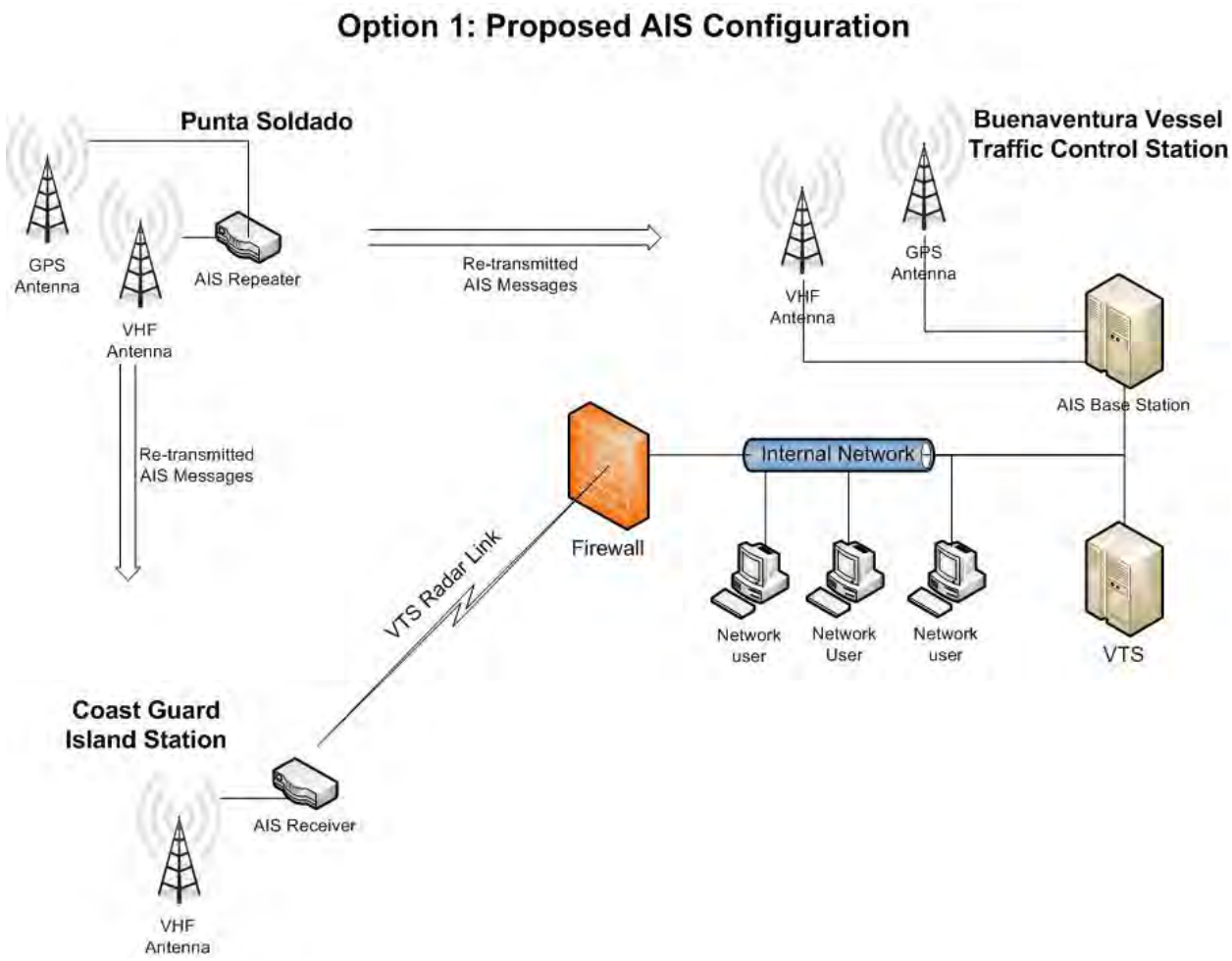


Figure 2-15: Configuration of Automated Identification System (AIS) Components – Option 1

The first configuration option provides the minimum AIS functionality for integration into the VTS. This option includes the installation of an AIS base station, backup AIS receiver, and an AIS repeater to provide full AIS coverage of the port. The following illustrates the required components for each site:

1. Maritime Traffic Control Station: Serves as the primary AIS receiver location for the port. The equipment at this site will interface directly with the VTS over a local area network (LAN) connection.

The unobstructed view available via this site will provide full AIS coverage for the port, channel, and the direct approach to the channel.

a. AIS Base Station: AIS transmit and receive capabilities

b. VHF antennae

c. GPS antennae

d. A hot spare AIS base station is recommended in case of hardware failure

2. Punta Soldado: Located at the mouth of the channel, the equipment at this site will provide extended coverage into the Pacific Ocean. Due to the remote nature of the site, an AIS Repeater is recommended in lieu of an AIS Receiver. The repeater will rebroadcast all AIS messages to the Marine Traffic Control Station which is well within range of any commercial grade AIS repeater. The implementation of the repeater will eliminate the need to provide LAN, Internet, or wireless connectivity between the Punta Soldado site and the Marine Traffic Control Center.

a. AIS Repeater

b. VHF antennae

c. GPS antennae

d. A hot spare AIS repeater is recommended in case of hardware failure.

3. Coast Guard Station: This site serves as a backup to the Marine Traffic Control Station and will include AIS receive-only functionality. This is important in the event of an antennae outage or other failure that would prevent AIS receive capabilities at the primary facility. Even though the repeater range at Punta Soldado can adequately cover vessel traffic in the port, it will not be connected to the primary facility via Local Area Network (LAN), Internet, or other communication method. In the event of a failure at the primary facility, the repeated messages must still be captured by equipment that can be linked to the VTS. The AIS receiver at the Coast Guard Station provides a cost effective backup solution.

It is assumed that a power source is available, and that space will be available to mount up to an eight-foot antenna on the roof of the Coast Guard facility for connection to the AIS receiver. In order to eliminate redundancy and to reduce cost, the connectivity proposed for the radar installation at the Coast Guard station will be used to transmit the AIS messages to the base station.

a. AIS Receiver

b. VHF antenna

c. A hot spare AIS receiver is recommended in case of hardware failure.

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The diagram illustrates the configuration of the AIS components.

2.3.2.2. Option 2

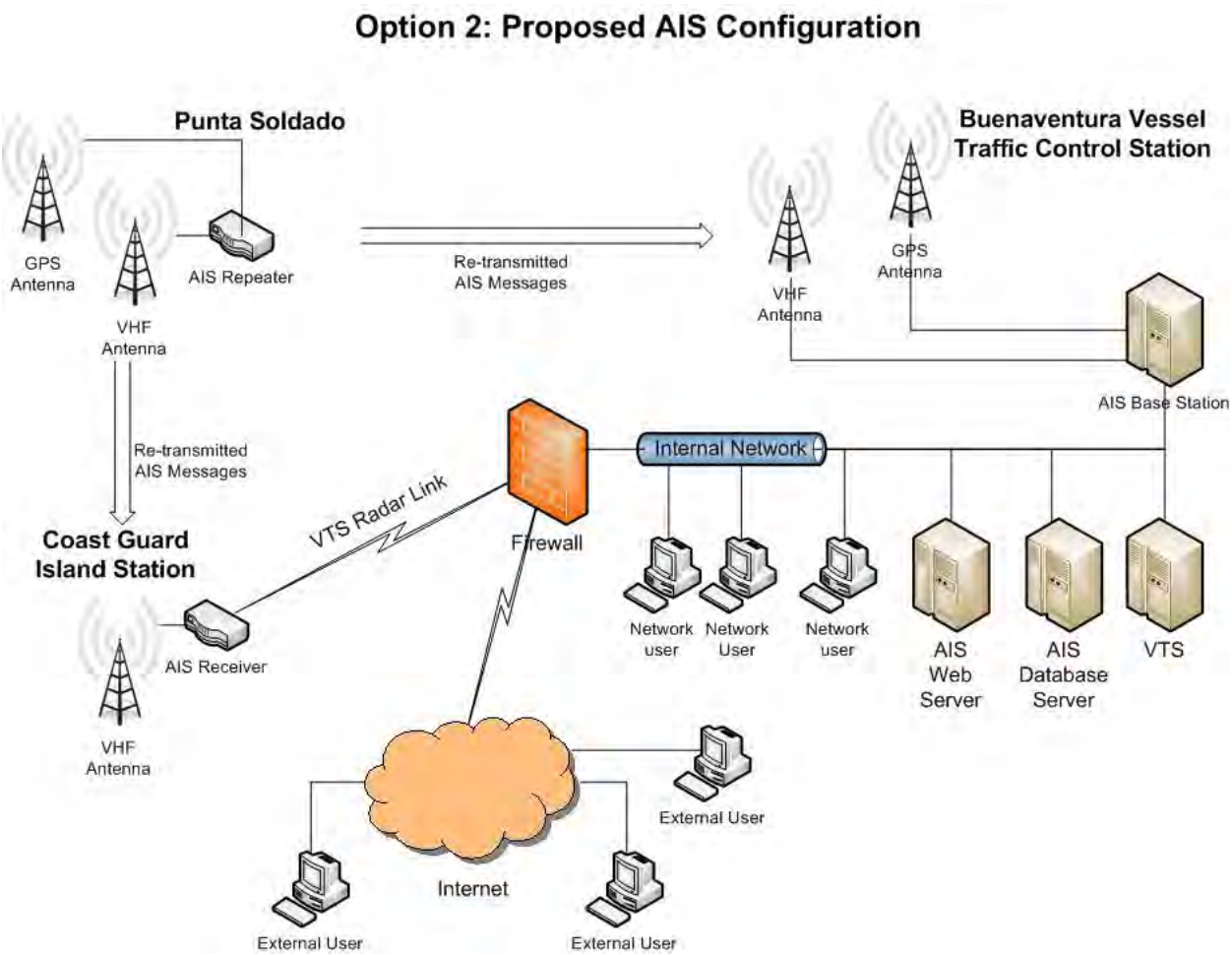

Figure 1-16 Configuration of the Automated Identification System (AIS) Components – Option 2

The second configuration option provides extended functionality for the port beyond the minimum AIS coverage. It includes the same AIS hardware listed in Option 1 with an additional component to provide enhanced maritime traffic recording and reporting features.

All commercial grade VTS systems include an AIS display component. But in many cases, the VTS is designed for use only by port security personnel due to the security sensitive nature of other information in the VTS such as radar and video feeds. This precludes access to AIS by the commercial sector and other entities not affiliated with the port that may have port safety and security missions. In

addition, traditional AIS systems only provide the current location of vessels and do not allow for the recording of the full vessel schedule which has both security and commercial applications.

Through the implementation of a separate web-based AIS display interface that includes vessel schedule reporting, the port can realize the following benefits:

- Enhanced security screening by comparing real-time vessel positions to anticipated schedules. Allows operators to identify potential security risks when unannounced or unscheduled AIS targets are visible.

- Provides security personnel that are involved in boarding missions and operations personnel who must facilitate cargo loading/discharge with advanced scheduling information to more adequately plan resources.

- Provides the commercial sector with advance vessel movement itineraries which promotes more efficient cargo operations.

- The combination of increased security measures and enhanced planning tools ultimately makes the port more efficient and competitive.

The following illustrates the required components for each site:

1. Maritime Traffic Control Station:

a. AIS Base Station: AIS transmit and Receive capabilities

b. VHF antennae

c. GPS antennae

d. AIS web application: This typically involves the implementation of the following:

   i. AIS web server: Provides interface for the community to access AIS and vessel schedule information via the Internet

   ii. AIS database server: Provides storage for the AIS and vessel schedule application

e. A hot spare AIS repeater is recommended in case of hardware failure.

2. Punta Soldado:

a. AIS Repeater

b. VHF antennae

c. GPS antennae

[Type text]

d. A hot spare AIS repeater is recommended in case of hardware failure.

3. Coast Guard Station:

a. AIS Receiver

b. VHF antenna

c. A hot spare AIS receiver is recommended in case of hardware failure.

The following diagram illustrates the configuration of the AIS components.

2.3.2.3 Configuration Recommendation

As described above, Option 2 is recommended because it provides the Port with the flexibility to easily extend AIS access to non-port personnel without compromising the security of the VTS. The added cost of implementing the additional components to host the AIS web application is justified by the additional security layer of the integrated vessel schedule data. This information also contributes to more efficient cargo operations throughout the region. The collection and dissemination of vessel schedules, in conjunction with AIS, is a standard configuration in many U.S. and European ports.

2.4 Preparation of specifications, procurement documents, cost estimates and implementation program for the Vessel Traffic System and Automated Identification System

The Directorate of Telematics (DITEL) intends to procure an integrated Vessel Traffic System to be installed in and around the port of Buenaventura, Colombia.

For ease of reference, the term “System” shall refer to the overall Vessel Traffic System (VTS), the term “Radar” shall refer to the radar subsystem or component, the term “Camera” shall refer to the Thermal infrared (IR) subsystem or component, the term “VTS Server” shall refer to the VTS control center hardware/software components, the term “Operator Display” shall refer to the VTS console and client hardware/software components, and the term AIS shall refer to the Automatic Identification System (AIS) subsystem or component.

The System shall provide a layered approach to the monitoring of vessel movements for the seaward approaches, navigation channels and anchorages, and port terminal areas of the port of Buenaventura. Radar and AIS shall provide the primary detection and tracking capabilities. Real-time data from these subsystems is combined and processed by the VTS Server for presentation to operators and stakeholders on the System’s Operator Displays.

In addition to the vessel traffic monitoring, navigation and management functionality the System also includes unique security surveillance capabilities. Specialized small target detection radars and night-capable Camera systems shall detect and alert the presence of low detectable vessels to provide the necessary intercept information for capture operations.

2.4.1 Provision of performance specifications for Vessel Traffic System and Automated Identification System components:

2.4.1.1 Performance specifications for VTS components

2.4.1.1.1 Environment

Externally mounted equipment shall be suitable for operation under the following conditions:

- Temperature: +55° C to -25° C
- Relative Humidity: 93% @ 40°C

Internally mounted equipment shall be suitable for operation under the following conditions:

- Temperature: +30° C to +15° C
- Relative Humidity: less than 90%

Availability: 99.6%

2.4.1.1.2 Radar Performance Specifications

High Resolution VTS Radar

i. Separation between small point targets for discrimination in range
   - 30m in Short Range mode
   - 75m in Long Range mode

ii. Separation between small point targets for discrimination in azimuth
   - 0.8 degrees

iii. Target Detection Range

Target	Clear	4mm/hr rain	Sea State
Small boat (RCS 1m^2, 1m ht)	5 NM	3 NM	up to 3
Small vessel (RCS 3m^2, 2m ht)	7 NM	4 NM	up to 3
Fishing Boat (RCS 10m^2, 3m ht)	8 NM	5 NM	up to 4
Small Freighter (RCS 100m^2, 5m ht)	11 NM	9 NM	up to 5
Large Freighter (RCS 1000m^2, 8m ht)	13 NM	11 NM	up to 6

Small Target Detection Radar

i. Separation between small point targets for discrimination in range
   - 40m in Short Range mode
   - 100m in Long Range mode

ii. Separation between small point targets for discrimination in azimuth
   - 1.3 degrees

iii. Target Detection Range

Target	Clear	4mm/hr rain	Sea State
Surface Swimmer (RCS 0.03m^2, 0.2m ht)	2 NM	1.4 NM	up to 3
Very small craft (RCS 0.5m^2, 0.5m ht)	4 NM	2.8 NM	up to 3
Small boat (RCS 1m^2, 1m ht)	5 NM	3 NM	up to 3
Small vessel (RCS 3m^2, 2m ht)	6 NM	4 NM	up to 3
Fishing Boat (RCS 10m^2, 3m ht)	7 NM	4 NM	up to 4
Small Freighter (RCS 100m^2, 5m ht)	10 NM	8 NM	up to 5
Large Freighter (RCS 1000m^2, 8m ht)	12 NM	10 NM	up to 6

Radar Extractor/Tracker/Controller

i. Probability of detection: 0.8
ii. Number of plots per antenna rotation: ≥ 5000
iii. Number of confirmed tracks: ≥ 700
iv. Speed of tracked targets: ≤100 kts
v. Turn rate of tracked targets: ≤ 10° /second
vi. Accuracy in track position:
   - Range: ≤ 0.75% of range covered by radar or 10m + selected pulse length, whichever greater
   - Bearing: ≤ 1°
vii. Accuracy of track data:
   - Speed: ≤ 1 kt
   - Course: ≤ 2°
viii. Time for confirmation of tentative track: ≤ 1 minute
ix. Time from track confirmation to achievement of specified accuracy: ≤ 2 minutes
x. Time from data loss to automatic track termination: ≥ 1 minutes

2.4.1.1.3 Thermal IR Camera

The Thermal IR Camera provides dual sensor capability that includes thermal IR and color daylight capabilities.

i. The Thermal IR sensor shall provide a thermal image of targets and allow the operator to recognize target shapes. The type of vessel shall be capable of being identified at a minimum range of 3 NM from the camera location.
The color camera sensor shall provide color imagery targets to allow the operator to identify targets. The identity of a vessel by shape, color and other features shall be capable of being determined at a minimum range of 1 NM from the camera location.

2.4.1.1.4 Marine Communications System

The Marine Communications System shall comprise a Global Maritime Distress Safety System (GMDSS) compatible very high frequency (VHF)/digital selective calling (DSC) capability. Each VTS Console position shall have headset/microphone, speaker and radio control panel allowing control of local and remote (Punta Soldado) VHF transceiver. The VHF/DSC system shall meet the following specifications:

i. Frequency: 156 to 174 MHz
ii. Transmitter output power: 25W or greater
iii. Digital Selective Call (DSC) Encoder/Decoder
iv. Dedicated DSC Watch Receiver (Channel 70)
v.

2.4.1.1.5 Meteorological and Hydrographic System

The VTS shall integrate with locally available meteorological and hydrographic data sources. Where local resources are not available, supplemental sensors shall be provided that meet the following specification requirements:

- Height of Tide: ≤± 0.10 m
- Rate of Tidal Stream/ Current: ≤ ± 0.5 knots
- Direction of Tidal Stream/Current: ≤ ± 10 Degrees
- Wave height: ≤ ± 10% of the height
- Wave Direction: ≤ ± 20 Degrees
- Wind speed: ≤ ± 1m per sec
- Wind Direction: ≤ ± 10 Degrees
- Visibility: ≤ ± 10% of the distance
- Air Temperature: ≤ ± 1**0**C

[Type text]

- Air Humidity: ≤ ± 5 %
- Air Pressure: ≤ ± 2 hPa
- Sea Surface Temperature: ≤ ± 10C

2.4.1.2 Performance specifications for AIS components

- The following are minimum performance specifications for the major AIS components.
-

2.4.1.2.1 AIS Base Station

General Specification Requirements

Integrated GPS receiver	Yes
Receive frequency bandwidth	156.025-162.025MHz
Transmit Frequencies	156.025-162.025MHz
Antenna Ports (VHF TX and RX)	Must include as combined or separated
Interface	RS232 and Ethernet
Hot swap capable	Yes
IALA Recommendation A-124 Compliant	Yes
IEC 62320-1 Compliant	Yes
Remote Management	Yes
Rack Mountable	Yes

3 Functional Requirements

Type A Messages	Yes
Type B Messages	Yes
ATON Messages	Yes
Receive AIS Text Messages	Yes
Transmit AIS Text Messages	Yes
Local AIS Storage	Yes
Remote Management	Yes

4

2.4.1.2.2 AIS Receiver

General Specification Requirements

Type A Messages	Yes
Type B Messages	Yes
Interface	RS232 and Ethernet
GPS	Yes
Receive frequency bandwidth	156.025-162.025MHz
Antenna Interface	Type N connector

[Type text]

2.4.1.2.3 AIS Repeater

General Specification Requirements

Type A Messages	Yes
Type B Messages	Yes
Interface	RS232 and Ethernet
GPS	Yes
Receive frequency bandwidth	156.025-162.025MHz
Transmit Frequencies	156.025-162.025MHz
Antenna Interface	Type N connector

2.4.1.2.4 AIS Antenna

General Specification Requirements

Required Bandwidth	156.025-162.025MHz
Height	8 foot recommended
Type	Omni-directional VHF

2.4.2 Provision of performance specifications for ancillary facilities and utilities needed for Vessel Traffic System

2.4.2.1 Performance specifications for ancillary facilities and utilities for VTS

2.4.2.1.1 General performance requirements for Ancillary facilities:

Environment

Externally mounted equipment shall be suitable for operation under the following conditions:
- Temperature: +55° C to -25° C
- Relative Humidity: 93% @ 40°C

Internally mounted equipment shall be suitable for operation under the following conditions:
- Temperature: +30° C to +15° C
- Relative Humidity: less than 90%

2.4.2.1.2 AC Power System requirements and power budget for VTS equipment

VTS Control Center Equipment

1.	VTS Control Console	90-250VAC	4,100 Watts max
2.	VTS Server Rack	90-250VAC	2,100 Watts max
3.	Radar Server Rack	90-250VAC	1,405 Watts max
4.	VTS Radar motor	115/220VAC 1Ø	Start: 4,500 Watts Run: 1,200 Watts
5.	VTS Radar Transceiver	90-250VAC	500 Watts
6.	Camera & Wireless Link	90-250VAC	225 Watts

Punta Soldado Radar Site

7.	Radar Server Rack	90-250VAC	2,300 Watts max
8.	VTS Radar motor	115/220VAC 1Ø	Start: 4,500 Watts Run: 1,000 Watts
9.	VTS Radar Transceiver	90-250VAC	500 Watts
10.	Camera & Wireless Link	90-250VAC	225 Watts
11.	Small Target Detection Radar motor	115/220VAC 1Ø	Start: 5,500 Watts Run: 1,100 Watts

Coast Guard Island Radar Site

12.	Radar Server Rack	90-250VAC	1,405 Watts max
13.	Camera & Wireless Link	90-250VAC	225 Watts

Small Target Detection Radar

motor 115/220VAC 1Ø Start: 5,500 Watts Run: 1,100 Watts

2.4.2.1.3 Coast Guard Island Radar Tower specifications

i. *Height:* *50ft (15m)*

ii. Structure: triangular in plan, with pipe legs and pipe/angle braces. All material is hot dip galvanized after fabrication inside and out

iii. Environmental: designed per ANSI/TIA-222 Rev. G. for 85mph basic wind speed, no ice, Structure Class II; Exposure Category: C; Topography Category: 1

iv. Other:

a. Top Platform with handrails
b. Safety climbing device with full body harness
c. Lightning/grounding system
d. ICAO Obstruction Lighting (per local requirements)

v. All necessary wiring and conduit

2.4.2.2 Performance Specifications for Ancillary Facilities and Utilities for AIS

2.4.2.2.1 Maritime Traffic Control Station

1. Antenna Requirements

   a. Space required to mount 8’ VHF omnidirectional antenna on facility roof. Unobstructed view of harbor and channel required.

   b. Space required to mount 3” wide GPS antenna on facility roof. Unobstructed view of sky required.

   c. Both antennas must be above or below the radar equipment to avoid interference.

   d. Conduit required from antenna installation location to the server room in the Marine Traffic Control Station to support two VHF cables.

2. AIS Base Station Requirements

   a. Power Requirements: 110/220 VAC

   b. Approximate space requirements: 19" X 24" for rack

   c. Ethernet cables / facilities required to connect to VTS

2.4.2.2.2 Coast Guard Station

1. Antenna Requirements

   a. Space required to mount 8’ VHF omni-directional antenna on facility roof. Unobstructed view of harbor and channel required.

   b. Antenna must be above or below the radar equipment to avoid interference.

c. Conduit required from antenna installation location to receiver location.

2. AIS Receiver Requirements

a. Approximate space requirements: 7” x 4” indoors

b. Connectivity: Ethernet connectivity into Coast Guard facility network

c. Power Requirements: 120VAC

2.4.2.2.3 Punta Soldado Site

1. Antenna Requirements

a. Space required to mount 8’ VHF omni-directional antenna on radio or radar tower. The placement should be as high on the tower as allowable.

b. Space required to mount 3” wide GPS antenna on facility roof. Unobstructed view of sky required.

c. The antenna must be above or below the radar equipment to avoid interference.

2. AIS Repeater Requirements

a. Approximate space requirements: 5” x 5”

b. Power Requirements: 12V DC

2.4.3 Preparation of Procurement Documentation for Purchase and Installation of VTS and AIS system

2.4.3.1 Preparation of Procurement Documentation for Purchase and Installation of VTS System

Procurement documentation for purchase and installation of VTS systems is provided in Appendix A2.

2.4.3.2 Preparation of Procurement Documentation for AIS System

Procurement documentation for purchase and installation of AIS systems is provided in Appendix B2.

2.4.4 Scope of Work

2.4.4.1 Scope of Work for VTS

The Directorate of Telematics (DITEL) intends to procure a turn-key Vessel Traffic System (VTS). The VTS shall provide improved navigation and monitoring of all vessels near Buenaventura’s coastline, main

shipping channel, vessel anchorages and waterways adjacent to the port terminals and facilities at the Port of Buenaventura.

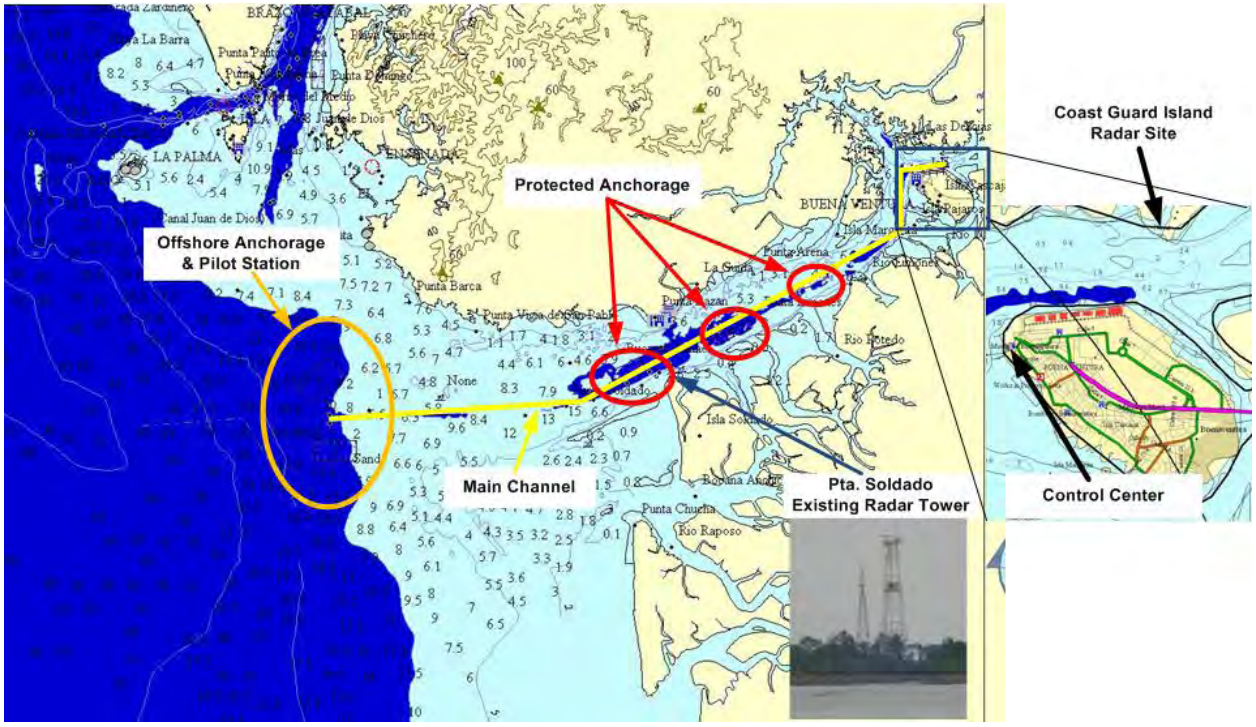

Figure 2-17 Configuration of the coverage area

This Scope of Work shall define the contractor's responsibilities for the implementation of the VTS.

The VTS shall comprise two remote, unmanned radar sites and a control center. One remote radar site, at Punta Soldado will include a high resolution VTS radar, small target detection radar and thermal IR camera. A second remote radar site, at Coast Guard Island, will include a small target detection radar and thermal IR camera. Each remote radar site shall be connected by wireless, fast Ethernet microwave links to the command center located in the new DIMAR / Colombian Coast Guard Maritime Traffic Control Center building on Buenaventura Island. Additional high resolution VTS radar and thermal IR camera shall be located on the roof of the new DIMAR / Colombian Coast Guard Maritime Traffic Control Station building.

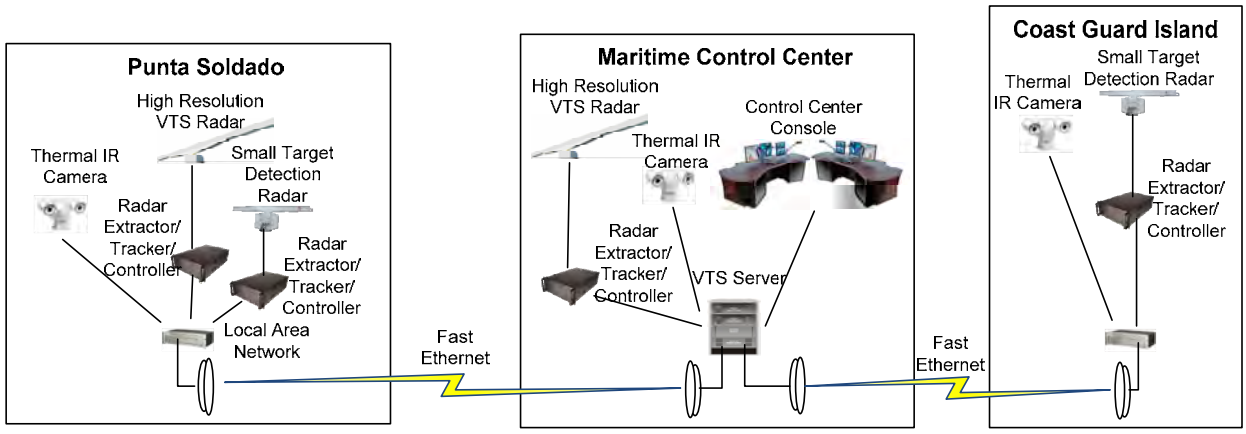

Figure 2-18 Architecture of the Buenaventura Vessel Traffic System

Radar Extractor Tracker / Controller and Thermal IR Cameras shall be co-located with each radar unit. VTS command and control software and associated servers and operator consoles shall be installed in the new DIMAR / Colombian Coast Guard Maritime Traffic Control Station building.

1.1 Site Survey and design finalization

The contractor shall conduct a site survey to confirm the VTS system design. Upon completion of the site survey, the contractor shall develop an installation material list (cables, hardware, etc) for items not included with the VTS equipment. The contractor shall engage local support services for the installation phase. These services shall include (but not be limited to) electricians, mechanics, riggers, carpenters, and transportation support.

The contractor shall identify all permits and variances needed to commence the VTS installation and assure these are in place and approved prior to the commencement of work.

1.2 VTS Control Center Equipment

The contractor shall supply the VTS Control Center equipment and installation material (identified during the site survey). The equipment list is as follows:

1.2.1 VTS Server

The VTS Server is a fully integrated 19-inch equipment rack that houses the main VTS servers, network appliances, power conditioner/Uninterruptible Power Supply (UPS) and supporting components. The equipment rack shall be no less than 18U (rack units) with closed side panels and locking front and rear access doors. The rack shall include proper ventilation. The rack equipment shall include:

a. VTS Server
   Rack mount server no greater than 3U
   - Quad Core Intel® Xeon® 3.0GHz or equal processor

[Type text]

- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- HarborGuard Maritime Surveillance Server software or equivalent

b. Command & Control Server

Rack mount server no greater than 3U

- Quad Core Intel® Xeon® 3.0GHz or equal processor
- 4GB RAM
- Hard Drive-1, 150GB, SAS (hot plug), 15,000 RPM
- Hard Drive-2, 150GB, SAS (hot plug), 15,000 RPM
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- IP Security Center Server application or equivalent
- The .NET framework v2.0 and v3.5
- Microsoft SQL 2005 SP2

b) Video Manager Server

Rack mount server no greater than 3U

- Quad Core Intel® Xeon® 3.0GHz or equal processor
- 4GB RAM
- Hard Drive-1, 150GB, SAS (hot plug), 15,000 RPM
- Hard Drive-2, 300GB, SAS (hot plug), 15,000 RPM
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- Axis Camera Station Server application or equivalent

c) Maintenance LCD Monitor/Keyboard/Pointing device, Acnodes KDM-3178 or equal

Rack mount, 1U slide out monitor/keyboard assembly.

- 17-inch TFT monitor
- 8-port keyboard, video and mouse (KVM) switch
- 105 keys, keyboard and touch pad

d) Network Switch

Rack mount, no greater than 1U

- 100/1000GB, 16-port or better

e) Power Conditioner/UPS

Rack mount unit, no greater than 4U

- Online, double conversion UPS to provide protection against line fluctuations and transients. Provides standby power for up to 15 minutes while emergency power system activates.
- Network connection for monitoring and access to event logs via browser application

1.2.2 VTS Control Center Console

The VTS Control Center Console shall provide three (3) operator positions; Operator 1, Operator 2 and Supervisor. The console shall include work surface and rack space for client computer hardware. The console shall comprise:

a) Emcor FP2-107 Flat Panel II Console or equal

b) VTS Client, Operator Workstation 1
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- HarborGuard Maritime Surveillance Client application or equivalent
- Dual head video graphics card

Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum

Desktop Keyboard/Mouse with KVM switch
3-axis Joystick

c) Video Manager Client, Operator Workstation 1
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Axis Camera Station Client application or equivalent
- Dual head video graphics card

Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum

Desktop Keyboard/Mouse

d) VTS Client, Operator Workstation 2
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- HarborGuard Maritime Surveillance Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse with KVM switch
3-axis Joystick

e) Video Manager Client, Operator Workstation 2
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Axis Camera Station Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse

f) VTS Client, Supervisor Workstation
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- HarborGuard Maritime Surveillance Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen

- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse with KVM switch
3-axis Joystick

g) Command & Control Client, Supervisor Workstation
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- IP Security Center Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse with KVM switch

1.2.3 VTS Control Center Radar

The VTS Control Center Radar includes the High Resolution VTS Radar mounted on the building roof, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly. The VTS Control Center Radar shall comprise:

a) High Resolution VTS Radar:
- 18-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.45° horizontal beam width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB
- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
0.06µsec/3000 0.24µsec/2000 0.50µsec/1000 1.0µsec/750
- 24 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro
- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet

- Radar Interface Card (PCI),High resolution (12-bit) radar analog / digital (A/D) capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink
- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and sensitivity time control (STC),, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility
- Maintenance Display Monitor, 17-in LCD with keyboard, 1U rack-mount slide assembly

c) Radar Equipment Rack
A 19-inch equipment rack shall house the RadarPro Advanced Radar Processor, network appliances, power conditioner/UPS and supporting components. The equipment rack shall be no less than 12U (rack units) with closed side panels and locking front and rear access doors. The rack shall be located in a protected, indoor location and shall include proper ventilation.

d) Maintenance LCD Monitor/Keyboard/Pointing device:
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 105 keys, keyboard and touch pad

i. Network Switch Rack mount, no greater than 1U

ii. 100/1000GB, 8-port or better

e) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Provides standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

1.2.4 VTS Control Center Communications Equipment

The VTS Control Center shall include a radio communications system that provides the VTS Operators the ability to communication with vessels operating under the control and jurisdiction of the VTS. In addition, the VTS Control Center operating console computers shall have email and Internet access. A

telephone system shall provide the VTS Operators land-line telecommunication services (voice and facsimile).

The Radar Communication system shall comply with GMDSS Area A-1 Coast Station requirements and shall comprise:

- Operating station at each VTS console position (two Operator and one Supervisor) that includes headset/speaker, microphone and radar operator control panel (this can be stand-alone or computer graphical user interface (GUI))
- Operating Marine channels shall include: VHF/DSC watch channel 70, VHF Channel 16, and other channels deemed necessary by the VTS operations authority.
- Radio Transceiver and Control unit shall be located in the equipment server room with a high gain VHF whip antenna located on the VTS Control Center building roof
- A back-up Radio Transceiver and Control unit shall be installed in the radar equipment room at the Punta Soldado tower with a high gain VHF whip antenna installed on the tower. This back-up unit shall be connected to the VTS Control Center via the wireless microwave link

1.2.5 VTS Control Center Meteorological and Hydrographic Equipment

The VTS Control Center shall have access to meteorological and hydrographic data from the Port of Buenaventura and surrounding area. This information shall be obtained from existing Government and private resources and displayed to the VTS Operators. The minimum meteorological and hydrographic data to be provided shall include:

- Temperature and humidity
- Wind speed and direction
- Tidal information
- Marine forecast (12hr and 24hr)
- Visibility
- Precipitation

1.3 Punta Soldado Remote Radar Site

The contractor shall supply Punta Soldado Remote Radar Site equipment and installation material (identified during the site survey). The equipment list is as follows:

1.3.1 Punta Soldado VTS Radar

The Punta Soldado VTS Radar includes the High Resolution VTS Radar mounted on the existing radar tower, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly in the tower equipment shelter. The Punta Soldado VTS Radar shall comprise:

a) High Resolution VTS Radar:
   - 18-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.45° horizontal beam

width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB
- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
  0.06µsec/3000 0.24µsec/2000 0.50µsec/1000 1.0µsec/750
- 24 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro
- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet
- Radar Interface Card (PCI),High resolution (12-bit) radar A/D capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink
- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and STC, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility
- Maintenance Display Monitor, 17-in LCD w/ keyboard, 1U rack-mount slide assembly

1.3.2 Punta Soldado Small Target Detection Radar

The Punta Soldado Small Target Detection Radar includes the Series 1000 Radar mounted on the existing radar tower, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly in the tower equipment shelter. The Punta Soldado Small Target Detection Radar shall comprise:

a) Small Target Detection Radar:
- 9-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.9° horizontal beam width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB

- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
  0.06µsec/3000 0.25µsec/2000
- 80 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro
- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet
- Radar Interface Card (PCI),High resolution (12-bit) radar A/D capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink
- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and STC, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility

1.3.3 Radar Equipment Rack

A 19-inch equipment rack shall house two (2) RadarPro Advanced Radar Processors, network appliances, power conditioner/UPS and supporting components. The equipment rack shall be no less than 18U (rack units) with closed side panels and locking front and rear access doors. The rack shall be located in a protected, indoor location and shall include proper ventilation.

a) Maintenance LCD Monitor/Keyboard/Pointing device
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 8-port KVM switch
- 105 keys, keyboard and touch pad

b) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 8-port or better

c) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

1.4 Coast Guard Island Remote Radar Site

The contractor shall supply Coast Guard Island Remote Radar Site equipment and installation material (identified during the site survey). The equipment list is as follows:

1.4.1 Coast Guard Island Small Target Detection Radar

The Coast Guard Island Small Target Detection Radar includes the Series 1000 Radar mounted on the existing radar tower, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly in the tower equipment shelter. The Coast Guard Island Small Target Detection Radar shall comprise:

a) Small Target Detection Radar:
- 9-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.9° horizontal beam width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB
- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
  0.06µsec/3000 0.25µsec/2000
- 80 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro
- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet
- Radar Interface Card (PCI),High resolution (12-bit) radar A/D capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink
- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and STC, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks

per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility

1.4.2 Radar Equipment Rack

A 19-inch equipment rack shall house the RadarPro Advanced Radar Processor, network appliances, power conditioner/UPS and supporting components. The equipment rack shall be no less than 12U (rack units) with closed side panels and locking front and rear access doors. The rack shall be located in a protected, indoor location and shall include proper ventilation.

a) Maintenance LCD Monitor/Keyboard/Pointing device
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 8-port KVM switch
- 105 keys, keyboard and touch pad

b) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 8-port or better

c) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

1.4.3 Radar Tower

A self-supporting tower shall be provided that will have a top-mounted platform to support the Small Target Detection Radar transceiver /antenna unit, VTS Earth Observation (EO)/Infrared (IR) sensor and Point-to-Point wireless microwave antenna. The tower shall meet the following requirements:

a. self-supporting tower designed per ANSI/TIA-222 Rev. G. for 85mph basic wind speed, no ice, Structure Class II; Exposure Category: C; Topography Category: 1… Rohn Model SSV or equal design

b. Antenna Load:

a. (1) 6’ Rotating Radar Antenna (at top – mounted on pedestal)

b. (1) Flat Panel Antenna (approx 14”x14”) at top

c. (1) Camera (approx 10”x7”) at top

b) Tower design triangular in plan, with pipe legs and pipe/angle braces. All material is hot dip galvanized after fabrication inside and out.

c) Tower materials include:

a. Tower sections

b. Anchor bolt assembly, including bolts and templates

c. 1- 8’ x 8’ Top Platform with handrails

d. 1- Custom Radar Antenna Pedestal Mount (on top platform)

e. 1- Each mount - flat panel antenna, Camera

f. Outside face climbing ladder

g. Safety climbing device with full body harness.

h. Lightning/grounding system including.

i. 6 5/8 inch x 8 ft galvanized ground rods

ii. Galvanized tower attachment lug with hardware

iii. Galvanized rod clamp

iv. 10ft of #4 tinned solid copper wire

v. 1-lightning rod with 2/0 copper downlead

ii. Obstruction Lighting International Civil Aviation Organization (ICAO) kit complete with:

i. Double Obstruction Light

ii. Photoelectric control

b. All necessary wire and conduit for installation on the tower

d) Sufficient paint for one field applied coat of Rohn "No-Prime" water-base tower paint, white and orange per ICAO or Federal Aviation Administration (FAA) Specifications (Federal Standard No. 595 Colors, 12197 and 17875)

e) Foundation design with soil report supplied by others

f) Installation and design drawings sealed by Professional Engineer

1.4.4 Back-up Emergency Power

The Coast Guard Island remote radar site shall include a back-up emergency power system that provides automatic change-over capability in the case of a loss of primary AC power. The emergency back-up power system shall operate for up to 12-hours without refueling. The emergency back-up power system shall be designed for 50% excess capacity to account for future growth.

1.5 VTS Camera System

The VTS camera system shall consist of three camera units, one installed on the roof of the Control Center Building, one installed on the Punta Soldado radar tower and one installed on the Coast Guard Island radar tower. The contractor shall provide and install the camera system equipment as follows:

1.5.1 Earth Observation (EO)/Infrared (IR) Sensor

a) Thermal camera specifications

- Array format: 320 x 240
- Detector type: Long life, uncooled vanadium oxide (VOx Microbolometer
- Effective resolution: 76,800
- Pixel pitch: 25µm
- Focal length: 100mm
- Field of view: 4.6° x 3.7°
- Zoom: 2x E-zoom
- Spectral range: 7.5µ to 13.5µm
- Focus range: Athermalized, focus-free

b) Day/night color camera

- Array format: 640 x 480
- Detector type: EMCCD
- Effective resolution: 307,200
- Pixel pitch: 10µm
- Focal length: 8.6 to 154mm
- Field of view: 40.5° x 2.4°
- Zoom: Continuous
- Spectral range: 0.45µm to 1.1µm
- Focus range: On demand auto-focus

c) Control
- Serial: RS-232/-422/-485 Pelco-D, Bosch

d) Pan/Tilt Performance
- Pan Angle/speed: Continuous 360°, 0.1° to 100°/sec
- Tilt angle/speed: +90° to -185°, 0.1° to 30°/sec

e) General
- Power Requirements: 24 VDC (+/- 25%)
- Power Consumption: ≤100 W

1.5.2 Camera Sensor Interface Unit

The Camera Interface Unit shall house the camera power supply and IP Encoder in an environmentally protected enclosure.

a) Enclosure rating: IP66

b) Operating Temperature: -10C to +55C

c) AC/DC Power Supply
- Input Voltage: 90-240 VAC 50/60Hz
- Output Rating: 24 VDC, 150 W

d) IP Video Encoder, Axis 241Q or equal

1.6 Point to Point Wireless Network

The point –to-point wireless system shall provide Fast Ethernet connectivity between the Punta Soldado Remote Radar Site and the Coast Guard Island Remote Radar Site with the Control Center. The electronic components shall be encased in a robust outdoor enclosure that can withstand temperatures from -40° F to +140° F (-40° C to +60° C) and winds up to 202 mph (325 kph). The contractor shall provide all mounting accessories, cables, conduits and fixtures necessary to mount the antenna units on the towers and connect the units to the Radar Server Rack network switch. The contractor shall assure antenna configuration and location provides suitable path performance between sites to maintain a mean aggregate data rate of not less than 150 Mbps and a link availability of 99.99999%. Since the microwave path is over water, the contractor shall design the link to minimize the negative effects of multi-path propagation. The contractor shall supply and install the Motorola PTP-48600 or an equivalent system with the following specifications:

1.6.1 Punta Soldado to Control Center Link

a) Frequency: 4.710 – 4.940 GHz

b) Channel Size: Configurable to 5, 10, or 20 MHz

c) Channel Selection: By Dynamic Frequency Selection or manual intervention; automatic selection on start-up and continual adaptation to avoid interference

d) Transmit Power: Varies with modulation mode and settings from +27 to +22 dBm

e) System Gain Margin: Minimum 35 dB or better

f) Receiver Sensitivity: Adaptive, varying between -98 to -60 dBm

g) Modulation: Dynamic; adapting between Binary Phase Shift Keying (BPSK and 256 Quadrature Amplitude Modulation (QAM

h) Error correction: Forward Error Correction (FEC

i) Duplex scheme: Time Division Duplex (TDD) and Half Duplex Frequency Division Duplex (HD-FDD), Dynamic or Fixed ratio

j) Antenna: Dual polarized, appropriate Gain for 9.0 nm path length

k) Security and Encryption: 128/256-bit Advanced Encryption Standard (AES) Encryption

l) Ethernet protocol: Institute of Electrical and Electronics Engineers IEEE 802.3

m) User data throughput: Dynamically variable up to 150 Mbps at the Ethernet (aggregate):
5 MHz Channel: up to 48 Mbps
10 MHz Channel: up to 100 Mbps
20 MHz Channel: up to 150 Mbps

n) Latency (typical one way): <2 ms in 20 MHz Channel
<3 ms in 10 MHz Channel
<5ms in 5 MHz Channel

o) Quality of Service (QoS: 802.1p (2 Levels)

p) Ethernet Interface: 10/100/1000 Base T (RJ-45)

q) BIT LED Indicators: Power status, Ethernet link status and activity

r) System Management: Web or Simple Network Management Protocol (SNMP)

s) Installation: Built-in audio and graphical assistance for link optimization

t) Connection: connection — Distance between outdoor unit and primary network up to 100 meters

u) Dimensions: — Outdoor Unit (equal or less than):Width 309mm, Height 309mm, Depth 105mm
Indoor Unit (equal or less than): Width 250mm, Height 40mm, Depth 80mm

v) Weight: — Outdoor Unit (equal or less than): 4.3kg
Indoor Unit (equal or less than): 0.86 kg

w) Ingress Protection: — Outdoor Unit: International Electrotechnical Commission (IEC) International Protection Code IP65
Indoor Unit: IEC International Protection Code IP53

1.6.2 Coast Guard Island to Control Center Link

a) Frequency: — 4.710 – 4.940 GHz

b) Channel Size: — Configurable to 5, 10, or 20 MHz

c) Channel Selection: — By Dynamic Frequency Selection or manual intervention; automatic selection on start-up and continual adaptation to avoid interference

d) Transmit Power: dBm — Varies with modulation mode and settings from +27 to +22

e) System Gain Margin: — Minimum 42 dB or better

f) Receiver Sensitivity: — Adaptive, varying between -98 to -60 dBm

g) Modulation: — Dynamic; adapting between BPSK and 256 QAM

h) Error correction: — FEC

i) Duplex scheme: — Time Division Duplex (TDD) and Half Duplex Frequency Division Duplex (HD-FDD), Dynamic or Fixed ratio

j) Antenna: — Integral with Outdoor Unit, appropriate Gain for 1.4 nm path length

k) Security and Encryption: — 128/256-bit AES Encryption

l) Ethernet protocol: — IEEE 802.3

m)	User data throughput:	Dynamically variable up to 150 Mbps at the Ethernet (aggregate): 5 MHz Channel: up to 48 Mbps 10 MHz Channel: up to 100 Mbps 20 MHz Channel: up to 150 Mbps
n)	Latency (typical one way):	<2 ms in 20 MHz Channel <3 ms in 10 MHz Channel <5ms in 5 MHz Channel
o)	QoS:	802.1p (2 Levels)
p)	Ethernet Interface:	10/100/1000 Base T (RJ-45)
q)	BIT LED Indicators:	Power status, Ethernet link status and activity
r)	System Management:	Web or SNMP
s)	Installation:	Built-in audio and graphical assistance for link optimization
t)	Connection: connection	Distance between outdoor unit and primary network up to 100 meters
u)	Dimensions:	Outdoor Unit (equal or less than):Width 370mm, Height 370 mm, Depth 105mm Indoor Unit (equal or less than): Width 250mm, Height 40mm, Depth 80mm
v)	Weight:	Outdoor Unit (equal or less than): 5.5kg Indoor Unit (equal or less than): 0.86 kg
w)	Ingress Protection:	Outdoor Unit: IP65 Indoor Unit: IP53

1.6.3 Wireless Network Physical and Environmental Requirements

The point-to-point wireless network equipment shall meet the following physical and environmental requirements:

a)	Operating Temperature:	-40°C to +60°C
b)	Humidity:	100% Condensing
c)	Wind Speed:	202 mph (325 kph)
d)	Power Source:	90-240 VAC 50/60Hz

e) Power Consumption: 55 W

1.7 Maintenance Plan

Due to the remote location and challenges associated with operating in Colombia, some of the primary considerations for any system are maintainability and availability of critical spare parts. It is extremely important that the system be relatively maintenance free and provide for plug-and-play operations. As part of the offer, the contractor shall provide the following:

- Sample maintenance plan
- Periodic maintenance requirements
- Mean Time Between Failure (MBTF)
- Lowest replaceable units
- All long lead time items
- Life cycle component compatibility
- Suggested spare parts list with pricing details

During the initial Warranty period, the contractor shall provide routine and preventative maintenance actions. During the warranty, the contractor shall provide two hour service response (during normal working hours) and 24/7 phone response.

1.8 Training

The contractor shall provide a training plan and syllabus for a "train the trainer" course. The contractor shall develop and provide lesson plans, course material, and manuals for operator and maintenance training.

Training shall be conducted for Operators, Supervisors and Maintainers. This training shall consist of both classroom and live operational system training. The recommended training class duration is as follows:

- *Operator Training* *3 day*
- *Supervisor Training* *3 day*
- *Maintainer Training* *5 days*

2.4.4.2 Scope of Work for AIS

The following scope of work should be used for the procurement and installation of the AIS system. In order for the project to move forward, it is assumed that the construction of the Marine Traffic Control Station will be completed and the facility will be operational.

A. DITEL Team

Identify DITEL personnel to coordinate the AIS implementation project. The following individuals should be identified and assigned:

1. Project Manager: Responsible for the oversight of the project, the coordination of all resources, and reporting to DITEL management on the progress of the project.
2. Project Director: Responsible for the approval of all purchases, agreements with third parties, and contracts with vendors/contractors.
3. Purchasing Agent: Responsible for the procurement of all equipment and services. This function may be performed by the Project Manager if allowed by the DITEL's internal procedures.
4. Network Engineer: Responsible for the installation and configuration of the AIS equipment and software. If a network engineer is not on staff, see section D. below: Identify and Engage Local Contractors.

B. Site Survey / Preparation

The Project Manager will coordinate a site survey of each of the AIS locations listed in this proposal to ensure the equipment as recommended can be accommodated and all power and communication services are in place or can be implemented. This survey must take place prior to ordering equipment and services.

1. Marine Traffic Control Station

a. Server Room Space: Ensure adequate space is available for the equipment.

b. Power: Ensure power requirements as specified are in place.

c. Antenna Location: Identify suitable location for the AIS antennas on the roof of the facility.

d. Conduit: Ensure that an appropriate conduit from the roof to the server room is available for the VHF antenna cable runs.

e. Network connectivity: Ensure network facilities are in place to connect AIS Base Station to VTS.

2. Coast Guard site

a. Approvals: Obtain necessary approvals from the Coast Guard to place a VHF antenna on the roof of its facility and store an AIS receiver inside the building.

b. Antenna Location: Identify suitable location for the placement of the antenna. Antenna must be mounted on the roof of the Coast Guard station or adjacent radio tower if available with a clear line of sight to the harbor and channel.

c. Equipment Space: Ensure that the Coast Guard can dedicate a secure location in the building for the placement of the AIS receiver.

d. Power: Make sure power requirements as specified are in place at the AIS receiver location.

e. Conduit: Ensure that an appropriate conduit from the roof to the AIS Receiver location is available for the VHF antenna cable run.

3. Punta Soldado site

a. Antenna Location: Obtain the necessary approvals to place a VHF antenna on the radio tower at a sufficient height, to mount the GPS antenna on the roof of the facility or on the radio tower, and to store an AIS repeater inside an adjacent facility.

b. Antenna location: Identify suitable location for the placement of the antenna on the radio tower.

c. Equipment space: Identify a suitable location inside an adjacent facility for the placement of the AIS repeater.

d. Power: Ensure power requirements as specified are in place at the AIS repeater location.

e. Conduit: Ensure that an appropriate conduit from the radio tower to the AIS repeater is available for the VHF antenna cable run.

The Project Manager will confirm that each of the sites can accommodate the specified equipment, and forward the final list of equipment to the Purchasing Agent.

C. Equipment Acquisition

The Purchasing Agent will contact vendors to ascertain the availability of equipment and confirm pricing. The Purchasing Agent must work with the Project Manager and the Project Director in the event that pricing and availability of equipment has changed since the drafting of this proposal.

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The project team may need to adjust budgets or purchasing decisions based on availability and current pricing. The scope of the purchase may also be altered based on the site survey listed in A. above. A final purchasing plan should be drafted for approval by the Project Director.

Once all necessary approvals have been received, the Purchasing Agent will place orders with the vendors. The Purchasing Agent will report to the Project Manager on the anticipated delivery status.

D. Identify and Engage Local Contractors

Several of the AIS components will require local contractors/personnel to install, and in the future, maintain equipment. The Port of Buenaventura may have personnel on staff that can perform the tasks; otherwise the Project Manager will need to coordinate efforts to identify the necessary resources. Once identified, the Purchasing Agent will finalize agreements with the contractors and schedule service.

1. Antenna Installation: Identify and engage a local contractor who is certified on the installation of VHF antenna equipment. The contractor must be capable of installing antenna equipment on rooftops and radio towers. The contractor should be engaged for approximately three days (one day per AIS site). This includes the following tasks:

    a. Mount the VHF and GPS antennas

    b. Mount lightning arresting equipment in conjunction with the antenna installation

    c. Complete cable installations between the VHF and GPS antennas, and the AIS receiver/repeater equipment

    d. Test connectivity of the equipment

    e. Make adjustments to antenna and cables based on testing results if needed

    Approximate Rate: US$ 2400 / day (US$300 / hour)

2. Network Engineer: If not on staff, identify and engage a network/systems engineer for the installation and testing of AIS and server equipment at the Marine Traffic Control Station, installation of the AIS receiver at the Coast Guard station, and the AIS repeater at the Punta Soldado site. The network engineer should be contracted for a minimum of seven days for the installation, configuration, and testing of the AIS equipment.

    a. 2 days: AIS receiver and AIS Repeater
    b. 2 days: AIS Base Station
    c. 3 days: AIS Software

    Approximate Rate: US$ 1400 / day (US$175 / hour)

The Network Engineer should have strong background in or certified on:

a. General network infrastructure design and best practices
b. Network router and firewall design and configuration
c. Microsoft Windows Server operating systems
d. TCIP and other networking protocols
e. General server and PC hardware installation skills

E. Install Equipment

The following details the installation plan of the equipment. In general, there are very few prerequisites for the installation of equipment and services – any will be noted below. The Project Manager will coordinate all installation times with the team and will work with the Purchasing Agent for the hiring and scheduling of contractor resources.

1. VHF and GPS Antennas

    a. Required Personnel: VHF antenna contractor, Network Engineer, Project Manager

    b. Tasks:

        i. Project Manager will coordinate the installation schedule with the contractor identified in C.1. above. Providing that all antenna equipment has been received, DITEL may realize a cost savings by scheduling the installation at multiple sites for the same day.

        ii. Project Manager will obtain necessary approvals from the Coast Guard and Punta Soldado sites to install on the scheduled day(s).

        iii. VHF antenna contractor will install the AIS antenna equipment, and run VHF cables to the AIS receiver site.

        iv. During the install, the Network Engineer should be on site to ensure that AIS signals are being received by the AIS equipment at each facility.

2. AIS Receiver and Repeater

    a. Required Personnel: Network Engineer, Project Manager

    b. Tasks

        i. Project Manager will coordinate the installation schedule with the contractor identified in C.1. above. The receiver and repeater installation should be coordinated with the antenna implementation.

ii. The Network Engineer will install AIS receiver and repeater equipment in conjunction with the antenna install.

iii. The Network Engineer will connect AIS equipment to antenna cable and test receipt of AIS messages.

3. AIS Base Station

a. Required Personnel: Network Engineer, Project Manager

b. Optional Personnel: AIS trainer (see Training below)

c. Tasks

i. The Network Engineer will install the AIS base station.

The installation may be coordinated with an on-site trainer from the product vendor.

ii. The Network Engineer will install the AIS base station, and will connect AIS Base Station to the VHF and GPS antenna cables from the roof of the structure.

iii. The Network Engineer will configure AIS Base Station per equipment operating instructions.

iv. The Network Engineer will connect base station to VTS per equipment operating instructions

v. The Network Engineer will test receipt of AIS messages in the VTS

4. AIS Software

a. Required Personnel: Network Engineer, Project Manager, Software Vendor

b. Tasks

i. The Project Manager will coordinate the software installation with the Software Vendor.

ii. The Network Engineer and/or Software Vendor will install all necessary hardware and software.

iii. The Network Engineer will ensure connectivity from the Internet to the AIS system.

The Project Manager will report to the Project Director on the progress of the installation.
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F. Training

It is recommended that DITEL engage on-site training services from the equipment and software suppliers for this project. If approved, the Project Manager will schedule the resources and the Purchasing Agent will place orders for training with the equipment/service suppliers. Any onsite training services should be coordinated in conjunction with or immediately following the installation of equipment.

If DITEL chooses not to train its own personnel on the equipment, the Purchasing Agent should obtain quotes from the local contractors for ongoing maintenance costs.

1. AIS Base Station and Receivers

   One AIS trainer is recommended on site for three (3) days to support the installation and configuration of the AIS base Station, and its integration into the VTS. The person will also provide training on the basic operation and maintenance of the base station equipment.

   Estimated Cost:

Item	Description	Total
Airfare	Roundtrip Airfare 1 person	US$1000.00
Vendor Rate	2000.00 / Day x 5 Days. *Includes 3 days onsite and two days travel*	10,000.00
Accommodations and expenses	US$800.00 / Day x 5 Days *Includes 3 days onsite and two days travel*	4000.00
Total		US$ 15,000.00

2. AIS Software

   One Software Technician/Trainer is recommended on site for five (5) days to support the installation and configuration of the AIS software system, and its integration into the Client network. The person will also provide training on the basic operation and maintenance of the system.

   Estimated Cost:

Item	Description	Total
Airfare	Roundtrip Airfare 1 person	US$1,000.00
Vendor Rate	1000.00 / Day x 7 Days *Includes 5 days onsite and two days travel*	7,000.00

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Accommodations and expenses	US$800.00 / Day x 7 Days *Includes 5 days onsite and two days travel*	5,600.00
Total		US$ 13,600.00

G. Staffing

The following staff should be considered for the maintenance and daily operation of the AIS system and network. These positions may overlap with or can be filled by the VTS personnel.

The following positions are recommended to be filled:

1. System Administrator (1.5 Full-Time Equivalent personnel): A system administrator is recommended for the maintenance of the AIS. If the Network Engineer listed in B.2. above is a DITEL employee, this person can serve in this role. In addition, a second individual should be trained for this function to ensure continual coverage during vacations and absences, and to ensure the transfer of knowledge based in the event of employee turnover. These staff members must be available for off-hours support.

   Approximate annual salary: US$60,000 per employee

2. Operational Personnel (Minimum – 8): Eight operations staff are necessary for the daily operation and monitoring of the AIS system and port traffic. These individuals can also serve as VTS watchstanders. The operations staff should have the following qualifications/skills:

   a. Experience in port operations and security. Previous experience with or certification in the operation of VTS type systems is desired.

   b. Familiar with or trained in basic navigation rules and best practices. Previous experience in vessel operations and navigation is desired (i.e. vessel pilots and operators, licensed mariners).

   Based on a 24/7 operation, the following staffing schedule can be used as a baseline:

   a. Monday – Friday, 7am to 3pm: 2 operators
   b. Monday – Friday, 3pm to 11pm: 1 operator
   c. Monday – Friday, 11pm to 7am: 1 operator
   d. Saturday/Sunday, 7am to 3pm: 1 operator
   e. Saturday/Sunday, 3pm to 11pm: 1 operator
   f. Saturday/Sunday, 11pm to 7am: 1 operator
   g. One part-time operator to cover vacations and absences

   Approximate annual salary: US$40,000-US$50,000 per employee

2.4.5 Preparation of Final Capital Cost Estimate for Vessel Traffic System and Automated Identification System

2.4.5.1 Capital Cost Estimates for VTS

Component	*Sub-total*	*Total (US$)*
Control Center Equipment		**$547,950.00**
VTS Server		
HarborGuard VTS Server Hardware/Software	$64,400.00	
HarborGuard IT Security Center Server Hardware/Software	$143,900.00	
Video Manager Server Hardware/Software	$11,800.00	
UPS Power Conditioning	$4,500.00	
Network Appliances	$2,100.00	
19-inch Rack, integration, accessories	$1,500.00	
Operator Console		
Emcor Console	$11,900.00	
Supervisor Workstation HarborGuard VTS Client Hardware/Software	$19,500.00	
Supervisor Workstation HarborGuard IP Security Center Client Hardware/Software	$6,900.00	
Operator Position-1 Workstation HarborGuard VTS Client Hardware/Software	$19,500.00	
Operator Position-1 Workstation Video Manager Client Hardware/Software	$5,200.00	
Operator Position-2 Workstation HarborGuard VTS Client Hardware/Software	$19,500.00	
Operator Position-2 Workstation Video Manager Client Hardware/Software	$5,200.00	
High Resolution VTS Radar		
Series 1000 18X VTS Radar	$85,500.00	
RadarPro Advanced Radar Processor	$68,400.00	
19-inch Rack, integration, accessories	$2,100.00	
Thermal IR Multi-sensor Camera		
FLIR PT-CNV-304 PTZ Multi-sensor Camera	$51,900.00	
Sensor Interface Box	$3,150.00	
VHF/DSC Communications	$21,000.00	
Punta Soldado Radar Equipment		**$318,250.00**
High Resolution VTS Radar		

Series 1000 18X VTS Radar	$85,500.00	
RadarPro Advanced Radar Processor	$68,400.00	
19-inch Rack, integration, accessories	$2,100.00	
Small Target Detection Radar		
Series 1000 9X Small Target Detection Radar	$38,800.00	
RadarPro Plus Advanced Radar Processor	$68,400.00	
Thermal IR Multi-sensor Camera		
FLIR PT-CNV-304 PTZ Multi-sensor Camera	$51,900.00	
Sensor Interface Box	$3,150.00	
Coast Guard Island Equipment		**$195,800.00**
Small Target Detection Radar		
Series 1000 9X Small Target Detection Radar	$38,800.00	
RadarPro Plus Advanced Radar Processor	$68,400.00	
Thermal IR Multi-sensor Camera		
FLIR PT-CNV-304 PTZ Multi-sensor Camera	$51,900.00	
Sensor Interface Box	$3,150.00	
Radar Tower, 60-ft	$21,250.00	
Emergency Back-up Power System	$12,300.00	
Point-to-Point High Speed Wireless Network Link Equipment		**$55,506.00**
Command Center to Punta Soldado Link	$30,190.00	
Command Center to Coast Guard Island Link	$25,316.00	
Subtotal Equipment		**$1,117,506.00**
General and administrative costs, integration, program management, installation and spares		**$1,382,494.00**
TOTAL		**$2,500,000.00**

Table 2-9 Capital Cost Estimates for VTS Equipment

The priced equipment list summarizes estimates based on catalog prices for each sub-system. This estimate used mid-range equipment prices. The very high prices may be 20-30% higher and the low prices may be 10-20% lower. What are not captured are the turn-key costs. An Integrator or Prime Contractor who would bid this project would need to include General and Administrative costs, Systems Integration costs, Program Management costs, Installation costs, spares and overall fee. The total costs of the project would easily be in the $2.5M range. There would also be some local content which would add to the total overall costs.

2.4.5.2 Capital Cost Estimates for AIS

Option 1: The following represents the estimated capital cost for Option 1 described in section 2.3 based on current equipment availability and pricing.

	Subtotal	*Total*
Marine Traffic Control Station		
AIS Base Station	US$25,000.00	
Antenna Equipment	3200.00	US$28,200.00
Coast Guard Station		
AIS Receiver	5,000.00	
Antenna Equipment	2,400.00	7,400.00
Punta Soldado Site		
AIS Repeater	5,000.00	
Antenna Equipment	2,600.00	7,600.00
Spare Equipment	22,000.00	22,000.00
Shipping	5,000.00	5000.00
Installation		
Antenna Contractor	7,200.00	
Network Contractor	5,600.00	17,000.00
Training		
AIS Hardware	15,000.00	15,000.00
Grand Total		**US$ 102,200.00**

Table 2-10 Capital Cost Estimates for AIS Option 1

3. **Option 2:** The following represents the estimated capital cost for Option 2 described in section 2.3 based on current equipment availability and pricing.

	Subtotal	*Total*
Marine Traffic Control Station		
AIS Base Station	25,000.00	
Antenna Equipment	US$3200.00	US$28,200.00
Coast Guard Station		
AIS Receiver	5,000.00	
Antenna Equipment	2,400.00	7,400.00
Punta Soldado Site		
AIS Repeater	5,000.00	
Antenna Equipment	2,600.00	7,600.00
Spare Equipment	22,000.00	22,000.00
AIS web software	240,000.00	240,000.00
Shipping	5,000.00	5000.00
Installation		
Antenna Contractor	7,200.00	
Network Contractor	9,800.00	17,000.00
Training		
AIS Hardware	15,000.00	
AIS Software	13,600.00	28,600.00
Grand Total		**US$ 355,800.00**

Table 2-11 Capital Cost Estimates for AIS Option 2

2.4.6 Preparation of Operating Cost Estimates for Vessel Traffic System and for Automated Identification System

2.4.6.1 Operating Cost Estimates for VTS

The operating costs for the VTS are broken down into the following categories:

- Annual Labor for the VTS Operators and Supervisors
- Annual Labor and material costs for the Maintenance Plan
- Annual costs for support services associated with the operation of the VTS

The local labor costs for the various labor categories are not available for this report, so a best estimate of labor categories and labor hours will be presented here.

a) VTS Operators and Supervisors annual costs
It is calculated that the VTS Control Center with two Operator Console positions and one Supervisor Console position will require a total of 17 persons to provide 24/7/365 coverage. This is further broken down to 6 Supervisors, each requiring 1,847 hours per year for a total of 11,082 man-hours, and 11 Operators for a total of 20,317 man-hours per year.

b) Maintenance Plan annual costs
   - An initial investment of spare parts inventory would require an expenditure of US$110,000.00
   - Annual sustainment of spares and consumables… $5,000.00 per year
   - Labor costs associated with scheduled and preventative maintenance… VTS Service Technician/Engineer…. 120 man hours per year
   - VTS Software... annual maintenance (from vendor)… $25,000 per year

c) Support services
   - It is assumed that all VTS facilities and locations are on government owned facilities and, accordingly, no rental or lease costs for these facilities are needed.
   - The VTS Control Center will require Internet access, so the inclusion a high speed Internet service provider must be considered as part of the operating costs
   - The VTS equipment requires commercial power, so the cost of electrical service must be included in the annual operating cost budget. The following identifies the estimated (worse case) electrical consumption requirements of the VTS equipment by site:
     - VTS Control Center Site 43,800 kWh per year
     - Punta Soldado Radar Site 52,560 kWh per year
     - Coast Guard Island Radar Site 26,280 kWh per year
     - Total 122,640 kWh per year

2.4.6.2 Operating Cost Estimates for AIS

The following represents estimated annual operating expenses. It is likely that the staffing requirements and costs will be shared with the VTS system. The equipment replacement, maintenance, and repair may vary from year to year. Although spare equipment has been recommended for the initial order, the budget should include funds for the replacement of the spares as they are used.

	Subtotal	*Total*
Staffing		
System Administrators	US$90,000.00	
Operators	320,000.00	US$410,000.00
Equipment Replacement		
AIS Receiver	5000.00	
Antenna Equipment	2000.00	7000.00
Antenna Inspection / Maintenance / Repair	4000.00	4000.00
Grand Total		**US$ 421,000.00**

Table 2-12: AIS Operating Costs

2.4.7 Preparation of Implementation Program for Vessel Traffic System and Automated Identification System

2.4.7.1 Implementation Program for VTS

The contractor shall prepare and submit an implementation plan and schedule that assures the completion of the VTS within a 12-month period. The contractor shall use the following schedule and milestones as guidance when preparing the final implementation plan.

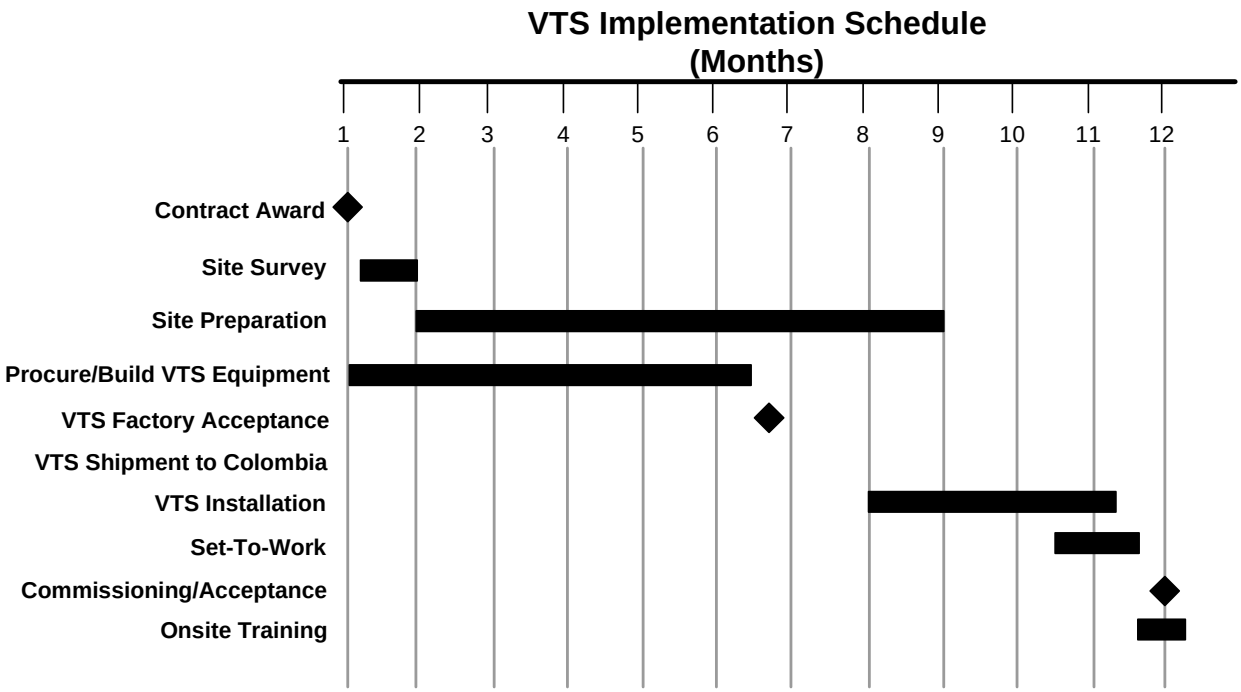

Figure2-19 Implementation Program for Vessel Traffic System (VTS)

2.4.7.2 Implementation Program for AIS

The following represents an estimated implementation schedule based on the Scope of Work in 2.4.iv above.

Milestone	Task
Week 1-2	Form Project Team
	Complete Site Survey
	Begin Process of obtaining approvals for Coast Guard and Punta Soldado AIS equipment placement
Week 3	Verify Site Survey against Proposal
Week 4	Finalize approvals for Coast Guard and Punta Soldado AIS equipment placement
	Modify plan as necessary based on site survey and site approval process
	Begin process of identifying antenna and network engineer contractors
Week 5	Verify availability and pricing of finalized equipment list
	Obtain internal approvals for purchasing
Week 6	Purchase equipment (approximate 45 days for delivery)
Week 7 - 12	Interview and hire system administrators and operations staff
	Track and verify equipment shipment status
	Finalize selection of antenna and network engineer contractors and schedule resources
	Schedule on-site training resources
Week 13	Expected equipment delivery complete
Week 14	Installation of AIS equipment and antenna equipment begins by network engineer and antenna contractor
Week 15	Completion of AIS equipment and antenna equipment
	On-Site training and configuration by training resources

Table 2-13: Implementation Program for AIS

Prepared for use by: Directorate of Telematics (DITEL)

REQUEST FOR PROPOSALS

FOR

Vessel Traffic System (VTS) for the Port of Buenaventura Colombia

Submission Deadline: **TBD**

Local Time - TBD

Submission Place: **TBD**

SEALED PROPOSALS SHALL BE CLEARLY MARKED AND RECEIVED PRIOR TO THE TIME AND DATE SPECIFIED ABOVE. PROPOSALS RECEIVED AFTER SAID TIME AND DATE WILL NOT BE ACCEPTED OR CONSIDERED.

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1 INTRODUCTION

This solicitation is for technical proposals from qualified firms to provide a Vessel Traffic System (VTS) for the Port of Buenaventura Colombia. The VTS will provide monitoring of all vessels near Buenaventura's coastline, main shipping channel and port terminal facilities. The VTS will also provide security and surveillance of waterways adjacent to the main navigable waters and port facilities.

1.1 PROJECT OBJECTIVE

The objective of the VTS is to improve maritime domain awareness to enhance the safety and security of the Port of Buenaventura, its waterways and installations. This will improve the overall safety and security posture of the port. Section 5 details the Terms of Reference (TOR) for this RFP and Annex 1 provides the detailed Scope of Supply.

1.2 PROPOSALS TO BE SUBMITTED

Technical and financial proposals are solicited from interested and qualified firms. The administrative and technical requirements as detailed throughout the RFP will apply. Specific proposal format and content requirements are detailed in Section 3. Upon detailed evaluation of technical and financial proposals, one firm will be selected for contract negotiations.

1.3 CONTRACT FUNDED BY

The negotiated contract will be funded by the Government of Colombia in accordance with the terms and conditions to be negotiated with the winning firm.

1.4 REFERENCE DOCUMENTS

A. International Association of Marine Aids to Navigation and Lighthouse Authorities – IALA
IALA Recommendation V-128 on Operational and Technical Performance Requirements for VTS Equipment: Edition 3.0, June 2007

2 INSTRUCTIONS TO OFFERORS

2.1 PROJECT TITLE

The project is called "Vessel Traffic System of the Port of Buenaventura in Colombia"

2.2 DEFINITIONS

The following definitions and terms are used in this RFP.

- The term "Request for Proposals" means this solicitation of a formal technical and financial proposal including qualifications statement.
- The term "Offeror" means the firm, including any and all subcontractors, which responds to the RFP and submits a formal proposal, and which may or may not be successful in being awarded this procurement.

2.3 EXAMINATION OF DOCUMENTS

Offerors should carefully examine and address all items specified in this RFP. Failure to adhere to this format may disqualify an Offeror from consideration.

Submission of a proposal shall constitute evidence that the Offeror is free of any uncertainty with respect to conditions which would affect the execution, and completion of the project.

2.4 RESPONSIBILITY FOR COSTS

Offeror shall be fully responsible for all costs incurred in the development and submission of the proposal or any other cost incurred by Offeror prior to issuance of an agreement or contract. Neither DITEL nor the Government of Colombia, assume any contractual obligation as a result of the issuance of this RFP, the preparation or submission of a proposal by an Offeror, the evaluation of proposals, or final selection.

The Contractor is responsible for compliance with export licensing requirements, if applicable, in the performance of the Terms of Reference (TOR) and Scope of Supply.

2.5 CONFIDENTIALITY

DITEL will use best efforts to preserve the confidentiality of any proprietary or confidential information marked as such by the Offeror.

2.6 ECONOMY OF PROPOSALS

Proposal documents should be prepared simply and economically, providing a comprehensive and concise description of the Offeror's capabilities to satisfy the requirements of the RFP. There is no necessity for expensive bindings or other promotional material unless such material is absolutely pertinent to the proposal. Emphasis should be placed on completeness and clarity of content.

2.7 CONDITIONS REQUIRED FOR PARTICIPATION

Firms may utilize subcontractors from Colombia and are encouraged to do so to the extent practical. The Offer's proposal shall indicate the extent of local contractor participation as a percentage of the overall offer.

2.8 LANGUAGE OF PROPOSAL

All proposal documents shall be prepared and submitted in English or Spanish.

2.9 PROPOSAL SUBMISSION REQUIREMENTS

The Cover Letter in the proposal must be addressed to:

TBD

An original (1) and three (3) copies of your proposal and a CD, in Spanish, must be received at the above address no later than **TBD** local time, on **TBD**.

Proposals may be sent by mail, overnight courier, or hand-delivered. Whether the proposal is sent by mail, courier or hand-delivered, the Offeror shall be responsible for actual delivery of the proposal to the above address before the deadline. Any proposal received after the deadline will be returned unopened. Upon timely receipt, all proposals become the property of DITEL.

2.10 PACKAGING

Proposals shall be individually wrapped, sealed, and labeled for content including "original" or "copy number x". The original and five (5) copies shall be collectively wrapped and sealed, and clearly marked for content.

2.11 AUTHORIZED SIGNATURE

The proposal must contain the signature of a duly authorized officer or agent of the Offeror empowered with the right to bind the Offeror.

2.12 EFFECTIVE PERIOD OF PROPOSAL

The proposal shall be binding upon the Offeror for ninety (90) days after the proposal due date. Offeror may withdraw or modify this proposal at any time prior to the due date upon written notification signed in the same manner and by the same person who signed the original proposal.

2.13 EXCEPTIONS

Firms agree by their response to the RFP to abide by the procedures set forth therein. Material modifications in the TOR, Scope of Supply or responsibilities of the parties will not be accepted.

Any exceptions in the proposal shall be clearly identified, and shall include the scope of such exception, and its impact, on the procurement. DITEL shall make final determination as to the responsiveness of such exceptions and their acceptability.

2.14 OFFEROR QUALIFICATIONS

As provided in Section 3, Offerors shall submit evidence that they have relevant past experience.

2.15 RIGHT TO REJECT PROPOSALS

DITEL reserves the right to reject any and all proposals and to accept or reject any or all of the items in the proposal, and to award the contract in whole or in part if it is deemed in the best interest of DITEL.

2.16 PRIME CONTRACTOR RESPONSIBILITY

Offerors have the option of subcontracting parts of the services they propose. The Offeror's proposal must include a description of any anticipated subcontracting arrangements, including the name, address, and qualifications of consultants and subcontractors. The successful Offeror shall cause appropriate provisions of its contract with DITEL to be inserted in all subcontracts ensuing to ensure fulfillment of all contractual provisions by subcontractors.

2.17 AWARD

An award resulting from this RFP shall be made to the Offeror which offers the best combination of qualifications and price. However, DITEL reserves the right to reject any and all proposals, and will be the sole authority for determining if a proposal has satisfactorily met the requirements of this RFP.

2.18 COMPLETE SERVICES

The successful Offeror shall be required to (a) furnish all supplies, supervision, transportation, and other execution accessories, services, and facilities; (b) provide and perform all necessary labor; and (c) in accordance with good technical practice, with due diligence, and in accordance with the requirements, stipulations, provisions and conditions of this RFP and the resultant contract, execute and complete all specified work to the satisfaction of DITEL.

2.19 INVOICING AND PAYMENT

Deliverables under the contract shall be completed on a schedule to be agreed upon in a contract with DITEL. The Contractor may submit invoices to DITEL to the attention of the designated Project Director in accordance with a schedule to be negotiated and included in the contract. Upon approval of each invoice, the DITEL will process payment to the Contractor. The financial proposals will be submitted in U.S. dollars, Colombian pesos or a combination of these currencies. The payment currency will be negotiated with the winning firm.

2.20 WARRANTY

Offerors shall include a One Year Warranty as the baseline offer. The Warranty begins upon successful completion Commissioning and acceptance. Offerors shall propose optional two year and three year warranty.

3 PROPOSAL FORMAT AND CONTENT

To expedite proposal evaluation, and to assure that each proposal receives the same orderly review, all proposals must follow the format described in this section.

Proposals shall include a Table of Contents and all sections and pages appropriately numbered. Offerors are encouraged to submit concise and clear responses to the RFP. Proposals shall contain all elements of information requested without exception. Instructions regarding the required scope and content are given in this section. DITEL reserves the right to include any part of the selected proposal in the final contract.

Offerors shall submit one (1) original and three (3) copies and a CD in English or Spanish.

The following is required for each proposal:

- Transmittal Letter
- Cover/Title Page
- Table of Contents
- Introduction and Executive Summary
- Company Information
- Organizational Structure, Management Plan, and Key Personnel
- Technical Approach and Work Plan
- Experience and Qualifications
- Price Proposal
- Miscellaneous (product cut-sheets, brochures, etc)

Detailed requirements and directions for the preparation of each section are presented below.

3.1 INTRODUCTION AND EXECUTIVE SUMMARY

An Executive Summary should be prepared describing the major facts or features of the proposal, including any conclusions, assumptions, and generalized recommendations the Offeror desires to make. Offerors are requested to make every effort to limit the length of the Executive Summary to a maximum of three (3) pages.

3.2 COMPANY INFORMATION

3.2.1 Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), similar information must be provided for each subcontractor. Offerors are requested to limit the length of the each Company Profile to one (1) page per firm.

1. Name of firm and business address, including telephone and fax numbers.
2. Year established (include former firm names and year established, if applicable).
3. Type of ownership and parent company, if any.
4. Project Manager's name, address, telephone and fax number, if different from (1).
5. Certified copy of Articles of incorporation and Certificate of Good Standing issued by responsible entity
6. Latest balance sheet of assets and liabilities

3.2.2 Offeror's Authorized Negotiator

Provide name, title, address, telephone and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

3.2.3 Negotiation Prerequisites

1. Discuss any impact that all current or anticipated commitments may have on the ability of the Offeror or its subcontractors to complete the project as proposed and within the project schedule.

2. Identify any specific information which is needed from DITEL before commencing contract negotiations.

3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL

Describe the Offeror's proposed project organizational structure. Discuss how the project will be managed including the principal and key staff assignments for this project. Identify the Project Manager

who will be the individual responsible for this project. The Project Manager must have the responsibility and authority to act on behalf of the Offeror in matters related to the proposed project.

Provide a listing of personnel (including subcontractors and consultants) to be engaged in the project, with the following information for key staff: position in the project; pertinent experience; résumé; and other relevant information. If subcontractors are to be used, the organizational relationship between the firms must be described. A manpower schedule and the level of effort for the project period, by activities and tasks as detailed under the work plan shall be submitted. A statement confirming the availability of the proposed project manager and key staff over the duration of the project must be included in the proposal.

3.4 TECHNICAL APPROACH AND WORK PLAN

Describe in detail the proposed technical approach and work plan. Discuss the project requirements as perceived by the Offeror. Include a brief narrative of tasks within each activity series. Note specifically any task activities included or excluded which may differentiate Offeror's technical approach from others. Begin with the information gathering phase and continue through delivery and approval of all required reports.

Prepare a detailed schedule of performance that describes all activities and tasks within the work plan, including periodic reporting or review points, incremental delivery dates, and other project milestones.

Based on the work plan and previous project experience, explain when and where Offeror will require support from DITEL. Detail the amount of staff time required by DITEL or participating agencies and any work space or facilities needed.

Offerors may elect to propose alternative approaches and/or activities and tasks if it is felt they will provide technical, schedule, or other advantages to DITEL. The Offeror should cite the applicability of alternative approaches/activities to achievement of project objectives and the projected advantages to be gained through their use. To assure that all proposals will be comparable and any alternatives will be evaluated against a relevant background, each Offeror must provide a full response to the RFP as written before any full or partial alternative is proposed. Alternatives must be clearly identified as such.

3.5 EXPERIENCE AND QUALIFICATIONS

Provide a discussion of the Offeror's experience and qualifications that are relevant to the objectives and TOR. If a subcontractor(s) is being used, similar information must be provided for the prime and each subcontractor firm proposed for the project. Relevant experience and qualifications of key staff proposed shall be provided including letters of commitment from the individuals proposed concerning their availability for contract performance.

Not more than six (6) relevant and verifiable project references must be provided, which shall include the following information:

- Project name
- Name and address of client (indicate if joint venture)
- Client contact person (name/ position/ e-mail / current phone and fax numbers)
- Period of Contract
- Description of services provided
- Dollar amount of Contract
- Amplifying information (optional)

Offerors are strongly encouraged to include in their experience summary primarily those projects that are similar to or larger in scope than the project described in this RFP.

3.6 PRICE PROPOSAL

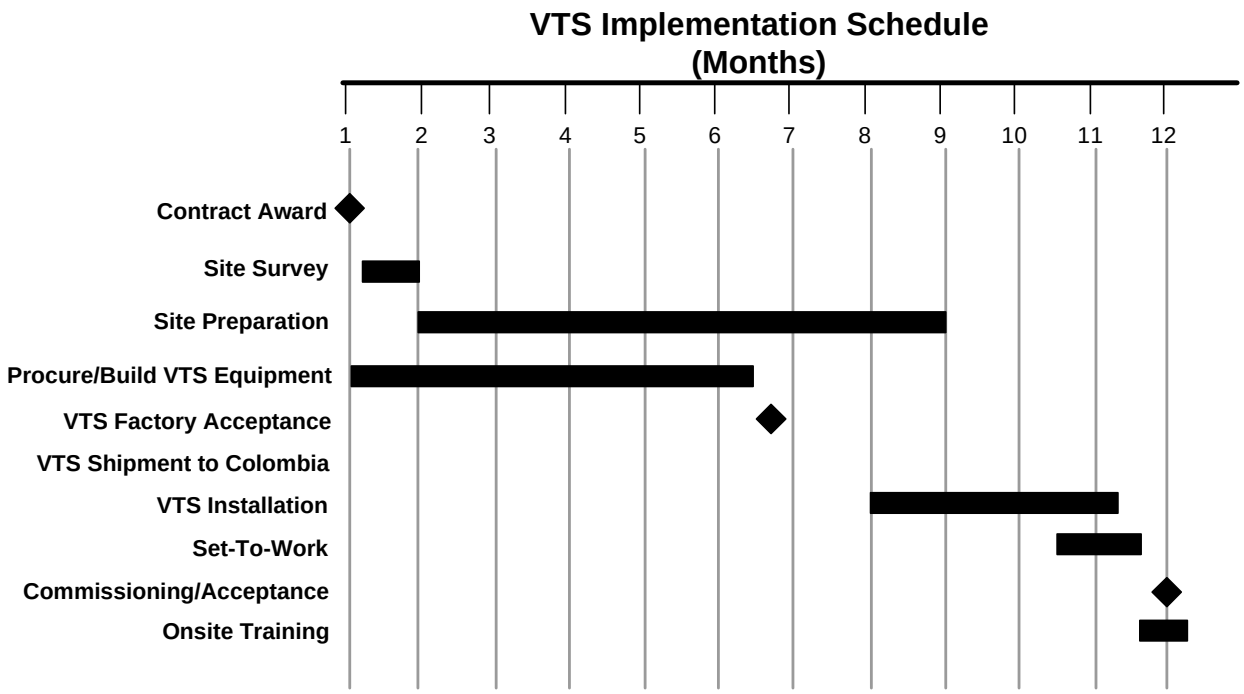
Offerors shall submit a firm, fixed price proposal that is broken down as follows:

A. Site Survey
B. Site Preparation
C. Procure, build, delivery and install VTS equipment components
D. Factory Acceptance Testing
E. Site Acceptance Testing and Commissioning
F. On-site Operator and Maintainer Training
G. Two (2) Year Spare Parts
H. Optional Two Year Warranty
I. Optional Three Year Warranty

4 DELIVERY SCHEDULE

DITEL has developed the following delivery schedule for the Vessel Traffic System. The Offeror shall identify compliance with this schedule in the proposal and if an accelerated schedule can be offered, it should be detailed in the proposal along with all dependencies.

Figure A2-1: Implementation Program for Vessel Traffic System (VTS)



5 AWARD CRITERIA

Individual proposals will be initially screened by a DITEL Procurement Selection Committee. The Committee will then conduct a final evaluation and ranking of qualified Offerors, and DITEL shall promptly initiate contract negotiations with the best qualified Offeror. If a satisfactory contract cannot be negotiated with the best qualified Offeror, negotiations will be terminated. Negotiations shall then be undertaken with the second most qualified Offeror, and so forth.

The selection of the Contractor will be based on the following criteria:

- Demonstrated understanding of the project and proposed method of approach.
- Overall organization, completeness, and quality of work plan including cohesiveness, conciseness, and clarity of response.
- Commitment of time of key team members to this project.
- Project team experience.
- Lead team members' competency, especially the Project Manager, in relation to the assignments (with particular consideration to the qualifications, experience, availability, accessibility, expertise, and recent experiences relevant to this project).
- Demonstrated analytical ability with projects similar in nature to this project.
- Length of time that the company has been legally constituted.
- Technical Experience
- Demonstrated knowledge and awareness of design, installation and integration of VTS, Radar, AIS, EO/IR, and Network systems, in addition to experience in the design of border/port monitoring and control systems.
- Price
- Technical and financial capability of the bidder and ability to perform

Proposals which do not include all requested information may be considered non-responsive.

6 Terms of Reference

6.1 Concept of Operations

DITEL intends to procure a turn-key Vessel Traffic System (VTS). The VTS shall provide improved navigation and monitoring of all vessels near Buenaventura's coastline, main shipping channel, vessel anchorages and waterways adjacent to the port terminals and facilities.

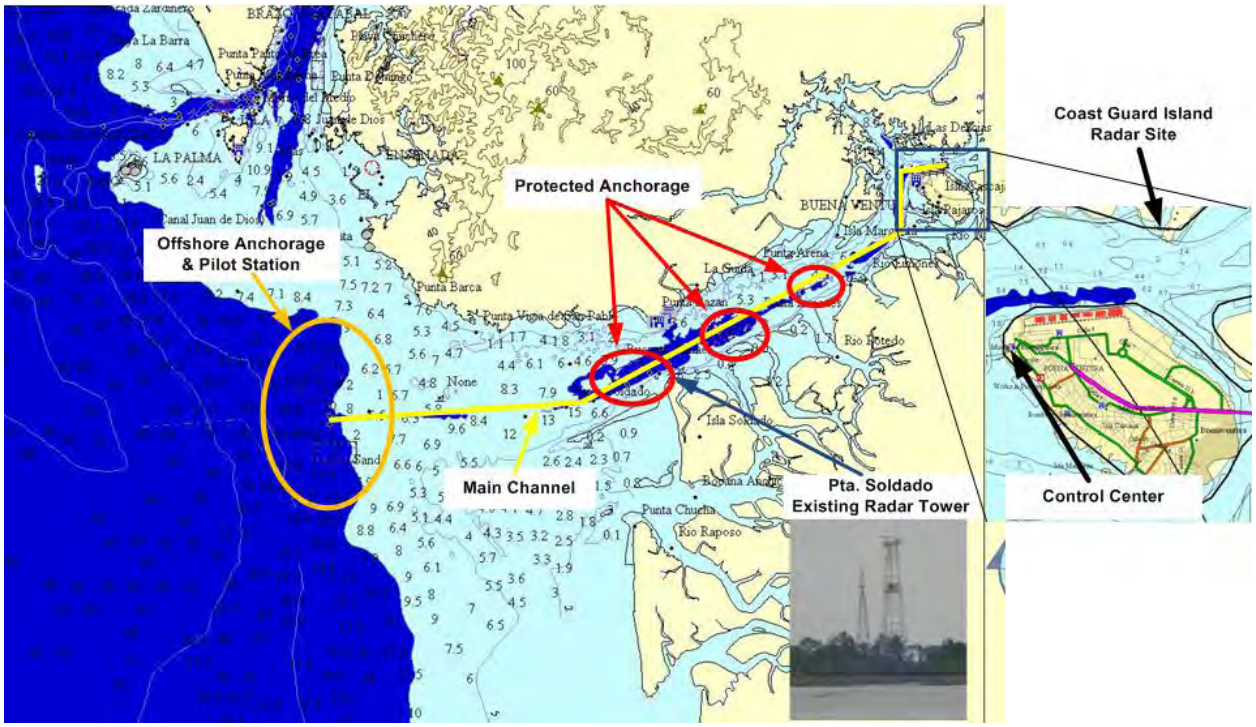


Figure A2-2 Configuration of the coverage area

In addition to the vessel traffic monitoring, navigation and management functionality the System also includes unique security surveillance capabilities. Specialized small target detection radars and night capable Camera systems shall detect and alert the presence of low detectable vessels to provide the necessary intercept information for law enforcement and national defense operations. Communications facilities shall allow the operators to communicate directly with all vessels operating in the area as well as other VTS stakeholders.

The operating environment is a tropical region so the VTS radar system design shall incorporate measures that mitigate the effects of fog, high humidity and heavy rains on radar performance. It is the recommendation that X-Band radar is the best choice that meets the performance recommendations of IALA Recommendation V-128 for “Standard” system capability.

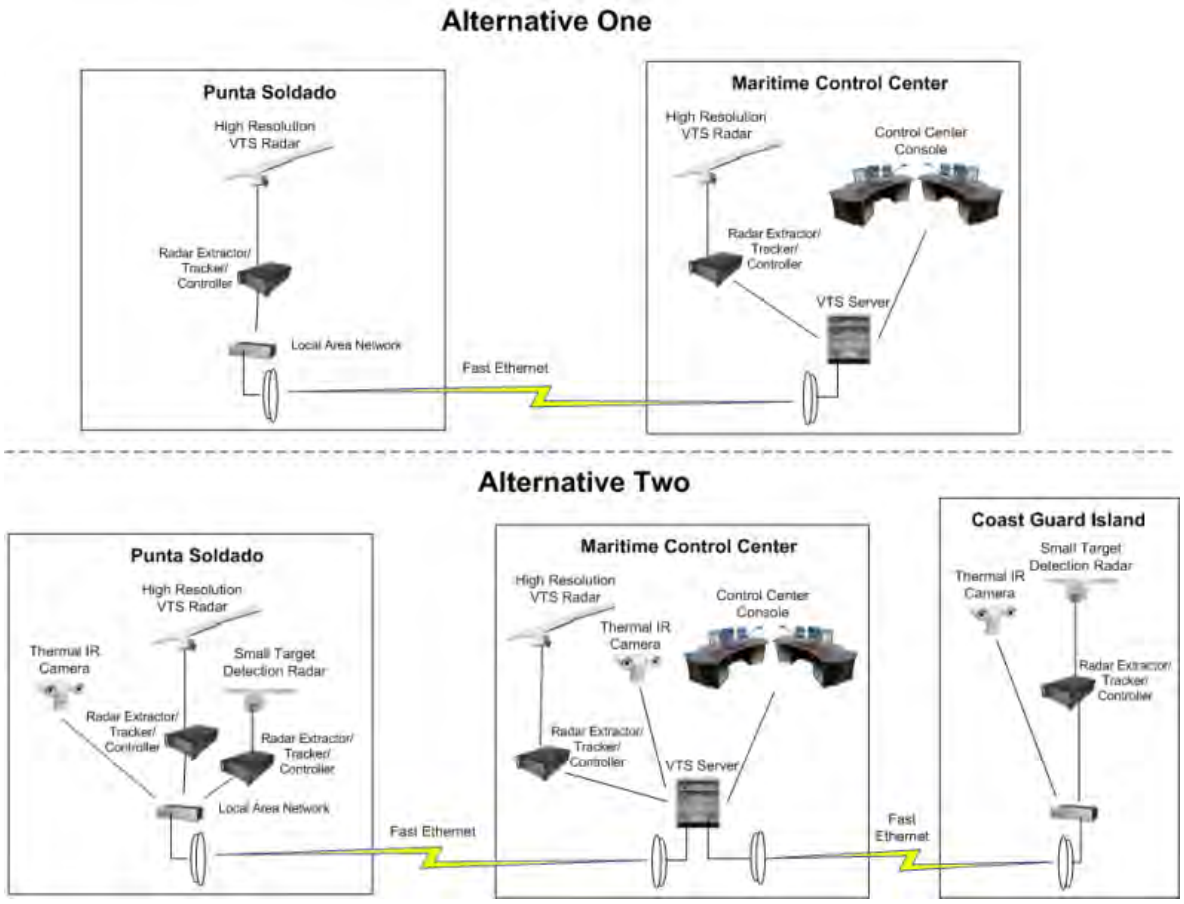


Figure A2-3 - Alternative One and Two Layout Diagrams

6.1.1 VTS Functionality

The System shall provide a layered approach to the monitoring of vessel movements for the seaward approaches, navigation channels and anchorages, and port terminal areas of the port of Buenaventura. Radar and AIS shall provide the primary detection and tracking capabilities and real-time data from these subsystems is combined and processed for presentation to operators and stakeholders.

The control center shall contain operator console positions for three operators: two regional operators and one supervisor. Each operator display position shall present radar and AIS track data on a digital nautical chart display. Each operator position shall have the ability to independently change views, scales and display attributes without affecting other display views.

Alarm and alert rules shall be configurable and provide the ability to:

- Alert the operator when tracked targets enter a predefined geographic zone
- Alert the operator when a tracked target leaves a predefined geographic zone
- Alert the operator when a tracked target varies from a predefined course
- Alert the operator when a tracked target exceeds a predefined speed
- Alert the operator when a tracked target is less than a predefined speed
- Alert the operator when a tracked target or targets are in collision conflict with other targets

All above referenced alerts shall be recorded to an electronic log.

Each operator shall have the ability to control and view each system thermal camera. The system shall provide the operator with the ability to “slew-to-cue”, point the camera to any geographic location. The system shall provide the operator the ability to “slew-to-track”, attached the camera to any radar or AIS tracked target for automatic camera following. The operator shall have the ability to initiate a DVR recording on any camera.

The system shall allow external stake-holder access to limited data via a web-browser interface. This information shall include lists and geographic view of all AIS targets in the system.

The system shall support secure, full remote access of radar, camera and AIS data for special authorized users (i.e. law enforcement, national defense).

6.1.2 Site Layout

The VTS shall comprise two remote, unmanned radar sites, one at Punta Soldado and a second at Coast Guard Island. Each remote radar site shall be connected by wireless, fast Ethernet microwave links to the command center located in the new General Maritime Directorate (DIMAR) / Colombian Coast Guard building in Buenaventura. Additional VTS radar shall be located on the roof of the new DIMAR / Colombian Coast Guard building.

The use of these existing sites takes advantage the infrastructure already in place, thus eliminating the costly preparation and construction at undeveloped sites.

The candidate sites shall include:

- New maritime traffic control station (under construction) in Buenaventura
    - Shall house the VTS control center equipment
    - Roof of this 7-story building shall be the site for VTS radar antenna, surveillance camera(s) communications and AIS antenna. Would also serve as an antenna site for microwave links to other remote sub-systems
- Punta Soldado Radar tower
    - The Existing tower shall be used for the radar equipment. The Offeror shall evaluate the usability of the existing radar system to meet the VTS detection and performance requirements. If it is determined the existing radar does not meet the requirements the Offeror shall replace this radar
    - Existing equipment shelter on the tower shall house radar extractor/tracker and control hardware/software equipment
    - A second small target detection capable radar shall be installed on the tower
    - The Thermal Camera system shall be installed on the tower
    - Back-up Very High Frequency (VHF)/Digital Selective Calling (DSC) remote communications transceiver, controller and antenna
- Punta Soldado Communication tower
    - This existing tower is available for microwave link antenna (connect radar to maritime traffic center). The Offeror shall determine the appropriate location for the point-to-point microwave link antenna (Radar Tower or Communication Tower) for compliant path to the control center
- Coast Guard island
    - The Offeror shall provide and install a 50ft tower for the high performance small target detection radar and surveillance camera
    - The Offeror shall provide an emergency back-up power system to provide operating power for the Coast Guard Island radar and camera equipment

The Scope of Work (Annex 1) shall further define the contractor's responsibilities for the implementation of the VTS.

6.2 General performance requirements for the System:

6.2.1 Environment

Externally mounted equipment shall be suitable for operation under the following conditions:

- Temperature: +55° C to -25° C
- Relative Humidity: 93% @ 40°C

Internally mounted equipment shall be suitable for operation under the following conditions:

- Temperature: +30° C to +15° C
- Relative Humidity: less than 90%

Availability: 99.6%

6.2.2 Radar Performance Specifications

High Resolution VTS Radar

i. Separation between small point targets for discrimination in range
   - 30m in Short Range mode
   - 75m in Long Range mode

ii. Separation between small point targets for discrimination in azimuth
   - 0.8 degrees

iii. Target Detection Range

Target	Clear	4mm/hr rain	Sea State
Small boat (RCS 1m^2, 1m ht)	5 NM	3 NM	up to 3
Small vessel (RCS 3m^2, 2m ht)	7 NM	4 NM	up to 3
Fishing Boat (RCS 10m^2, 3m ht)	8 NM	5 NM	up to 4
Small Freighter (RCS 100m^2, 5m ht)	11 NM	9 NM	up to 5
Large Freighter (RCS 1000m^2, 8m ht)	13 NM	11 NM	up to 6

Small Target Detection Radar

i. Separation between small point targets for discrimination in range
   - 40m in Short Range mode
   - 100m in Long Range mode

ii. Separation between small point targets for discrimination in azimuth
   - 1.3 degrees

iii. Target Detection Range

Target	Clear	4mm/hr rain	Sea State
Surface Swimmer (RCS 0.03m^2, 0.2m ht)	2 NM	1.4 NM	up to 3
Very small craft (RCS 0.5m^2, 0.5m ht)	4 NM	2.8 NM	up to 3
Small boat (RCS 1m^2, 1m ht)	5 NM	3 NM	up to 3

Small vessel (RCS 3m^2, 2m ht)	6 NM	4 NM	up to 3
Fishing Boat (RCS 10m^2, 3m ht)	7 NM	4 NM	up to 4
Small Freighter (RCS 100m^2, 5m ht)	10 NM	8 NM	up to 5
Large Freighter (RCS 1000m^2, 8m ht)	12 NM	10 NM	up to 6

Radar Extractor/Tracker/Controller

i. Probability of detection: 0.8
ii. Number of plots per antenna rotation: ≥ 5000
iii. Number of confirmed tracks: ≥ 700
iv. Speed of tracked targets: ≤100 kts
v. Turn rate of tracked targets: ≤ 10° /second
vi. Accuracy in track position:
- Range: ≤ 0.75% of range covered by radar or 10m + selected pulse length, whichever greater
- Bearing: ≤ 1°

vii. Accuracy of track data:
- Speed: ≤ 1 kt
- Course: ≤ 2°

viii. Time for confirmation of tentative track: ≤ 1 minute
ix. Time from track confirmation to achievement of specified accuracy: ≤ 2 minutes
x. Time from data loss to automatic track termination: ≥ 1 minutes

6.2.3 Thermal IR Camera

The Thermal IR Camera provides dual sensor capability that includes thermal IR and color daylight capabilities.

i. The Thermal IR sensor shall provide a thermal image of targets and allow the operator to recognize target shapes. The type of vessel shall be capable of being identified at a minimum range of 3 NM from the camera location.
ii. The color camera sensor shall provide color imagery targets to allow the operator to identify targets. The identity of a vessel by shape, color and other features shall be capable of being determined at a minimum range of 1 NM from the camera location.

6.2.4 Marine Communications System

The Marine Communications System shall comprise a Global Maritime Distress Safety System (GMDSS) compatible very high frequency (VHF)/digital selective calling (DSC) capability. Each VTS Console position shall have headset/microphone, speaker and radio control panel allowing control of local and remote (Punta Soldado) VHF transceiver. The VHF/DSC system shall meet the following specifications:

i. Frequency: 156 to 174 MHz
ii. Transmitter output power: 25W or greater
iii. Digital Selective Call (DSC) Encoder/Decoder
iv. Dedicated DSC Watch Receiver (Channel 70)

6.2.5 Meteorological and Hydrographic System

The VTS shall integrate with locally available meteorological and hydrographic data sources. Where local resources are not available, supplemental sensors shall be provided that meet the following specification requirements:

1. Height of Tide: ≤± 0.10 m
2. Rate of Tidal Stream/ Current: ≤ ± 0.5 knots
3. Direction of Tidal Stream/Current: ≤ ± 10 Degrees
4. Wave height: ≤ ± 10% of the height
5. Wave Direction: ≤ ± 20 Degrees
6. Wind speed: ≤ ± 1m per sec
7. Wind Direction: ≤ ± 10 Degrees
8. Visibility: ≤ ± 10% of the distance
9. Air Temperature: ≤ ± 1**0**C
10. Air Humidity: ≤ ± 5 %
11. Air Pressure: ≤ ± 2 hPa
12. Sea Surface Temperature: ≤ ± 1**0**C

ANNEX 1 – Scope of Work

ANNEX 1: Scope of Work

The Directorate of Telematics (DITEL) intends to procure a turn-key Vessel Traffic System (VTS). The VTS shall provide improved navigation and monitoring of all vessels near Buenaventura's coastline, main shipping channel, vessel anchorages and waterways adjacent to the port terminals and facilities at the Port of Buenaventura.

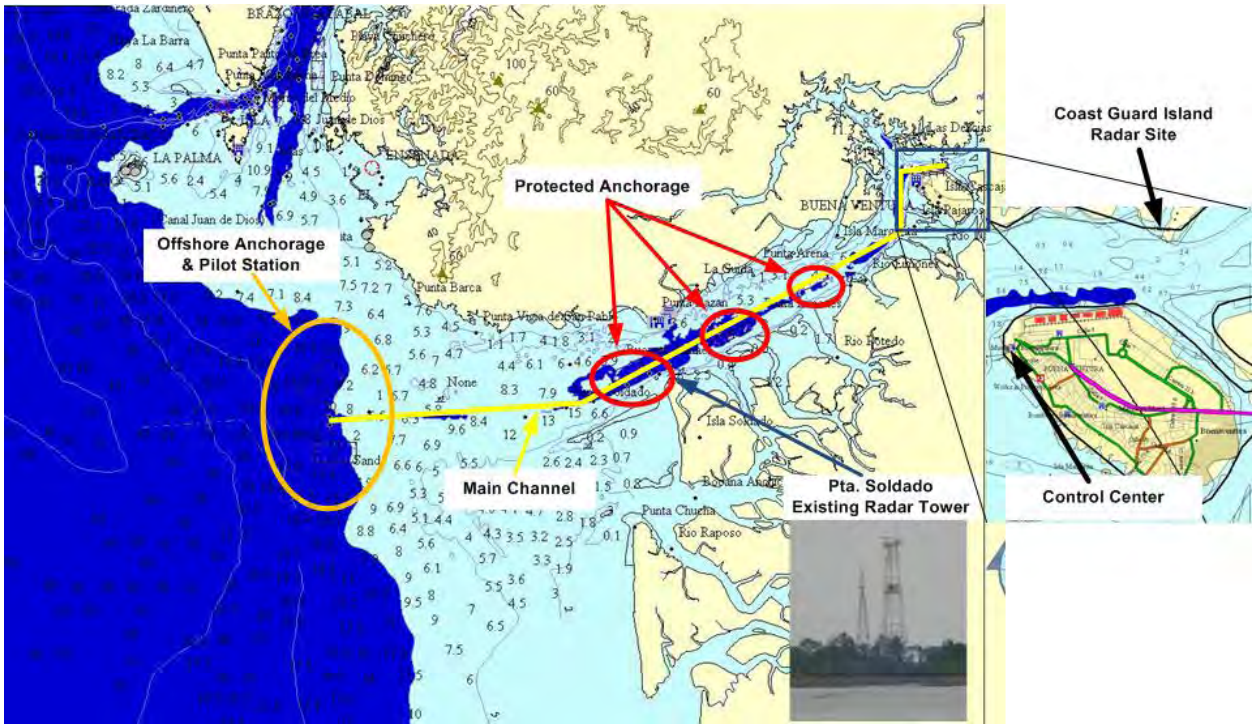


Figure A2-4 Configuration of the coverage area

This Scope of Work shall define the contractor's responsibilities for the implementation of the VTS.

The VTS shall comprise two remote, unmanned radar sites and a control center. One remote radar site, at Punta Soldado will include a high resolution VTS radar, small target detection radar and thermal IR camera. A second remote radar site, at Coast Guard Island, will include a small target detection radar and thermal IR camera. Each remote radar site shall be connected by wireless, fast Ethernet microwave links to the command center located in the new DIMAR / Coast Guard Maritime Traffic Control Center building on Buenaventura Island. Additional high resolution VTS radar and thermal IR camera shall be located on the roof of the new DIMAR / Coast Guard Maritime Traffic Control Station building.

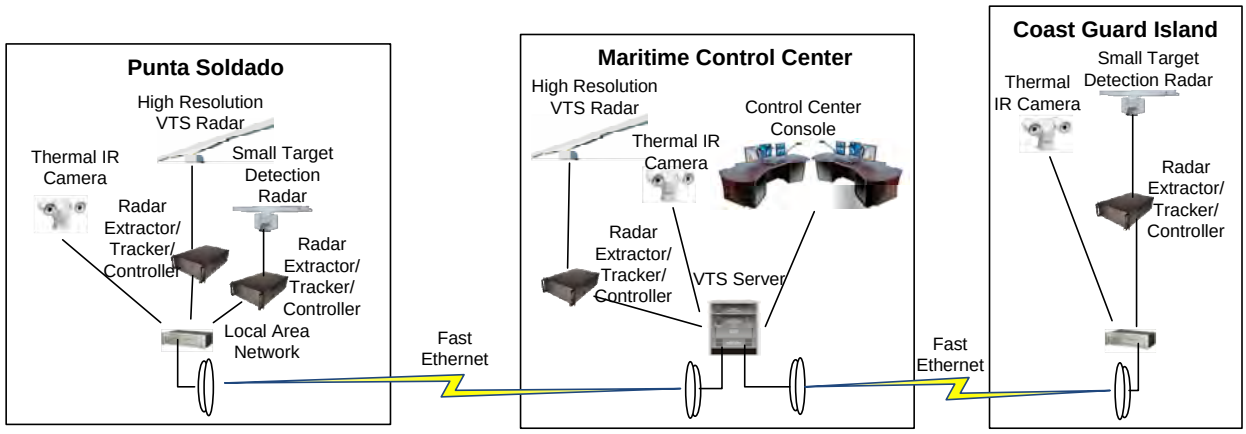


Figure A2-5 Architecture of the Buenaventura Vessel Traffic System

Radar Extractor Tracker / Controller and *Thermal IR Cameras shall be co-located with each radar unit. VTS command and control software and associated servers and operator consoles shall be installed in the new* DIMAR / Coast Guard Maritime Traffic Control Station *building.*

1.1 Site Survey and design finalization

The contractor shall conduct a site survey to confirm the VTS system design. Upon completion of the site survey, the contractor shall develop an installation material list (cables, hardware, etc) for items not included with the VTS equipment. The contractor shall engage local support services for the installation phase. These services shall include (but not be limited to) electricians, mechanics, riggers, carpenters, and transportation support.

The contractor shall identify all permits and variances needed to commence the VTS installation and assure these are in place and approved prior to the commencement of work.

1.2 VTS Control Center Equipment

The contractor shall supply the VTS Control Center equipment and installation material (identified during the site survey). The equipment list is as follows:

1.2.1 VTS Server

The VTS Server is a fully integrated 19-inch equipment rack that houses the main VTS servers, network appliances, power conditioner/Uninterruptible Power Supply (UPS) and supporting components. The equipment rack shall be no less than 18U (rack units) with closed side panels and locking front and rear access doors. The rack shall include proper ventilation. The rack equipment shall include:

a) VTS Server
Rack mount server no greater than 3U

[Type text]

- Quad Core Intel® Xeon® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- HarborGuard Maritime Surveillance Server software or equivalent

b) Command & Control Server
Rack mount server no greater than 3U
- Quad Core Intel® Xeon® 3.0GHz or equal processor
- 4GB RAM
- Hard Drive-1, 150GB, SAS (hot plug), 15,000 RPM
- Hard Drive-2, 150GB, SAS (hot plug), 15,000 RPM
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- IP Security Center Server application or equivalent
- The .NET framework v2.0 and v3.5
- Microsoft SQL 2005 SP2

c) Video Manager Server
Rack mount server no greater than 3U
- Quad Core Intel® Xeon® 3.0GHz or equal processor
- 4GB RAM
- Hard Drive-1, 150GB, SAS (hot plug), 15,000 RPM
- Hard Drive-2, 300GB, SAS (hot plug), 15,000 RPM
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- Axis Camera Station Server application or equivalent

d) Maintenance LCD Monitor/Keyboard/Pointing device, Acnodes KDM-3178 or equal
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 8-port keyboard, video and mouse (KVM) switch
- 105 keys, keyboard and touch pad

e) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 16-port or better

[Type text]

f) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Provides standby power for up to 15 minutes while emergency power system activates.
- Network connection for monitoring and access to event logs via browser application

1.2.2 VTS Control Center Console

The VTS Control Center Console shall provide three (3) operator positions; Operator 1, Operator 2 and Supervisor. The console shall include work surface and rack space for client computer hardware. The console shall comprise:

a) Emcor FP2-107 Flat Panel II Console or equal

b) VTS Client, Operator Workstation 1
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- HarborGuard Maritime Surveillance Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse with KVM switch
3-axis Joystick

c) Video Manager Client, Operator Workstation 1
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Axis Camera Station Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen

- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse

d) VTS Client, Operator Workstation 2
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- HarborGuard Maritime Surveillance Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse with KVM switch
3-axis Joystick

e) Video Manager Client, Operator Workstation 2
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Axis Camera Station Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse

f) VTS Client, Supervisor Workstation
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal

[Type text]

- HarborGuard Maritime Surveillance Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse with KVM switch
3-axis Joystick

g) Command & Control Client, Supervisor Workstation
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- IP Security Center Client application or equivalent
- Dual head video graphics card
Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
Desktop Keyboard/Mouse with KVM switch

1.2.3 VTS Control Center Radar

The VTS Control Center Radar includes the High Resolution VTS Radar mounted on the building roof, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly. The VTS Control Center Radar shall comprise:

a) High Resolution VTS Radar:
- 18-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.45° horizontal beam width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB
- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
0.06µsec/3000 0.24µsec/2000 0.50µsec/1000 1.0µsec/750
- 24 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro

[Type text]

- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet
- Radar Interface Card (PCI),High resolution (12-bit) radar analog / digital (A/D) capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink
- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and sensitivity time control (STC),, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility
- Maintenance Display Monitor, 17-in LCD with keyboard, 1U rack-mount slide assembly

c) Radar Equipment Rack
A 19-inch equipment rack shall house the RadarPro Advanced Radar Processor, network appliances, power conditioner/UPS and supporting components. The equipment rack shall be no less than 12U (rack units) with closed side panels and locking front and rear access doors. The rack shall be located in a protected, indoor location and shall include proper ventilation.

d) Maintenance LCD Monitor/Keyboard/Pointing device:
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 105 keys, keyboard and touch pad

- *Network Switch Rack mount, no greater than 1U*
- *100/1000GB, 8-port or better*

e) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Provides standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

1.2.4 VTS Control Center Communications Equipment

The VTS Control Center shall include a radio communications system that provides the VTS Operators the ability to communication with vessels operating under the control and jurisdiction of the VTS. In addition, the VTS Control Center operating console computers shall have email and Internet access. A telephone system shall provide the VTS Operators land-line telecommunication services (voice and facsimile).

The Radar Communication system shall comply with GMDSS Area A-1 Coast Station requirements and shall comprise:

- Operating station at each VTS console position (two Operator and one Supervisor) that includes headset/speaker, microphone and radar operator control panel (this can be stand-alone or computer graphical user interface (GUI))
- Operating Marine channels shall include: VHF/DSC watch channel 70, VHF Channel 16, and other channels deemed necessary by the VTS operations authority.
- Radio Transceiver and Control unit shall be located in the equipment server room with a high gain VHF whip antenna located on the VTS Control Center building roof
- A back-up Radio Transceiver and Control unit shall be installed in the radar equipment room at the Punta Soldado tower with a high gain VHF whip antenna installed on the tower. This back-up unit shall be connected to the VTS Control Center via the wireless microwave link

1.2.5 VTS Control Center Meteorological and Hydrographic Equipment

The VTS Control Center shall have access to meteorological and hydrographic data from the Port of Buenaventura and surrounding area. This information shall be obtained from existing Government and private resources and displayed to the VTS Operators. The minimum meteorological and hydrographic data to be provided shall include:

- Temperature and humidity
- Wind speed and direction
- Tidal information
- Marine forecast (12hr and 24hr)
- Visibility
- Precipitation

1.3 Punta Soldado Remote Radar Site

The contractor shall supply Punta Soldado Remote Radar Site equipment and installation material (identified during the site survey). The equipment list is as follows:

1.3.1 Punta Soldado VTS Radar

The Punta Soldado VTS Radar includes the High Resolution VTS Radar mounted on the existing radar tower, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly in the tower equipment shelter. The Punta Soldado VTS Radar shall comprise:

a) High Resolution VTS Radar:
- 18-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.45° horizontal beam width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB
- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
  0.06µsec/3000 0.24µsec/2000 0.50µsec/1000 1.0µsec/750
- 24 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro
- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet
- Radar Interface Card (PCI),High resolution (12-bit) radar A/D capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink
- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and STC, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility
- Maintenance Display Monitor, 17-in LCD w/ keyboard, 1U rack-mount slide assembly

1.3.2 Punta Soldado Small Target Detection Radar

The Punta Soldado Small Target Detection Radar includes the Series 1000 Radar mounted on the existing radar tower, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly in the tower equipment shelter. The Punta Soldado Small Target Detection Radar shall comprise:

[Type text]

a) Small Target Detection Radar:
- 9-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.9° horizontal beam width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB
- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
  0.06µsec/3000 0.25µsec/2000
- 80 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro
- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet
- Radar Interface Card (PCI),High resolution (12-bit) radar A/D capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink
- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and STC, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility

1.3.3 Radar Equipment Rack

A 19-inch equipment rack shall house two (2) RadarPro Advanced Radar Processors, network appliances, power conditioner/UPS and supporting components. The equipment rack shall be no less than 18U (rack units) with closed side panels and locking front and rear access doors. The rack shall be located in a protected, indoor location and shall include proper ventilation.

a) Maintenance LCD Monitor/Keyboard/Pointing device
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 8-port KVM switch
- 105 keys, keyboard and touch pad

[Type text]

b) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 8-port or better

c) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

1.4 Coast Guard Island Remote Radar Site

The contractor shall supply Coast Guard Island Remote Radar Site equipment and installation material (identified during the site survey). The equipment list is as follows:

1.4.1 Coast Guard Island Small Target Detection Radar

The Coast Guard Island Small Target Detection Radar includes the Series 1000 Radar mounted on the existing radar tower, Radar Extractor/Tracker/Control and supporting components located in a 19-inch rack assembly in the tower equipment shelter. The Coast Guard Island Small Target Detection Radar shall comprise:

a) Small Target Detection Radar:
- 9-foot end fed, slotted waveguide antenna array, Circular Polarized, ≤0.9° horizontal beam width
- 25KW, X-Band (9415MHz), pulse modulated radar Transceiver Unit
- High dynamic range receiver ≥ 100dB
- Four selectable Pulse Width and Pulse Repletion Frequency (PRF) selections
  0.06µsec/3000 0.25µsec/2000
- 80 RPM antenna scan rate (nominal)

b) Radar Extractor/Tracker/Controller
- Rack mount, 4U Industrial PC
- CoreDuo Processor, 4GB RAM
- Windows XP Pro
- 250GB Hard Drive
- CD/DVD/RW Drive
- 1GB Ethernet
- Radar Interface Card (PCI),High resolution (12-bit) radar A/D capture and high speed radar signal processor
- Radar Control Card (PCI), Radar transceiver control/interface with composite downlink video decoder/separator and RS-422 control uplink

[Type text]

- Base Radar Software, Extractor/server with true scan averaging, OS-CFAR, Pulse Filter and STC, installation/test/set-up utilities
- Advanced Processing Module, for small target detection
- Target Tracker Module, includes Plot Extractor and Target Tracker for up 1000 target tracks per scan
- Dual Mode Plot Extractor/Tracker for simultaneous small target and fast target detection/tracking
- Radar Display Client module provides local operation, maintenance and setup utility

1.4.2 Radar Equipment Rack

A 19-inch equipment rack shall house the RadarPro Advanced Radar Processor, network appliances, power conditioner/UPS and supporting components. The equipment rack shall be no less than 12U (rack units) with closed side panels and locking front and rear access doors. The rack shall be located in a protected, indoor location and shall include proper ventilation.

a) Maintenance LCD Monitor/Keyboard/Pointing device
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 8-port KVM switch
- 105 keys, keyboard and touch pad

b) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 8-port or better

c) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

1.4.3 Radar Tower

A self-supporting tower shall be provided that will have a top-mounted platform to support the Small Target Detection Radar transceiver /antenna unit, VTS Earth Observation (EO)/Infrared (IR) sensor and Point-to-Point wireless microwave antenna. The tower shall meet the following requirements:

a. self-supporting tower designed per ANSI/TIA-222 Rev. G. for 85mph basic wind speed, no ice, Structure Class II; Exposure Category: C; Topography Category: 1… Rohn Model SSV or equal design

b. Antenna Load:

[Type text]

- (1) 6’ Rotating Radar Antenna (at top – mounted on pedestal)
- (1) Flat Panel Antenna (approx 14”x14”) at top
- (1) Camera (approx 10”x7”) at top

c) Tower design triangular in plan, with pipe legs and pipe/angle braces. All material is hot dip galvanized after fabrication inside and out.

d) Tower materials include:

i. Tower sections

ii. Anchor bolt assembly, including bolts and templates

iii. 1- 8’ x 8’ Top Platform with handrails

iv. 1- Custom Radar Antenna Pedestal Mount (on top platform)

v. 1- Each mount - flat panel antenna, Camera

vi. Outside face climbing ladder

vii. Safety climbing device with full body harness.

viii. Lightning/grounding system including.

- 6 5/8 inch x 8 ft galvanized ground rods
- Galvanized tower attachment lug with hardware
- Galvanized rod clamp
- 10ft of #4 tinned solid copper wire
- 1-lightning rod with 2/0 copper downlead

ix. Obstruction Lighting International Civil Aviation Organization (ICAO) kit complete with:

- Double Obstruction Light
- Photoelectric control

x. All necessary wire and conduit for installation on the tower

e) Sufficient paint for one field applied coat of Rohn "No-Prime" water-base tower paint, white and orange per ICAO or Federal Aviation Administration (FAA) Specifications (Federal Standard No. 595 Colors, 12197 and 17875)

f) Foundation design with soil report supplied by others

g) Installation and design drawings sealed by Professional Engineer

1.4.4 Back-up Emergency Power

The Coast Guard Island remote radar site shall include a back-up emergency power system that provides automatic change-over capability in the case of a loss of primary AC power. The emergency back-up power system shall operate for up to 12-hours without refueling. The emergency back-up power system shall be designed for 50% excess capacity to account for future growth.

1.5 VTS Camera System

The VTS camera system shall consist of three camera units, one installed on the roof of the Control Center Building, one installed on the Punta Soldado radar tower and one installed on the Coast Guard Island radar tower. The contractor shall provide and install the camera system equipment as follows:

1.5.1 Earth Observation (EO)/Infrared (IR) Sensor

a) Thermal camera specifications
- Array format: 320 x 240
- Detector type: Long life, uncooled vanadium oxide (VOx Microbolometer
- Effective resolution: 76,800
- Pixel pitch: 25µm
- Focal length: 100mm
- Field of view: 4.6° x 3.7°
- Zoom: 2x E-zoom
- Spectral range: 7.5µ to 13.5µm
- Focus range: Athermalized, focus-free

b) Day/night color camera
- Array format: 640 x 480
- Detector type: EMCCD
- Effective resolution: 307,200
- Pixel pitch: 10µm
- Focal length: 8.6 to 154mm
- Field of view: 40.5° x 2.4°
- Zoom: Continuous
- Spectral range: 0.45µm to 1.1µm
- Focus range: On demand auto-focus

[Type text]

c) Control
- Serial: RS-232/-422/-485 Pelco-D, Bosch

d) Pan/Tilt Performance
- Pan Angle/speed: Continuous 360°, 0.1° to 100°/sec
- Tilt angle/speed: +90° to -185°, 0.1° to 30°/sec

e) General
- Power Requirements: 24 VDC (+/- 25%)
- Power Consumption: ≤100 W

1.5.2 Camera Sensor Interface Unit

The Camera Interface Unit shall house the camera power supply and IP Encoder in an environmentally protected enclosure.

a) Enclosure rating: IP66

b) Operating Temperature: -10C to +55C

c) AC/DC Power Supply
- Input Voltage: 90-240 VAC 50/60Hz
- Output Rating: 24 VDC, 150 W

d) IP Video Encoder, Axis 241Q or equal

1.6 Point to Point Wireless Network

The point –to-point wireless system shall provide Fast Ethernet connectivity between the Punta Soldado Remote Radar Site and the Coast Guard Island Remote Radar Site with the Control Center. The electronic components shall be encased in a robust outdoor enclosure that can withstand temperatures from -40° F to +140° F (-40° C to +60° C) and winds up to 202 mph (325 kph). The contractor shall provide all mounting accessories, cables, conduits and fixtures necessary to mount the antenna units on the towers and connect the units to the Radar Server Rack network switch. The contractor shall assure antenna configuration and location provides suitable path performance between sites to maintain a mean aggregate data rate of not less than 150 Mbps and a link availability of 99.99999%. Since the microwave path is over water, the contractor shall design the link to minimize the negative effects of multi-path propagation. The contractor shall supply and install the Motorola PTP-48600 or an equivalent system with the following specifications:

1.6.1 Punta Soldado to Control Center Link

a) Frequency: 4.710 – 4.940 GHz

b) Channel Size: Configurable to 5, 10, or 20 MHz

[Type text]

c)	Channel Selection:	By Dynamic Frequency Selection or manual intervention; automatic selection on start-up and continual adaptation to avoid interference
d)	Transmit Power:	Varies with modulation mode and settings from +27 to +22 dBm
e)	System Gain Margin:	Minimum 35 dB or better
f)	Receiver Sensitivity:	Adaptive, varying between -98 to -60 dBm
g)	Modulation:	Dynamic; adapting between Binary Phase Shift Keying (BPSK and 256 Quadrature Amplitude Modulation (QAM
h)	Error correction:	Forward Error Correction (FEC
i)	Duplex scheme:	Time Division Duplex (TDD) and Half Duplex Frequency Division Duplex (HD-FDD), Dynamic or Fixed ratio
j)	Antenna:	Dual polarized, appropriate Gain for 9.0 nm path length
k)	Security and Encryption:	128/256-bit Advanced Encryption Standard (AES) Encryption
l)	Ethernet protocol:	Institute of Electrical and Electronics Engineers IEEE 802.3
m)	User data throughput:	Dynamically variable up to 150 Mbps at the Ethernet (aggregate): 5 MHz Channel: up to 48 Mbps 10 MHz Channel: up to 100 Mbps 20 MHz Channel: up to 150 Mbps
n)	Latency (typical one way):	<2 ms in 20 MHz Channel <3 ms in 10 MHz Channel <5ms in 5 MHz Channel
o)	Quality of Service (QoS):	802.1p (2 Levels)
p)	Ethernet Interface:	10/100/1000 Base T (RJ-45)
q)	BIT LED Indicators:	Power status, Ethernet link status and activity
r)	System Management:	Web or Simple Network Management Protocol (SNMP)
s)	Installation:	Built-in audio and graphical assistance for link optimization

[Type text]

t) Connection: connection — Distance between outdoor unit and primary network up to 100 meters

u) Dimensions: — Outdoor Unit (equal or less than):Width 309mm, Height 309mm, Depth 105mm
Indoor Unit (equal or less than): Width 250mm, Height 40mm, Depth 80mm

v) Weight: — Outdoor Unit (equal or less than): 4.3kg
Indoor Unit (equal or less than): 0.86 kg

w) Ingress Protection: — Outdoor Unit: International Electrotechnical Commission (IEC) International Protection Code IP65
Indoor Unit: IEC International Protection Code IP53

1.6.2 Coast Guard Island to Control Center Link

a) Frequency: — 4.710 – 4.940 GHz

b) Channel Size: — Configurable to 5, 10, or 20 MHz

c) Channel Selection: — By Dynamic Frequency Selection or manual intervention; automatic selection on start-up and continual adaptation to avoid interference

d) Transmit Power: dBm — Varies with modulation mode and settings from +27 to +22

e) System Gain Margin: — Minimum 42 dB or better

f) Receiver Sensitivity: — Adaptive, varying between -98 to -60 dBm

g) Modulation: — Dynamic; adapting between BPSK and 256 QAM

h) Error correction: — FEC

i) Duplex scheme: — Time Division Duplex (TDD) and Half Duplex Frequency Division Duplex (HD-FDD), Dynamic or Fixed ratio

j) Antenna: — Integral with Outdoor Unit, appropriate Gain for 1.4 nm path length

k) Security and Encryption: — 128/256-bit AES Encryption

l) Ethernet protocol: — IEEE 802.3

[Type text]

m)	User data throughput:	Dynamically variable up to 150 Mbps at the Ethernet (aggregate): 5 MHz Channel: up to 48 Mbps 10 MHz Channel: up to 100 Mbps 20 MHz Channel: up to 150 Mbps
n)	Latency (typical one way):	<2 ms in 20 MHz Channel <3 ms in 10 MHz Channel <5ms in 5 MHz Channel
o)	QoS:	802.1p (2 Levels)
p)	Ethernet Interface:	10/100/1000 Base T (RJ-45)
q)	BIT LED Indicators:	Power status, Ethernet link status and activity
r)	System Management:	Web or SNMP
s)	Installation:	Built-in audio and graphical assistance for link optimization
t)	Connection: connection	Distance between outdoor unit and primary network up to 100 meters
u)	Dimensions:	Outdoor Unit (equal or less than):Width 370mm, Height 370mm, Depth 105mm Indoor Unit (equal or less than): Width 250mm, Height 40mm, Depth 80mm
v)	Weight:	Outdoor Unit (equal or less than): 5.5kg Indoor Unit (equal or less than): 0.86 kg
w)	Ingress Protection:	Outdoor Unit: IP65 Indoor Unit: IP53

1.6.3 Wireless Network Physical and Environmental Requirements

The point-to-point wireless network equipment shall meet the following physical and environmental requirements:

a)	Operating Temperature:	-40°C to +60°C
b)	Humidity:	100% Condensing
c)	Wind Speed:	202 mph (325 kph)
d)	Power Source:	90-240 VAC 50/60Hz

[Type text]

e) Power Consumption: 55 W

1.7 Maintenance Plan

Due to the remote location and challenges associated with operating in Colombia, some of the primary considerations for any system are maintainability and availability of critical spare parts. It is extremely important that the system be relatively maintenance free and provide for plug-and-play operations. As part of the offer, the contractor shall provide the following:

- Sample maintenance plan
- Periodic maintenance requirements
- Mean Time Between Failure (MBTF)
- Lowest replaceable units
- All long lead time items
- Life cycle component compatibility
- Suggested spare parts list with pricing details

During the initial Warranty period, the contractor shall provide routine and preventative maintenance actions. During the warranty, the contractor shall provide two hour service response (during normal working hours) and 24/7 phone response.

1.8 Training

The contractor shall provide a training plan and syllabus for a “train the trainer” course. The contractor shall develop and provide lesson plans, course material, and manuals for operator and maintenance training.

Training shall be conducted for Operators, Supervisors and Maintainers. This training shall consist of both classroom and live operational system training. The recommended training class duration is as follows:

- Operator Training 3 day
- Supervisor Training 3 day
- Maintainer Training 5 days

B2 Procurement documentation for AIS system

The following procurement documentation is being presented for use in acquiring and implementing the recommended AIS components.

I. INTRODUCTION

The Directorate of Telematics (DITEL) is implementing an Automatic Identification System in conjunction with the implementation of a Vessel Traffic System (VTS) at the Port of Buenaventura.

A. General Requirements

DITEL is seeking a contractor to provide an AIS solution for integration into a VTS. This integration will provide real-time vessel position coverage of the Port of Buenaventura, the channel from the Pacific Ocean to the port, and Pacific Ocean coverage approaching the channel. The real-time AIS vessel positions will be integrated into a Vessel Traffic System (VTS) to display a common operating picture of the port.

The goal of the project is to implement the necessary AIS infrastructure and system for VTS integration. The AIS contractor will be required to work closely with port personnel and DITEL's VTS contractor to integrate the AIS solution with the VTS installation.

The project includes the following:

- Identify, purchase and implement an AIS base station at the Port of Buenaventura Maritime Traffic Control Station (MTCS).
- Identify, purchase and implement an AIS receiver at a backup site in the Port of Buenaventura.
- Identify, purchase and implement an AIS repeater at the Punta Soldado site (entrance to the channel).
- Identify, purchase and implement the necessary VHF antenna, cables, and other supporting equipment for each of the three AIS sites.
- Integrate the position data from the AIS solution with the VTS.
- Train Client staff on the configuration, maintenance and use of the AIS system.

Unless special equipment and configuration is required, existing facilities will be used for the implementation of the AIS equipment (base station, receivers, and antenna). Physical and configuration specifications for the equipment are to be provided by the AIS contractor.

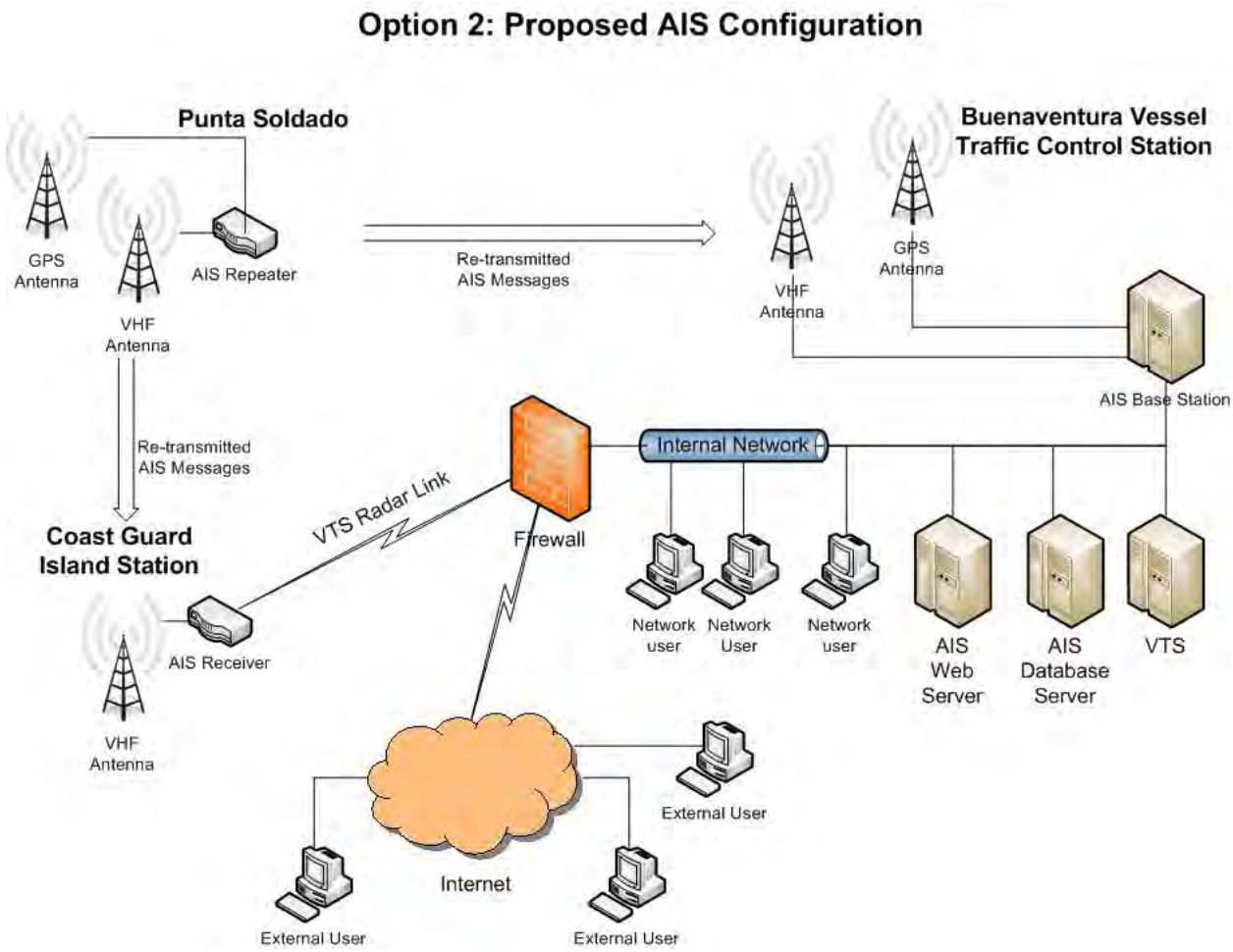


Figure B12-1 Configuration of the Automated Identification System (AIS) Components – Option 2

B. General Parameters

1. The development and implementation of the solution must be compatible with existing facilities and server equipment, security infrastructure, and communication lines.
2. Any hardware proposed by the contractor shall meet or exceed current AIS standards as defined by the International Maritime Organization and the International Telecommunication Union - Radio Communication Sector.
3. Contractors bidding on the project shall describe all of the requirements and projected costs necessary to implement their solutions, such as hardware, software, licensing, support packages, travel costs, and other administrative costs.
4. The successful end of all stages of implementation shall include an appropriate period and tools for testing, training, and transition.

5. The AIS system will not impact the performance of existing systems or limit system maintainability
6. The Contractor will provide all relevant technical documentation for maintenance and support of the AIS system. Documents will be provided in both paper and electronic format.
7. The AIS Contractor will provide training to port personnel.

C. Bid Parameters

1. The contractor shall provide a schedule of deliverables, and the costs associated with each component, that addresses the needs and requirements identified in this RFP. Those costs are to be valid for six months.
2. The schedule of deliverables shall contain projected dates that the hardware, software, integration, documentation, training, and other requirements shall be completed.
3. Payment on the contract shall be tied to an agreed schedule of deliverables. The contract shall be negotiated after selection of the Contractor.
4. The Contractor will include a rate chart for future additions and modifications to the system.
5. Contractors bidding on the project shall provide pertinent contact information. This shall include the name of the project manager and other team members as appropriate, phone, fax, email, office address, etc.
6. Contractors bidding on the project shall provide references. This shall include prior customers with name and contact information provided, as well as a brief description of the work done for them.
7. Contractors bidding on the project shall provide a brief history of the company and a corporate financial overview.
8. Contractors bidding on the project shall summarize the qualifications and length of employment of employees or sub-contractors working on the project. Please provide an organization chart or description that shall include the project manager, project staff, sub-contractors, and the percentage of their time dedicated to this project.
9. Contractors bidding on the project shall provide examples of solutions they have developed for complex 24/365 operational environments or otherwise demonstrate an appreciation of the needs of such an environment.

II. COMPONENT DETAIL

The following components are required for the implementation of this project.

A. Maritime Traffic Control Station

The Marine Traffic Control Station (MTCS) located at the Port of Buenaventura will serve as the primary operating facility for the VTS and AIS. The MTCS is a seven story building with an unobstructed view of the port and channel.

The AIS antenna equipment must be installed on the roof of the facility with cable runs made to the AIS equipment housed in the MTCS.

The AIS contractor will provide, install, and configure the following equipment at this site:

1. AIS base Station

General Specification Requirements

Integrated GPS receiver	Yes
Receive frequency bandwidth	156.025-162.025MHz
Transmit Frequencies	156.025-162.025MHz
Antenna Ports (VHF TX and RX)	Must include as combined or separated
Interface	RS232 and Ethernet
Hot swap capable	Yes
IALA Recommendation A-124 Compliant	Yes
IEC 62320-1 Compliant	Yes
Remote Management	Yes
Rack Mountable	Yes

Functional Requirements

Type A Messages	Yes
Type B Messages	Yes
ATON Messages	Yes
Receive AIS Text Messages	Yes
Transmit AIS Text Messages	Yes
Local AIS Storage	Yes
Remote Management	Yes

2. AIS Antenna

General Specification Requirements

Required Bandwidth	156.025-162.025MHz
Height	8 foot recommended
Type	Omni-directional VHF
Lightning arrestor	Yes

3. GPS Antenna

General Specification Requirements

Lightning arrestor	Yes

The contractor will provide an AIS software interface solution. The interface will be separate from the VTS, and will be a web based portal to provide non-General Maritime Directorate (DIMAR) / Coast Guard security personnel with access to non-sensitive AIS information for commercial cargo operations purposes. The contractor will provide the software in conjunction with all necessary hardware to host the solution.

The AIS web portal should have the following functionality:

- Web Access from standard browsers (Internet Explorer, Firefox, etc)
- Display AIS A
- Display AIS B
- Display target direction
- Display AIS transmitted data
- Pan and zoom map capabilities
- Display latitude and longitude
- Display target names
- Display target list
- Capability to enter and display the full vessel schedule
- Supporting vessel database
- Capability to add user-defined location markers

B. Coast Guard Island Station

The Coast Guard Island Station located at the Port of Buenaventura will serve as the backup AIS site. The site has an unobstructed view of the port and channel, and will contain an AIS receiver as a backup to the MTCS AIS receiver. The Coast Guard site will also contain backup VTS radar equipment – the connectivity to the MTCS will utilize the existing infrastructure as implemented by the VTS radar equipment installation.

The antenna will be installed on an existing tower or on the Coast Guard facility.

The AIS contractor will provide, install, and configure the following equipment at this site:

1. AIS Receiver

   General Specification Requirements

Type A Messages	Yes
Type B Messages	Yes
Interface	RS232 and Ethernet
GPS	Yes
Receive frequency bandwidth	156.025-162.025MHz

2. AIS Antenna

General Specification Requirements

Required Bandwidth	156.025-162.025MHz
Height	8 foot recommended
Type	Omni-directional VHF
Lightning arrestor	Yes

C. Punta Soldado

The Punta Soldado site is located at the mouth of the channel leading to the Pacific Ocean. This site will provide extended AIS coverage off-shore by means of an AIS repeater. The site has an unobstructed view of the Pacific Ocean and channel.

The antenna will be installed on an existing tower. No direct connectivity will be required between the site and the MTCS as the repeated AIS data is within range of the MTCS.

The AIS contractor will provide, install, and configure the following equipment at this site:

1. AIS Repeater

General Specification Requirements

Type A Messages	Yes
Type B Messages	Yes
Interface	RS232 and Ethernet
GPS	Yes
Receive frequency bandwidth	156.025-162.025MHz
Transmit Frequencies	156.025-162.025MHz
Operating Mode	RATDMA

2. AIS Antenna

General Specification Requirements

Required Bandwidth	156.025-162.025MHz
Height	8 foot recommended
Type	Omni-directional VHF
Lightning arrestor, gas discharge	Yes

3. GPS Antenna

General Specification Requirements

Lightning arrestor	Yes

III. INSTALLATION AND INTEGRATION

A. Installation – The AIS contractor is required to arrange for and install all equipment at the sites listed above under section II. Local subcontractors may be required for the installation of AIS antenna equipment.

1. Install all necessary equipment to provide full AIS coverage of the Port of Buenaventura, the channel, and Pacific Ocean approach to the channel to the extent of at least 30 miles.
2. Establish connectivity between the MTCS and secondary sites (Coast Guard and Punta Soldado).
3. Install and configure AIS web portal. Establish connectivity to the Internet for consumption by port customers.
4. Test equipment at all sites and make adjustments to ensure optimal performance.
5. Test system outage scenarios to ensure continued coverage with one or two AIS receiver locations inoperable.

B. Integration – The AIS contractor is required to perform the following integration:

1. Work with DITEL personnel and/or VTS contractor to integrate the AIS system with the VTS.
2. Integrate the AIS data feeds with the AIS web portal.

IV. TRAINING

AIS contractor will train port personnel in the following:

1. Installation of AIS equipment and software.
2. Maintenance of AIS equipment and provide recommended maintenance plans and schedule.

3. Operation of all AIS hardware and software.

3.0 Development of Optical Character Recognition System

The following information listed herein describes the development of an Optical Character Recognition System (OCR) at Sociedad Portuaria Regional de Buenaventura Columbia (SPRBun).

This document provides the following information:

3.1 Preparation of layout of Optical Character recognition system
3.2 Preparation of illustrative description and technological recommendations of components needed for OCR system
3.3 Description of requirements to integrate OCR system to the terminal operation system
3.4 Comparison of alternate OCR systems and recommend one for implementation
3.5 Preparation of specifications, procurement documents, cost estimated and implementation program for OCR system

I. Preparation of template for data base of vehicles and personnel to expedite processing in gates
II. Provision of performance specifications for OCR system components
III. Provision for performance specifications for ancillary facilities and utilities needed for OCR system
IV. Preparation of procurement documents for purchase and installation of OCR system
V. Preparation of scope of work for purchase and installation of OCR system
VI. Preparation of final capital cost estimates for OCR system
VII. Preparation of operating costs for OCR system
VIII. Preparation of implementation program for OCR system

OCR Recommendations

Optical Character Recognition (OCR) technology alone will enable only the automatic recognition of containers and other equipment (trucks) at SPRBun. To gain operational benefit from the technology, it must be integrated into a larger Automated Gate System (AGS) that can identify drivers and their purpose for arriving at the terminal, as well as control traffic during entry and exit.

The implementation of OCR technology, within an integrated AGS, should enable automation and allow SPRBun to maximize gate throughput velocity as well as improve security, safety and cost efficiency of the operation.

The implementation of an AGS should provide SPRBun considerable benefits, including:

Increased Security by eliminating physical interaction between truck drivers and terminal personnel.

Lower Operating Costs by reducing the number of personnel required for the terminal to operate the gate areas.

Reduced Theft by prohibiting bribery through remote gate management and driver interaction.

Increased Data Accuracy by reducing manual input errors.

Higher Throughput Velocity by decreasing gate queue times at the entry and exit gates.

Cleaner Environment by reducing the amount of exhaust from idling trucks in the entry and exit gates.

Added Throughput Capacity by facilitating more transactions per hour.

Increased Safety by ensuring personnel are not required in any gate lane.

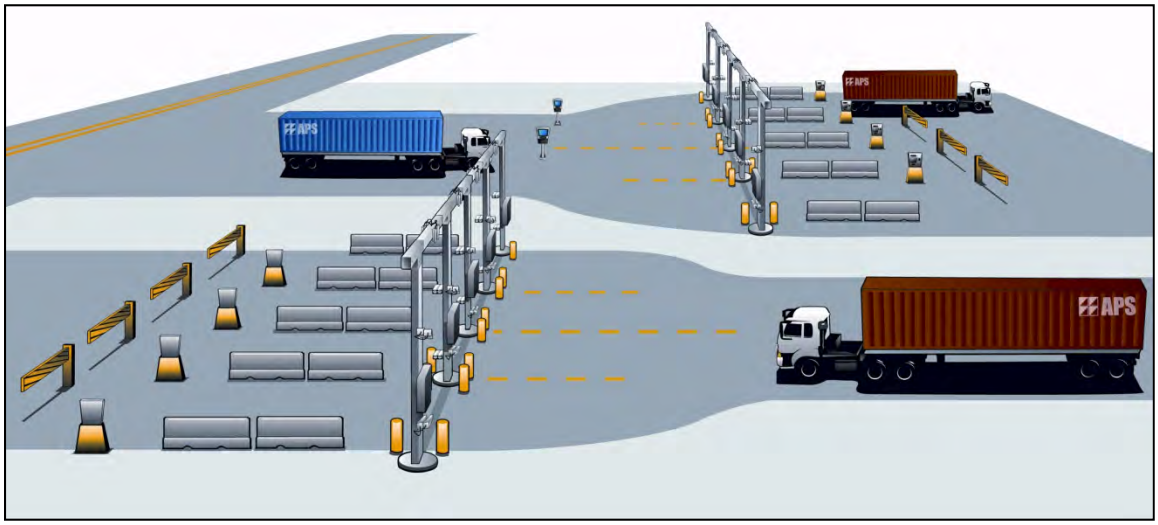


Figure 3-1 - AGS diagram

Key AGS functions available to SPRBun

- Optical Character Recognition (OCR) of ISO containers and vehicle licence plates.
- Integration of weigh scale data at each OCR portal
- Driver Gate Kiosks to automate driver ID, printing and Voice over Internet Protocol (VoIP) communications
- Integrated high security access control using terminal identification cards
- Remote damage inspection of equipment using high resolution images
- Gate Clerk Software to remotely view images and communicate with drivers
- Real-time integration of data to host/Terminal Operating Systems (TOS)

3.1 Preparation of layout of OCR system at each gate

The Automated Gate System (AGS) approach focuses on the automated identification and verification of both truck drivers and their equipment as they enter and exit the terminal. The information collected is then integrated through software interface to the TOS (COSMOS) for validation. The table below illustrates the areas where OCR "checkpoints" are recommended. At the recommended "checkpoints" a mix of OCR portals to automate license plate recognition (LPR) and/or container recognition (CR), and equipment damage inspection images (DII))and driver interface Kiosks (outfitted with equipment to allow clerk-to-driver communications in the lanes, seal verification, driver identification, etc.) are recommended.

Map Area	Gate Area	Description	Lane count	Kiosk count	Portal count	Portal setup
A	Paraboloides	Export Load entry(P-check)	2	0	0	0
B	Paraboloides	Empty trucks entry	4	4	4	LPR
C	Paraboloides	Full trucks Exit	5	5	5	LPR +CR + DII
D	Export inspection	Export Load entry(A-check)	2	1	1	LPR + CR + DII
E	Free Zone	Entry / Exit for inspection	1	0	1	LPR + CR
F	Pekin gate	Empty Container entry (2)/exit (3)	5	5	5	LPR + CR
G	Coffee and Sugar	Coffee and Sugar Entry	2	1	1	LPR

Table 3-1 – AGS Equipment Locations

System Overview

The recommended AGS for SPRBun would integrate OCR checkpoints and driver kiosks to automatically identify and validate drivers and equipment during facility entry and exit. The equipment locations, identified above are mapped below.

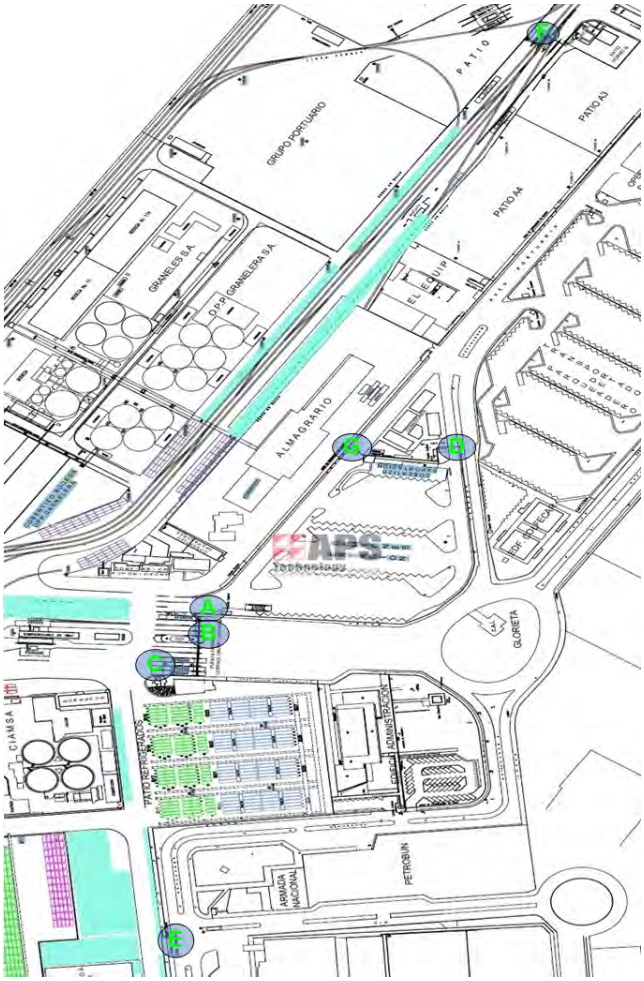


Figure 3-2 - SPRBun AGS locations

3.2 Preparation of illustrative description and technological recommendation of components needed for OCR system

3.2.1 Portal Overview

The recommended AGS consists of twelve (12) drive-through OCR portals. The portals include subsystems to automatically identify container number, container size/type code, and/or license plate

number of passing equipment (depending on location). Additionally, six (6) of the portals include high resolution damage inspection cameras to capture images of the container (back, front, sides, top, and bottom) using one array of cameras.

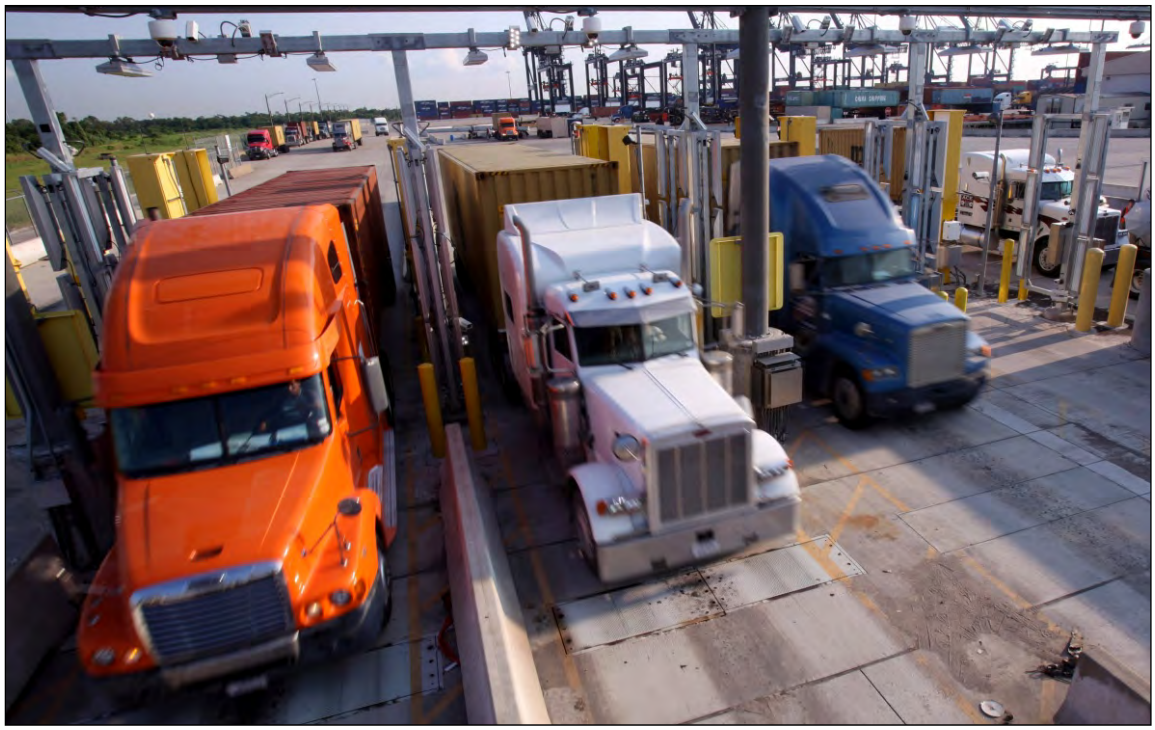


Figure 3-3 - OCR Portals at Port of Houston, USA

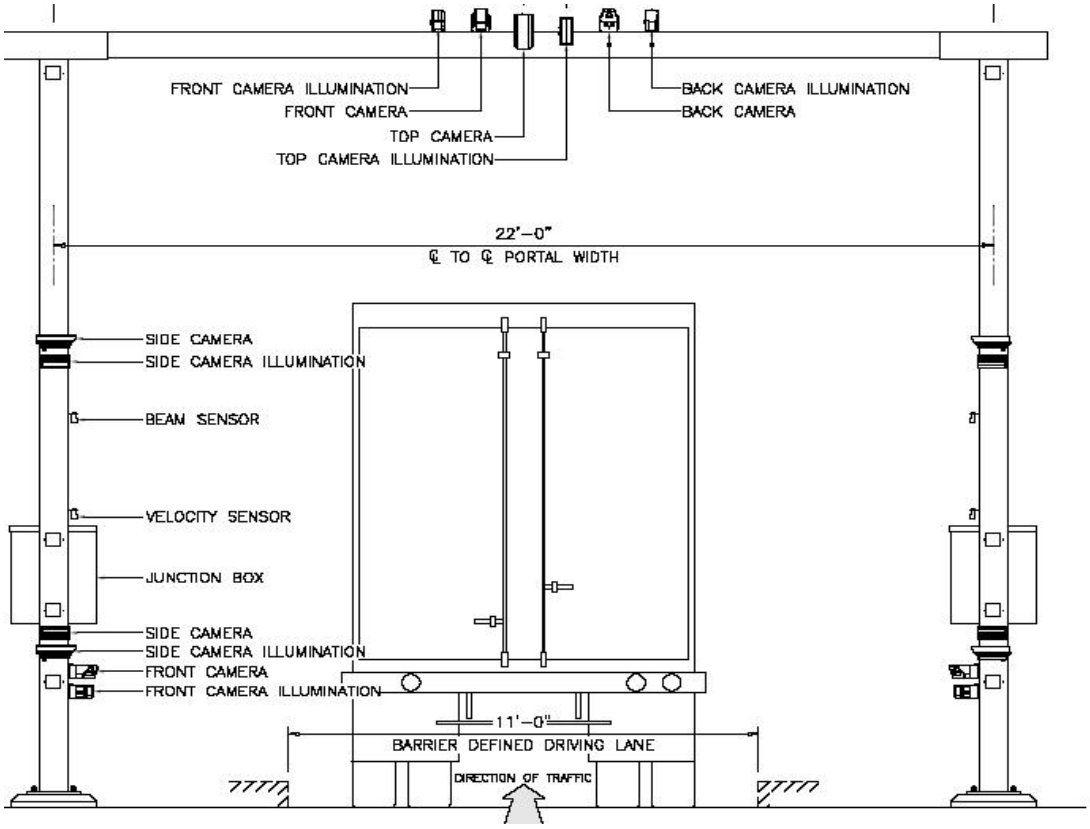


Figure 3-4 - Sample OCR Portal design

3.2.2 Portal Equipment

The following equipment is recommended to completely outfit each portal:

Equipment enclosures

Small equipment enclosures (one per portal) provide termination points for the electrical and communications cabling, as well as all cabling for the portal equipment. Additionally, each enclosure houses all power supplies, one network switch, and any serial to IP conversion devices.

Figure 3-5 - Portal enclosure layout

Cameras

Commercially available, off-the-shelf IP-based area scan cameras should be used to capture images of the equipment numbers (container top/sides/back/front, the trailer (2 sides), and the license plate). Multiple cameras are deployed for each type to ensure redundancy should one camera fail or should direct sunlight impede one camera.

Figure 3-6- Cameras and LED Illumination units on a portal

Illumination

Low power LED illuminators should be used to light the areas of interest during low lighting conditions.

Sensors

Each portal includes an array of sensors to trigger the beginning and end of each transaction as well as determine equipment speed, length and classification.

3.2.3 Centralized Equipment

Servers

The recommended AGS requires seventeen (17) commercially available servers that provide the following functions:

- Portal OCR Servers: One server per portal to perform Container/Chassis OCR to meet performance specifications (12 total servers)
- LPR servers: One server per three lanes to perform OCR of license plates at the Five (5) LPR lane locations (2 total servers)
- OCR Messaging Server: One (1) server to consolidate the transmission and receipt of all OCR messages between the lane servers and the TOS.
- Central Gate Control: One (1) server to consolidate the transmission and receipt of all messages between the kiosk servers and the TOS.
- Image Archive Server- One (1) server to store picture receipts of all transactions

A 19" equipment rack to rack mount OCR and central processing servers would be necessary for storing all seventeen (17) recommended server**.**

3.2.4 Portal Software

The recommended AGS captures, identifies and records all transactions processed through the gates at SPRBun. Described herein are all of the different types of images that the recommended AGS will locate and capture.

Container OCR

The recommended base system records five separate numbers to provide maximum OCR accuracy (Left side, Right side, Top-Front, Top-Rear, and Rear Door). The system extracts the equipment ID and ISO equipment code from each image within a few seconds, day or night, and in the most extreme weather conditions (fog, rain, salt exposure, wind, any vehicle vibrations or ambient light).

Cargo containers are identified as specified in International Standards Organization (ISO) Standard 6346: 1995, Freight Containers – Coding, Identification, and Marking. The basic nomenclature of this standard is as follows:

- Owner's Code – Consists of three capital letters that are unique. E.g., CCL. The owners' codes will be based on official registered codes, and additional codes that are known to exist.
- Equipment Category – Capital letter identifying the type of container, as follows:
    - U for all freight containers
    - J for detachable freight container-related equipment
    - Z for trailers and chassis
- Serial Number – Six numerals (e.g., 123456)

- Check Digit – A digit that provides a means for validating the accuracy of the owner code and serial number. The check digit follows the ISO standard rules and algorithm.

Container Size/Type Code

AGS automatically identifies container dimensions via OCR of the Size and Type codes found adjacent to the Equipment Initial and Number. OCR of these codes will be conducted via a separate process, but using the same images captured for Container OCR.

Figure 3-7 – ISO Equipment Code example

License Plate OCR

Each portal includes two cameras and illuminators to capture truck license plate images. An OCR application will control all cameras and extract the equipment number as with the container process. This data will be sent within a transaction to the Central OCR server for further processing. The license plate reader should be able to capture the images of license plates on the side doors of trucks as well as license plates at the front and rear of vehicles.

Figure 3-8 - License plate image example

Equipment Damage Inspection Imaging

Six of the recommended portals should include one upgraded, high-resolution camera capable of capturing both OCR and inspection images. Additional lighting is also required as well as a stand-alone application to allow the review of all archived images from the following views:

These images are also available for review within an intranet reporting application or linked within the TOS clerk software application (COSMOS or equivalent).

Container Damage Inspection

Figure 3-9 - Stitched Inspection Image (Side)

Empty Container Verification

Pan-tilt-zoom (PTZ) cameras are recommended to accelerate the process of checking empty containers. PTZ cameras should be mounted behind certain gate lanes to validate the condition of the opened container. In this scenario, SPRBun users will utilize rear PTZ camera to confirm an empty container by the following process:

1. An empty container approaches the gate pedestal and is logged into the system as an empty.

2. The driver is then instructed to open the rear container doors via the pedestal intercom.
3. Empty/Non-empty status is verified using the rear-view PTZ camera.
4. If validated against system data, ticket is printed and driver allowed into yard.

Under vehicle imaging

International Ship Port Facility Security code (ISPS) regulations may require terminals complete an under-vehicle inspection. If so, capturing under-vehicle images or video of passing equipment is recommended to ensure compliance of the requirements. This will allow SPRBun to examine the underside of inbound vehicles and equipment.

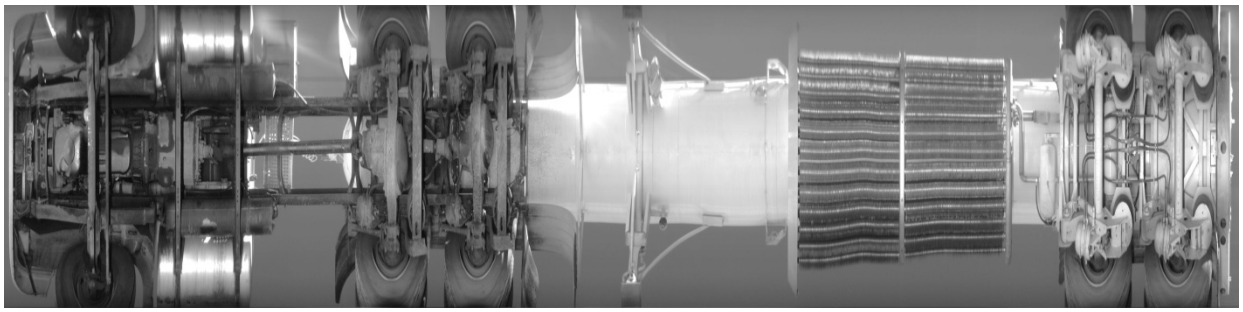


Figure 3-10 - Under vehicle inspection image example

Container Security Seals

ISPS may require verification of security seal numbers as part of the future gate process. Minimum compliance with this requirement requires a high resolution image of the security seal to verify integrity. If this is a requirement high resolution cameras on the portals as well as in-lane PTZ cameras (at the kiosks) to obtain high resolution images of the seal are recommended. This will allow a remote user to identify seal integrity and, possibly, verify the seal ID number. This would also enable SPRBun to relocate this function from the gate lane into a secured building, improving the safety of the terminal gate.

Figure 3-11 - Seal inspection images

3.2.5 Driver Communication

Driver Kiosks

It is recommended that certain gate lanes noted herein be equipped with an elevated pedestal and driver kiosk located some distance ahead of the portal with interactive communication functions. Kiosk functions should include:

Available Kiosk Equipment

- Voice/Intercom - Voice Over Intranet Protocol (VoIP) allows driver- clerk communication
- Call button - allows driver to notify clerk of their presence
- Biometric fingerprint reader– facilitates driver identification
- ID Card Reader – facilitates driver identification
- Barcode scanner - provides verification of successful mission ticket or entry pass
- License Plate cameras/illuminators (some lanes) - certain kiosks need to be outfitted with LPR cameras and equipment to match portal-to-pedestal transactions.
- Thermal ticket printer - Prints mission tickets for driver
- Driver Face camera - allows clerk to verify driver's identification

External of kiosk

- Rear PTZ camera - enable container/chassis views and verification of an empty container
- Barrier gate arm (some lanes) - allows driver to pass once transaction is verified and mission ticket is printed
- All cabling, power supplies, etc

Figure 3-12 - Alternate kiosk mounting approach (Apapa, Nigeria)

3.2.6 AGS System Software

Gate Control System

It is advised to implement Gate Control System which allows the administration and setup and control of gate users, lanes and areas. A web-enabled exception handling application allows remote clerks (on terminal) to resolve errors and control gate transactions that are not processed automatically. Given that all gate traffic should be required to register their container, LPR and Driver information prior to arrival, we expect more than 75% of all gate traffic will not require human interaction via the Exception software.

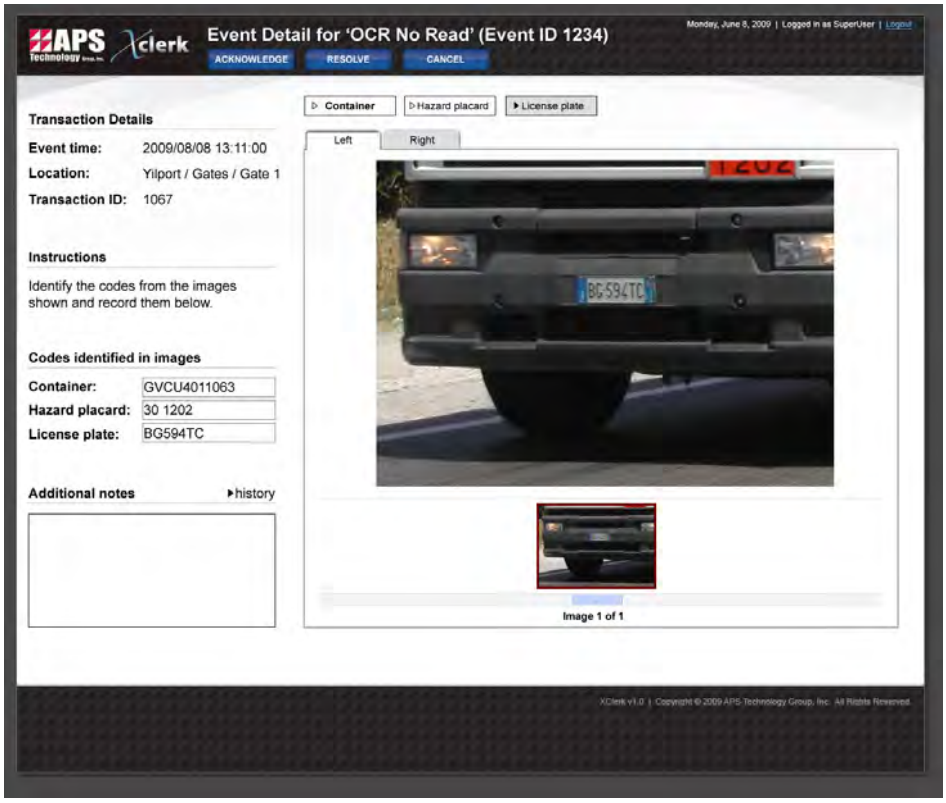


Figure 3-13 - Gate Exception Handling Application

The application provides for image review, live video (from lane/kiosk cameras), and VoIP driver communication to the lane kiosk intercom. The application works in conjunction with a TOS gate module and provides no data update capability. The gate control system is not a replacement for the TOS and its gate business rules logic nor does it provide data update capability in place of a TOS.

The application provides the following functionality:

- Classification, queuing and notification of LPR, OCR and/or appointment exceptions (requires integration of TOS appointment data)
- Display of OCR portal images (to correct OCR misreads, review images, etc.)

- Display of live video from APS kiosk face camera
- 2 way VoIP communication to each APS kiosk

Operating Scenario

When a truck pulls into a lane they will scan their ID card to begin process. Once the card is swiped, the gate automation checks to see if the transaction is validated. If the transaction is validated in the TOS, the transaction will complete and the TOS will print an entry ticket to the kiosk lane printer. If there is a problem with the transaction data in the TOS, the transaction is then entered into a system controlled queue. The exception application will be updated to note a waiting driver, the lane number, wait time etc. If the card read fails the trucker will press a call button and the trucker is placed in the queue without any attempt at automation.

In the exception application the clerk will have the option to click the Next button or manually select a lane. Once the clerk presses the Next button the console application will determine which lane to select. This is determined by wait time. The application will choose the longest wait time from the queue. If a specific console has been selected for only In-Gate or Out-Gate, only those transactions that apply will be considered. Additionally, the clerk will have the ability to select a lane manually instead of clicking the Next button. Once a lane is selected by the application or user the lane is locked so other consoles cannot automatically or manually select this same lane. At this time the audio for the selected gate lane is activated along with the associated portal images displayed. The clerk will have the option to click a link to have the OCR or damage inspection image open up in a new window. Once the clerk has gathered all the necessary information by speaking with the driver and viewing the video and/or OCR images the clerk will update corrected OCR or transaction data in the TOS module and mark the transaction as complete. This will clear all information from this lane setting the status of the lane and console to clear and releasing the lock on the lane.

System Reporting

A reporting application for all OCR transactions and images is recommended. This will entail a web-based tool designed to allow local or remote users the ability to query and review images captured during gate transactions (no data update capabilities are included at this time).

A host of system and transactional reports are available with the system. Users will need only access an IP-address from a standard web browser to query and review reports and associated images. Data is searchable using one or more parameters including Container number and/or transaction ID, date and time, lane of interest, etc. (see Container Trace Report Example below). Access to report functions will be controlled via password protection ensuring the security of the OCR data access.

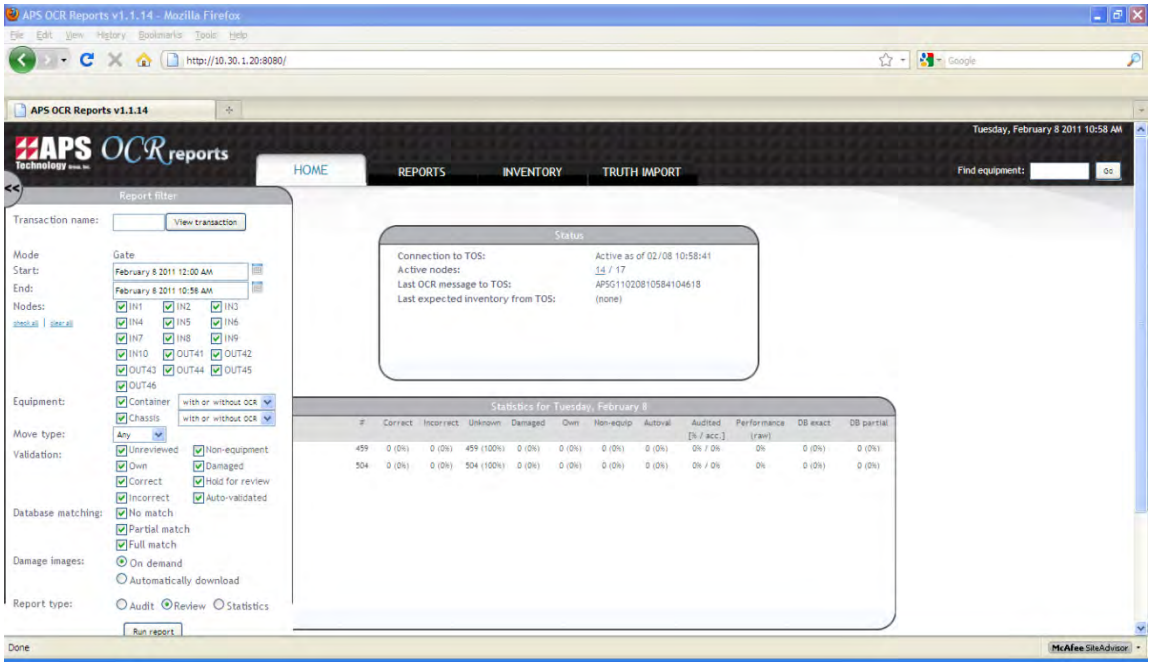


Figure 3-14 - OCR Report Search Page

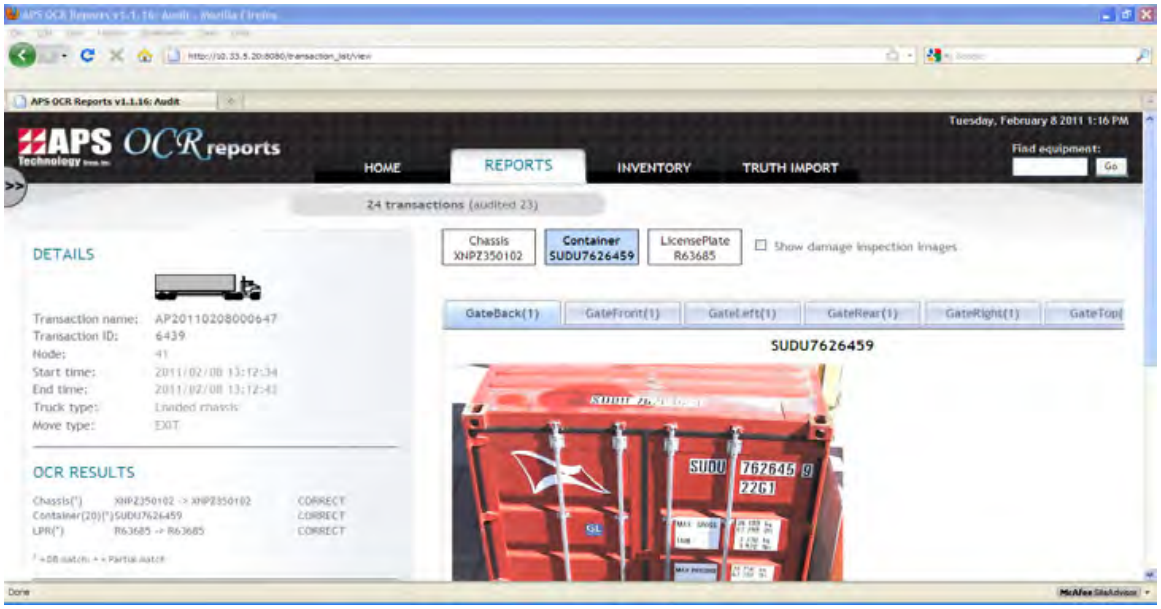


Figure 3-15 - Container Trace Report Example

3.3 Description of requirements to integrate OCR system to the Terminal Operating System

The AGS provider should have extensive experience integrating the data created/required by its system with host/TOS systems. Providing real-time, electronic transfer of all AGS data to the SPRBun TOS (COSMOS or equivalent) via XML utilizing a transmission control protocol (TCP)/ internet protocol (IP) socket interface is recommended. COSMOS and equivalent TOS provide an interface document to outline this approach.

Selecting a preferred technology partner with experience implementing AGS with a major TOS is preferred. This allows the use of existing COSMOS or equivalent integration specifications as a guide to complete the development and customization work required for a successful project implementation.

I. Alternatives for the Gate OCR System

A. Alternative 1 - APS Technology Group
B. Alternative 2 – NASCENT Technology
C. Alternative 3 - CAMCO Technologies
D. Alternative 4 - SAIC Security and Transportation Technology

II. Alternatives for the Terminal Operating System (TOS)

A. Alternative 1 - COSMOS
B. Alternative 2 – Tideworks Technology
C. Alternative 3 - NAVIS

III. Hardware Alternatives

A. IBM
B. HP
C. Psion
D. Motorola Symbol

IV. Integration Issues

V. Web Sites Surveyed for This Report

3.3.1 Alternatives for the Gate OCR System

We have analyzed three alternatives for automating the gates at SPRBun. The companies are APS Technology (which is described in this report), NASCENT, and CAMCO Technology.

Alternative 1 - APS Technology

The solution proposed by APS Technology automates data collection and security at 7 gates (or 21 lanes) to collect data on trucks, chassis, and containers. This data is passed through the network to the TOS database. The two modules proposed by APS in other sections of this report are the Driver Gate Kiosk, and the Gate OCR Portal. These two modules are APS software modules, which interface or are integrated with the COSMOS, Tideworks, or Navis TOS's.

Ports Using APS Technology

- Port of Virginia - APS and Navis
- Port of Houston - APS and Navis
- Port of Baltimore- APS and Navis
- Port of Cartagena, Colombia – APS and Navis
- Port of Yilport (Turkey) – APS and Navis
- Port of Tacoma – APS and Navis
- Ports of Los Angeles, Long Beach, Oakland - APS
- Dubai Ports – APS
- Port of Mobile - APS

Alternative 2 - NASCENT Technology

NASCENT Technology is a leading provider of technology solutions for the Transportation Industry. They have years of proven experience and technological innovation in the following areas:

- Automated Gate Systems (AGS)

- Terminal Technology Consulting
- Terminal Operating Systems (TOS) Development
- System Integration Services
- Gate, Yard Management, Inventory, Rail, and Inspection Systems
- RF Data Collection Systems

SYNAPSE™ is a revolutionary suite of Terminal Automation Products designed specifically for the Transportation industry. Its modular and scalable design affords the opportunity for clients to "judiciously" implement technology depending on their current situation(s) and present needs. A specific concern or opportunity can be targeted with pinpoint accuracy.

The SYNAPSE™ "plug-and-play", IP based design has provided an unparalleled technology product offering for today's fast-paced, cost-conscious transportation companies.

Current modules include:

- Gate Operations
- Yard Operations
- Rail Operations
- Mobile Solutions
- Facilities Management
- Communications
- Integration Gateway
- Reporting

Background. In order to avoid the common shortcomings of outdated and proprietary competing products while providing cost-efficient, realistic, "state-of-the-art" technology solutions, our engineers started with a "blank page" design approach.

Tasked with having to solve current and expected issues, NASCENT engineers set out to list the pre-requisites for SYNAPSE™:

- The system had to be modular.
- It had to be cost-effective and easily maintained.
- It needed to be easily integrated into a client's existing/future infrastructure.
- It had to complement a client's existing technology, systems and/or business processes.
- It needed to be scalable to accommodate growth.
- It had to be easily customized for various sites and clients.
- It needed to enable centralization so those sites could be remotely operated.

- It had to be supportable remotely.
- etc.

Ports or Terminals Using NASCENT

- Port of Virginia - APM Terminal Portsmouth, VA
- Port of Charleston
- Norfolk Southern Corporation
- Maersk Sealand
- Port of Honolulu, Hawaii

Camco Technologies is NASCENT's Vision Partner offering state-of-the-art, High Quality, OCR and Damage Inspection Portals.

Alternative 3 - CAMCO TECHNOLOGIES

CAMCO is another gate automation provider in addition to APS. The following is a description of their gate operating system (GOS):

http://www.camco.be/camco/en/products/ocrcameraportal

GOS (Gate Operating System)

The GOS is the software suite specifically developed by CAMCO to manage and steer complete gate processes and sub-processes that are active in modern terminal operations.

Each terminal in this world has slightly different gate processes due to local laws and practices, requiring software that is adapted to cover these specific processes.

Key features

- Proven and mature software, operational in several major terminals
- State of the art, based on .NET
- Framework based
- Proven interfaces with all commercial TOS systems such as Zebra Navis, Tideworks,

Cosmos, TSB...

- Simulators on different levels to accelerate the integration process
- Supports all major databases (Oracle, DB2, SQL Server...)
- Supports multiple communication standards (TCP/IP, Simple Object Access Protocol (SOAP), file transfer protocol (ftp), Java Message Services (JMS), web services, ...)
- Supports server virtualization (VMware...)
- Supports numerous process points such as kiosk, operators, camera portals, access points...
- Gate process is fully customizable to every specific gate operation
- Visual overview of gate operation, all applications have a graphical interface
- Web application available
- Real-time process monitoring
- Multi-lingual support for kiosk and operator screens
- Support for interfacing with access control equipment (ISPS security, traffic barriers, traffic lights, ...)
- Built-in monitoring and diagnostic capabilities

Concept

To allow this customization per gate automation project, the GOS consists of a wide variety of software components or "building blocks". Typically 10% of a gate automation solution is comprised of customer-specific components, such as gate processes, kiosk screens and other specific interfaces. These components are implemented through bespoke software development. The remainder of the solution is built using field-proven generic components, customized through configuration.

Alternative 4 – SAIC Security and Transportation Technology

SAIC offers the Intelligent Intermodal Solutions (IIS), which they describe as follows :

Intelligent Intermodal Solutions (IIS)

SAIC's IIS systems provide automated processing at the gates and on the quay to improve efficiency, throughput and security.

Overview

A busy cargo terminal needs to keep track of thousands of containers, trucks and drivers every day — all at the fast pace of commerce. SAIC's IIS systems provide automated processing at the gates and on the

quay to improve efficiency, throughput and security. With IIS systems providing timely, accurate information from key locations, the terminal can streamline its gate and quay operations and manage traffic more efficiently than ever.

Features

IIS system components at key locations throughout the terminal work together to identify containers, trucks and drivers, and deliver information where it's needed.

- At the gates, the IIS system uses OCR to read numbers on containers, chassis and license plates.
- In the lanes, Gatestand kiosks automate the terminal transaction for drivers.
- On the quay, the CraneView OCR system reads container numbers and records stow positions as containers are moved by cranes.
- The IIS server stores images and data from IIS components and other sources throughout the terminal, and exchanges data with the terminal operating system (TOS).
- Using IIS workstations at central locations, clerks can manage the gate processes remotely, and inspectors can check containers for damage online.

Benefits

- Enhances efficiency through automation and centralized operations
- Increases throughput by streamlining processing
- Improves security by identifying containers, trucks and drivers
- Reduces data errors and incorrect container moves
- Improves safety by keeping personnel out of traffic areas

3.3.2 Alternatives for the TOS

This section addresses the Terminal Operating System (TOS) and its interface to the Gate OCR Systems. The three systems analyzed are the COSMOS, Tideworks, and Navis TOS's. Hardware analysis centers on IBM, HP, and Psion.

Alternative 1 - COSMOS

COSMOS is the current Terminal Operating System (TOS) implemented at SPRBun.

COSMOS calls their TOS the Container Terminal Control System (CTCS) and offers the following features:

CTCS integrates:

- Control of all administrative and technical gate operations for delivery and pick-up of containers via truck, rail, vessel and barge
- Enhanced order management for the storage of details of expected containers
- Follow-up of all container movements and positions in the yard
- Container logistics and support of specific customer instructions for seals, stickers, weighing of containers, etc.
- Customs support functions
- Facilities and gateways to container freight station and repair shop
- Several reports, statistics, automatic invoicing and archiving
- Support for RDT communication
- Advanced "standing orders" utility
- Break bulk support
- Multi terminal facilities
- Self-service truck counter
- Report scheduler
- Shift and gang productivity reporting

Currently the Engineering Department is responsible for gate activity. The current system is manual and the keyboard is used for input. Radio frequency equipment from Psion is in use.

The Engineering Department says that COSMOS is rigid which tells us that there is a lack of flexibility with the current operation.

If SPRBun decides to stay with COSMOS, it will require obtaining the AGS (Automatic Gate System) Module. The AGS is the COSMOS software interface required between the OCR software (COSMOS calls this OCR software the GOS or Gate Operating System) and the TOS. The GOS initiates data entry and retrieval through the AGS to the TOS. In one of the following reports, CAMCO uses the same GOS generic description. Cosmos describes the interfacing application as follows:

> Interfacing
>
> AGS is the interfacing application between the GOS and the TOS. The GOS gathers truck and container data from administrative and physical checks. It transmits all relevant

data to the TOS. Based on the received information, the TOS will perform the necessary validations, trigger respective processes to plan or pick up containers and generate the related moves.

Gate In Operations

Receive truck and container data from the GOS

Create truck calls

Administrative check of received containers

Register bundles

Physical check of received containers

Create moves

Return result to the GOS, optionally enhanced with customs document information

In case manual intervention is required, the GOS will be informed of this event, after which the gate becomes available again for the processing of a new truck call. The GOS will receive information about the execution of manual interventions by means of another dedicated communication channel.

Truck Driver Identification

The truck driver identification badge or Cargo Card, which provides every registered driver with his own electronic identity, was developed to aid and considerably speed up container terminal handling. Its main purpose is identification, registration and security.

During the administrative check the driver's badge is swiped through a badge reader. Data collected from this badge is sent via AGS to the host system. Truck calls will be linked to badge numbers. At the gate out the badge can be read again. This way for example OCR data of the pictures taken at the gate out can be linked to the truck call.

Truck Triggering

The GOS can inform the TOS of a truck arrival at a specific interchange zone on the terminal. The truck driver confirms his arrival at the interchange zone by means of the

truck triggering devices (keyboard, card reader, ...). At that moment the TOS releases the moves for handling the units for this truck. This way moves are prevented from being released too early and transporters will not have to wait for trucks that have not arrived just yet.

Gate Out Operations

Receive truck and container data from the GOS

Validate containers loaded on truck at the Gate Out

Check whether all handlings are executed

Declare the call executed

Return data to the GOS in order to trigger EIR printout

Information Requests

At any point in the truck cycle the GOS can use requests to retrieve up-to-date information of a truck call to update the data available in the GOS or to control the gates, reprint documents, etc.

Communication

All communication between the GOS and the TOS is going via XML messages sent through a dedicated communication channel. A single XML message containing truck and container information, truck driver information, or truck trigger data is sent to the TOS, split up into the different components and interpreted. A response is composed and a single XML message is sent back.

The communication with the client can be done with WebSphere MQ or TCP/IP sockets.

Alternative 2 – Tideworks

Tideworks Technology, Inc., headquartered in Seattle, Washington, is subsidiary of Carrix, Inc., parent of SSA Marine, formerly known as Stevedoring Services of America, a leading international marine terminal operator with operations in the United States, Mexico, Panama, Chile and Vietnam. Tideworks states that they leverage proven technology and industry best practices to maximize operational productivity and enhance communication with customers and partners.

Tideworks' core terminal solutions - Mainsail®, Spinnaker Planning Management System®, and Genoa Breakbulk Management System® - are built on more than 30 years of industry experience. Engaged by more than 25,000 users at over 70 sites, Tideworks describes its solutions as having the proven scalability to process well over one million TEUs per year in a given facility.

Tideworks offers a number of software modules used to custom tailor the product to the port's operation.

Mainsail Vanguard incorporates all the functionality needed to handle any cargo type, including containers, rolling stock and break-bulk cargo. Mainsail enables you to run your operation the way you want with highly flexible tools for inventory management, reporting and customer service.

Spinnaker eliminates the guesswork from planning with sophisticated tools for vessel, berth, yard, and rail planning.

Genoa Breakbulk Management System® is a suite of systems that will help you effectively manage all aspects of your multipurpose terminal business and deliver on customers' expectations. Genoa supports terminals that handle all cargo types - break-bulk, bulk, ro-ro, and containers - and can operate as a standalone system, in dedicated or multipurpose terminal environments. The system enables you to pre-plan vessel operations; plan, allocate and register the use of resources; and reserve storage space in the sheds, container yard or on the quay for all cargo types. Fully developed financial functions allow you to forecast costs, track purchase orders, and generate invoices.

GateVision effectively integrates into one user interface the key components of the gate transaction: voice communication, video information, and the Terminal Operating System (TOS). Users effortlessly collect truck, container, and associated equipment data from cameras strategically located in the lanes. Advanced features, such as auto-focusing cameras and color-coded key controls for all user functions, save valuable processing time and increase productivity. Completely scalable to your operational needs, GateVision can be optionally deployed with Optical Character Recognition (OCR)

technologies to further enhance gate processing speed and accuracy, requiring a minimal investment in hardware.

Tideworks has clients at numerous container and rail terminals in the United States and Canada, in Colombia -- Santa Marta International Terminal Company (SMITCO) and Dole Food Company, in Chile -- San Vicente and San Antonio Terminal Internacional, Guayaquil, Ecuador, Guatemala, Honduras and Costa Rica, Manzanillo International Terminal, Panama, Manzanillo, Veracruz, Progreso and Cozumel, Mexico, Kingston Wharves, Jamaica, and many seaports in the United States.

Alternative 3 – NAVIS

In October, 2007, Zebra Technologies bought Navis, an Oakland, California vendor of a premier Terminal Operating System (TOS). In January, 2011, Zebra announced divestiture of Navis. On the same date, Cargotec Corporation announced the acquisition of Navis. Navis will continue its business with its customers as an independent part of Cargotec irrespective of equipment supplier. In spite of these changes, Navis flexible and scalable TOS software is the leading system globally in marine terminals, rail yard operations, and distribution centers. Navis systems help customers coordinate and automate the movement of containers and equipment in terminal and yard environments as well as enable customers to manage the operations of a single terminal or multiple terminals in different geographic locations from a central location.

According to the company, Navis is the leader in proven, mission-critical solutions for managing logistics, assets, inventory and cargo across the global supply chain. With its diverse portfolio of products, Navis solutions enable the world's leading logistics providers to increase capacity, lower operating costs, and improve customer service.

Founded in 1988, Navis established itself as the first company to provide automated container terminal operating systems (TOS) that improve velocity and visibility of cargo movement through port and intermodal facilities. Today,

Navis continues to deliver innovative technologies like Navis™ SPARCS N4 that enables you to fully integrate gate to yard to vessel operations to increase responsiveness throughout the terminal operation. With SPARCS N4, it is now possible for terminal operators to reap the benefits of high-quality, low-risk packaged software, without sacrificing the flexibility of a custom solution, at a fraction of the total cost of ownership (TCO) of competitor products and

in-house projects. Designed to deliver the most scalable, open, deployable, adaptable, and maintainable TOS available today, Navis SPARCS N4 is a proven solution.

What is NAVIS SPARCS N4?

Navis SPARCS N4 is Navis' next generation terminal operating system, specifically designed to offer unparalleled value and grow with the customer at the lowest possible total cost of ownership (TCO). This means that you have a system that is very maintainable and adaptable over the entire life-cycle of the product while allowing customers the flexibility and scalability they need to run their operations – from a single terminal to multiple terminals across multiple geographic locations, all within a single instance.

WHAT CAN NAVIS DO?

Optimize Utilization of Container Handling Equipment

The Navis SPARCS N4 PrimeRoute pools equipment across cranes, while combining yard and equipment constraints with operating business rules to optimize work assignments in real-time for efficient use of equipment, shorter travel distances, fewer unladen moves, and lower fuel, labor and maintenance costs.

Improve Yard Utilization

The Navis SPARCS N4 Expert Decking helps space-constrained terminals increase utilization of yard space in order to handle growth without adding new land. Without Expert Decking, yard assignments are made manually and are subject to the limits of ad-hoc human judgment, leading to underutilized yard space, inefficient decking and higher operating costs. With Expert Decking, each container is assigned to its optimal position based on the business rules and constraints of the terminal, providing a much higher utilization of yard space, up to 90% reduction in re-handles, and enhanced equipment utilization.

Optimize Vessel Planning

The SPARCS N4 AutoStow option combines stowage factors (e.g., type, weight) with yard constraints and operating strategy to select the best container to load in real-time, resulting in improved vessel

stow plans, up to 70% reduction in planning time, higher yard productivity and increased responsiveness to operational challenges.

Automate Crane Scheduling and Monitoring

The Navis SPARCS N4 Quay Commander provides real-time monitoring of crane schedules, vessel container moves, vessel activities, and vessel labor assignments, enabling dynamic adjustments to predicted load, discharge times and crane sequences. With Quay Commander, vessel planners can achieve more accurate predictions of container move and completion times, increased labor productivity, and more tightly integrated equipment control.

Navis SPARCS N4 Features

System Foundation

- Highly scalable fault tolerant architecture
- Multiple platform and database support
- Deploy with leading commercial or open source databases and vendor agnostic infrastructure
- Powerful and intuitive Rich Internet Client
- No client software installation required
- Configurable lists and filters
- Context sensitive actions menus
- Export data to Microsoft® Office
- Powerful role and context based security model
- Language localizable
- Extended security for community users
- Online context sensitive help
- Context sensitive entity inspectors
- Smart pop-ups for containers, vessels and trains
- Instant access to all related functions
- Powerful, flexible reporting
- Automatically schedule and send reports to e-mail recipients
- Configure, import and export report definitions
- Support for multiple output formats
- Container event notifications
-

Extended Security for Community Users

- Online context sensitive help
- Context sensitive entity inspectors
- Smart pop-ups for containers, vessels and trains
- Instant access to all related functions
- Powerful, flexible reporting
- Automatically schedule and send reports to e-mail recipients
- Configure, import and export report definitions
- Support for multiple output formats
- Advanced notification engine
- User definable notification events
- Receive notifications by Email or SMS
- Automatically selects desired party for notification

System Deployment Options

- Internet access via rich application client
- Multi-Facility
- Configure business rules across multiple terminals within a specific geographic region for improved operational control, coordination and efficiency
- Multi-Complex
- Configure and manage multiple terminals for increased deployment, administrative and operational savings along with full multi-terminal operational visibility and control
- Global visibility and management

Manage disparate facilities regionally or globally for scalability, redundancy and reliability

Standard Options

Bills of Lading

Detailed bills of lading and hold management

<u>Gate</u>

- Appointments to better manage gate peaks and troughs
- Configurable user interface and business rules
- Integrated Trouble Desk
- Equipment Pooling integration
- SDKs for extending and customizing

Bookings

- Export bookings, rail based bookings and equipment orders
- Detailed booking history

Vessel

- Flexible vessel schedule and service rotations
- Line Sharing
- Capture vessel performance and statistics
- Configurable vessel services, permissions and holds
- Record load and discharge moves

Rail

- Flexible schedule and service rotations
- Record load and discharge moves
- Define rail car types and associated constraints

Advanced Events and Holds

- Define events, holds, permissions and rules
- Apply events, holds and permissions to operational entities
- Configurable data capture requirements fields
- Advanced notification engine using event and filter based criteria with automatic selection of recipients
- Customer controlled customization with the ability to embed source code at specific event based trigger points and specific gate processes

EDI

- Multi-stage transformation, processing and transmission
- Communication options including FTP, SFTP, email, and Web Services
- Support yard, gate, vessel and rail operations
- Interactive map designer for handling new message types
- Configurable filtering and posting rules based on current state of data, source and destination criteria

Transformation Designer

- Interactive designer, create maps and dictionaries for new message type

Facility Planning and Control

Yard Planning and Control

- Detailed yard model and real-time views
- Configurable color palettes and filtering
- Instant information pop-ups and utilization reporting
- Flexible allocations, status modeling and notes
- Automated real-time position assignment
- Automated tracking and notification of planning errors
- Automated key slot creation and overflow processing

Vessel Planning and Control

- Detailed vessel definition and real-time views
- Configurable color palettes and filtering
- Instant information pop-ups
- Assisted selection, sequencing and re-sequencing tools
- Advanced stowage validation
- Real-time tracking of plan execution
- High quality and configurable output

Rail Planning and Control

- Train schedule
- Inbound and outbound rail planning and consists
- Rail car constraint validation for optimal rail planning processes
- Assisted selection, sequencing and re-sequencing tools
- Real-time tracking of plan execution

Equipment Control

- Equipment capability and deployment modeling
- Point-and-click dispatch with validation
- Detailed equipment performance reports
- Instant information pop-ups

Advanced Vessel Operations

Advanced Vessel

- Graphical crane sequence planning and berth scheduling
- Integrated crane shift assignment management

Hazardous Checking by Class and UN

Stability and Lashing

AutoStow, automated and optimized vessel planning

Advanced Optimization

Expert Decking

- Automated and optimized yard planning
- Configurable yard planning strategies
- Equipment congestion and availability consideration

PrimeRoute for Straddle Carriers

- Automated and optimized dispatch
- Pool across multiple diverse operations
- Schedule based dispatching

PrimeRoute for Terminal Tractors

- Automated and optimized dispatch
- Pool across multiple diverse operations
- Schedule based dispatching

Twin-lift for Straddle Carriers

Monitor

Automatic, just-in-time data updates

Graphical gauges with configurable thresholds

Sparklines and charts to track recent trends

Out-of-the-box metrics, gadgets, charts, and tables for vessel, crane, and yard.

Radio Data Terminal Execution

Radio Data Terminal Foundation

- Real-time monitoring and management of all equipment
- Screen layouts based on device capabilities
- User selectable language
- Inventory of grounded yard areas
- Recording of container seal numbers and damages
- Management of quay side and rail operations

Refrigerated Cargo Management

- Automated connection work list and monitoring

Truck Control Management

Software Development Kits (SDKs)

Gate infrastructure integration web services

SNX - Reading and updating of reference and real-time operational data

Inventory - Reading and updating of container data and associated holds and permissions

Automated reefer monitoring

As can be seen in this report, a number of seaports worldwide use Navis and some have already integrated the APS OCR system for gate automation and security (recommended in this report) into the Navis TOS. The ports using both Navis and APS are the Yilport Container Terminal in Turkey, the Virginia Port Authority, the Houston Port Authority, the Maryland Port Authority (Baltimore), Port of Tacoma, and the Port of Cartagena, Colombia.

With its worldwide seaport implementations and years of experience, it would appear that Navis has the jump on other competitors in the TOS market.

Ports Using Navis:

- Ports of Virginia
- Port of Houston
- Port of Baltimore
- Port of Cartagena, Colombia
- Port of Yilport, Turkey
- Port of Tacoma, Washington
- Port of Charleston, South Carolina
- Port of Spain / Port of Trinidad and Tobago
- Port of Saigon, Vietnam
- Maher Terminals, USA
- Port of Haifa, Israel

3.3.3 Hardware Alternatives

Hardware - IBM

SPRBun currently uses IBM hardware supplemented by various other vendor peripherals and network devices. There is no need to switch to another vendor if the port is satisfied with the IBM solution. However, it is recommended that the IBM servers be upgraded to the latest IBM Power hardware, specifically the POWER7 systems.

POWER7 Systems, which IBM calls blade servers, deliver unprecedented performance for both transactional and throughput computing for UNIX, IBM, and Linux applications with up to four times the performance and workload consolidation capacity, and three times the performance per watt of POWER6 processor-based systems. IBM calls their Unix operating system, AIX - Advanced Interactive Executive. SPRBun uses an even older system, POWER5.

Blade servers have become increasing popular because of their outstanding flexibility, simplified management, and efficiency. The performance of POWER7 processors has helped the IBM BladeCenter PS700, PS701, and PS702 Express to be the leaders among Reduced Instruction Set Computers (RISC) and Intel Itanium® blade servers in these metrics. This flexibility and efficiency directly leads to reduced cost of energy and data center floor space savings. The superior performance of the Power based blades leads to a requirement for fewer blades which also helps reduce cost of management and software licensing as well as additional reductions in energy and floor space usage.

Cost of each new server ranges from $5,000 to $35,000 depending on performance and capacity.

If the vendor of the selected TOS would prefer another hardware solution, the next section addresses the Hewlett-Packard (HP) servers, however, IBM claims their hardware outperforms both HP and Sun platforms. Both IBM and HP are well supported in the international community.

Hardware – Hewlett-Packard (HP)

HP manufactures two lines of servers called the HP Proliant models and the HP Integrity systems. Both groups of servers run the Unix operating system which is the latest HP operating system some of the older ports are moving to.

If SPRBun decides to look at the HP alternative, then their TOS vendor, such as Navis Corporation, could recommend a specific configuration.

Hardware – Psion

SPRBun uses the Psion radio frequency type of wireless handheld and mobile computers. This product line was called Psion/Teklogix until January, 2011, when Psion dropped the name Teklogix from the name. However, we understand the product will not change, only the name.

If SPRBun is happy with the use of Psion products there is no reason to change. Psion has a large presence worldwide and enjoys a great reputation for radio frequency controlled handheld and mobile computers.

Hardware – Motorola Symbol

Should the port desire to look at another vendor, it might want to investigate the Motorola Symbol Technologies line of radio frequency products.

Integration Issues

The TOS selected for implementation at SPRBun will drive the hardware and network requirements at the port. The TOS will also define how difficult it will be to integrate the gate automation with the rest of the application.

It is our view that the port should select the best TOS available and then address the integration issues for other applications that would need to be replaced or integrated into the selected system. The Port should then acquire the modules for the selected TOS to enable it to function together with the AGS system.

Websites Surveyed for This Report

www.cargotec.com

www.cosmosworldwide.com

www.aps-technology.com

www.versiant.com

www.portsolutionintegrators.com

www.motorola.com

www.tideworks.com

www.zebra.com/zes

www.jjsea.com

www.sattel.com.au

www.psion.com

www.ibm.com

www.hp.com

www.worldcargonews.com

www.nascent.com

www.camco.com

3.4 Comparison of alternative OCR system approaches and recommendation of one for implementation

It is our recommendation that the OCR/AGS system be installed at the locations outlined in section 3.1. This approach enables the existing traffic patterns to remain constant. One alternative would be to reduce the number of portals and kiosks installed and reduce the number of entry and exit gate areas for the terminal. This could be accomplished due to the increase in throughput productivity which is anticipated using OCR and an automated gate system (AGS), instead of manual key entry and paperwork, which could reduce the average gate processing time to 1 minute (including customs oversight).

An additional alternative is to include OCR on the quay and RTG cranes in addition to the gates. While this was not included in the scope of this study, OCR at these locations would provide location and identification information to the terminal operating system (TOS) when containers are loaded or unloaded to or from vessels, stacked or transported to or from the yard, or retrieved for customs inspection. This alternative is recommended to provide greater control of movements in our out of the port, not only by road, but also by ship, as well as movements within the port and between the port and customs.

3.5 Recommendations of specifications, procurement documents, costs estimates, and implementation program for OCR system

3.5.1 Preparation of template for data base of vehicles and personnel to expedite processing in gates

The following information should be included in the data base:

Truck Operators (Drivers and Helpers)

Complete name (First name, First last name, Second last name)
Address
Telephone
Cellular phone
e-mail
Identification card number
Date of birth
Place of birth
Employer or sponsoring organization and affiliation
Operator company
Address
Telephone
Contact name
Road Use Tax (RUT)
Biometric samples (fingerprint and/or iris scan)
Electronic signature
Digital photograph
Height
Weight
Identity verification document
Emergency contact name, address, phone and cell phone

Truck information

Truck manufacturer
Truck model year
Truck model
Vehicle Identification Number (VIN)
Truck license plate number
State or province
Truck engine information:
Engine manufacturer
Engine model
Engine model year
Axles
Gross vehicle weight
Environmental compliance status:
Diesel emissions
Emissions control equipment manufacturer if any
Emissions control serial number
Emissions control equipment installer name
Emissions control installer contact information
Registered Owner
Tax Identification Number
Road Use Tax (RUT)
Mailing Address
Physical address
Telephone
Fax
Cell phone
e-mail
Contact name
Operator company
RUT
Address
Telephone
Fax
Cell phone

e-mail
Contact name (first name, first last name, second last name)

Container information

Markings:
Owner code
Product group code, consisting of one of capital letters U, J or Z
U for all freight containers
J for detachable freight container- related equipment
Z for trailers and chassis
Six-digit registration number
Check digit
License plate number
Tare weight
Maximum gross weight
Dimensions: Length, width and height
Registered Owner
Address
Telephone
Contact name
RUT
Operator company
Address
Telephone
Contact name
RUT

Chassis

Axles
Tare weight
Maximum gross weight
Registered Owner

Mailing Address
Physical Address
Telephone
Contact name
RUT
Operator company
Mailing Address
Physical Address
Telephone
Fax
e-mail
Contact name
RUT

Transportation Refrigeration Unit (TRU)

Registered Owner
Address
Telephone
Contact name
RUT
Operator company
Address
Telephone
Contact name
RUT
Transportation Refrigeration Unit (TRU) / TRU Generator Set Information:
TRU/TRU Generator Set Unit Type
TRU/TRU Generator Set Manufacturer
TRU/TRU Generator Set Model
TRU/TRU Generator Model Year
TRU/TRU Generator Serial Number
TRU/TRU Generator Unit ID
Vehicle: Vehicle Identification Number (VIN)

Vehicle License Plate Number
Vehicle License State or Province
Railcar reporting mark
Shipping container number
Company equipment number

Company information

Business name
Tax identification number
Type of ownership
Mailing address
Physical address
Contact name (First name, first last name, second last name)
Telephone
Cell phone
Fax
e-mail

3.5.2 Provision of performance specifications for OCR system components

Performance Specifications

The following are the recommended base level system requirements that should be established for the OCR system.

#	Specification Description	Criteria
1	Read success rate of readable License Plate numbers	≥ 95%
2	Read success rate of readable container numbers	≥ 97%
3	Read success rate of ISO size type codes	≥ 95%
4	Read success rate of truck & container configuration (single 40, single 20, twin 20, bobtail, etc.)	≥ 97%
5	Read success rate of chassis	> 95%
6	OCR data available to TOS after truck clears portal	≤ 3 seconds
7	Time required between 2 consecutive trucks through portal	≤ 2 seconds
8	Speed range through portal while still achieving contract levels	0-35 MPH
9	Maximum trucks per hour/portal(*see note[1])	350

Table 3-2 – Performance specifications of OCR system components

[1] Although portal throughput capacity is 350/hour, real world volumes average between 200-250/hour and are influenced by approaching traffic patterns, bollard arrangement, lane dimensions, percentage of consistent drivers, etc.

3.5.3 Provision of performance specifications for ancillary facilities and utilities needed for OCR system

A. Facility Use

Access to facility space at all gate locations would be needed. Also, space within the server room would be necessary to all servers and network equipment. On-site storage within one (1) 40 foot container would be needed to store equipment during installation and spare parts after installation.

B. Civil Infrastructure/ Utility Requirements

Certain Civil and infrastructure requirements are necessary when implementing an AGS. Requirements for both vendor and SPRBun include:

Engineered Drawings

Vendor would provide standard site requirement drawings for all equipment. Please note, local engineering requirements may impact the specifications made herein and may result change orders to scope/equipment.

Civil Works

Civil and electrical contractors would provide all trenching, conduit, patching and concrete services in preparation for portal installation per vendor supplied drawings, including, but not limited to:

Trenching/Backfill/Paving

Civil works contractor would be required to trench to and from both entry and exit areas, as well as between lanes. Client will also be required to excavate four (4) 3’ x 4’ concrete foundations and all protective bollard areas.

Concrete

Civil works contractor would be required to pour four (4) concrete foundations for the portal structures. Client will also provide up to sixteen (16) 8” dia. Pipe Bollards, 60” above ground and at a depth of 30” into a 48” deep x 18”diameter (ø) concrete footing.

Conduit

Electrical contractor would install one 2” and one 1” conduit to the base of each portal. All conduits will include pull strings. The inclusion of one spare 2” conduit throughout the gate area installation is recommended as added flexibility for future technologies.

Network Infrastructure

The AGS system will communicate over a TCP/IP local area network consisting of fiber optic cabling supplied by the telecommunications contractor. Each portal lane will require a minimum of 6 strands of dedicated single-mode fiber connecting to the local area network (LAN)/server room. Each kiosk will require a minimum of two category (CAT)6 cables connecting to the LAN/server room.

Electrical Service

Electrical contractor would provide three (3) 110/240VAC (20A) electrical circuits to the each portal location; including adjacent power source and panel. Kiosks require one (1) 110/240VAC (20A) electrical circuit. Included should be surge protection devices and circuit breakers within each enclosure.

3.5.4 Preparation of procurement documents for purchase and installation of OCR systems

This document represents sufficient verbiage to enable SPRBun to construct a Request for Information (RFI) for the procurement of an AGS/OCR system. The Request for Proposals is presented in the Appendices.

3.5.5 Preparation of scope of work purchase and installation of OCR system

To ensure completion of the recommended OCR Solution the following would be required by the vendor and SPRBun.

A. OCR Vendor Scope of Work

- OCR cameras and equipment (8 per portal)
- LPR cameras and equipment (2 included into portal or at kiosk location)
- Driver Communication Kiosks (15)
- OCR server (1 per portal, housed with client server room ,total:12)
- Image Archive Server (1)
- OCR Messaging Server (1)
- Gate Control Server (1)
- OCR software: Container, chassis and license plate code recognition
- LPR Servers (2)
- Presence and velocity sensor package (1 ea. Per portal)
- Network switch (1 per portal)
- National Electrical Manufacturers Association (NEMA) 4X equipment enclosure (1 per portal)
- Vendor data transmission, reporting and Alert System software

- Gate Control Software with exception handling capability
- Power Supplies for equipment
- Attendance at preliminary project meeting
- Onsite engineering design meeting attendance
- Remote attendance of weekly project status meetings (1 hour)
- Onsite site preparedness visit
- Onsite installation
- Onsite and Offsite commissioning and integration assistance
- GoLive Support

B. SPRBun and additional Vendors Scope of Work

- Site preparation/civil works including trenching, conduit, portal footers, bollards, etc
- All local permits and required construction bonds
- All electrical cabling
- All fiber optic LAN connections, fiber connectors, etc.
- Cut and Installation of ground loops
- Supply and installation of traffic control equipment, barriers, etc.
- Lane striping and speed bumps if required

3.5.6 Preparation of final capital cost estimates for OCR system

Capital Costs

These are generally costs that can be depreciated over the life of the system (est. 5 years):

- Facility preparation (infrastructure, cabling, electrical)
- Facility equipment purchased by SPRBun (servers, rack, AC, etc)
- AGS Hardware and software
- Professional services required to support installation

Rough Order of Magnitude (ROM) Automated Gate System Pricing for SPRBun			
QTY	**Description**	**Unit Cost**	**Total Amount**
Hardware/Software Systems			
12	Gate Portal OCR System for container, LPR	$ 125,000	$ 1,500,000
15	Driver Communication Kiosk System	$ 25,300	$ 379,500
5	License plate recognition stations(kiosk)	$ 13,730	$ 68,650
		Sub Total System	**$ 1,948,150**
Associated Services			
1	System prep, install & commissioning	$ 228,600	$ 228,600
1	Site Preparation, civil works, cabling	N/A	N/A
1	Data Integration with COSMOS or equivalent TOS	$ 22,110	$ 22,110
1	Travel and per diem	$ 42,000	$ 42,000
1	Project management, personnel training	$ 88,600	$ 88,600
		Sub Total Services	**$ 381,310**
		Grand Total	**$ 2,329,460**

Table 3-3 – Rough Order of Magnitude (ROM) Automated Gate System (AGS) pricing for SPRBun

3.5.7 Preparation of operating cost estimates for OCR system

Operational Costs

One time operational costs include:

- Installation, commissioning and initial system support
- Project and Risk Management

- COSMOS or equivalent TOS Software conversion or upgrade
- Training

Recurring Costs

Monthly and/or quarterly recurring costs of operating and maintaining the systems over the project cycle, including:

- High speed, remote data connection to allow system monitoring and support
- Direct support services (preventive maintenance of equipment by local AGS partner)
- COSMOS or equivalent TOS remote support service increase
- Remote monitoring & support services including system health check, software upgrades, etc.

We estimate these costs to average 10-15% of the project total above per annum.

3.5.8 Preparation of implementation program for OCR system

Implementation Plan

We suggest a phased Implementation approach that requires key milestones be accomplished within each phase. This approach provides project stakeholders visibility to key task dependencies during the project lifecycle. This methodology, when combined with project management tools such as Microsoft Project, ensures transparency and allows for client review and oversight. We expect one year is required to complete all phases after contract award.

The four project phases are:

1. Initiate
2. Prepare
3. Deploy
4. Maintain

A summary diagram of noting key tasks included in each phase is included below.

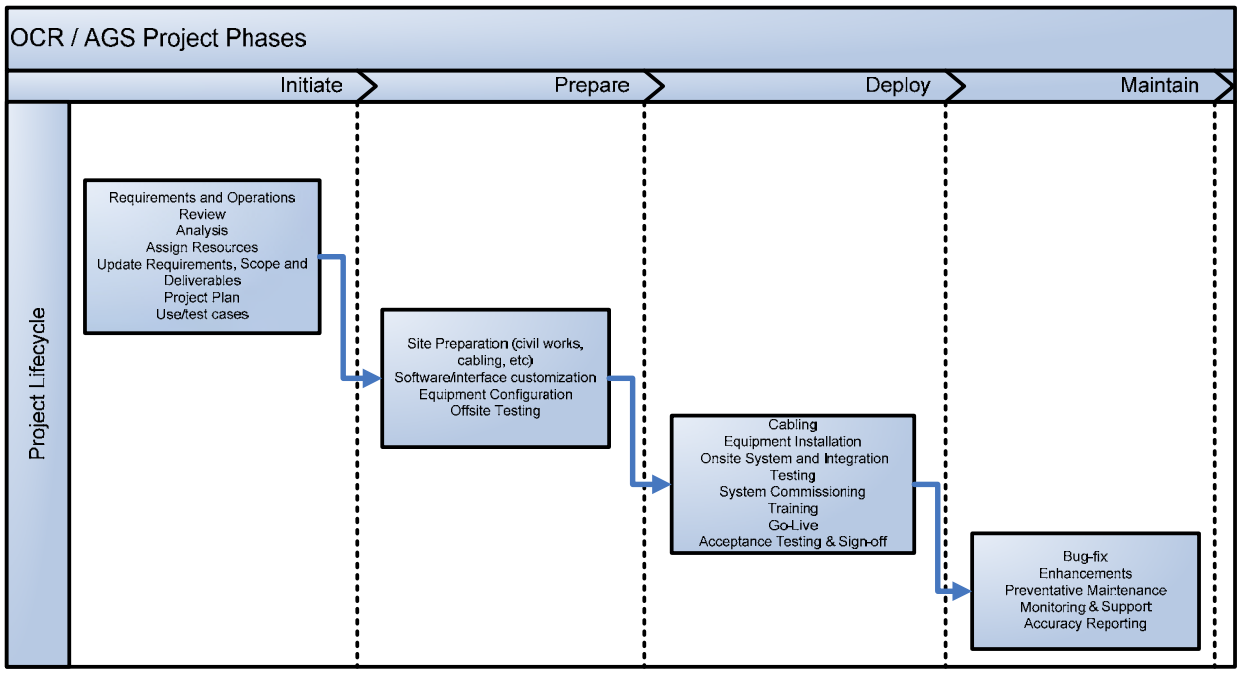


Figure 3-16 – OCR / AGS Project Phases

Phase 1: Initiate

Goals:

1. Audit, review and improve the general operational processes of the terminal including pre-arrival scheduling, gate processes including A check, Pcheck, etc.
2. Define clear Functional Requirements that will be used by all project teams to specify how the system should function and what performance methods are required.

Functional Concept:

Goal 1: Given the high number of personnel involved in each operational area, it is difficult to determine a clear "current state" of operations for the terminal that shows actual costs and productivity metrics. An initial audit is needed to capture and correlate ALL terminal data for a 2-4 week period. At this point, the actual processes could be reviewed to find where improvements can be made (regardless of technology). Finally a process improvement plan could be assembled that would assign responsibility for the work within agreed timelines.

Goal 2: Create a formal requirements document that clearly explains the project, along with all stakeholders their respective roles and responsibilities.

Phase 2: Prepare

Goals:

1. Using the Requirements document as a guide, begin work to improve the utilization of the TOS to require COSMOS TRAFFIC module or equivalent to be implemented.
2. Begin procurement, preparation and testing activities on all equipment
3. Prepare the facility for the installation

Functional Concept:

Goal 1: Using data captured in Goal 1 above, work with the COSMOS or other TOS team, SPRBun operations management and all data entry and equipment operators to implement the TRAFFIC module.

Goal 2: Includes equipment ordering, configuration, and remote testing of all equipment with the TOS.

Goal 3: Includes civil works, concrete, conduit, as well as all communications and electrical cabling required on each location.

Phase 3: Deploy

Goals: Installation and onsite testing of all equipment

Functional Concept: Concurrent installation and testing of OCR and AGS systems in coordination with the COSMOS or equivalent TOS upgrades.

Phase 4: Maintain

Goals: Ensure the installed equipment is receives adequate Maintenance and Support (M&S) required to maintain contract accuracy levels and achieve productivity and labor reduction benefits outlined herein.

Functional Concept: Requires annual M&S contracts with all vendors to provide remote support, bug fixes, enhancements, etc. This phase also requires preventive maintenance of equipment by local personnel.

Attachment A3

General Information and Proposal Requirements

GENERAL INFORMATION AND PROPOSAL REQUIREMENTS (cont'd)

1. Project Description

Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun) requires the procurement, installation and maintenance of an Automated Gate System (AGS) including certain Optical Character Recognition (OCR) technology to automate gate operations within its container facility in Buenaventura, Colombia.

SPRBun's approach to the development of this system is to request proposals from bidders that have an existing system that is already known to work in other ports. Although SPRBun wishes to use the most technologically and competitively advanced systems; there is no desire to be on the "bleeding" edge of technology. Any integration or operational difficulties that temporarily interfere with port operations will be very costly. Therefore, proposed systems that have the best chance of selection are those that are proven in other terminals around the world. Furthermore, SPRBun wishes to purchase "off-the-shelf" systems with commercially available components (not custom designed or manufactured). SPRBun will not design the system. Rather, SPRBun looks to the selected vendors to provide designs that exceed the stated operational requirements.

The systems SPRBun chooses to buy will be selected in part on the following attributes:

1. Lifetime cost to deliver automated solution,
2. Predicted proven reliability on equipment found at SPRBun,
3. Demonstrated technology operating in Colombia or other sites,
4. Maintainability by SPRBun or local personnel,
5. Safety attributes,
6. Ease of operation,
7. Capabilities to grow, upgrade, or modify as requirements change.

2. Acknowledgment of RFP Package Receipt

Please acknowledge receipt of this RFP package, and whether you intend to submit a proposal, by Facsimile or Email to:

Email:
Attention:

3. Proposal Questions and Receipt

Suppliers should submit any questions regarding this proposal by (INSET CUTOFF DATE FOR QUESTIONS). A compiled question and answer response will be sent to all Suppliers by (INSERT CUTOFF DATE FOR RESPONSES TO

GENERAL INFORMATION AND PROPOSAL REQUIREMENTS (cont'd)

QUESTIONS). Proposals will be received at SPRBun headquarters, on (INSERT DEADLINE DATE).

4. Submitting Proposals

All proposals must be completed and signed by an authorized officer. Each proposal must be enclosed in a sealed envelope clearly marked as follows:

SPRBun PROPOSAL FOR AGS
RFP # xxx

SUPPLIER NAME

Addenda, if necessary, should be clearly marked with your firm's name.

This sealed envelope shall be addressed to:
Ing. Domingo S. Chinea Barrera
Gerente General
My(r) Gilberto Ocampo Zuluaga
Director de Seguridad Portuaria
SPRBun Sociedad Portuaria Regional de Buenaventura, S.A.
Avenida Portuaria, Edif. Administración
Buenaventura, A.A. 478-10765
Colombia
Tel. (57-2) 241-0700

Sealed proposals clearly marked shall be received prior to the time and date specified above. Proposals received after the said time and date will not be accepted or considered. Proposals may be sent by mail, express document courier or hand delivered. Whether the proposal is sent by mail, express document courier or hand delivered, Offeror shall be responsible for actual delivery of the proposal to the above address by the deadline. Proposals sent by e-mail or fax will not be accepted or considered. Any proposal received after the deadline will be returned unopened. Each proposal must be sealed to ensure confidentiality of content and labeled as indicated above. SPRBun is not responsible for the premature opening of proposals not properly labeled.

GENERAL INFORMATION AND PROPOSAL REQUIREMENTS (cont'd)

5. Proposal Modification and Withdrawal

Facsimile or written notification of withdrawal of proposals already submitted will be considered if received prior to the time fixed for the receipt of proposals, but not thereafter. Negligence on the part of the proposal's author in preparing the proposal confirms no right of modification or withdrawal after the opening.

6. Price and Availability

All proposals shall be submitted on a firm-fixed price basis in U.S. dollars and shall be valid for a minimum of ninety (90) days.

7. Request for Proposal Scope

Copies of this request for proposal scope have been furnished to all RFP recipients. In the event changes are made to the RFP scope or to the time for receipt of the proposals, copies of such changes will be transmitted to each RFP recipient in the form of an Addendum.

8. Addendum

Any addendum issued prior to the proposal opening is to be included in the proposal, and will become part of the final agreement.

9. Agreement by Proposals Author

By submitting a proposal, each supplier thereby agrees:

a) That the supplier's proposal will not be withdrawn after the time fixed for the opening of the proposals and before (INSERT DEADLINE DATE).

b) Should the supplier's proposal be accepted, the supplier will execute, within a reasonable time after receipt of written notice of such acceptance, an agreement with SPRBun or its designee.

c) SPRBun reserves the right to reject any and all proposals, to call for new proposals, to waive an irregularity in any proposal and to make an award, in whole or in part, on either a fixed-price or adjusted price basis to one or more prospective suppliers..

d) The acceptance of the proposals will depend upon compliance to details of the supplier requirements, price, specifications and drawings, and other factors.

10. Alternative Proposals

Alternative proposals are encouraged, and will be accepted under the following conditions:

a) The supplier must first complete, and submit, a proposal which meets all the requirements and specifications indicated herein.

b) Changes or additions to the project specifications and scope listed in Attachment “B” will be considered if:

   1. The proposed changes meet or exceed the specified requirements indicated in Attachment “B, and

   2. The supplier provides a narrative explaining the reasoning for the changes and delineates the differences between the standard proposal and the alternative.

11. Standards that Exceed Requirements

Supplier shall describe all features and benefits of its proposal that exceed SPRBun’s specified requirements stated in Attachment “B”.

12. Spare Parts

a) Supplier’s proposal shall provide a list of recommended spare parts, its proposed equipment most likely to wear out within two years, with unit prices and lead time of availability and origin, for the first two years of operation’s normal maintenance.

b) Each proposal should also describe any discounted spare parts programs offered, or other methods to enable SPRBun to attain the best life cycle cost for all proposed equipment.

c) Supplier shall guarantee that all parts and major components for its proposed equipment shall be available within 24 hours of Owner’s order.

13. Training and Documentation

Supplier shall provide all necessary technical, operating, safety and maintenance published material and training as applicable to ensure that SPRBun personnel have proper understanding of the proposed equipment for correct operation. Any material supplied shall be updated periodically as necessary. All training and

manuals are to be in the English and Spanish language and dimensions in inches and metric.

a) Training shall be provided by a local agent of the supplier approved to operate a business in the city of Buenaventura, Colombia. Supplier agent shall provide such training, as required, to train SPRBun's day and night shift operators, which may require training during night or weekend hours.

b) Training shall be provided for SPRBun's IT and engineering/maintenance staff, which shall consist of class room and hands-on training using supplier's provided maintenance and operating manuals (in English and Spanish language, dimensions in inches) to ensure that the maintenance staff becomes proficient in the knowledge of recommended preventative maintenance cycles and procedures to minimize downtime and prolong life of the proposed equipment.

c) Supplier shall provide a written explanation of how it shall accomplish the above requirements.

14. Installation and Testing

Supplier's proposal shall include cost to fully install and test the proposed equipment to meet Acceptance Test Plan (submitted by supplier with bid).

a) SPRBun shall be provided 72 hours advance notice of when the proposed equipment will be tested for acceptance, in order to witness performance tests.

b) Performance tests shall be carried out by the supplier to enable SPRBun to verify that that all stated operating performance capabilities meet or exceed proposed equipments stated performance values.

15. Installation Experience and References

Supplier's proposal shall list all past installations for similar marine terminal's gate operations, with complete details on the capabilities installed for each of these modes of operation. In addition, supplier shall provide a minimum of three references with complete contact information (Point of Contact, physical address, mailing address, telephone, fax and e-mail) for the above installations that are currently in operation (including any operating installation must be within the country of Colombia). Supplier shall also list any alliance partners that will be providing services to meet the requirements of this request for proposal.

16. Supplier Assumptions, Issues, and/or Constraints

GENERAL INFORMATION AND PROPOSAL REQUIREMENTS (cont'd)

Supplier's proposal shall include any and all assumptions, issues, and/or constraints that may apply to this request for proposal.

17. Supplier Meeting and Presentation

Additional technical information may be required to evaluate each supplier.

18. Required Project Timetable (calendar days)

Event	Date
Issue RFP's	0 days
Submission of Written Questions Due	+7 days
Responses to Questions	+14 days
Proposals Due	+21 days
Notice of Intent	+30 days
Mobilization Payment	+45 days
Drawings, Project Plan, ATP, functional specification submitted	+45 days
Equipment Shipped to SPRBun	+90 days

19. To be determined

Attachment B3

Project Scope and Requirements

PROJECT SCOPE AND REQUIREMENTS (cont'd)

Scope

Portal Overview

The Automated Gate System (AGS) recommended consists of twelve (12) drive-through Optical Character Recognition (OCR) portals. The portals include subsystems to automatically identify container number, container size/type code, and/or license plate number of passing equipment (depending on location). Additionally, six (6) of the portals include high resolution damage inspection images of the container (back, front, sides, top, and bottom) using one array of cameras.

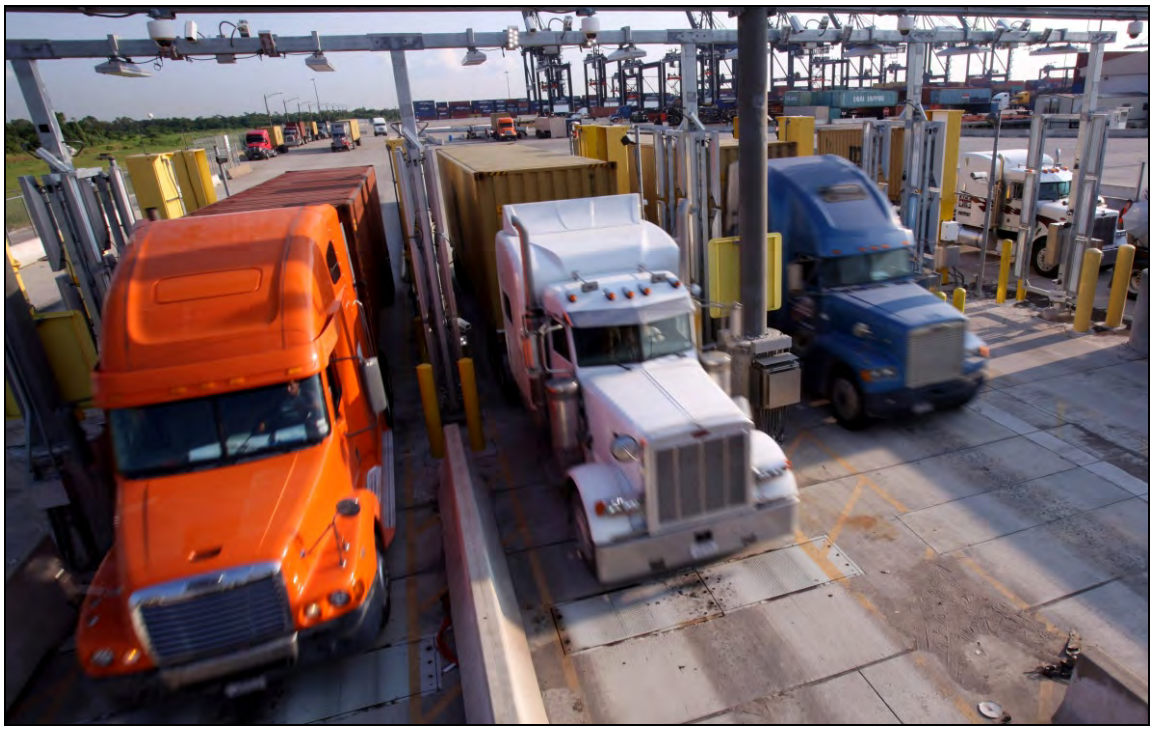


Figure B3-1 - OCR Portals at Port of Houston, USA

PROJECT SCOPE AND REQUIREMENTS (cont'd)

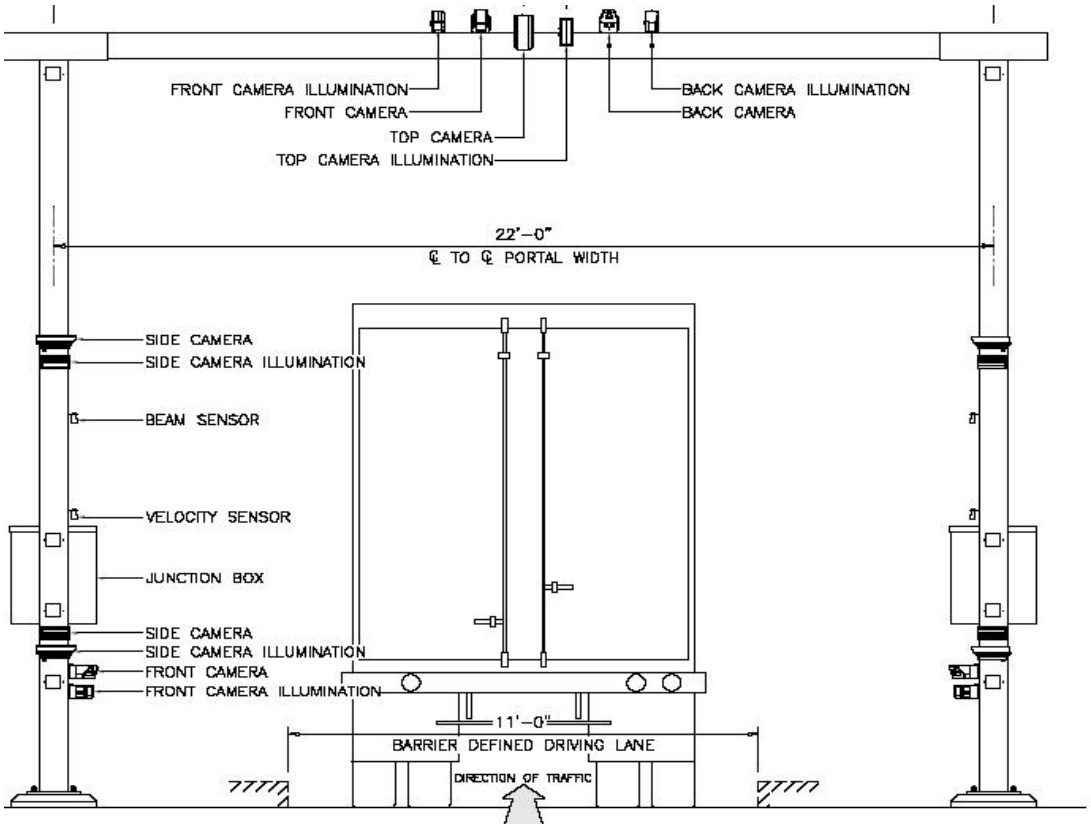


Figure B3-2 - Sample OCR Portal design

Portal Equipment

The following equipment is recommended to completely outfit each portal:

Equipment enclosures

Small equipment enclosures (one per portal) provide termination points for the electrical and communications cabling, as well as all cabling for the portal equipment. Additionally, each enclosure houses all power supplies, one network switch, and any serial to IP conversion devices.

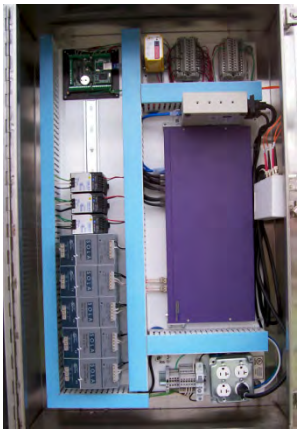


Figure B3-3 - Portal enclosure layout

PROJECT SCOPE AND REQUIREMENTS (cont'd)

Cameras

Commercially available, off-the-shelf Internet Protocol (IP)-based area scan cameras should be used to capture images of the equipment numbers (container top/sides/back/front, the trailer (2 sides), and the license plate). Multiple cameras are deployed for each type to ensure redundancy should one camera fail or should direct sunlight impede one camera. The cameras should capture images of the plates in the front and rear of the vehicle and on the side doors, as well as images of numbers of containers and trailers.

FigureB3-4- Cameras and LED Illumination units on a portal

Illumination

Low power Light Emitting Diode (LED) illuminators should be used to light the areas of interest during low lighting conditions.

Sensors

Each portal includes an array of sensors to trigger the beginning and end of each transaction as well as determine equipment speed, length and classification.

Centralized Equipment

Servers

The recommended AGS requires seventeen (17) commercially available servers that provide the following functions. All servers that perform OCR servers should be located inside the central server room:

- Portal OCR Servers: One server per portal to perform Container/Chassis OCR to meet performance specifications (12 total servers)
- License Plate Recognition (LPR) servers: One server per three lanes to perform OCR of license plates at the Five (5) LPR lane locations (2 total servers)

PROJECT SCOPE AND REQUIREMENTS (cont'd)

- OCR Messaging Server: One (1) server to consolidate the transmission and receipt of all OCR messages between the lane servers and the Terminal Operating System (TOS).
- Central Gate Control: One (1) server to consolidate the transmission and receipt of all messages between the kiosk servers and the TOS.
- Image Archive Sever- One (1) server to store picture receipts of all transactions

A 19" equipment rack to rack mount OCR and central processing servers would be necessary for storing all seventeen (17) recommended server**.**

Portal Software

The recommended AGS captures, identifies and records all transactions processed through the gates at SPRBun. Described herein are all of the different types of images that the recommended AGS will locate and capture.

Equipment Damage Inspection Imaging

Six of the recommended portals should include one upgraded, high-resolution cameras capable of capturing both OCR and inspection images. Additional lighting is also required as well as a stand-alone application to allow the review of all archived images from the following views: These images are also available for review within an intranet reporting application or linked within the TOS clerk software application (COSMOS or equivalent).

Container Damage Inspection

Figure B3-5 - Stitched Inspection Image (Side)

Empty Container Verification

Pan Tilt Zoom (PTZ) cameras are recommended to accelerate the process of checking empty containers. PTZ cameras should be mounted behind certain gate lanes to validate the condition of the opened container. In this scenario, SPRBun users will utilize rear PTZ camera to confirm an empty container by the following process:

1. An empty container approaches the gate pedestal and is logged into the system as an empty.
2. The driver is then instructed to open the rear container doors via the pedestal intercom.
3. Empty/Non-empty status is verified using the rear-view PTZ camera.
4. If validated against system data, ticket is printed and driver allowed into yard.

Under vehicle imaging

International Ship and Port Facility Security Code (ISPS) regulations may require terminals complete an under-vehicle inspection. If so, capturing under-vehicle images or video of passing equipment is recommended to ensure compliance of the requirements. This will allow SPRBun to examine the underside of inbound vehicles and equipment.

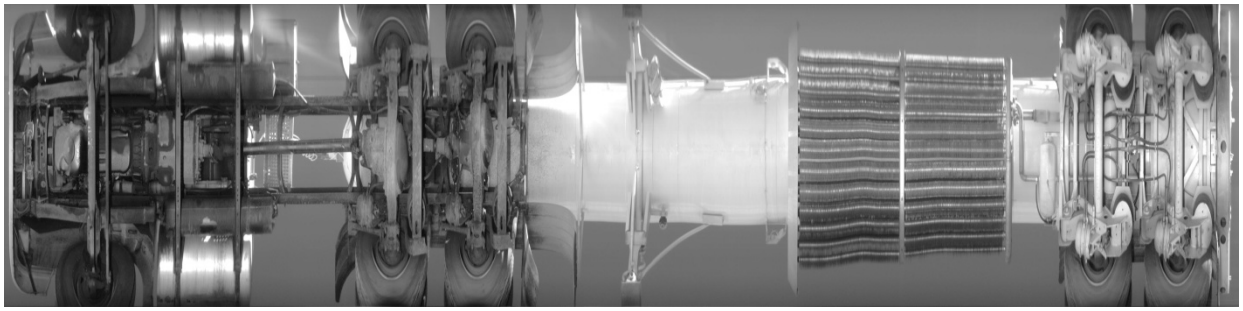


Figure B-6 - Under vehicle inspection image example

Container Security Seals

ISPS may require verification of security seal numbers as part of the future gate process. Minimum compliance with this requirement requires a high resolution image of the security seal to verify integrity. If this is a requirement high resolution cameras on the portals as well as in-lane PTZ cameras (at the kiosks) to obtain high resolution images of the seal is recommended. This will allow a remote user to identify seal integrity and, possibly, verify the seal ID number. This would also enable SPRBun to relocate this function from the gate lane into a secured building, improving the safety of the terminal gate.

Figure B3-7 - Seal inspection images

Driver Communication

Driver Kiosks

It is recommended that certain gate lanes noted herein be equipped with an elevated pedestal and driver kiosk located some distance ahead of the portal with interactive communication functions. Kiosk functions should include:

Available Kiosk Equipment

- Voice/Intercom- Voice Over Intranet Protocol (VOIP) allows driver- clerk communication
- Call button- allows driver to notify clerk of their presence
- Biometric fingerprint reader– allows driver identification
- ID Card Reader – allows driver identification
- Barcode scanner- provides verification of successful mission ticket or entry pass
- License Plate cameras/illuminators (some lanes) - certain kiosks need to be outfitted with LPR cameras and equipment to match portal to pedestal transactions.

PROJECT SCOPE AND REQUIREMENTS (cont'd)

- Thermal ticket printer- Prints mission Tickets for driver
- Driver Face camera- allows clerk to verify driver's identification

External of kiosk

- Rear PTZ camera- enable container/chassis views and verification of an empty container
- Barrier gate arm (some lanes)- allows driver to pass once transaction is verified and mission ticket is printed
- All cabling, power supplies, etc

Figure B3-8 - Alternate kiosk mounting approach (Apapa, Nigeria)

AGS System Software

Gate Control System

It is advised to implement Gate control System which allows the administration and setup and control of gate users, lanes and areas. A web-enabled exception handling application allows remote clerks (on terminal) to resolve errors and control gate transactions that are not processes automatically. Given that all gate traffic should be required to register their container, LPR and Driver information prior to arrival, we expect more than 75% of all gate traffic will not require human interaction via the Exception software.

PROJECT SCOPE AND REQUIREMENTS (cont'd)

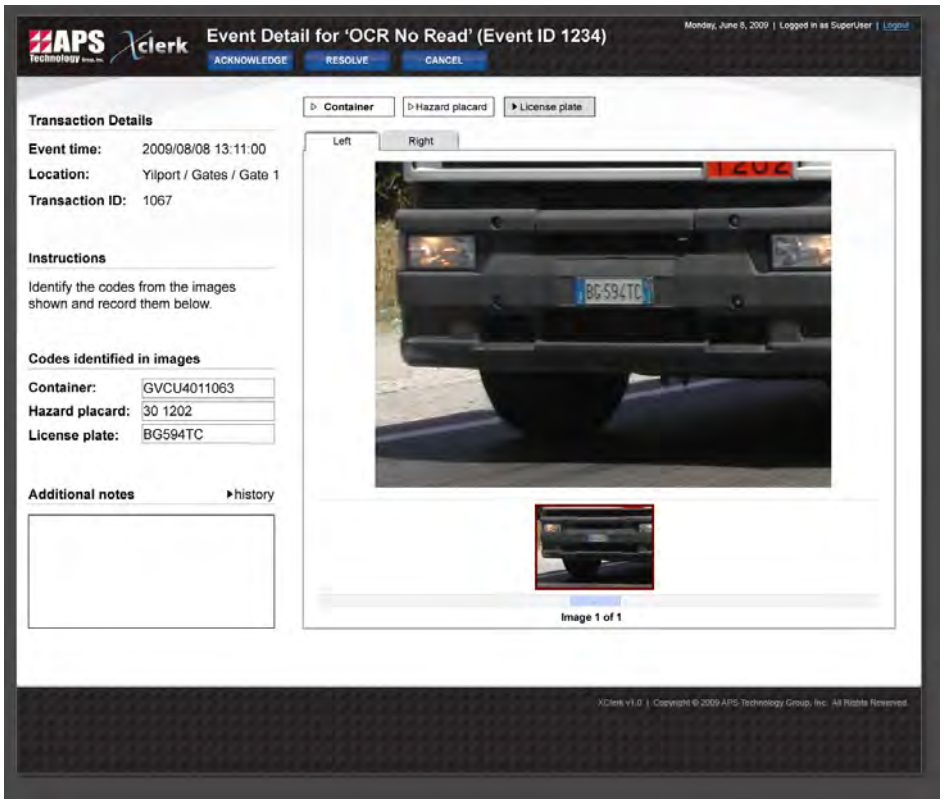


Figure B3-9 - Gate Exception Handling Application

The application provides for image review, live video (from lane/kiosk cameras), and Voice over Internet Protocol (VoIP) driver communication to the lane kiosk intercom. The application works in conjunction with a TOS gate module and provides no data update capability. X-Clerk or equivalent is not a replacement for the TOS and its gate business rules logic nor does it provide data update capability in place of a TOS.

The application provides the following functionality:

- Classification, queuing and notification of LPR, OCR and/or appointment exceptions (requires integration of TOS appointment data)
- Display of OCR portal images (to correct OCR misreads, review images, etc.)
- Display of live video from APS kiosk face camera
- 2 way VoIP communication to each APS kiosk

PROJECT SCOPE AND REQUIREMENTS (cont'd)

Facility Information

The Automated Gate System (AGS) approach focuses on the automated identification and verification of both truck drivers and their equipment as they enter and exit the terminal. The information collected is then integrated through software interface to the TOS (COSMOS or equivalent) for validation. The table below illustrates the areas where OCR "checkpoints" are recommended. At the recommended "checkpoints" a mix of OCR portals (to (automate license plate recognition (LPR) and/or container recognition, and equipment damage inspection) and driver interface Kiosks ((outfitted with equipment to allow clerk-to-driver communications in the lanes, seal verification, driver identification, etc.)

Map Area	Gate Area	Description	Lane count	Kiosk count	Portal count	Portal setup
A	Paraboloides	Export Load entry(P-check)	2	0	0	0
B	Paraboloides	Empty trucks entry	4	4	4	LPR
C	Paraboloides	Full trucks Exit	5	5	5	LPR + # container + DII
D	Export inspection	Export Load entry(A-check)	2	1	1	LPR + # container + DII
E	Remote Check Point/ Free Zone	All truck traffic entry	1	0	1	LPR + # container
F	Pekin gate	Empty Container entry (2)/exit (3)	5	5	5	LPR + # container
G	Coffee and Sugar	Coffee and Sugar Entry	2	1	1	LPR

PROJECT SCOPE AND REQUIREMENTS (cont'd)

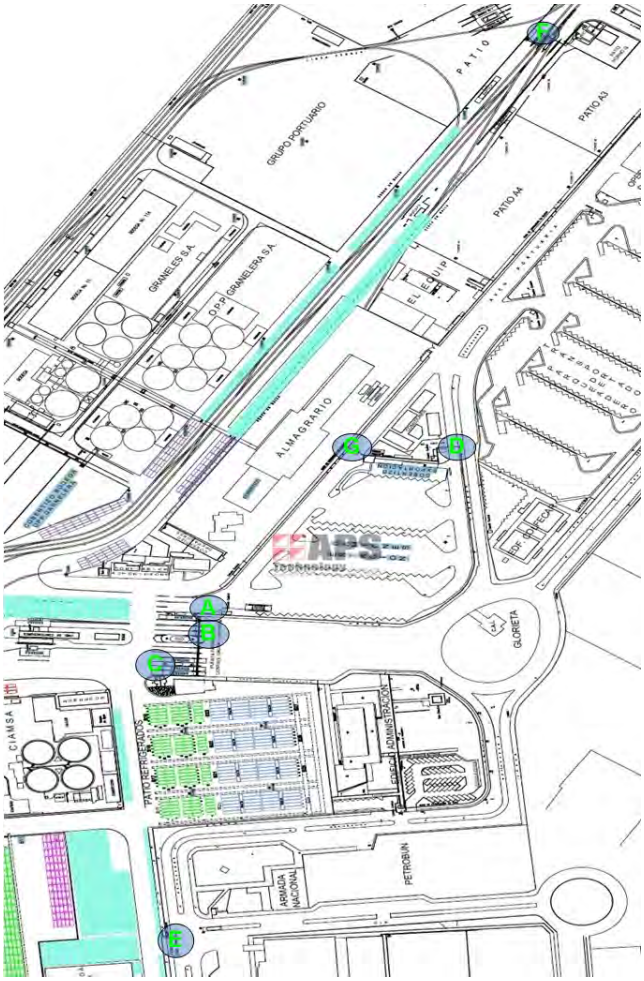


Figure B3-10 - SPRBun AGS locations

PROJECT SCOPE AND REQUIREMENTS (cont'd)

General Requirements

Quality:
Supplier shall provide a written explanation to address the following operation or quality issues:

1. System Performance standards
2. Supplier should provide both AGS and OCR processing time, accuracy rates, and accuracy improvement methods and options by OCR read type. Container/Chassis/License Plate
3. Supplier assumptions for proposal.
4. Acceptance testing methodology and plan
5. Problem tracking and resolution process

Proposal Pricing:
Supplier's proposal shall include the following:

1. Separate pricing breakdowns for each gate area (e.g. Paraboloides.)
2. All unit costs shall be included.
3. Construction and infrastructure costs shall be included.
4. TOS Integration costs shall be provided.
5. Bilingual Spanish and English speaking project manager and lead technician included in project team
6. Spare equipment requirements/recommendations

Miscellaneous Project Concerns
Supplier proposal shall address all the below concerns:

1. Off hours work availability? Affect on pricing? Affect on timeline?
2. What are the sign off procedures?
3. Need plan of construction & install, test and implementation.
4. What project management methodology will be used?
5. What reporting will be available?
6. Supplier requirements for power, data, work area, etc.

Components
Since some components in use today are manufactured in foreign countries, SPRBun wishes to ensure the systems fielded are logistically supportable in Colombia. Bidders with more than 25% custom made or self-engineered hardware components that are commercially available off-the-shelf (COTS) will not be considered. Proposals shall include a description of the parts, the costs thereof, and the manufacturer of the item noting where manufacturing occurs.

PROJECT SCOPE AND REQUIREMENTS (cont'd)

Supplier shall describe how it will provide maintenance and support:

1. Who?
2. What?
3. Where?
4. How?
5. Price?
6. Service Length?
7. Warranty?
8. Service Agreement?

Operational Requirements

Gate Throughput is defined as the number of trucks moving through a gate divided by the number of open lanes divided by the length of time (in hours). Thus 1000 trucks entering a gate with 10 lanes over a four-hour period is a throughput of 25 trucks per lane per hour. Trouble referrals caused by faulty pre-advise data (wrong data entered by trucking company) or failure of the trucker to obtain credentials are not included in the calculation of Gate Throughput.

1.1.1 Increase Container Throughput. AGS shall increase container throughput per day per acre without increasing gate capacity. The ultimate objective is to move more containers through the terminal with existing assets and fewer personnel. Also, SPRBun will not add more truck gates or lanes. System approaches that help SPRBun accomplish this objective will be considered. Approaches that do not help SPRBun meet this goal will not be considered.

1.1.1.1 Increase Container Throughput via Trucks. The vast majority of containers arriving or departing from the terminal overland do so on trucks. Increasing the throughput at the terminal will incur a similar increase in truck traffic. Moving trucks through the gates more efficiently will only marginally aid in the overall efficiency of the port if systems inside the gates do not work more efficiently as well; therefore, AGS shall reduce truck waiting times from xx minutes to 2 minutes when pre-advised.

1.1.1.1.1 More Trucks. The number of truck transactions has been steadily increasing for years. SPRBun recently signed two additional large-scale retailers who will be transporting more goods through the terminal, which will require more trucks to enter the terminal each day.

PROJECT SCOPE AND REQUIREMENTS (cont'd)

1.1.1.1.2 Utilize existing gate areas. SPRBun will not expand its lane count or modify its lane widths. AGS will operate, with full damage inspection capability, to capture all areas of the container and trailer, in the existing gate footprint of each gate area outlined herein.

1.1.1.1.3 Improve efficiency and throughput at Truck Gates. SPRBun will use automated systems to improve Gate Throughput. AGS shall meet a Gate Throughput of at least _____.

1.1.1.1.4 Reduce data entry requirements. SPRBun requires automated systems that reduce or eliminate data entry by SPRBun employees. SPRBun will retain the ability to manually operate the terminal gates for use as a backup system in the event of an emergency or to augment the automated system as necessary. AGS shall correctly automatically identify and record all required data for 95% of all containers, and 95% of all trucks.

1.1.1.1.4.1 Auto ID container number. AGS shall automatically identify containers of all sizes including 20, 40, 45, 48, 53, and 20/20 foot containers that follow International Organization for Standardization (ISO) 6346 standard formats including the check digit verification. AGS shall correctly identify the container number on 95% of all containers

1.1.1.1.4.2 Auto ID Truck. AGS shall automatically identify trucks using license plate or some other means of identifying the trucks entering and departing gates and while moving throughout the terminal. The AGS should integrate information on the license plates in front and / or back of vehicles with plates on the side doors in the process of automatic identification.

1.1.1.1.5 Auto ID Container Seal. Bidders with a solution that can verify seals are unbroken and/or auto ID

container seals will be considered. SPRBun will not specify a particular seal as part of this project; therefore, seal monitoring products should be able to verify seals of all types. AGS solution should correctly identify the seal on 99% of all containers.

1.1.1.1.6 Auto ID Hazardous placard labels. Bidders with a solution that can verify and classify International Maritime Consultative Organization (IMCO)/Hazardous placards will be considered. AGS solution should correctly identify the presence of placard on 99% of all containers.

1.1.1.1.7 Auto ID Door direction. Bidders with a solution that can verify container door direction will be considered. AGS solution should correctly identify the door direction on 99% of all containers.

1.1.1.1.8 Auto Verify Empty Containers. Automatically verifying empty containers is not a part of this project; however, bidders that can verify that containers are empty will be favorably considered. Automated Tracking and Monitoring System (ATAMS) should correctly automatically verify that 99.9% of all empty containers are empty. ATAMS shall not allow any false positives (identify a full container as an empty container).

1.1.1.1.9 Auto Inspect Chassis and Containers for Damage. Remote inspections are not a part of this project; however, bidders with the solution that can remotely or automatically inspect and report on container and chassis damage will be considered first. AGS should allow all containers to be inspected remotely without manual intervention by SPRBun employees.

1.1.1.1.10 Keep Driver in Truck When Possible. AGS should keep truckers in their trucks to minimize turn times. ATAMS shall ensure 99% of all truck drivers do not have to get out of the cab of their truck unless opening doors for an inspection.

1.1.1.1.11 Fewer Gate Troubles. AGS should improve efficiency by reducing the number of trucks that are referred to the trouble gates. System solutions that aid in this

goal will be considered. Subsystem solutions that increase gate troubles may be penalized.

1.1.1.1.12 Improved Pre-advise. SPRBun will require all shippers to pre-advise their shipments using appointment system before entering the terminal. This data will be available to AGS to aid in processing.

1.1.1.1.13 Ensure Credentialing Completed before Driver gets to Gate. SPRBun will require all truck drivers properly credentialed before making their way to the entrance gates. AGS system approaches should help SPRBun in this endeavor.

Civil/construction requirements

A. Facility Use

Access to facility space at all gate locations would be needed. Also, space within the server room would be necessary to all servers and network equipment. On-site storage within one (1) 40 foot container would be needed to store equipment during installation and spare parts after installation.

B. Civil Infrastructure/ Utility Requirements

Certain Civil and infrastructure requirements are necessary when implementing an AGS. Requirements for both vendor and SPRBun include:

Engineered Drawings

Vendor would provide standard site requirement drawings for all equipment. Please note, local engineering requirements may impact the specifications made herein and may result change orders to scope/equipment.

Civil Works

Civil and electrical contractors would provide all trenching, conduit, patching and concrete services in preparation for portal installation per vendor supplied drawings. Including, but not limited to:

Trenching/Backfill/Paving

Civil works contractor would be required to trench to and from both entry and exit areas, as well as between lanes. Client will also be required to excavate four (4) 3’ x 4’ concrete foundations and all protective bollard areas.

Concrete

Civil works contractor would be required to pour four (4) concrete foundations for the portal structures. Client will also provide up to sixteen (16) 8” dia. pipe bollards, 60” above ground and at a depth of 24”. Client

PROJECT SCOPE AND REQUIREMENTS (cont'd)

will also provide up to sixteen (16) 8” dia. pipe bollards, 60” above ground and at a depth of 30” into a 48” deep x 18”diameter (ø) concrete footing.

Conduit

Electrical contractor would install one 2” and one 1” conduit to the base of each portal. All conduits will include pull strings.

Network Infrastructure

The AGS system will communicate over a TCP/IP local area network consisting of fiber optic cabling supplied by telecommunications contractor. Each portal lane will require a minimum of 6 strands of dedicated single-mode fiber connecting to the Local Area Network (LAN)/server room. Each kiosk will require a minimum of two Category (CAT) 6 cables connecting to the LAN/server room.

Electrical Service

Electrical contractor would provide three (3) 110/240VAC (20A) electrical circuits to the each portal location; including adjacent power source and panel. Kiosks require one (1) 110/240VAC (20A) electrical circuit. Included should be surge protection devices and circuit breakers within each enclosure.

Attachment C3

Pro forma Construction Contract

To be prepared by SPRBun legal department

Attachment D3

Terminology and Abbreviations

The following terms and abbreviations are used throughout this document.

AGS:	Automated Gate System
ATAMS	Automated Terminal and Monitoring System
EIR:	Equipment Interchange Receipt
Gate Clerk:	Personnel who verify and/or correct un-automated transactions and the container ID, truck ID, chassis ID, Generator Set (GenSet) ID numbers versus SPRBun business rules.
GenSet	Generator Set - a diesel or gas-powered electric generator used to power the refrigerated containers.
Mechanic:	Personnel who inspect containers for empty, inspect containers and chassis for damage, and make inputs regarding the above into AGS inspection software.
OCR:	Optical Character Recognition - The machine recognition of printed characters.
OOG:	Out of Gauge. This is used to identify an oversized container or conditions where the cargo is larger than the container and protrudes in some manner, usually through an opening in the top.
POV:	Privately Owned Vehicle
QoS:	Quality of Service
RFID:	Radio Frequency Identification
RFP:	Request for Proposal
ROI:	Return on Investment
RTG:	Rubber-Tired Gantry crane is an off road overhead cargo container crane with the lifting mechanism mounted on a crossbeam supported on vertical legs which run on rubber tires.
Supplier:	An entity that provides only materials, not labor, to either a vendor, bidder, or directly to SPRBun depending on reference.
TCO	Total Cost of Ownership. For purposes of this document, TCO is defined as the sum total of all cost relating to specific technology over a 5-year period.
TOS:	Terminal Operating System. The software that manages the flow of containers through the terminal.
TEU:	A standard "Twenty Foot Equivalent Unit" steel ocean-shipping container
Top Loader:	An off road truck-like cargo container handler that uses an overhead telescopic boom to lift empty or loaded cargo containers by grabbing the top of the containers (also called a “top pick” or “top handler”).
Transaction:	A delivery or a receivable. A truck that delivers and then receives a container has made two transactions.
Turnkey:	A project in which a separate entity is responsible for setting up a plant or equipment and putting it into operations. It can include contractual actions at least through the system, subsystem, or equipment installation phase and may include follow-on contractual actions, such as testing, training, logistical and operational support.

UTR:	Utility Tractor Rig also known as a jockey truck, yard truck, yard tractor, yard hustler or prime mover. It is an off road mobile utility vehicle used to carry cargo containers with or without chassis.
Vendor:	An entity that has been selected by SPRBun to provide a subsystem (or partial subsystem) as described in an RFP, and has a written contract directly with SPRBun.

4.0 Development of Computer Monitoring Security System

To provide the services applicable for computer security monitoring, AECOM recommends that SPRBun utilize a Physical Security Information Management (PSIM) software application. A PSIM software application enables the end user to integrate disparate physical security devices and systems; enable the correlation of data from multiple sensor systems; apply analytics and intelligence through a series of robust engines; and help filter out irrelevant information such as false alarms. PSIM software platforms are more commonly used within a Command and Control environment and consist of commercial-off-the-shelf (COTS) software technology, which provides the ability to view and manage all alarms and incidents. The software is typically web-based and allows for seamless integration with numerous end devices and security subsystems including video (cameras, recorders, analytics), sensors, access control, Fire, Radio Frequency Identification (RFID), Chemical Biological Radiation Nuclear (CBRN), Computer Aided Dispatch (CAD), Radar, Sonar, Heating Ventilation Air Conditioning (HVAC), Building Management System (BMS), etc., while maintaining a unified operations console and practices. The functionality on the user interface can be customized, configured and modified according to varying operational needs.

The PSIM provides a common user interface or “Dashboard” application that graphically displays alarm related notifications, video, and data on a single/multiple display format required for the management of all the access control and video subsystems. In addition, the SPRBun Security Operations Center (SOC) operator must have a means of responding to the situation through the Dashboard. It is recommended that as a requirement by SPRBun to include single “button” automated alerts for different emergency scenarios such as weather related announcements (i.e. hurricane, etc.), hazardous spill, and intruders. The automated alerts will initiate the specific dashboard subsystems in conjunction with administrative policies. The graphical interface or “Dashboard” will give the operator enhanced situational awareness. Operators and supervisors will be able to view system resources from various locations, allowing for the remote viewing and monitoring of multiple systems simultaneously.

The importance of integrating all the disparate systems into one graphical interface with automated notification will simplify the SOC operator’s dependence on visually detecting a situation. While there is some integration that currently exists at the Port that notifies the operators during an event, integrating a Computer Monitoring Security System (PSIM) will greatly enhance the Ports security effectiveness when coupled with other additional technologies recommended for the Port.

4.1 Review of present subsystem of CCTV's, access control networks and devices for intrusion detection

The existing electronic security systems used at the port include Closed Circuit Television (CCTV), Access Control and Intrusion Detection. The system is quite comprehensive in terms of coverage and has been the focus of attention by SPRBun. The Closed Circuit Television (CCTV) system has been growing over the last few years by adding additional surveillance capabilities in strategic areas around the Port and in the Free Zone inspection area. The access control system uses biometric hand geometry readers, an advanced technology which is the preferred solution for airports and seaports. The intrusion detection system provides good coverage of the perimeter, where installed, and is integrated to the CCTV system cameras. Overall the security coverage was found to be more than adequate for ensuring controlled access, with extensive surveillance capabilities. Integrating the existing systems as part of the Computer Monitoring solution should be accomplished with minimal effort given the open architecture solutions employed at the Port. A brief overview of the existing systems is provided in the following paragraphs.

4.1.1 CCTV System

The CCTV system is composed of approximately 363+ Panasonic cameras that include both fixed and PTZ (Pan Tilt Zoom), and both black/white and color. The cameras are connected via coax to select interface locations throughout the Port. The signal is converted from coax (analog) to fiber (digital) at the camera hub locations around the property and reconverted using GE Security rack mount transceivers in card cages in the Server Room Patch Facility where the cables are then cross-connected to the Digital Video Recorder (DVR) racks.

The DVR's include the 16 channel WJ-RT416 with 3 TB of storage for the standard cameras and also the WJ-HD500B High Definition for the HD PTZ cameras installed. Panasonic WJ-SX850 Video Switchers and Panasonic WJMPU850 CPU are used for processing and distribution to the video recorders and monitors. As part of the Panasonic 850 solution that was installed, the Panasonic WV-CU850 Ethernet System Controller is used by the security operators to control the camera image pull up and PTZ control.

The CCTV camera model numbers are as follows. The quantities of each were unknown.

Fixed Cameras

- WV-CP470 (Discontinued)
- WV-CP480
- WV-CP500

PTZ (Pan Tilt Zoom) Cameras

- WV-CS854 24X (Discontinued)
- WV-CW864 24X (Discontinued)
- WV-CW964 30X

The camera located across the bay was not specifically identified, however, it was a PTZ camera equipped with "FLIR" technology. The use of Forward Looking Infra-Red (FLIR) technology is very prevalent at secure facilities due to the easily identifiable object emitting heat against a dark background. This technology should be used more prominently at the Port of Buenaventura around the perimeter and at new locations around the bay.

4.1.2 Access Control System

The Port uses the Software House C-Cure 9000 access control software version 1.18 for the access control system installed at the port. The Port relies exclusively on the use of hand geometry and pin code to control access in/out of various locations.

There is a personnel badging system, but the badges are not made to be used for proximity or swipe capabilities. These are also issued by the Port Security department.

4.1.3 Intrusion Detection System

The Port installed a perimeter intrusion detection system (IDS) about 6 years ago as an additional measure of detection. The system was identified as the Senstar Stellar Fence Protection System (FPS). The FPS processor connects to two transducer sensor cables, and is mounted on or near the fence in the middle of two detection zones (left and right). Mechanical disturbances detected by the sensor cable are sent to the FPS processor. The processor contains the circuitry that analyzes the detected disturbance. The electronics are designed to match the characteristics of the sensor cable input and only report as events those signals that are similar to the disturbances caused by climbing, cutting or lifting the fence fabric.

Alarms are sent to the Security Operations Center for the operator to review via CCTV. Should an event be identified as a security risk, then the operator notifies the roving security patrol or National Police to respond.

Should more detailed information be desired, please refer to the Deliverable 1 Report on Data collection and review of existing conditions for more specific information about each subsystem.

4.2 Analysis of arrangements and subsystems and their adaptability to computer monitoring

The term "Computer Monitoring" implies the use of technology to integrate disparate systems to achieve a centralized platform by which security events alert the security operators and particular actions need to be performed to address and mitigate the event. The goal of this project is to provide a system that will provide "intelligence" by integrating the CCTV, access control and intrusion detection systems together. By working together, the systems can deter, detect and document any detected security event that occurs on the Port property.

The installed systems are readily adaptable to most computer monitoring platforms by virtue of the open architecture systems employed by each system. Interoperability already exists at the Port between the CCTV and the IDS. Connecting the access control to initiate the recording of CCTV at a particular hand reader can also be accomplished with the existing systems. The missing component is the software platform that collects the data from all three systems and adds a layer of intelligence to interact with the security operators so that they can effectively do their job. This missing layer is known as the Physical Security Information Management (PSIM) software application.

Each of the existing systems is readily adaptable to a PSIM solution. Each hand reader, camera and IDS zone box will be termed as an individual "sensor" and will be interfaced via the software set up in the PSIM. This is accomplished through COTS "libraries" that have already been developed by CCTV camera manufacturers, access control reader manufacturers, and IDS manufacturer's and are commonly available from PSIM solution vendors.

How are they adaptable? All three systems are currently segregated through their own servers and are installed in the Security Operations Center (SOC) Server Room. The interface to the servers is via a network connection on the existing Local Area Network (LAN). The PSIM server is configured to locate the other servers and performs a query of all installed devices. Each device ("sensor") such as a hand reader, camera, etc. is uniquely identified and is added in to the PSIM database and the connection can be verified through a toolbox on the dashboard menu.

Again, all three systems are suitable to be adapted into the PSIM platform. The technology is actually quite simple and does not require previous exhaustive code writing to make the systems work, as was the case 10-15+ years ago.

4.3 Preparation of recommendations for subsystems and procedures for adapting to Computer Monitoring Security System

As part of this project it is a requirement to develop recommendations for subsystems that would be necessary to implement the Computer Monitoring Security System. In developing the baseline recommendations that are outlined in section 4.6 (also termed "alternatives") AECOM is using our broad experience in defining which system(s) are best suited for this particular location and application. There are dozens of vendors that offer similar services/products but some are more advanced and comprehensive than others and have a proven install base that SPRBun can look to as a basis of comparison.

The subsystems that will be required for the Computer Monitoring Security System include:

- PSIM Solutions
- Video Wall Solutions

In order to provide recommendations, a capability matrix is usually the best approach. For the PSIM solution, AECOM compared the following vendors as being the more prominent suppliers of the PSIM dashboard solutions. The vendors are named at the top of the page with capabilities listed and the actual ability of the vendor to provide that capability. While not all items listed are specific to SPRBun, they are important features to note for future considerations once the system is installed and operational. The capability matrix will extend over the next several pages

4.3.1 PSIM Solution Comparison

The matrix provided below provides a significant comparison of the various vendors PSIM solutions. This matrix addresses the major points of interest from a client user, administrator, and technician.

Table 4-1: Physical Security Information Management (PSIM) Solution Comparison Chart

Capabilities	Proximex	NICE Situator	Vidsys	Aegis KapLogic
Operational Functionality				
Integrates related security information from disparate systems	√	√	√	√

Displays maps, alarms, and sensors on the map	√	√	√	√
Show global dashboard and summary views of each security zone or area	√	√		
Show Sensor Only View (without maps)	√			
View maps of security zones and areas based on user/user group permissions (without custom development)	√			
View and control sensors based on user/user group permissions (without custom development)	√			
Through the map and sensor on the map, show live/recorded video, take door actions (unlock, lock, query door activity, etc.), take actions for other sensor types.	√	√		
Demonstrate management capabilities and ability to play live, recorded video, PTZ controls, matrix views, guard tours	√	√	√	Limited
Show and display incident and operator response workflow and tasks correlated as a part of the alert	√	√		
Generate incident report in 10 seconds with all relevant alert detail in multiple report formats	√	√		
Display all alarm details in compact window to automatically show all relevant incident related sensor information such as video (if avail), door activity (if avail), badge IDs, response tasks, maps, etc. without requiring operator to manually open several additional windows	√			
Through the operator console, demonstrate the investigation of a user and his/her activity across a single or multiple access control systems for a user-defined timeframe.	√	√		
Demonstrate the ability to generate trend reports within 30 seconds that display alarms per different days of the week, alarms during different hours of the day, operator response times, sensors generating the most alarms, etc.	√			
Show and demonstrate an intelligent camera-based tracking tool to enable an operator to display and show adjacent cameras to the active view and follow a suspect across multiple cameras.	√		Performa nce problems	

Demonstrate the ability to generate reports from intelligent camera-based tracking tool within 30 seconds of the track being complete. Report to include video snapshot, sensor ID/time, and map locations.	√			
Demonstrate the ability to search on sensor names, alarms, zones, areas	√			
Demonstrate the ability to easily search, filter, sort, and group hundreds/thousands of alarms in the alarm list	√			
Demonstrate the ability to show blue force resources tracking on map based on geocoordinates	√	√	√	
Demonstrate 2-way communications with mobile client	√	Skype only	√	
Demonstrate object tracking on map based on geocoordinates	√	√		
Administration				
Demonstrate full Graphical User Interface (GUI) driven administration console	√	√	√	
Demonstrate sensor autodiscovery with subsystems	√		√	
Demonstrate sensor autosynchronization with subsystem - i.e. add new sensors to PSIM solution when added to access control system	√			
Demonstrate how sensors can be easily clicked and dropped on maps	√	√		
Show how to deploy rules for raising alarms and defining priorities and actions	√	√	√	
Demonstrate that system is functional without having operator workflow tasks defined	√		√	√
Demonstrate Visio-like business logic designer and policy engine to easily drag and drop activities, conditions, and actions to be linked together graphically and to automatically execute based on changing environmental conditions.	√			

Show large library of precreated and open business logic activities to integrate with different system types (i.e. escalate, generate report, send email, check threat level, etc.)	√	√		
Show generic Open Database Connectivity (ODBC), web services, and external method activities to be called directly from the Visio-like business logic designer	√			
Show how custom Powershell activities can be created and included in the business logic designer	√			
Demonstrate how business logic policies can be exercised offline (non-production) to simulate alarms	√	√		
Demonstrate the ability to save business logic policy templates and to reuse the policies	√	√		
Demonstrate the ability to correlate multiple alarms to reduce false and redundant alarms and to raise critical alarms	√			
Demonstrate the ability to suppress multiple instances of same alarm to a single line if necessary	√			
Demonstrate how the system can be offered as a training aid to simulate alerts and tracks operator responses	√			
Architecture and Performance				
Open Service Oriented Architecture with distributable components (not traditional client server)	√	limited	limited	
Demonstrate that solution is Commercial Off-the-Shelf COTS-based solution with Microsoft Installer (MSI) installation files for core components and integration modules.	√	√	?	
Demonstrate that integrations are bi-directional such that vendor specific alarms are shown in PSIM User Interface (UI) and status updates to the alarm are updated in either system	√	√	?	
Demonstrate that users/roles/groups can be created and allow configuration of user/group/role responsibilities and privileges	√	?	?	
Demonstrate the ability to show 2D or 3D maps	√	√	√	

Show test results that system can scale to tens of thousands of sensors on a single server	√			
Show test results that system can scale to 500 alarms per second without loss of alarms	√			
Demonstrate that system centrally stores all user profiles, maps, sensor configurations, sensor icons, business logic, and rules	√			
Demonstrate that system can self monitor and generate events on connectivity and service problems	√	?	?	
Show documentation for full, open published Software Development Kits (SDKs) for integrating new sensors, systems, alarms, and information into the system	√	√		
Show documentation for full, open published SDKs for extracting and delivering alarm and sensor information to 3rd party systems	√	√		
Demonstrate that the system can run in a virtual machine	√			
Provide referenceable technology partners using SDK	√			
Integrations				
Demonstrate out-of-box integration or provide installed reference site that shows system can integrate with most major video management systems (Digital Video Recorders (DVR), Network Video Recorders (NVR), etc.) – Panasonic, Cisco Video Surveillance Operations Manager (VSOM) / Video Surveillance Manager (VSM), Verint, Lenel NVR/DVR, Vicon, OnSSI, Bosch, etc.	√	√	√	
Demonstrate out-of-box integration with Video Management System (without the use of any 3rd party system) that enables - Live and archived video to be played through the PSIM console - Video can be exported - Video snapshot images can be taken - Move PTZ cameras from PSIM console through VSM - Generate new video alerts in PSIM console - Alarms generated in VSOM can be shown in PSIM console through HTTP - Browse a full list of cameras configured in VSM	√	some	some	

and add to PSIM system				
Demonstrate out-of-box integration or provide installed reference site that shows that system can integrate with most major physical access control systems - Cisco Physical Access Manager (CPAM), Lenel, SoftwareHouse Ccure, GE PP, Hirsch Velocity, JCI P2000	√	√		
Demonstrate out-of-box integration and bi-directional synchronization with Access Control System (ACS) (without the use of any 3rd party system) that enables - ACS alarms and details to be displayed in PSIM console - Alarm status between ACS system and PSIM system to be synchronized - ACS controls - open doors, unlock doors, lock down, etc. - Door activity to be displayed as a part of a door alarm in the PSIM console - Badge IDs to be displayed as a part of the door alarm in the PSIM console - Ability to investigate specific badge holders or users for user-defined times - Ability to correlate ACS alarm with other alarms - Ability to suppress multiple duplicate alarms to single line - Browse a full list of ACS devices in add to PSIM system	√	some	limited	
Demonstrate out-of-box integration or provide installed reference site that shows integration with intrusion alarm systems	√	√		
Demonstrate out-of-box integration or provide installed reference site that shows integration with fire alarm systems	√	√		
Demonstrate out-of-box integration or provide installed reference site that shows integration with video analytics systems	√	√		
Demonstrate out-of-box integration or provide installed reference site that shows integration with intercom systems	√			
Demonstrate out-of-box integration or provide installed reference site that shows integration with computer aided dispatch systems	√			
Demonstrate out-of-box integration or provide installed reference site that shows integration with radar systems	√			

Demonstrate out-of-box integration with Cisco Internet Protocol (IP) Interoperability and Collaboration System (IPICS) (without the use of any 3rd party system) that - Sends notifications to one or more recipients through policy engine - Simultaneously calls many external users at telephone numbers from different phone types that Cisco IPICS obtains from a predefined recipients list - Delivers notifications to IPICS by sending Hypertext Transfer Protocol (HTTP) get request to the primary dial engine - Enables one or more IPICS dedicated dial engines to be specified for delivering of the notification - Plays a designated message to each user who answers the call based on PCM (pulse code modulation) or International Telecommunications Union (CCITT) u-Law format supported by IPICS - Captures results of each call in a log file that can be reviewed at any time.	√			
Demonstrate or provide installed reference site that shows integration with chem/bio sensor systems	√			
Demonstrate that the system supports health monitoring (ping, HTTP application test, etc.) in addition to performance monitoring (Simple Network Management Protocol (SNMP) traps, HTTP, Syslog, Windows Management Instrumentation (WMI)) of security devices and security infrastructure	√	√		
Demonstrate or provide installed reference site that shows integration with ID management systems for badge provisioning and credential management	√			
Company				
Is US-based and owned company	√		√	√
Support personnel and engineers are based in US	√		√	√
Over 25 installations of PSIM solution	√	?		

Pedigree in building large-scale enterprise-level systems and security management systems	√			
Pedigree integrating disparate systems and building connectors	√			
Provides a hardware appliance	√			
Flexible pricing for starting small and then scaling up	√			

The matrix goes well beyond the items required in the current scope of work as it relates to the SPRBun project but the additional capabilities need to be shown for future consideration (such as integrating the Vessel Traffic System (VTS), etc.). As clearly demonstrated in this matrix, the Proximex solution yields the highest scorecard.

All the solutions operate on standard file servers and the server requirements are contained elsewhere in this deliverable under performance specifications.

4.3.2 Procedures for adapting PSIM recommendation to Computer Monitoring Security System

Most PSIM solutions are considered standalone solutions that require their own server platform and software installation. The server connects to the same Local Area Network (LAN) where the Closed Circuit Television (CCTV), Access Control and Intrusion Detection System (IDS) systems reside. Consideration to conduct software upgrades to the existing systems should be performed to ensure the latest versions are installed prior to implementation. Section 4.6 discusses the specific high level steps to be taken to perform the integration from a high level.

4.3.3 Video Wall Recommendations

The video wall will be a key component of the Computer Monitoring Security System since the system dashboard display is of key relevance. The use of video walls in situation rooms such as the Security Operations Center (SOC) is a common practice for this specific application as well as traffic management, command and control rooms, etc. The current CRT monitor layout is not conducive to providing an effective means by which alerts can be displayed, viewed, and addressed by the operators. Furthermore, there are space constraints in the existing SOC which does not lend itself to rear projection monitor schemes. There may also be a desire for other programming (weather, local news, VTS, etc.) and this would be a far better solution than individual CRT monitors. Therefore, the recommendation is to include providing a video wall solution that will meet the space constraints of the space and provide

high definition quality monitors to achieve the best possible image available from the existing CCTV system cameras. The large-scale maps can be configured automatically to show the alarm conditions, weather-related problems, etc. The video display wall consists of a matrix of flat screens and an image processor array. This enables the wall screens to show individual images on a single screen or multiple.

Two of the key discriminators in determining the proper video wall solution include installation footprint and heat dissipation. Of the vendors reviewed, only two were able to satisfy the footprint requirements:

- Clarity Matrix
- Barco LCD Display Wall

Both manufacturer's have a broad installation base around the world providing video wall images for the clients such as the military, NASA, financial institutions, casinos, etc. Both offer a 46" and a 55" monitor solution. The most significant discriminator however is the heat dissipation factor. Anyone who has been in a room with a large LCD has experienced how warm the room can get. Multiply the units x 24 to form the wall and it would be a significant heat load requiring mechanical upgrades. Furthermore, each LCD usually has a fan unit to cool the power supply which over time can get noisy, especially when there are 24 of them installed. The Clarity solution addresses these two key discriminators by removing the power supplies and fan units and installing them in a rack mounted solution.

4.3.4 Procedures for adapting Video Wall recommendation to Computer Monitoring Security System

The video wall uses rather simple concepts for adapting to the signal sources and displaying those sources in a pre-programmed manner. The existing CCTV image outputs are routed through a matrix switcher which is connected to the individual monitors. By changing the source at the matrix (via the keyboard command at the operator station), the image is changed to the desired source. This is currently accomplished using coaxial cables to the monitors. With a video wall solution each monitor is cabled with two Category 6 cables and a power cable from the power supply rack. Each monitor is connected to a video processor. The processor sends the signal(s) to a controller. The controller sends the video information to the screen in a predetermined format such as one image per monitor or 2, 4, 6, 10, etc. depending on the final configuration requirements as dictated by SPRBun. The key is to ensure that flexibility and adaptability is provided in the installed system. Section 4.6 discusses the specific steps to be taken to perform the integration from a high level.

4.4 Preparation of an illustrative description of programs and components and recommendation for components of computer security monitoring

The main components described below are recommended as part of the computer security monitoring system. The main program and components are as follows:

- Physical Security Information Management (PSIM) Software
- Video Display Wall System
- CCTV Headend Upgrade
- Thermal Infrared Cameras
- Video Analytics

4.4.1 PSIM Components

Computer Monitoring includes both the collection and display of information but also includes an additional critical component and that is the policy based notification rules to be followed during an event. The sample scenario, where an intruder is detected scaling the perimeter fence line by the Sensor Stellar intrusion system, which then triggers the integrated CCTV camera assigned to that "zone" and providing a visual alarm on the PSIM dashboard display, is only part of the arrangement that needs to be included. The "next steps" in terms of what the SOC operators are supposed to do is part of the development of the policies and procedures to be followed during that type of event.

The PSIM solution must provide for defining those events and the subsequent actions to be taken by the operator. Ideally, using the example of an intruder described above, when the visual alarm appears on the screen in front of the security operators there are certain actions that should occur to mitigate this violation. This event should trigger the PSIM dashboard to automatically pop up with a set of instructions the operator is to follow so that there are no steps missed in dealing with this problem. As performed at other ports, a series of steps are outlined on the dashboard, several of those with automated features to help facilitate notification and response.

These actionable steps need to be pre-established to include the specific actions that Port Security needs to define and have incorporated into the PSIM dashboard. This is very typical of how these systems are used at large Ports around the world. There are a number of actions above that occur without the operator needing to do anything manually which is a key benefit of the PSIM solution: to automate and provide direction.

The existing systems currently installed at the Port are capable of being integrated into the PSIM solution. The key is how the notifications which include the policies and procedures are set up that can take the most time. Keep in mind, the events to be monitored can include, for example: vehicle going wrong direction (such as existing at Free Zone Gate which is only one way in); vessel traveling on

river/bay after dark; multiple failures to login in at hand geometry reader; excessive vehicle speed on Port Property, etc.

The following information illustrates the recommended PSIM solution and provides a high level overview of some of the capabilities which should be of interest to SPRBun.

Proximex Surveillint™ – Incident Management- Situational Awareness

When an incident is detected, Operators see visual indication of the location of the incident on a Geographic Information System (GIS)-referenced map and hear audio alerts to the incident.

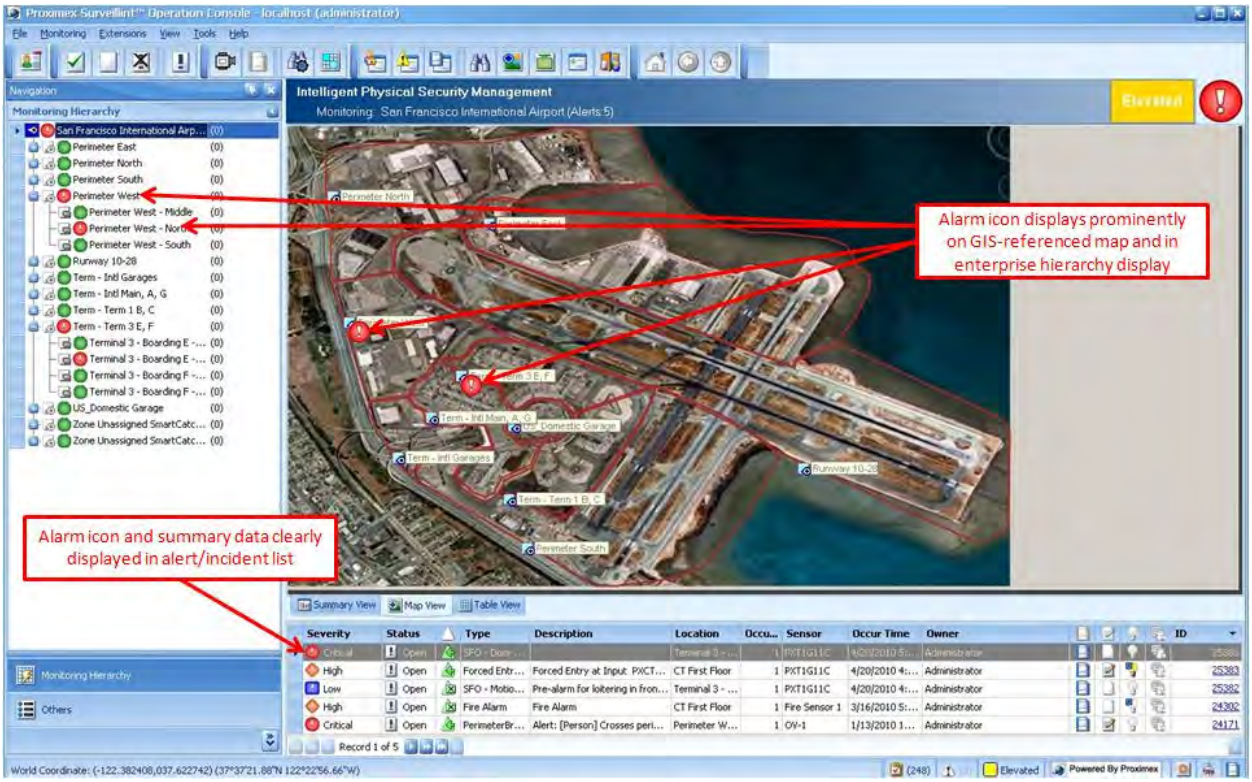


Figure 4-1 PSIM operations console display with alarm event

In addition to alarm icon display on the Geographic Information System (GIS)-referenced map, Operators also are presented with incident summary data clearly displayed in an alert/incident list, which can be sorted by severity, status, occur time, location, alert/incident owner or other criteria. The Operator is also automatically presented with contextual details of the incident, enabling him/her to follow the Concept of Operations incident/alert response tasks pertinent to this incident. Operators can

rapidly perform critical, alert/incident-specific response tasks and can refer to appropriate contextual information such as the incident below:

Incident Example: Door Forced or Held Open:

- Live video of the incident reporting area from one or more cameras (enables the operator to determine if there is an immediate danger in the area)
- Recorded video starting seconds (time is configurable) prior to the alarm from one or more cameras (enables the operator to determine what/who caused the alarm)
- Contextual information from the appropriate access control system
    - The last "n" (number is configurable) accesses and events for the affected door/gate (enables the operator to determine whether the same person has been going through the door/gate repeatedly leading up to the incident, who the last person was to be granted access through the door/gate, and/or whether the last valid access was within of the alert/incident
    - The accesses and events for the affected door/gate over the last "n" (time is configurable) minutes, which provides similar benefit to the last "n" accesses.
    - For access control alerts - a link to badge database (enables the operator to compare the badge image of people who have been granted access through the door/gate with the image of the individual(s) present at the door/gate at the time of the alert/incident)
- Instructions for steps the operator must take to respond to and clear a priority alarm (ensures the operator is using the most up-to-date response procedures). Following the Operator Task List ensures that the Operator is acting based on the Port's specific Concept of Operations for the incident based on:
    - Incident Type
    - Day/Time of Incident
    - Location of Incident
    - Correlation with Other Incidents
    - Current Port Threat Level
    - Other Port specific criteria
- A mini-map of the location of the alarm in the alarm detail as well as an icon that will shift the focus of the main map to the alarm area.
- Notes page (enables the operator to capture his/her observations with the alarm) – this is a free-form field that is inherent in the Surveillint alarm details
    - The Operator will also be able to add video "snapshots" from either the live or recorded video to his/her notes through the click of a single button.
- Command access to lock down an area or perform on-demand business logic policies that have been drafted for the specific type of alert

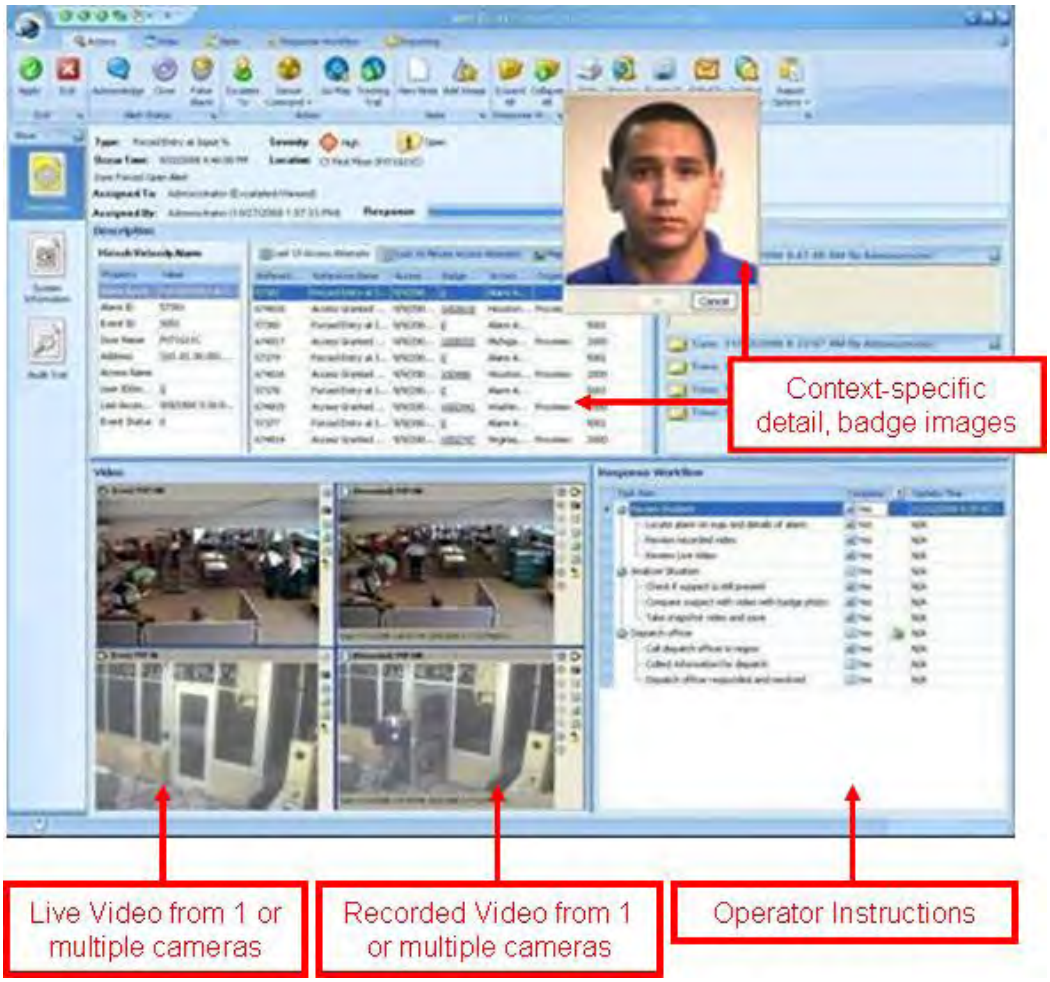


Figure 4-2 PSIM operations display with identification, video and instructions to be followed

For complete situational awareness, the Operator is then able to track the subject from either the live or recorded video (forward or backward in recorded video with EZ Track) to vector first responders to the subject and to visually verify the subject's activities from his last known location to his current location.

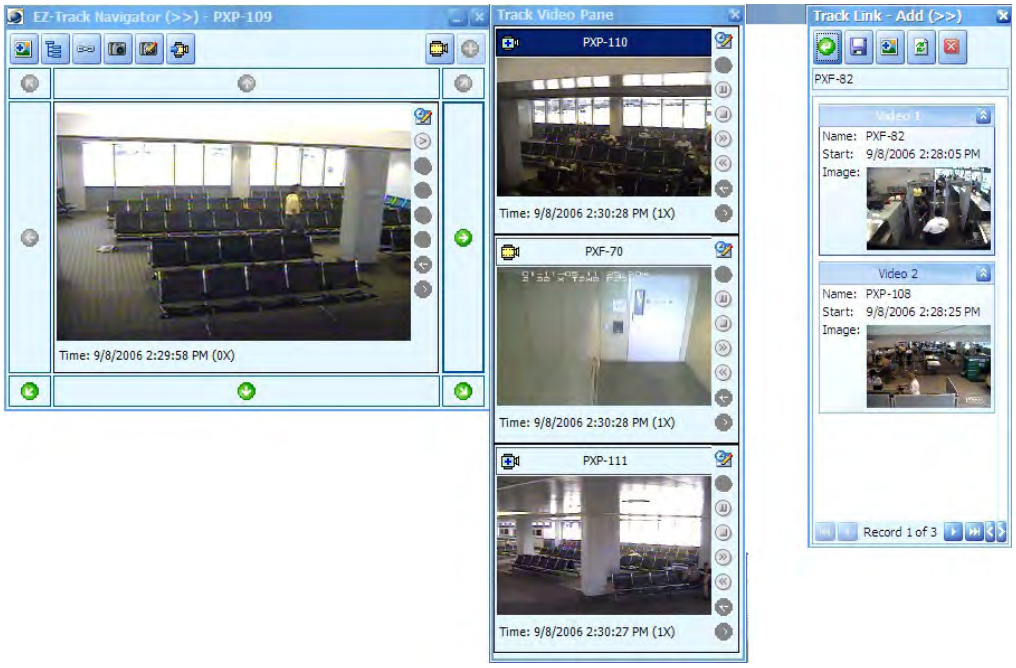


Figure 4-3 Display of recorded video onscreen after an event

This capability can be used to enable Operators to track subjects who improperly passed through security checkpoints/gates and catch up to the person in real-time to allow the security team to:

- Detain the subject
- Visually verify that the subject did not perform any dangerous activities from the time he left the checkpoint/gate to the time he was detained

For communication with response personnel, operators will be able to utilize Simple Mail Transfer Protocol (SMTP) mail, phone/radio communications through other third party applications, or notification through a computer aided dispatch (CAD) system.

4.4.2 Video Display Wall

The video display wall will facilitate all the capabilities of an integrated solution. Today, the Security Operations Center (SOC) utilizes cathode ray tube (CRT) monitors and a couple of flat screens as the display system. The recommendation is to implement the video wall to provide a high quality, dynamic graphical display that will provide the required imagery including: Graphical User Interface – Port-wide Overview; CCTV images, and alarm notifications. The capabilities further include for future integration of

the Vessel Tracking System maps, weather channel, and local news station broadcasts (cable/satellite), etc.

The systems reviewed are comparable to each other as they met the narrow footprint criteria not available by other vendors. The vendors researched included:

- Barco Systems (www.barco.com)
- Clarity Matrix Systems (http://www.planarcontrolroom.es/products/)

Both of these vendors offer superior capabilities and are well recognized globally as being the more prominent video wall solution vendors. The recommendation is to provide a seamless composition of liquid crystal display (LCD) screens with programmable screen configurations so the Port can maintain the current monitoring screen images but appears as one single screen or several larger screens.

Figure 4-4 Video display wall for traffic monitoring

Large scale maps can be automatically brought up to display alarm conditions, weather related problems, etc. By implementing these simple systems, the display capabilities are almost limitless. The preference for using slim-line profile monitors means there is no impact to the current SOC space with a bulky footprint.

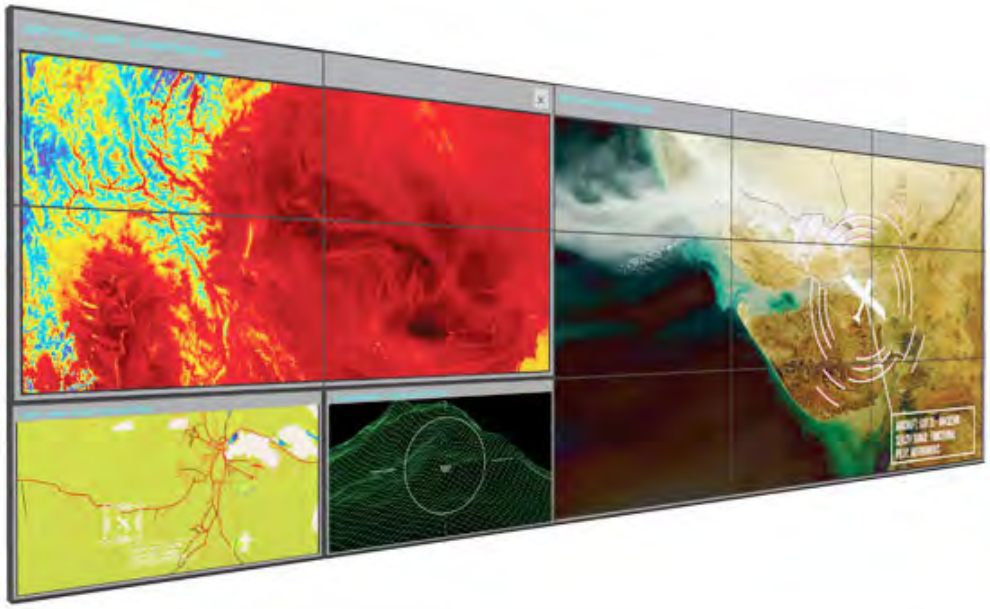


Figure 4-5 Video display wall for aircraft and weather monitoring

The system recommended by AECOM is the Clarity Matrix system primarily due to cost and serviceability. The system is very simple to set up and configure.

4.4.3 Thermal IR Camera

The current CCTV coverage is comprehensive at the Port capturing images of operations in progress and general surveillance activities. The one area that is lacking adequate coverage is the waterside. There is a single FLIR camera installed at the Coast Guard base across the bay from the Port. The camera is set on a “patrol” mode where the camera scans the wharf side from North to South and back again. The vulnerability is recognized as the area to the North, East and South which is the “zone” where smaller vessels could access the vessels or Port property unimpeded. The recommendation is to provide coverage of this zone by creating a boundary that would detect vessels as small as 4m x 3m as far away as 2000m. The boundary is shown graphically in Figure 4-6.

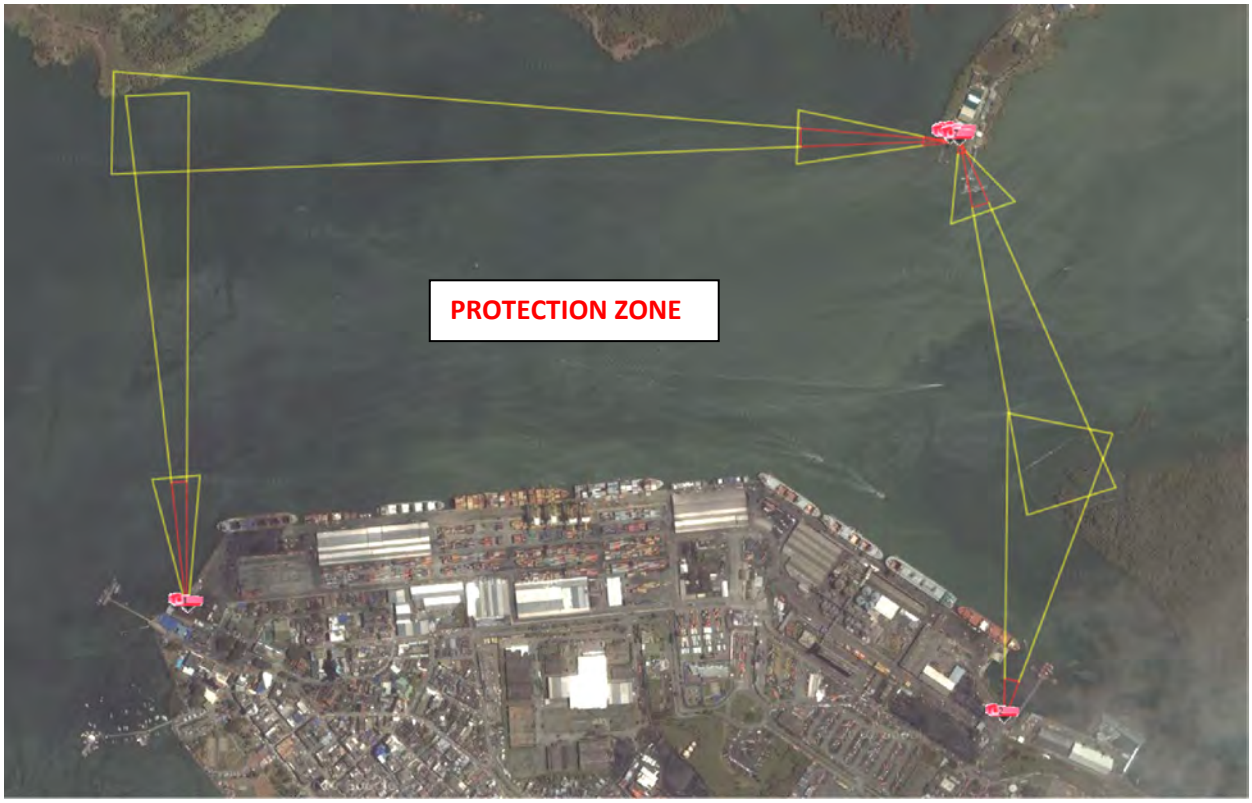


Figure 4-6 Limits of protection zone with thermal cameras

Once the zone has been intruded, the existing FLIR PTZ camera can track the vessel as long as the operator chooses to. This is of particular interest at night to know if a small vessel is on the water when it shouldn't be based on the understanding that there are no boats allowed on the water after dark. The combination of using thermal IR cameras with video analytics will play a large part protecting the water side of the Port.

4.4.4 Video Analytics Camera

Video analytics boost security by automatically alerting personnel to take action when a security event occurs. The analytics comes into play when an alert is triggered by predetermined events such as a boat moving at a high rate of speed or a boundary zone has been penetrated. The analytics determine when these certain criteria are met. Video tracking occurs when a target has been selected through the analytics decision tree and the target is tracked as it progresses and can be handed off from camera to camera along a waterway, for example.

There are a number of "triggers" that can be programmed but managing the nuisance alarms/false alarms that can be produced is dependent on the level and complexity of the system used. There are a number of vendors that produce video analytic software, which vary in their ability to accurately capture an event. Some systems tout capabilities that are yet to be further refined and thus don't work as well as other analytic events. Some of the most basic monitoring features such as speed, direction, or zone penetration seem to be particular events that are fairly well worked out thus causing lower false alarms. In a Port environment such as Buenaventura, these particular events are probably more likely to be implemented than any other (boundary zone penetration, etc.)

The case of the port presents opportunities for the application of this technology, either in static areas such as fences or areas which are static according to schedule, such as at night or when not working, for example, freight or container yards when cargo is not being handled. Video analytics can also be used for the analysis of unusual movements or lack of movements, such as people loitering, vehicles speeding or remaining excessively in a restricted area like a truck staying too long alongside of a warehouse, anti-tailgating to prevent vehicles from following another through open barriers, abnormal small boat movements and intrusion detection. These events can be programmed as indicators of criminal activity, including theft, introduction of contraband and sabotage.

The application of video analytics requires the selection of concept between distributed analysis on intelligent cameras or local processors and central analysis on a host computer. Implementation of video analytics requires careful design and attention to the concept of operations to ensure appropriate algorithms are selected and properly deployed for the proposed application. Properly designed, this evolving technology can supplement the existing CCTV system, access control system and intrusion detection system to improve overall reliability and probability of detection while reducing false and nuisance alarms.

AECOM has investigated a number of video analytic solutions. The system that has been integrated the most with the Proximex PSIM solution is SightLogix. A solution that will work very well with the CCTV system installed in Buenaventura is the SightSensor Camera.

SightSensor Camera:

Designed for high Probability of Detect (PD) and low Nuisance Alarm Rates (NAR), the SightSensor camera incorporates either a visible or a thermal imager, lens optics, electronic stabilization, on-board image processing, video analytics software, camera control, and geospatial target tracking, all sealed inside a ruggedized NEMA 4X nitrogen-purged housing. There are three variations of SightSensor systems:

- Visible
- Thermal
- WideView

Long-Range Day/Night Visible Detection Camera

The Visible SightSensor is an intelligent day/night video detection camera for large outdoor perimeter and buffer zone surveillance. The camera consists of a visible imager.

Long-Range Thermal Video Detection Camera

The Thermal SightSensor is an intelligent video thermal surveillance camera for large outdoor perimeter and buffer zone surveillance, in all weather and geographical conditions. The camera works in zero light and widely dynamic lighting situations and consists of a thermal imager.

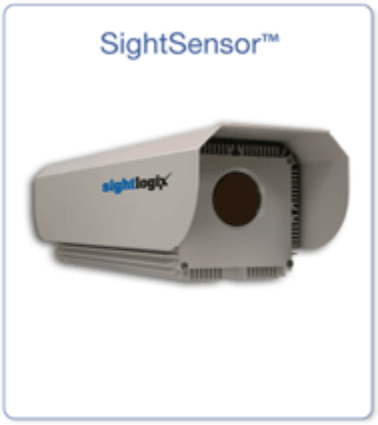


Figure 4-7 SightSensor intelligent camera

Wide-Area Day/Night Visible Detection Camera

The WideView SightSensor is an intelligent visible spectrum detection camera for wide-area, outdoor buffer zone surveillance. The camera consists of a visible imager, complete with 105° field of view lens. A wider field of view and increased reliability means fewer cameras needed to protect the facility.

For the Port of Buenaventura, the recommendation is to use the Long-Range Thermal Video Detection Camera solution, as it provides the most robust features and working in thermal mode versus visible light is preferred, especially in long range mode. This camera solution along with the SightTracker solution that would connect to existing cameras already installed at the port would provide the additional layer of coverage that perhaps the fence sensor system may not provide such as tracking an intruder. This solution is recommended for perimeter cameras and for cameras observing specific areas where problems tend to occur more often.

4.5 Indicate how the computer monitoring security system will be integrated into SPRBun's security program, and make recommendations of changes or additional security components

The benefit of using a PSIM based product is that it typically is a seamless implementation with the major brand name subsystems such as Pelco, SoftwareHouse C-Cure and Senstar Stellar. More importantly, the PSIM software also interfaces very well with video analytic systems, vessel tracking systems, fire alarm systems, etc. Together, these systems will comprise the Computer Monitoring Security System (CMS) and provide for a more secure Port with automation assisting the Security Operations Center (SOC) operators and Port Security staff.

4.5.1 Integration

The steps of integration will include activities being performed both concurrently and sequentially. A high level approach is listed below.

1. After contract award the successful integrator would deploy to Buenaventura to perform a kickoff meeting with key Port Management and Port Security personnel. The kickoff meeting will include a review of the scope of services following a high level Port Operations overview provided by SPRBun. During the kickoff meeting, breakout meetings will be determined and scheduled while the integrator is on-site. Following the kickoff meeting, a thorough site visit will be conducted to familiarize the contractor with the particular layout with emphasis on key/strategic areas of interest.
2. A detailed inventory of the site equipment will be conducted including: the perimeter intrusion detection system noting the sensor module locations and the sensor cable routes; the exact placement of the existing CCTV camera locations; the location of all access control devices including hand geometry readers, door contact switches, mag-locks, controllers, etc.; a detailed inventory of the Security Operations Center (SOC) monitoring space; a detailed inventory of the SOC equipment racks; a detailed inventory of all installed software and server hardware system information. Included in this survey will be a detailed investigation of the available power and power backup capabilities as well as the mechanical systems conditioning the SOC area.
3. A site visit to the Isla Guardacostas (Coast Guard Island) will be required to investigate the existing FLIR camera and wireless transmission equipment and to verify the possibility/feasibility of adding additional thermal cameras on the same tower. Existing power and cable routes will be reviewed.
4. A detailed survey of all security “hub” locations where all the CCTV feeds consolidate and connect to the Port Local Area Network (LAN). An investigation of the existing power sources and mechanical conditioning of these spaces will be documented.
5. One of the lengthiest and most detailed activities is the development of the specific alarm policies and procedures for each event the Port would like to have incorporated into the PSIM. For each event, policies and procedures need to be documented so that when the system is up and running, the programmer will understand what the Port desires to happen when a particular event occurs. This step should commence as early in the overall integration process as possible.
6. The SOC monitoring room will be detailed and dimensioned for the installation of a new video display wall and monitoring stations.
7. Following the capture of this information gathering task a findings debriefing will be performed with Port personnel. Action items will be generated for both entities to complete and the integrator deploys back to their home city to begin the detailed design effort.

8. Once the design is completed a 2nd meeting will be conducted at Buenaventura to review the detailed system requirements. This is performed to ensure that the proposed solution and the implemented solution are synergistic in their goals.
9. Upon final review and approval by the Port personnel, the procurement process will begin. Long lead items will have been ordered shortly after the initial site surveys once the particulars have been verified that pertain to those unique items. All other items will be ordered following Port approval.
10. Ordered items will be staged and stored at a bonded warehouse in the United States until such time that the materials can be loaded into a container(s) and shipped to Buenaventura. The integrator will have a receiving team to accept the cargo and arrange for transportation to a secure staging area pre-designated during the initial site visit. Here all the materials for the project will be stored and secured while the construction and installation activities are conducted. The integrator may require an armed guard service to provide additional security with the cooperation of the National Police and Port Security.
11. The implementation will begin in the SOC monitoring area. The current CRT monitors will need to be replaced with a triple screen display for each operator that provides the same images that were projected on the monitors. The displays will be much smaller but the duration of working in this scenario should be expedited to minimize having to work in this manner for long. The video display wall, server, software and integration activities will bring up the same images as existed prior to the implementation.
12. The installation of the necessary utility upgrades or mechanical systems will be conducted in this area as necessary during the video display wall installation. Concurrently, installation of the thermal IR cameras can begin including power and IT cabling to the camera locations.
13. The next effort will be the installation of the PSIM server and software application. The existing systems will be integrated as they are into the PSIM without any impact to the security operation.
14. Prior to the system coming on-line, user training must be conducted. The integrator will set up a mock training area and coordinate the training sessions with SPRBun.
15. Once the system is up and operational, the integrator will maintain an on-site presence to address any technical/operational questions for a period of up to 14 days. This ensures the operators will have support through the initial “break–in” period and also facilitates determining the minor adjustments that need to be made to the system to obtain the desired results as determined in the earlier scope development process.

4.5.2 Recommendations or changes to the existing security system

There are two distinct recommendations to be made to the existing security system (excluding the display wall):

- Replacement of CCTV Headend Equipment

- Replace Operator Consoles

Implementation of these recommendations coupled with the additional recommendations to incorporate a Computer Monitoring Security System would provide SPRBun with a robust and technologically current solution for years to come.

4.5.2.1 Replacement of CCTV Headend Equipment

As stated in the Site Survey Report it was noted that the existing CCTV Panasonic headend was composed of equipment that has since been discontinued and is no longer available from Panasonic. This includes video switchers, digital video recorders and operator controllers. This puts SPRBun in a vulnerable situation that should a device fail, the only recourse is to purchase a used replacement or to invest in a new replacement to satisfy that repair item. The recommendation is to replace the headend with new components that will provide additional capabilities and facilitate the newer technologies including Internet Protocol (IP) cameras which is part of the Port's overall security migration plan.

The current system includes the following discontinued components:

- WJ-SX850 Video Matrix Switchers
- WV-CU850 Controllers
- WJ-RT416/1000 DVR
- WJ-HD500 DVR

The current installed cameras system is an analog based system but the Port will eventually migrate to an IP based solution. The solution for accommodating both the new and the old CCTV systems is to procure and install a DVR that can accommodate both analog and IP based cameras. Based on the current camera count estimated at 384, the following is recommended to be installed at the Port to replace the legacy system:

- 24 Pelco Hybrid DVR's or equal
- 8 Pelco Keyboard CCTV Controllers or equal
- 16 Sennetech Code Translators

The code translator is required to convert the PTZ controls from Panasonic RS-485 to Pelco RS-422 and is applicable only to the PTZ cameras. The simple one line diagram of the new system is shown below.

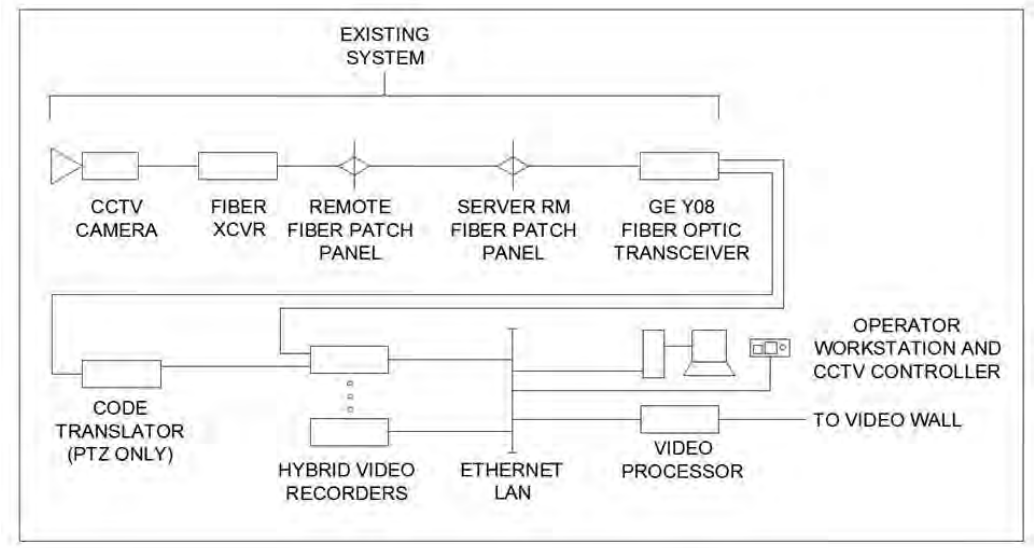


Figure 4-8 Connectivity diagram of new video system

There is sufficient space in the existing server room to add additional cabinets to bring this system on-line without impacting the existing system.

4.5.2.2 Additional CCTV Coverage

There was one area of the Port that was mentioned lacking in CCTV coverage. There is an area adjacent to the Coffee Warehouse and the Post Office that will require one PTZ CCTV camera to adequately patrol the area. One PTZ Day/Night camera is recommended to provide surveillance in this area when set on patrol.

4.5.2.3 Replacement of Operator Consoles

The operator workstations consist of the bare minimum accessories that would normally be associated with this type of space. The recommendation is to provide an upgraded workspace as found in similar facilities to equip the operator with a workspace consisting of the following:

- Ergonomic furniture: That includes ergonomic chairs, sliding keyboard shelf, work surface
- Radio holder/charger

- Telephone with pre-set speed dial buttons
- PC (with Pelco Control Point Client Installed), keyboard, monitor
- CCTV controller keyboard/joystick (WV-CU950)
- Task lighting
- Drawer space
- Duplex power outlet (for cell phone charger)

Understanding there are some space constraints and that the ceiling height is lower than desirable, care must be taken to ensure that the viewing angles from the desk to the video wall be virtually unimpeded.

The recommended furniture solution is the Wright-Line Profile Series, which is used in many operations centers around the world. The flexibility and quality provides the operator with an ideal work station solution. For this project, it is recommended to provide two 72-inch stations built for two operators each and one 48 inch station for the National Police position.

4.6 Compare Computer Monitoring Security system alternatives and recommend one alternative for implementation

AECOM has worked with a number of integrators and vendors on similar projects. Performing analysis of the various solutions and offerings is an important part of this process when narrowing down the more prominent and successful solutions and systems. For this specific project, the preparation of the subsequent recommendation required analysis of existing subsystems and the adaptability to the Computer Monitoring Security System.

In this instance, only those prospective PSIM providers who have a known install base at other seaports were considered. There are other systems that exist and perform similar capabilities but are geared more towards transportation markets such as rail stations, traffic management systems, etc. The key was to isolate those systems that are most viable and have an installation of comparable size to that of the Port of Buenaventura.

Selection of the vendors also includes the capability to interface to disparate systems by multiple manufacturers and the ability to implement the system by equally viable, experienced integrators.

The scope of work for this project was reviewed by these vendors to solicit integration and Dashboard solutions making sure complete interoperability is accomplished throughout each subsystem and all requirements are met. Based on discussions with each vendor and the results of the capability matrix

provided in Section 4.3.1 the Proximex solution is the recommended solution for SPRBun. Key decision points and factors in the final selection included:

- Integration and interoperability with C-Cure 9000
- Integration and interoperability with Senstar Stellar
- Integration and interoperability with Pelco VMS
- Integration and interoperability with audiovisual systems
- Number and size of product installations/integration

4.7 Preparation of specifications, procurement documents, cost estimates and implementation program for Computer Monitoring Security system

4.7.1 Preparation of performance specifications for computer security monitoring system

The Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun) intends to procure a Computer Monitoring Security System (CMS) to be installed at the Port of Buenaventura, Colombia.

For ease of reference, the term “System” shall refer to the overall Computer Monitoring Security System (CMS), the term “Camera” shall refer to the Thermal infrared (IR) and PTZ (pan tilt zoom) subsystem or component, the term “SOC” shall refer to the Security Operations Center, and the term “Operator” shall refer to the operators of the CMS and client hardware/software components.

The System shall provide a layered approach to the security monitoring of the Port property. Through the use of “sensor management” the system will facilitate reporting events to the SOC provided by the Intrusion detection system around the Port perimeter, access control points around the facility, and from the new Thermal IR cameras video detection system to be installed with views of the waterside.

The System includes unique security surveillance capabilities. Specialized small target video detection and night-capable Camera systems shall detect and alert the presence of low detectable vessels to provide the necessary intercept information for capture operations.

4.7.1.1 CCTV Cameras

Thermal IR Cameras will be used to establish a video motion detection boundary around the waterside of the Port. Additionally, a single PTZ camera is required near the coffee warehouse and the Post Office.

4.7.1.1.1 Environmental

Externally mounted equipment shall be suitable for operation under the following conditions:

- Temperature: +60° C to -30° C
- Relative Humidity: 0-100% @ 40°C

Availability: 99.6%

4.7.1.1.2 Thermal IR Camera Performance Specification

A. SUMMARY

The thermal video detection system consists of intelligent surveillance cameras which receive long wavelength infrared (LWIR) radiated energy to detect objects that violate a site's alarm policies. The system provides long-range automated outdoor perimeter and buffer zone protection, operating in all weather conditions and geographical locations. The system integrates camera control, image stabilization, advanced image processing, and geo-spatial based object tracking to minimize false and nuisance alarm rates. Direct processing of video at the imager level analyzes video and provides access to the full dynamic range of the camera core, increasing the amount of image data available for processing and providing enhanced sensitivity. In its maximum range configuration, the system detects inbound vehicle-sized objects up to 1,600 meters and humans up to 650 meters.

B. SECTION INCLUDES

1. SL-SS-NS series Global Positioning System (GPS) Analytic Target Sensor - Thermal (Long Wavelength Infrared (LWIR))
2. SL-SM-CS Sensor co-ordination and map-based target Global Positioning System (GPS) display software

C. LABOR AND MATERIALS

Unless otherwise provided in the Drawings and Specifications, the Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the Work.

D. REFERENCES

1. Conformity for Europe (CE)
2. Consultative Committee for International Radio (CCIR)
3. Electronic Industry Association (EIA)
4. Federal Communications Commission (FCC)
5. Institute of Electronic and Electrical Engineers (IEEE)
6. International Electrotechnical Commission (IEC)
7. International Organization for Standardization (ISO)
8. National Television System Committee (NTSC)
9. Phase Alternation by Line (PAL)
10. Underwriters Laboratories Inc. (UL)
11. Underwriters Laboratory Canada (ULC)
12. Factory Mutual (FM)
13. National Electrical Manufacturers Association (NEMA)
14. European Committee for Electro Technical Standardization (CENELEC)

E. DEFINITIONS

1. No Substitutes: The exact make and model number identified in this specification shall be provided without exception.
2. Or Equal: Any item may be substituted for the specified item provided that in every technical sense, the substituted item provides the same or better capability and functionality
3. Or Approved Equal: A substitute for the specified item may be offered for approval by the Owner. The proposed substitution must, in every technical sense, provide the same or better capability and functionality as the specified item. Such requests for approval shall be submitted in accordance with the provisions, and must be obtained within the time frames outlined.

F. DRAWINGS AND SPECIFICATIONS

1. Contractor shall be provided three (3) sets of the Drawings and Specifications for his use. Additional sets, if requested by Contractor, shall be furnished to the Contractor for the actual cost of reproduction.
2. Contractor shall carefully study the Drawings and Specifications, and shall at once report any error, unforeseen circumstances, inconsistency or omission he may discover.

G. SUBMITTALS

1. General: Submittals shall be made in accordance with the Conditions of the Contract and Submittal Procedures Section.
2. Shop Drawings and Schematics: Shall depict the thermal video detection system in final proposed "as built" configuration. The following must be provided:
   I. Connection diagrams for interfacing equipment.
   II. List of connected equipment.
   III. Locations for all major equipment components to be installed under this specification.
3. Product Data: The following shall be provided:
   I. Technical data sheets.
   II. A complete set of instruction manuals.
4. Quality Assurance Submittals: A final test report shall be submitted to indicate that every device was tested successfully in a system test.

H. DELIVERY, STORAGE AND HANDLING

1. General: Delivery, storage, and handling of thermal video detection system shall be in accordance with the manufacturer's recommendations.
2. Ordering: The manufacturer's ordering instructions and lead-time requirements must be followed to avoid installation delays.
3. Delivery: The thermal video detection system shall be delivered in the manufacturer's original, unopened, undamaged container with identification labels intact.
4. Storage and Protection: The thermal video detection system shall be stored in a temperature environment of-30° to +70°C (-22° to 158°F) and protected from mechanical and environmental conditions as designated by the manufacturer.
   I. A sunshield shall be provided for protection from the direct rays of the sun to reduce internal housing temperatures.
   II. Where icing is to be expected, a window heater with automatic thermostat control and remote shutoff override shall be provided.

I. PROJECT/SITE CONDITIONS

1. Temperature Requirements: Products shall operate in an environment with an ambient temperature range of -30° to +60°C (-22° to 140°F).

J. WARRANTY

Manufacturer shall warrant the thermal video detection system to be free from defects in material or workmanship for a period of at least one year. Maintenance releases for embedded firmware shall be supported for a minimum of one year.

M. ACCEPTABLE MANUFACTURER

1. SightLogix or equal

   SightLogix, Inc.
   745 Alexander Road
   Princeton, NJ 08540
   Phone +1 609.951.0008
   Fax +1 609.951.0024
   www.sightlogix.com

2. Substitutions: Not Permitted unless equal
3. All modules shall be supplied from a single manufacturer

GENERAL SYSTEM DESCRIPTION

The thermal video detection system consists of an imager, complete with lens optics, built-in video analytics processing, embedded software, and environmental NEMA 4X nitrogen-purged housing. The system detects targets that violate security rules and specifies their GPS position, allowing synchronization with other system elements, including pan-tilt-zoom (PTZ) surveillance cameras and video management and situational awareness software packages.

THERMAL VIDEO DETECTION SYSTEM

1. The system shall receive infrared energy in the wavelength range of 8 – 14 micron emanating from potential objects of interest within the detection zone of the camera via an un-cooled Vanadium Oxide (VOx) microbolometer detector.

2. The system shall provide built in electronic motion stabilization to negate the effects of wind and vibration and allow undiminished operation of the video processor.
3. The system shall electronically factor out the effects of motion in a background environment of land, sky, or water in order to allow detection of foreign objects.
4. The system shall provide discrimination of small objects in a background of scene clutter by requiring no more than sixteen (16) scene pixels for object detection.
5. Data security: The system shall be capable of providing data security through AES encryption of system metadata, and control information; authentication (basic and digest log-in); and system tamper alarms. Secure Sockets Layer (SSL) protocol shall be used for trusted external communications to other system devices.
6. GPS Registration: The system shall use a geo-registration technique to capture the Global Positioning System (GPS) location of detected objects, and provide for communication of this information to other system elements providing tracking and display capability.
7. The system shall provide the following analytic capabilities:
    a. Modes: motion zone, multi-mode tripwire, directional zone violation, loitering, to and from zone
    b. Target information: height, width, speed, direction, aspect-ratio and absolute GPS position.
8. Zone configuration and requirements:
    a. The system's field of view shall be able to be divided into a collection of independent zones or regions, each with the ability to specify different alert criteria. Zones shall be capable of being designated as alarm or mask types.
    b. Each alarm type zone shall be able to be associated with a set of rules that specify more precisely the conditions under which alarms are generated. These rules must allow restricting alarms by time, by tripwire, by previous path, or by target attributes such as the target's size, speed, direction, and shape (aspect ratio). (See paragraph 2.02 G.)
    c. Zone alarm triggers: The following shall be elements of zone alarm trigger criteria:
        I. Object moving within zone (default).
        II. Configuration for response to analytic criteria referenced in paragraph 2.02 G.
        III. Multiple per zone trigger criteria.
9. The system shall support Moving Picture Experts Group MPEG-4 and Motion JPEG MJPEG compression, dual streaming, up to 30 frames per second.
10. The system shall have the ability for the data to stream at a Constant Bit-rate (CBR) or Variable Bit-Rate (VBR) with independent bit-rate settings for detection and non-detection conditions.

11. The system will provide a standard 10/100 Ethernet interface and optional 802.11 a/b/g interface.
12. The system shall allow for configurable bandwidth from 64 kbps to 8 Mbps, supporting satellite, cellular, wireless, and full broadband communication
13. The system shall be housed in a NEMA 4X nitrogen-purged enclosure.
14. The system shall use a rugged, multi-contact sealed Mil-C electrical connector that supports connectivity for power and data signals in a single unit and provides the means for removal from the enclosure for maintenance and installation.
15. The system shall not require any supplemental cooling and shall be available with supplemental heating.
16. The system shall be available with multiple lens combinations (see paragraph 2.03 - System Performance) providing acceptable trade-offs of field of view versus detection distance.

SYSTEM PERFORMANCE

1. Detection Reliability: The system shall reliably detect up to 64 human pedestrian targets in under one second, with each target occupying as few as 16 pixels, anywhere in the field of view, while simultaneously enduring a total physical imager movement of less than 100 pixels (shake from wind gusts, etc.) at a frequency of up to one hertz.
2. Object Tracking: The system shall be able to reliably track 64 objects simultaneously.
3. Field of View (FOV) and human detection distance: The system, when configured with appropriate lens and imager, shall detect objects directly approaching, with size as specified in paragraph 2.03 A, at the following minimum distances within the given field of view:

FOV (degrees)	Distance (meters)	Distance (feet)
50	90	295
36	130	425
20	230	755
14	330	1080
7	660	2165

4. Temperature range: The system shall operate in an environment with an ambient temperature range of -30° to +60°C (-22° to 140°F).

SPECIFICATIONS

A. Imager:

Detector:	Un-cooled Vanadium Oxide (VOx) Microbolometer
Detector Pitch	38 micron
Spectral Response	8-14 micron
Picture Elements	320 (H) x 240 (V)Lens (fixed):
Lens - Field of Views	7°, 14°, 20°, 36°, 50° available
Dynamic Range	16 bit digital sensor interface
NETD	< 85mK
Focus Adjustment	Fixed focus

B. Network:

Ethernet Compliance:	
Wired:	IEEE 802.3, 802.3i, 802.3u
Wireless:	IEEE 802.11 a/b/g (optional)
Interfaces:	
Wired:	RJ45
Wireless:	Integral (optional)
Data Rate:	64 kbps to 8 Mbps
Operating Mode:	Full-duplex
Network Protocols:	Internet Protocol (IP), User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Dynamic Host Control Protocol (DHCP), Address Resolution Protocol (ARP), Interior Gateway Management Protocol (IGMP) 3.0, Domain Naming System (DNS), Hypertext Transfer Protocol (HTTP and HTTPS), Real-Time Transport Protocol (RTP), Real-Time Streaming Protocol (RTSP), Network Time Protocol (NTP), Secure Shell (SSH), Secure Socket Layer/Transport Layer Security (SSL/TLS),Service Location Protocol (SLP)

C. Video Output

Compression Type:	MPEG-4– ISO/IEC 14496-2:1999 (Simple Profile, Advanced Simple Profile) MJPEG
Bit Rate Profile:	Constant (CBR) or variable bit rate (VBR)
Resolution:	320x240
Frame Rate (frames per second):	1, 2, 3, 4, 5, 6, 8, 10, 15, 20, 25, 30

D. Electrical

Voltage:	24 VAC/DC +/- 10%
Connector (power & data)	26 pin Mil-C
Power:	20 watts nominal 60 watts w/optional heater

E. Mechanical

Weight:	6.8 kg (15 lbs.)
Dimensions:	47.3 cm L x 16.2 cm W x 16.8 cm H (18.6” x 6.4” x 6.6”)
Enclosure:	NEMA 4X (IP66 compliant)
Nitrogen purge pressure	10 psi
Mounting:	3 x ¼-20 threads per inch (tpi) bolts

F. Environmental

Operating Temperature:	-30° to +60°C (-22° to 140°F)
Storage Temperature	-30° to +70°C (-22° to 158°F)
Relative Humidity:	0 to 100%
Emissions:	FCC Part 15, Class A

G. COMPATIBLE SYSTEM ELEMENTS

H. Tracking System: The system shall be capable of communicating with a tracking system, providing target GPS coordinates to allow PTZ camera positioning unit and continual target tracking.

a. Communication shall be via industry standard Extensible Markup Language (XML) over a Hypertext Transfer Protocol HTTP/HTTP Secure HTTPS interface and include real time reports of objects tracked, camera name, serial number, firmware version, GPS position, bearing, and vital operating information.

b. Tracked object parameters shall include current time, alarm state, creation time, GPS position, size, heading, speed, aspect ratio, and alarm zone.

I. Display System:

a. Display system shall display topological position and field of view of all video detection system units, overlaid on a geo-positioned aerial image of the surveillance area. This aerial image can be in standard image formats (e.g. JPEG)

b. Display system shall plot GPS locations of all security violations overlaid on a geo-located aerial image of the surveillance area in real time via red dot markings.

4.7.1.1.3 PTZ Camera Performance Specifications

Pelco Spectra IV or equal:

A. GENERAL

A. All equipment and materials used shall be standard components that are regularly manufactured and used in the manufacturer's system.

B. All systems and components shall have been thoroughly tested and proven in actual use.

C. All systems and components shall be provided with the availability of a toll-free (U.S. and Canada), with an international number,24-hour technical assistance program (TAP) from the manufacturer. The TAP shall allow for immediate technical assistance for either the dealer/installer or the end user at no charge for as long as the product is installed.

D. All systems and components shall be provided with a one-day turnaround repair express and 24-hour parts replacement. The repair and parts express shall be guaranteed by the manufacturer on warranty and nonwarranty items.

B. INDOOR/OUTDOOR CAMERA DOME SYSTEM

A. The indoor/outdoor camera dome system shall provide a 100Base-TX network interface for live streaming to a standard Web browser.

B. The indoor/outdoor camera dome system shall be a discreet camera dome system consisting of a dome drive with a variable speed/high speed pan/tilt drive unit with continuous 360° rotation; 1/4-inch high resolution color, monochrome, or color/black-white charge coupled device (CCD) camera; motorized zoom lens with optical and digital zoom; auto focus; and an enclosure consisting of a black box, lower dome, and a quick-install mounting.

C. The indoor/outdoor network positioning camera shall support standard IT protocols.

D. The indoor/outdoor network positioning camera shall use a standard Web browser interface for remote administration and configuration of camera parameters. The browser interface shall support multi-screen remote monitoring for up to 16 cameras on the same virtual local area network (VLAN) and provide PTZ (Pan Tilt Zoom) control including preset and pattern and on-screen display (OSD) for access to camera programming.

E. The indoor/outdoor network positioning camera shall feature open architecture connectivity for third-party software recording solutions allowing integration into virtually any IP-based system. It is also compatible with Endura and Digital Sentry® video management systems. As with all Pelco Internet Protocol (IP) camera solutions, Spectra® IV IP is Endura Enabled™ to record, manage, configure, and view multiple live streams.

F. The indoor/outdoor fixed dome system shall meet or exceed the following design and performance specifications.

C. ELECTRICAL SPECIFICATIONS

A. Ports	RJ-45 for 100Base-TX Auto MDI/MDI-X Autonegotiate/Manual setting
B. Cabling	Cat5 cable or better for 100Base-TX
C. Input Voltage	18 to 32 VAC; 24 VAC nominal 22 to 27 VDC; 24 VDC nominal
D. Input Power	
1. 24 VAC	23 VA nominal (without heater); 73 VA nominal (with heater)
2. 24 VDC	0.7 A nominal (without heater); 3 A nominal (with heater)
E. Alarm Outputs	
1. 35X SE, 27X SE	7
2. 23X SL	1
F. Auxiliary Outputs	
1. 35X SE, 27X SE	2
2. 23X SL	1

D. VIDEO SPECIFICATIONS

A. Video Encoding	H.264 base profile, MPEG-4, MJPEG
B. Video Streams	2, simultaneous
C. Frame Rate	Up to 30, 25, 24, 15, 12.5, 12, 10, 8, 7.5, 6, 5, 4, 3, 2, 1 (dependent upon coding, resolution, and stream configuration)
D.	Available Resolutions

*Recommended

Resolution			MJPEG		H.264 Base Profile		MPEG-4	
W	H	Format	Max IPS	Rec* Bit Rate	Max IPS	Rec* Bit Rate	Max IPS	Rec* Bit Rate
704	480	NTSC	30 ips	5.4 Mbps	30 ips	1.9 Mbps	30 ips	2.0 Mbps
352	240	NTSC	30 ips	1.3 Mbps	30 ips	0.5 Mbps	30 ips	0.6 Mbps
704	576	PAL	25 ips	5.4 Mbps	25 ips	1.9 Mbps	25 ips	2.0 Mbps

E. Web User Interface — Pelco Device Utility interface for viewing HTTP, requires Java Runtime Environment (JRE™)

F. Supported Protocols — TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, RTSP, NTP, IPv4, SNMP, QoS, HTTP, HTTPS, LDAP (client),
SSH, SSL, SMTP, FTP, mDNS (Bonjour®) and

G. Users — 20 simultaneous using unicast; unlimited using multicast H.264 or MPEG-4 802.1x (EAP)

H. Software Interface — Web browser view and setup, up to 16 cameras

I. Pelco System Integration — Endura® 1.5 or later (MPEG-4) or Endura® 2.0 or later (H.264); Digital Sentry® 4.2 IP bundle 3 or later; DX8100 Series 2.0 or later; and DVR5100 version 1.5.4 or later

J. Open IP Integration — Pelco IP camera API

K. Minimum Web Browser Requirements

1. Processor — Intel® Pentium® 4 microprocessor 1.6 GHz
2. Operating System — Microsoft® Windows® XP, Windows Vista®, or Mac® OS X 10.4 or later
3. Memory — 512 MB
4. Network Interface Card — 100 Mbps or greater
5. Web Browser* — Internet Explorer® 7.0 or later, Mozilla® Firefox® 3.0 or later
6. Monitor — 1024 x 768 pixels resolution, 16- or 32-bit pixel color resolution

*Internet Explorer is not supported by Mac OS X 10.4.

E. DOME DRIVE

A. The variable speed/high speed pan/tilt dome drive unit shall meet or exceed the following design and performance specifications.

1. Pan Speed — Variable between 400° per second continuous pan to 0.1° per second

2. Vertical Tilt	Unobstructed tilt of +2° to –92°
3. Manual Control Speed	Pan speed of 0.1° to 80° per second, and pan at 150° per second in turbo mode. Tilt operation shall range from 0.1° to 40° per second
3. Automatic Preset Speed	Pan speed of 400° and a tilt speed of 200° per second
4. Presets	
a. 35X SE, 27X SE (Models)	256 positions with a 20-character label available for each position; configurable camera settings, including selectable auto focus modes, iris level, LowLight™ limit, and backlight compensation for each preset; command to copy camera settings from one preset to another; and preset configuration through control keyboard or through dome system on-screen menu
b. 23X SL (Model)	64 positions with a 20-character label available for each position; configurable camera settings, including selectable auto focus modes, iris level, and backlight compensation for each preset; command to copy camera settings from one preset to another; and preset programming through control keyboard or through dome system on-screen menu
c. Preset Accuracy	± 0.1°
d. Proportional Pan/Tilt Speed	Speed decreases in proportion to the increasing depth of zoom
8. Automatic Power Up	
a. 35X SE, 27X SE (Models)	User-selectable to the mode of operation; the dome will resume when power is cycled, including an automatic return to position or function before power outage
b. Zones	8 zones with up to 20-character labeling for each, with the ability to blank the video in the zone
c. Motor Drive	Cogged belt with 0.9° stepper motor
d. Motor Operating Mode	Microstep to 0.015° steps
e. Motor	Continuous duty and variable speed, operating at 18 to 32 VAC, 24 VAC nominal
f. Limit Stops	
a. 35X SE, 27X SE (Models)	Configurable for manual panning, auto/random scanning, and frame scanning
g. Inner Liner	Rotating black ABS liner inside a sealed lower dome
h. Alarm Inputs	
a. 35X SE, 27X SE (Models)	Ability to control 7 alarm inputs
b. 23X SL (Model)	Ability to control 1 alarm input
i. Alarm Outputs	

a. 35X SE, 27X SE (Models)	Ability to control 1 auxiliary Form C relay output and 1 open collector auxiliary output
b. 23X SL (Model)	Ability to control 1 auxiliary Form C relay output
j. Alarm Output Configuration	Auxiliary outputs can be alternately configured to operate on alarm
k. Alarm Action	Individually configured for 3 priority levels, initiating a stored pattern or going to a preassigned preset position
l. Resume after Alarm	After completion of alarm, dome returns to previously configured state or its previous position
m. Window Blanking	
a. 35X SE, 27X SE (Models)	8, four-sided user-defined shapes, each side with different lengths; window blanking setting to turn off at user-defined zoom ratio; window blanking set to opaque gray or translucent smear; blank all video above user-defined tilt angle; blank all video below user-defined tilt angle
b. 23X SL (Model)	4, four-sided user-defined shape, each side with different lengths; window blanking setting to turn off at user-defined zoom ratio; window blanking set to opaque gray or translucent smear; blank all video above user-defined tilt angle; blank all video below user-defined tilt angle
n. Patterns	
a. 35X SE, 27X SE (Models)	8 user-defined configurable patterns including pan/tilt/zoom and preset functions, and pattern configuration through control keyboard or through dome system on-screen men
b. 23X SL (Model)	1 user-defined configurable pattern1 including pan/tilt/zoom and preset functions, and pattern configuration through control keyboard or through dome system on-screen menu
o. Pattern Length	User-defined length based on dome memory
p. Internal Clock	Internal system clock, user configurable for 12- or 24-hour day format and mm/dd/yy or dd/mm/yy calendar format
q. Scheduler	Internal scheduling system for configuration presets, patterns, window blanks, alarms, and auxiliary functions based on internal clock settings
r. Autosensing	Automatically sense and respond to protocol utilized for controlling the unit whether Coaxitron® or RS-422 Pelco P or Pelco D protocols
s. Menu System	Built-in setup of configurable functions and multiple languages including English, French, Italian, Spanish, Portuguese, German, Russian, Turkish, Polish, and Czech

t. Auto Flip	Rotates dome 180° at bottom of tilt travel
u. Password Protection	Configurable settings with optional password protection
v. Clear	Clear individual, grouped, or all configured settings
w. Freeze Frame	Freeze current scene of video during preset movement
x. Display Setup	User-definable locations of all labels and displays and user-selectable time duration of each display
y. Azimuth/Elevation/Zoom	On-screen display of pan/tilt locations and zoom ratio
z. Compass Display	On-screen display of compass heading and user-definable compass setup
aa. Camera Title Overlay	20 user-definable characters on the screen camera title display
bb. Video Output Level	User-selectable for normal or high output levels to compensate for long video wire runs
cc. Dome Drive Compatibility	All dome drives are compatible with all back box configurations
dd. RJ-45 Jack	Contains a plug-in jack on the dome drive for control and setup of the unit, the uploading of new operating code and language file updates, and is compatible with personal computers
ee. Remote Data Port	
	Compatibility Ability to set up and control unit, and upload new operating code and language file updates through the easily accessible optional remote data port; remote data port is also compatible with personal computers
ff. Power Consumption	Maximum 70 VA

F. The high resolution CCD camera shall meet or exceed the following design and performance specifications.

<u>Color/Black-White Optic System (35X)</u>

1. Image Sensor	1/4-inch EXview HAD™ CCD
2. Scanning System	Interlace/Progressive selectable
3. Effective Pixels	
a. NTSC	768 x 494
b. PAL	752 x 582
4. Horizontal Resolution	
a. NTSC	>540 TVL
b. PAL	>540 TVL
5. Lens	f/1.4 (focal length, 3.4~119 mm; 35X optical zoom, 12X digital zoom)
6. Configurable Zoom Speeds	3.2, 4.6, or 6.6 seconds
7. Horizontal Angle of View	55.8° at 3.4 mm wide zoom, 1.7° at 119 mm telephoto zoom
8. Focus	Automatic with manual override

9. Sensitivity at 35 IRE	
a. NTSC/EIA	0.55 lux at 1/60 sec (color) 0.018 lux at 1/2 sec (color) 0.00018 lux at 1/2 sec (B-W)
b. PAL/CCIR	0.45 lux at 1/50 sec (color) 0.015 lux at 1/1.5 sec (color) 0.00015 lux at 1/1.5 sec (B-W)
10. Synchronization System	Internal/AC line lock phase adjustable through remote control, V-sync
11. White Balance	Automatic with manual override
12. Shutter Speed	
a. NTSC	1/2~1/30,000
b. PAL	1/1.5~1/30,000
13. Iris Control	Automatic with manual override
14. Gain Control	Automatic/ off
15. Video Output	1 Vp-p, 75 ohms
16. Video Signal-to-Noise	>50 dB
17. Type of Lighting	Menu selection of indoor or outdoor lighting for optimum camera performance
18. Wide Dynamic Range	128X
19. Motion Detection	User-definable motion detection settings for each preset scene, can activate auxiliary outputs, and contains three sensitivity levels per zone
20. Electronic Image Stabilization	Electronic compensation for external vibration sources that cause image blurring; user selectable for 2 frequency ranges, 5 Hz (3~7 Hz) and 10 Hz (8~12 Hz)
21. Image Enhancement	Electronic improvement of sharpness of objects, lines or text in high contrast areas

<u>Color/Black-White Optic System (27X)</u>

1. Image Sensor	1/4-inch EXview HAD™ CCD
2. Scanning System	Interlace/Progressive selectable
3. Effective Pixels	
a. NTSC	768 x 494
b. PAL	752 x 582
4. Horizontal Resolution	
a. NTSC	>540 television lines (TVL)
b. PAL	>540 TVL
5. Lens	f/1.4 (focal length, 3.4~91.8 mm; 27X optical zoom, 12X digital zoom)
6. Configurable Zoom Speeds	3.2, 4.6, or 6.6 seconds
7. Horizontal Angle of View	55.8° at 3.4 mm wide zoom, 2.3° at 91.8 mm telephoto zoom
8. Focus	Automatic with manual override
9. Sensitivity at 35 IRE	

a. NTSC/EIA	0.55 lux at 1/60 sec (color) 0.018 lux at 1/2 sec (color) 0.00018 lux at 1/2 sec (black and white (B-W))
b. PAL/CCIR	0.45 lux at 1/50 sec (color) 0.015 lux at 1/1.5 sec (color) 0.00015 lux at 1/1.5 sec (B-W)
10. Synchronization System	Internal/AC line lock phase adjustable through remote control, V-sync
11. White Balance	Automatic with manual override
12. Shutter Speed	
a. NTSC	1/2~1/30,000
b. PAL	1/1.5~1/30,000
13. Iris Control	Automatic with manual override
14. Gain Control	Automatic/ off
15. Video Output	1 Vp-p, 75 ohms
16. Video Signal-to-Noise	>50 dB
17. Type of Lighting	Menu selection of indoor or outdoor lighting for optimum camera performance
18. Wide Dynamic Range	128X
19. Motion Detection	User-definable motion detection settings for each preset scene, can activate auxiliary outputs, and contains three sensitivity levels per zone

<u>Color/Black-White Optic System (23X)</u>

1. Image Sensor	1/4-inch EXview HAD™ CCD
2. Scanning System	2:1 interlace
3. Effective Pixels	
a. NTSC	768 x 494
b. PAL	752 x 582
4. Horizontal Resolution	
a. NTSC/PAL	>540 TVL
5. Lens	f/1.6 (focal length, 3.6~82.8 mm; 23X optical zoom, 12X digital zoom)
6. Configurable Zoom Speeds	2.9, 4.2, or 5.8 seconds
7. Horizontal Angle of View	54° at 3.6 mm wide zoom, 2.5° at 82.8 mm telephoto zoom
8. Focus	Automatic with manual override
9. Sensitivity at 35 IRE	
a. NTSC/EIA	0.65 lux at 1/60 sec (color) 0.15 lux at 1/60 sec (B-W)
b. PAL/CCIR	0.55 lux at 1/50 sec (color) 0.12 lux at 1/50 sec (B-W)
10. Synchronization System	Internal/AC line lock phase adjustable through remote control, V-sync
11. White Balance	Automatic with manual override

12. Shutter Speed
    a. NTSC 1/2~1/30,000
    b. PAL 1/1.5~1/30,000
13. Iris Control Automatic with manual override

14 Gain Control Automatic/ off

15. Video Output 1 Vp-p, 75 ohms
16. Video Signal-to-Noise >50 dB

4.7.1.2 Video Wall Displays

Planar Systems – Clarity Matrix 46 inch LCD Display

Matrix Specifications	
Specification List	Diagonal Size: 46 Inches Resolution: 1366 x 768 or better Aspect ratio (W:H) : 16:9 Technology: Commercial-grade direct view LCD Tiled image-to-image gap (min.) : 7.3 mm or better Brightness (maximum) : 700 candelas or nits Response time (typical) : 8ms or better Contrast ratio (full field) : 3000:1 or better Full viewing angle : 178° Colors : 16.7 million Backlight type : CCFL Backlight life (1/2 brightness) : 50,000 Hrs Mounted depth : 4.5" wall to front of screen Acoustic noise : Fan-less operation Heat load : 680 BTU per hour at 500 nit Operating temperature range : 5°-35°C Operating humidity range : 20-80% RH non-condensing Backlight control : Individual and wall control Backlight sensing and reporting : At display level Display module position sensing : Auto-sensing integrated Power consumption : 275-350 watts per panel (Approximately) Redundancy: 1+1 redundant power supplies for full 8 panels (Optional) Power supply voltage: 100-230V AC ± 10%, 50 to 60 Hz Power status: Diagnostics LEDs, health monitoring and alerts Safety regulations: Complies with EN60950, FCC Class A, CISPR22/85, CE,

4.7.1.3 Video Recorder 32 Channel H.264 Performance Specification

Pelco DS RealVue Xpress Hybrid Video Recorder with 4TB Storage

SYSTEM

Operating System	Windows® XP Professional
User Interface	DS ControlPoint
Internal Storage	500 GB, 1 TB, 2 TB, or 4 TB

VIDEO/AUDIO

Video Standards	NTSC/PAL	
Video Encoding	MPEG-4	
Video Decoding	iVEX, MPEG-4, MJPEG, wavelet, H.264	
Video Resolutions		
(Analog Cameras)	NTSC	PAL
D1	720 x 480	720 x 576
2CIF	704 x 240	704 x 288
CIF	352 x 240	352 x 288
Analog Camera Inputs	8, 16, or 32	
IP Camera Resolution	Up to 10 Megapixels	
IP Camera Capacity	16	
Recording Rate per Channel	30 ips (NTSC), 25 ips (PAL)	
Audio Channels	Up to 16	
Codec	MPEG1 Layer 2	
Bits Per Second	32 to 192 Kbps	
Sampling Frequency	32 kHz	

AUXILIARY INTERFACES

PTZ Interface	RS-232, RS-422, RS-485
Network	10/100/1000Base-T
Alarm Inputs	16 dry contact
Relay Output	1 Form C

MECHANICAL

Connectors

BNC	Video inputs and outputs
Terminal Blocks	Input triggers, audio inputs, RS-422/RS-485, output relays
Dual-DB15, RCA	Video inputs (unused)
USB	4 high-speed USB 2.0 ports: connect mouse and keyboard
DB15	VGA port
RJ-45	Dual 10/100/1000 Megabit Ethernet ports
6-Pin Mini-DIN	PS/2 mouse and keyboard
Audio Connectors	Miniature phono plug for line in (unused), line out, and microphone in (unused)
DB25	Printer

Optional I/O Connectors

Audio Levels	
Input	Line-level input
Output	Line-level output
Audio Connectors	Terminal block
Audio Inputs	Up to 16
Trigger Connectors	Terminal block
Trigger Inputs	TTL, dry contact to GND
Outputs	Form C relay, contact closure
RS-422/RS-485	Terminal block

ENVIRONMENTAL

Operating Temperature	50° to 95°F (10° to 35°C)
Storage Temperature	–40 to 149°F (–40 to 65°C)
Operating Humidity	20% to 80%, noncondensing
Operating Altitude	-50 to 10,000 ft (–15 to 3,048 m)
Operating Vibration	0.25 G at 3 Hz to 200 Hz at a sweep rate of 0.5 octave/min.

REMOTE PC CLIENT REQUIREMENTS

CPU Speed	Intel Core2 Quad Q9400 2.66 GHz (4 cores)
VGA Card	NVIDIA® GeForce™ 9600 GT (512 MB, minimum)
Memory	4 GB RAM

CERTIFICATIONS

- CE, Class A
- FCC, Class A
- UL Listed

4.7.1.4 PTZ Camera Code Translator

Sennetech SCT-1069 Camera Control Code Translator

The SCT-1069 is a Pelco to Panasonic control code translator designed to permit control of Panasonic cameras from Pelco controllers. It receives Pelco RS-422 commands and transmits the appropriate commands in Panasonic RS-485 code format. There are four independent Panasonic outputs.

Internal configuration switches allow the translator to work with Pelco "P" code or "D" code.

Input and output connections are made with mating screw terminal connectors. Front panel LEDs indicate status of power, receive, and transmit.

There is an optional 19" rack mount panel (one rack unit high).

Version 1.1 adds an auto iris command and a switch for sending old Panasonic code.
Version 1.3 changes the menu cursor commands to accomodate the CM9760 keyboard.
Version 1.5 Adds capability of sending Pansaonic menu cursor commands using Pelco goto preset commands.

SPECIFICATIONS

Size:	19"W x 1.75H x 5.45D
Weight:	1.5 lb
Power:	9Volt to 18Volt AC or DC at .75 Watts
Indicators:	Front panel LEDs: Power, Rx, & Tx
Biphase input:	(1) 3-pin mating screw terminal
Panasonic Outputs:	(4) 3-pin mating screw terminal

4.7.1.5 Keyboard with PTZ Control

PELCO KBD-5000 or Equal

TECHNICAL SPECIFICATIONS

A. The keyboard shall be compatible with all distributed, network-based video products. One keyboard can control all system cameras through a video console display or DVR display.

B. The keyboard controls are located on three modules in the keyboard. Modules shall be capable of rotating to suit user preferences. The keyboard modules shall include a variable speed, vector-solving joystick for precise pan/tilt/zoom (PTZ) control, jog/shuttle for playback control and pattern control, a keypad for camera and monitor control, and a built-in speaker. The keyboard shall have LED buttons that work in conjunction with the feature being used.

C. The keyboard shall be part of an integrated system and shall be configured so any number of keyboards can be added to the system. When combined with user interfaces (UIs), network video

recorders (NVRs), encoders, digital video recorders (DVRs), and video consoles, the keyboard forms an integral part of a complete network-based video control system.

D. The keyboard shall meet or exceed the following design and performance specifications.

POWER SUPPLY SPECIFICATIONS

A. Input Voltage	100-240 VAC, 50/60 Hz
B. Output Voltage	12 VDC
C. Power Output	20 W
D. Input Connector Type	Universal, interchangeable
E. Output Connector Type	2.5 mm screw-on barrel

KEYBOARD BASE SPECIFICATIONS

A. Keyboard Interface	Universal Serial Bus USB 2.0
B. Cable	USB, captive, 16.4 ft (5.0 m)
C. Input Voltage	12 VDC
D. Input Current	1.3 A (maximum)
E. Upstream Port	USB 2.0 (USB type B connector)
F. Downstream Port	2x USB 2.0 hi/full/low speed (USB type A connector)
G. Audio Output	Embedded speaker or plug-in headset, 0.5 W into 8-ohm load per channel
H. Audio Input	Plug-in microphone, mono (30 to 350 mVp-p); or line input, stereo (0.35 to 2.0 Vp-p)

KEYBOARD MODULE SPECIFICATIONS

A. Keyboard Keypad	0 to 9 keys, camera, monitor, and multiple view keys
B. Joystick	Fully proportional pan/tilt, variable speed; with zoom, iris, and focus controls
C. Jog/Shuttle	Proportional, fast forward, reverse, and video transport; menu navigation on VCD5000 video console display
D. Module Connectors	3 (1 for each module), USB 1.1 mini-USB

PHYSICAL SPECIFICATIONS

A. Dimensions	7.86” D x 14.76” W x 4.6” H (19.96 x 37.54 x 11.68 cm)
B. Unit Weight	2.68 lb (1.22 kg)

ENVIRONMENTAL SPECIFICATIONS

A. Ambient Temperature	70° to 74°F (21° to 23°C

B. Operating Temperature 32° to 104°F (0° to 40°C)
C. Operating Humidity Up to 96%

4.7.1.6 Operator Workstations

Wright-Line Profile Series

Core

The core serves as the primary structural foundation for the console system with heavy-duty 14 gauge and 16 gauge CRS (cold rolled steel). Overall construction is an open frame to maximize service access to interior of the core and to minimize any barriers to internal cabling and wiring. The base of the core (area of core parallel to flooring) and the top of the core is permeated with multiple cable ports to permit vertical cable management from core to (optional) attached walls. The sides of the core (perpendicular to floor) are permeated with similar portals to permit lateral cabling among cores. Portals measure 3-inches and 4-inches in diameter and are trimmed with a plastic sleeve to create a smooth, uniform surface. The core is available in (4) nominal sizes: 36, 48, 60 and 72 with an overall height of 28-30 inches to correlate to standard seated height applications. The core depth is approx. 6-inches deep to maximize internal cable management.

The core load rating is 1200-lbs based on a double-sided application and 750-lbs for a single-sided configuration. The core includes (2) adjustable glide feet to properly level unit. The face of the Core includes mounting points to accept cantilevered work surfaces. The core is a self-supporting unit with the stabilization of core-mounted feet or integrated docking stations for technology hardware.

The core accepts steel panels or skins to finish the exposed face of the core. These panels are easily removed by hand and permit service access to the interior of the core. Steel skins include a vent pattern to permit heat dissipation. The core accepts additional cores to create a continuous run of cores without breaks or interruptions. Additional cores shall attach mechanically without creating floor creep. The cores also accept connectors to create angled configurations based on 15-degree and 45-degree angles with a bolt-on vertical column that minimizes floor space consumption and permit continuous lateral cable management among cores. These connectors are available with concave and convex shape building options.

Core finish is epoxy powder-coated with a uniform application over all steel surfaces.

Work surface

Work surfaces are cantilevered tops that attach directly to a core and supported by (2) steel support brackets. The surface shall be mounted approx. 29-inches from the floor and provide clearance underneath the surface for optional keyboard platform accessories, personal storage modules or pedestals and optional storage for CPUs and rack mount hardware. The top is constructed of 45-lb particleboard construction with a decorative laminate finish on the top and an equivalent backer sheet on the underside of the top. Top thickness is 1.2-inch thick with a fully radiused bullnose front edge for comfort. The top is available in 30-in. and 36-in. depths and in widths to match core sizes: 36, 48, 60 and 72. Work surfaces shall be BIFMA rated to 300 lbs. (evenly distributed).

In additional to linear shapes, work surfaces styles also match the availability of concave and convex shaped workstation configurations. Work surface tops offer shapes to correlate to 15-degree and 45-degree angles.

Monitor Wall

A monitor wall is a vertical surface to support the attachment of ergonomic arms and user-supplied LCD Flat Panels. The framework is 14 gauge and 16 gauge CRS steel. This wall mechanically attaches directly to the top of a core to vertically stack and build viewing levels. The display wall is 12-inches to minimize vertical space consumption and maintains a sight line within room architecture. The wall matches the depth (6-inches) and width size of cores (36 - 72 wide) for space planning and appearance purposes. The wall includes an integrated 6063-T6 aluminum slat wall segment to accept mounting interfaces of monitor arms and optional filing accessories. The Flat Panel Display (FPD) wall includes multiple 3-inch and 4-inch portals to permit lateral and vertical pathways for cabling and wiring within a Profile unit. The base of each wall includes one (1) to two (2) removable raceway covers for accessibility to the interior of the display wall. These removable covers are trimmed with soft plastic edging or extrusions to permit seamless entry of cabling and wiring from the desktop into the display wall. A steel top trim finishes the exposed top portion of a display wall and shall be removable by hand. Top trim is constructed of steel with a dome shape to compliment system lines and includes an integrated vent pattern for heat dissipation.

The monitor wall gangs laterally to adjacent walls to create a continuous run of walls without breaks or interruptions. The walls also accept connectors to create angled configurations based on 15-degree and 45-degree standards with a bolt-on vertical column that minimizes desktop space consumption and permit continuous lateral cable management among walls. These connectors are available with concave and convex shape building options.

Monitor wall finish is epoxy powder-coated with a uniform application overall steel and aluminum surfaces.

4.7.1.7 Physical Security Information Management System (PSIM)

Proximex Surveillint™

- **PHYSICAL SECURITY INFORMATION MANAGEMENT (PSIM) GENERAL DESCRIPTION**
  - Contractor shall furnish and install Physical Security Information Management system (PSIM) for handling all security operations-related tasks and improve work efficiency without changing the existing security systems' functionality from a centralized workstation.
  - The system shall be able to integrate, connect and correlate information from security data and information from the following security subsystems.
    - CCTV management and control systems
    - Digital video recording systems
    - Physical access control systems
    - Intrusion Detection Systems

- Badge management systems
- Video analytics systems
- Response Systems
- Chemical/biological detection systems
- Radioactivity detection systems
- Phone Systems
- Intercom systems
- Motion detection systems
- Radar systems
- Location based device systems (RFID, GPS devices, etc)
- Computer Aided Dispatch Systems
- Notification Systems
- Building Management Systems
- IT Systems Management Systems
- Other related systems

o The system shall be able to display alarms from security subsystems based on predefined policies and business logic.

o The system shall enable the operator to quickly visualize the environment and assess alarm by reviewing related security information

o The system shall enable the operator to take action by sending an email, printing a report, dispatch with necessary information, etc.

PSIM PERFORMANCE AND OPERATING REQUIREMENTS

o **General PSIM Display Functionality**

The PSIM solution shall have the following general display functionality:

- View and handle multiple alarms at one time
- View multiple video windows at one time. Operators shall be able to resize and move video windows.
- View windows in a single monitor, across multiple monitors or video walls
- Access, display and manage events/alarms and related security data and information from subsystem based on priority and authority level.
- View and manage detailed response procedures and tasks
- Enable a single operator or multiple operators to monitor and control commands from connected subsystems, including all operational capabilities for detection, assessment, notification, entry control, and communications
- Provide the rapid annunciation and display of alarms to facilitate evaluation and assessment

- Enable different graphical user interface “skins” to be customized to provide a different look ‘n feel.

o **Map Display**

The PSIM solution shall have the following map display functionality

- View security environment through geospatial or fixed composite computer generated (JPEG, BMP, AutoCAD, etc.) map
- Allow user to interactively drill down to specified security zones and sub-zones
- Allow user to view sensor and related name from map console
- Allow resources and objects to be tracked on map with geo-referenced “breadcrumb” trail.
- Allow all resources, objects, sensors and elements on the map to be geo-referenced such that they have a real world coordinate.
- Visually display a camera sensor with related camera orientation, camera range and camera field of view angle
- Visually display an alarming sensor on map
- Visually differentiate sensor alarm severities on map through different color and icon identifiers
- Immediately view alarm details (including description, video, etc.) and investigate the alarm from the map
- Allow user to choose camera from map to view live video
- Allow user to choose camera and take live video image snapshot and save to file from any camera
- Allow user to choose camera from map to move PTZ cameras
- Allow user to choose camera icon from map to view recorded video from console
- Allow user to choose camera to play, pause, stop, fast-forward, rewind, and play recorded video from preset time
- Allow user to choose camera and take recorded video image snapshot and save to file or print from any live or recorded video
- Allow user to take action on Access Control door from console to open unlock door, relock door, allow momentary access for door, lock down door, release lock down
- Allow user to take query Access Control door from console to get last 5 activities for door, get activities for door in the last 5 minutes, get door activities for last hour, get door activities for the last day, etc.
- Allow user to view badge photo ID from door activity results
- Allow user to jump from one map to the next with a single click of a mouse with map links
- Allow map information “layers” to be displayed/hidden on items such as,
    - Sensor names

- ❖ Sensors
- ❖ Sensor range (camera – orientation, range, field of view angle)
- ❖ Security areas and zones
- ❖ Perimeter ranges
- ❖ Resource tracks

- Allow user to zoom in/out on different regions of map graphic

o **Navigation**

The PSIM solution shall have the following navigational display functionality:

- Allow user to navigate maps in a hierarchical list or tree based security zones or logical groups
- Allow user to navigate to a map or security zone through the map interface and through a graphical hierarchical tree view
- Allow user to quickly navigate to an open alarm through a hierarchical tree and related map.
- Allow user to navigate to search by sensor name and be directed to related graphical map
- Allow user to sort hierarchical tree by name of zone or area
- Visually indicate in the hierarchical tree/list if a sensor in a security zone is in an alarm state.
- Visually display the number of open alarms in a security zone or area in the hierarchical tree
- "Bubble up" the visual indication of the highest severity alarm to the next higher level in hierarchical tree.

o **Search and Trace Capabilities**

- Allow user to search and find sensor(s) names with text "wildcards"
- Allow user to search and find security zones and areas names with text "wildcards"
- Allow user to search and find alert ID to quickly find alert and alert details
- Allow user to search and trace all user activity related to a specific badge ID or user name
- Allow user to search and trace all user activity related to a specific user name

o **Video Display**

The PSIM solution shall have the following video display functionality:

- View live or recorded video from resizable and movable windows
- View live or recorded video from any monitor connected to PSIM workstation
- Display the same video controls irrespective of video system manufacturer
- Ability to perform video controls for video systems from PSIM workstation:
  - ❖ Play, fast-forward, rewind, pause, and specify time to play recorded video

        - Take a video still image (snapshot) from live or recorded video
        - Export video for user specified time and duration
        - Move PTZ cameras (if available)
    - View Video in Video Matrix
        - Display in 1x1, 2x2, 3x3 and 4x4 window formats
        - Enable predefined video windows to be displayed in matrix
        - Enable operator to specify video windows to be displayed in matrix
        - Enable matrix settings to be saved per user
        - View either live or recorded video can be displayed in the video matrix window.
        - Enable video snapshot to be taken and saved from any window pane in the matrix view
    - Rotate video in "virtual" video guard tour
        - Rotate through multiple video views based on predefined video camera sequence and duration.
        - Enable the user to pause the rotation of video and resume the video rotation again
        - Enable times between new video to be adjusted
        - Enable both live video and recorded video to be played through the video guard tour.
        - Enable alarms to be generated from any video pane
    - Enable user to only view and control video for which they have been assigned permissions by the administrator
    - Manually create an alarm from the live or recorded video with specified severity and description

- **Summary Dashboard**
    - Provide alarm summary of each monitoring zone or monitoring area in graphical chart format
    - Display the following charts per global area, monitoring zone or monitoring area
        - Open Alert Count by Monitoring Zone/Monitoring Area
        - New vs. Viewed (Opened Alerts)
        - Open Alert Count by Alert Severity
        - Highest Severity Alert
    - Enable Monitoring Zone or Monitoring area default to Summary view dashboard or to a map when the zone or area is selected.

- **Sensor List View**
    - Provide a tabular list of sensors in each monitoring area
    - Enable each column in the table to be sorted

- Enable each column to be filtered based on criteria
- Enable actions to be taken on each sensor similar to the icon on the map
  - For video cameras, choose the camera to view live video, recorded video, launch tracking capability, generate alert
  - For access control door choose the door to unlock door, relock door, allow momentary access for door, lock down door, release lock down, get last 5 activities for door, get activities for door in the last 5 minutes, get door activities for last hour, get door activities for the last day, etc.

o **Alarm Display**

The PSIM solution shall have the following alarm display functionality:

- Display real time, dynamic, iconic status of alarm point indications, overlaid onto a computer generated or GIS graphic map of the detection area and zone
- Display textual alarm description alarm status, severity, activity, operator actions, tasks and procedures, and time/date status.
- Allow users to view digital video scenes, automatically or manually, related to alarm for both live and recorded video
- Allow users to handle alarms based on priority
- Allow users to handle and view multiple alarms in individual windows or in a list
- Allow users to view alarm notification in system tray
- Allow users to view alarm notification and alarm summary in alert list window pane
- Allow users to view alarm notification in the hierarchical tree view
- Allow users to view alarm in a specific security zone and associated with specific sensor on the map
- Allow users to view a list of alarms associated to a sensor on the map
- Sort alarms list status by time/date
- Sort alarm list by severity (i.e. highest severity on top)
- Sort alarm list by alarm type
- Sort alarm list by location
- Allow users to choose which columns (details) are shown in the alarm list
- Allow users to scroll through multiple queued alarms
- Display associated queued video with each alarm
- Filter alarms by severity, status, sensor name, alert types
- Group alarms by type, location, sensor, etc.
- Subgroup alarms by type, location, sensor, etc.
- Have the same “look and feel” for different alarms generated or alarms generated from different systems
  - All alarm details are displayed in the same places and information is consistent

- Video windows and controls are in the same place and can be displayed with the same controls
- Notes are in the same location for different alarm types
- Acknowledgement of alarms can be performed in the same way for different alarms types
- Vendor specific information is displayed in the same portion of the user interface

o **Alarm Handling**

The PSIM solution shall have the following alarm handling functionality:

- Ability to display alarm condition through visual display and audible tone
- Ability to simultaneously handle multiple alarms from multiple workstations
- Ability to prioritize and display multiple alarms and status conditions according to pre-defined parameters such as alarm type, location, sensor, severity, etc.
  - Display the highest priority alarm and associated video in the queue as default, regardless of the arrival sequence
  - Place subsequent alarm in a queue according to predefined priorities without covering up or higher priority alarm
- Ability to automatically present an integrated window of the incident and access to the following incident related information and actions with a single mouse click or less
  - Related queued recorded video
  - Related live video from related camera
  - Related video PTZ controls (if camera is PTZ)
  - Related local map image with location of alarm
  - Related door activity
  - Related alarm notes
  - Acknowledge/close alarm
  - Take a visual image snapshots of live or recorded video to be printed, saved to disk or saved as a part of the alarm
  - Vendor specific sensor information (i.e. video analytics alarms may generate marked up images, etc.)
- Ability to automatically display related response instructions and tasks for each alarm
  - Tasks in checklist format
  - When tasks have been updated
  - Completion progress
  - Provide option to require operator to complete specific task(s) before alarm can be acknowledged or closed
- Ability to acknowledge or close alarms from central console and updates to be synchronized with related alarming security subsystems

- Ability to enter notes during the alarm and notes information to be shared with other users of the system
- Ability to view historical alarms that have been closed or acknowledged in the system to view activity, video, etc. (for duration of video being captured in the system)
- Ability to automatically stamp note entries with time/date and operator user name
- Enable new alerts to automatically open alert details window when alerts are received or for alerts to remain in the alerts list until a user clicks on the alert.
- Ability to generate comprehensive alarm report within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability to print comprehensive alarm report within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability to email comprehensive alarm report within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability to send comprehensive alarm report to wireless mobile device within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability for operator to quickly export associated video upon alarm occurrence.
- Ability to automatically and manually escalate alarms
  - Automatically escalate alarms if alarm is not addressed within a predefined time frame. Enable alarm to be escalated to new group or user and actions to be taken.
  - Operator can escalate and redirect alarm directly from the PSIM workstation while working on the alarm
  - Alarms can be redirected or escalated to pre-configured user group or user.
- Enable operator to generate a new alarm from map
  - Automatically capture the alarm time and date
  - Automatically capture the location of the alarm on the map
  - Enable operator to specify severity, alarm type, and alarm description
  - Enable appropriate response tasks to be associated with the alarms
  - Enable other operators to see and handle alarm similar to other alarm types
- Enable operator to generate a new video alarm while watching live or recorded video
  - Automatically capture the alarm time and date
  - Automatically capture the location of the alarm
  - Automatically capture video image snapshot and link to related video
  - Enable operator to specify severity and alarm description
  - Enable other operators to see and handle alarm similar to other alarm types

        - Enable appropriate response tasks to be associated with the alarms
    - Provide multiple alarm details display types based on operator experience
        - Simple view which defaults to alarm details and response tasks where operator chooses icons to view additional information such as video, notes, etc
        - All-in-one detailed views to provide operator with all relevant information at one time
    - Enable administrator to configure pop-up message if response tasks have not been completed for alarms before they are acknowledged or closed
    - Enable different sound types and sound files to be associated with different alarm types
    - Enable electronic voice playback of alarm and alarm description

- **Historical Alarm Handling**

  The PSIM solution shall have the following historical alarm handling functionality:

    - Ability to view historical alarms details even after the alarm has been acknowledged or closed.
    - Ability to sort alarms according to date/time, severity, type, and sensor ID or location.
    - Ability to group alarms according to date/time, severity, type, and sensor ID or location.
    - Ability to view associated alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available) and related queued video from time of alarm.

- **Auditing**

  The PSIM solution shall have the following auditing capabilities:

    - Ability to store and log all activities related to alarm
        - When alarm is created in PSIM system
        - When alarm is viewed by operator
        - When alarm is acknowledged, closed, or deleted
        - Actions taken on related sensor resources
        - Video snapshot images taken by operator
        - Notes entered by operator for alarm
        - Reports generated
    - Ability to display all activities while alarm is open
    - Ability to display all activities after alarm is acknowledged or closed
    - Ability to display activities on monitor and print report
    - Ability to export alarm report in various formats including pdf, jpeg, html, txt, and mht formats

- **Alarm Reporting**

  The PSIM solution shall have the following alarm reporting capabilities:

  - Ability to generate a full incident report within 30 seconds of the alarm being generated.
  - Ability to display report on monitor and print report
  - Ability to select information to be included in report at time of report generation.
    - Details of alarm including severity, time/date, description and location
    - Map of surrounding area associated with alarm
    - Associated door activity and badge holder information if access control alarm
    - Captured video image snapshots
    - Response instructions
    - Alarm activities (audit trail)
  - Ability to export alarm report in various formats including pdf, jpeg, html, txt, and mht formats
  - Ability to generate an alarm incident package including the full incident report and exported video from the incident in a specific folder location.

- **Trend Reporting**

  The PSIM solution shall have the following trend reporting capabilities:

  - The PSIM system shall allow generation of security trend reports to provide insight for proactive in resource planning and pinpoint specific problem areas and sensors.
    - Alarm Count Daily Report
    - Alarm Count Hourly Report
    - Alarm Detail Report
    - Alarm Response Time by Alarm Type Report
    - Operator Alarm Count Report
    - Operator Alarm Response Time Report
    - Operator End of Shift Report
    - Top X Alarm Response Time Report
    - Top X Alarms by Alarm Type Report
    - Top X Alarms by Area Report
    - Top X Alarms by Sensor Report
    - Top X False Alarms by Sensor Report
    - Top X Simulated Alarms By Sensor Report
  - Ability to display report on monitor and print report
  - Allow reports to be generated and filtered based on different criteria including
    - Time
    - Date

        - Area/Location(s)
        - Sensor(s)
        - Alarm type and source
        - Alarm severity
        - Simulated alarms
    - Create predefined report templates based on different criteria
    - Ability to customize the look and feel of the report
        - Chart Type
        - Enable/Disable Chart
        - X-Axis and Y-Axis labels
        - Color Scheme
    - Ability to save report templates to be reused at a later time
    - Ability to export report in various formats including pdf, jpeg, html, txt, and mht formats

- **Video Tracking**

  The PSIM solution shall have the following video tracking capabilities:

    - When operator is viewing video from an existing camera, automatically display video from adjacent cameras
        - Select the direction of movement to show adjacent video
        - Follow a suspect/object moving from one camera view to the next camera view by selecting one of the next camera views
        - Simultaneously watch current field of view while also viewing video from adjacent cameras
        - Should not require operator to memorize or enter in camera names/IDs or times.
        - Support live or recorded video
        - Fast-forward, rewind, pause or stop recorded video
        - Ability to track suspect/object forwards and backwards (if supported by video management system)
    - Ability to automatically build a track report when the operator moves from one camera to the next camera
        - Record camera ID and name
        - Record time and date
        - Record and update video still image
    - Ability to replay the path of the object suspect including
        - Camera ID and name
        - Time and date

- ❖ Video still image
- ❖ Animated map with associated camera location on map
- ❖ Breadcrumb trail showing the path of the object/suspect from camera to camera
- ❖ Recorded video for each video track

- Ability to generate 'track' report including camera IDs, video snapshots, times/dates, and map locations
- Ability to export report in various formats including pdf, jpeg, html, txt, and mht formats

o **Device Tracking**

The PSIM solution shall have the following device tracking capabilities:

- Track latitude and longitude or geospatial location of devices or objects (e.g. GPS enabled cellular phones, Radio Frequency Identification (RFID) devices, etc.)
- Allow devices to be associated with resources for resource tracking
- Enable multiple devices to be simultaneously tracked
- Enable device locations to be displayed in the PSIM geospatial map
- Enable details of devices to be called up from the map
- Enable tracked objects to be displayed/hidden
- Enable multiple objects to be tracked, but only show tracks of object when the object enters an alarm area/zone.
- When object enters alarm area/zone, show alarm details and geo-referenced breadcrumb tracks leading up to the alarm
- When object enters alarm area allow real-time updates of geo-referenced breadcrumb trail.

o **Resource Tracking**

The PSIM solution shall have the following resource tracking capabilities:

- Track latitude and longitude or geospatial location of resources (e.g. people, vehicles, water vessels, etc.) if associated with location based device
- Enable multiple resources to be simultaneously tracked
- Enable resource locations to be displayed in the PSIM geospatial map if associated with location based device
- Enable details of resources to be called up from the map
- Enable tracked resources to be displayed/hidden
- Enable search and find tracked objects by name.
- Automatically display the location of the resource on the map with single mouse click

o **Mobile Device Support**

The PSIM solution shall have the following wireless/cellular mobile device capabilities:

- Provide mobile operator in-context alarm information including all alarm details on mobile device
- Enable mobile operator the ability to view all alarms assigned to him/her on mobile device.
- Enable mobile operator to enter notes on the mobile device to be updated with central PSIM system
- Enable the mobile operator to view and update alarm on mobile device when wireless connectivity is lost and for information to be synchronized when wireless connectivity is reestablished
- Ability for mobile operator to receive escalated alarm on mobile device.
- Ability for mobile operator to create a new alarm in to the PSIM solution based on a photo taken by mobile device.
- Enable mobile operator to pull up cardholder information/credentials by entering in name or employee badge ID on mobile device.
- Enable mobile device to communicate securely with PSIM system

o **Data Integration**

The PSIM solution shall have the following data integration capabilities:

- Enable the bi-directional management of data sharing among security subsystems such as
  - CCTV management and control systems
  - Digital video recording systems
  - Physical access control systems
  - Intrusion Detection Systems
  - Badge management systems
  - Video analytics systems
  - Response Systems
  - Chemical/biological detection systems
  - Radioactivity detection systems
  - Phone Systems
  - Intercom systems
  - Motion detection systems
  - Location-based device systems (RFID, GPS devices, etc)
  - Computer Aided Dispatch Systems
  - Notification Systems
  - Radar Systems
  - IT Systems
  - Building Management Systems

- Provide an open web services-based Application Programming Interface (API) and Software Development Kit (SDK) to enable other systems to be easily integrated with the PSIM solution. The PSIM API and SDK will
  - Enable a vendor subsystem to raise new alarms in to the PSIM solution
  - Enable a vendor subsystem to deliver alarm details in to the PSIM solution
  - Enable the PSIM solution to browse a list of sensors (doors, alarm points, etc.) and add the sensors to the appropriate maps, sensor groups, monitoring areas, etc.
  - Enable the PSIM solution and the vendor subsystem to synchronize alarm status updates in real time
  - Provide the PSIM system to take actions on the vendor system such as retrieving Access Control System (ACS) door information, control ACS doors, move cameras, etc.
  - Enable object or resource geo-coordinate locations to be associated with the alarm or resource and tracked on the PSIM map
  - Enable a vendor system to retrieve escalated, correlated PSIM alarm detail information
  - Enable the PSIM console to be launched through a programmatic command
  - Enable a particular video window in the PSIM console to be displayed through a programmatic command
  - Launch a particular alarm window and alarm details in the PSIM console to be displayed through a programmatic command.

- **Other Users**

  The PSIM solution shall have the following user capabilities:

  - Enable multiple users to access system simultaneously
  - Enable multiple users to handle the same alarm at one time
  - Enable single or multiple users to view and manage alarms in defined areas
  - Enable changes (acknowledge/close/escalate/add comment) by one user to be seen by other users

- **Permissions and Groups**

  The PSIM solution shall have the following user and group permission capabilities:

  - Ability to utilize Windows security and Microsoft SQL Server security (Windows Authentication or SQL Server Authentication)
  - Ability to provide multiple security groups and roles:
    - Operators – to access operational functionality in the user interface.
    - Administrators – to access both the operational functionality and administrative and system related configuration functionality in the user interface.

    - Power Users – to access operational functionality and some limited administrative functionality
    - Video Viewer – to access video console only, and granted scope of hierarchy only
    - Mobile Operator – to access alarms via PDA or SmartPhone
- Ability to create new users with login and passwords and assign users to the appropriate security groups
- Ability to search and auto-filter user lists to find specific users
- Ability to assign security groups/roles to
    - View individual security zones and maps
    - View alarms in specific security zones and locations
    - View and control sensors in specific security zones and locations
    - Configure system including maps, sensors, policies, permissions, users
- Ability to grant or revoke the permission of the following functionalities to each security group/role
    - Access Administration Console
    - Access Operation Console
    - Access Video Console
    - Access Mobile PDA or SmartPhone
    - Access Business Logic Console
    - Access Alert Manager
    - Access Video Tracking / Pursuit
    - Access Report Wizard
    - Acknowledge Alert
    - Close Alert
    - Delete Alert
    - View Alert Details
    - View Deleted Alerts
    - Print Alert Details
    - Export Alert Details
    - Email Alert Details
    - Add Notes to Alert Details
    - Export Video
    - Video Snapshot
    - Create Video Alert
    - Run a Report
    - Save a Report
    - Save a Report as a New Report

- Print a Report
- Export a Report
- Access Preferences
- Identify a person via badge ID or image
- Limit access to recorded video to customizable timeframe
-

o **System Administration**

The PSIM solution shall have the following system administration capabilities:

- Allow systems administration functionality to be configured through a graphical user interface
- Ability to configure alarm policies and properties through user interface
- Ability to configure maps through user interface
- Ability to configure sensor locations through user interface
- Ability to configure sensor properties through user interface
- Ability to establish user access and permission levels through user interface
- Ability to create new users, logins and passwords specific for each user through user interface
- Ability to configure security zones through user interface
- Ability to easily add/remove/edit sensors as a part of a security zone through user interface
- Ability to configure all alarm priorities, text and graphics information, locate display alarm points, video displays/video recording and playback characteristics, password management, report generation and configuration and other related information
- Ability to archive, retrieve database via database tools

o **Configuration Wizard and Setup**

The PSIM solution to be able to be configured through a GUI based configuration wizard.

- Ability to have entire PSIM solution configured and functional through the configuration wizard
- Ability to have a checklist of items that need to be completed for each step
- Ability to have a progress meter to view progress of installation
- Ability to stop and resume the configuration at a later time
- Ability to view configuration tips and tricks
- Ability to link to the specific PSIM configuration screen for setup if required

o **Map Administration**

The PSIM solution shall have the following map administration capabilities:

- Ability to import map images from AutoCAD, BMP, JPEG and other standard image files
- Ability to geospatially reference maps and sensors on maps to real-world coordinates
- Ability to logically group maps and organize hierarchically
- Ability to add sensors to map, such as cameras and ACS doors, etc,
- Ability to display camera properties on map such as camera orientation, camera field of view angle, and camera range.
- Ability to represent different sensors types with different icons
- Ability to create security zones on map represented by polygon shapes to allow the operator to visually distinguish the different regions
- Ability to apply permissions to maps such that different groups and authority levels can only see the maps for which they have privileges to view
- Ability to display only security maps, sensors and alerts associated with security zone
- Ability to create links on the map to move back to the previous map views, move to another map, adjacent map (left, right, up, down, custom link), or go to the top level map with a single click of a button
- Ability to search and auto-filter security zones and areas to find specific zones/areas in large environments

o **Sensor Administration**

The PSIM solution shall have the following sensor administration capabilities:

- Ability to sustain frequent additions/removal/changes to sensors and sensor properties
- Ability to easily accommodate new sensor types such as access control alarms, intrusion alarms, video systems, etc. which may be added at a later date
- Ability to browse sensor subsystem for related sensor name or ID to add the sensor to the PSIM system
- Ability to update maps and graphical elements through graphical user interface
- Ability to define properties and details of sensors
  - Name
  - Description
  - Location
  - Position
  - Camera Specific - Field of view angle, distance, direction, type
  - Mapping to subsystem
- Ability to create sensor groups such that related sensors such as access control sensor and camera sensor can be in a sensor group to display appropriate video when alarm occurs or to correlate multiple alarms together in the group

- Allow more than one of the same type of sensor (camera, access control, intrusion alarm, etc.) to be added to the same group such that multiple cameras can be displayed per alarm or multiple alarms from similar devices can be correlated.
- Ability to search and auto-filter sensor lists to find specific sensor(s) in large sensor lists
- Ability to bulk import sensors and sensor configuration from xml, excel, or CSV file
- Ability to bulk monitoring area names with members from xml, excel, or CSV file
- Ability to bulk export sensor configurations for any sensor types

o **Alarm Policies and Business Logic Administration**

The PSIM solution shall have the following ability to handle the workflow alarms through Visio-like graphical user interface:

- Ability to be create an alarm policy to raise alarm in the PSIM system by defining conditions through configurable GUI-based business logic designer
  - ❖ Ability to match keywords or text from the alarming subsystem's event description to raise an alarm using criteria including exact match, exact NOT match, contains match, wildcard match and regularly expression match (such as forced door alarm, denied access, door open too long, etc.)
  - ❖ Ability to optionally match alarming subsystem's event status, event severity, and sensor type
  - ❖ Ability to customize the alarm description the PSIM system to use the exact description from the Event Source, a predefined Alert Description, or any customer description.
  - ❖ Ability to customize the alarm severity in the PSIM system based on the type of alarm subsystem event
- Ability to apply the alarm policy across all alarm subsystems or only selected alarm subsystems with a single alarm policy
- Ability to apply any alarm policy to one or more monitoring area(s) or zone(s) without having to reapplying the policy multiple times.
- Ability to apply any alarm policy to one or more sensors without having to reapply the policy multiple times.
- Ability to assign specific actions for each alarm
  - ❖ Email
  - ❖ Command line action
  - ❖ Correlation and fusion of additional incident related information
  - ❖ Alarm escalation
- Ability to automatically correlate related data and information to be displayed in real-time for each alarm and related rule

- ❖ Correlate data or information from any security subsystem such as related live video, related recorded video, door activity, door commands, operator response instructions, map location, badge images, etc.
- ❖ Automatically display information in real-time when an alarm is generated.
- ❖ Display all correlated information together in attached windows when an alarm is generated.
- ❖ Automatically display related response instructions and tasks for each alarm and related rule

- Ability to assign and apply business logic policy to specific sensors and or security zones
- Ability to create business logic policy to support multi-decision, multi-action workflow for any alarm through a drag and drop GUI-based designer
- Enable the following activities to be included in the business logic policy:
  - ❖ Enable business logic activity to display live video
  - ❖ Enable business logic activity to display recorded video based on a relative time offset from the alarm time
  - ❖ Enable business logic activity to display door activity based on configurable amount of time and/or events
  - ❖ Enable business logic decisions based on time of day
  - ❖ Enable business logic decisions based on severity
  - ❖ Enable business logic decisions based on location
  - ❖ Enable business logic decisions based on regular expression text matches
  - ❖ Enable business logic decisions based on security threat level
  - ❖ Enable business logic activity to escalate alarm after predefined time
  - ❖ Enable business logic activity to generate a new alarm
  - ❖ Enable business logic activity to make a call
  - ❖ Enable business logic activity to send email
  - ❖ Enable business logic activity to take action on sensor subsystem (ACS, camera commands, etc.)
  - ❖ Enable a custom Microsoft Powershell activity to be created and included in the business logic flow
  - ❖ Enable business logic to correlate multiple alarms together and take follow on action such as auto-acknowledging/closing prior alarms, creating new alarms, etc.
  - ❖ Enable business logic to activity to generate a report
  - ❖ Enable business logic to escalate an alert to notification service
  - ❖ Enable business logic to execute a web services call
  - ❖ Enable business logic to execute open database connectivity (ODBC) database call

- Enable business logic to invoke an external method call
- Enable business logic to generate a report on an incident in multiple report formats and with different customizable information
- Enable business logic to automatically send report to a predefined email
- Enable business logic to take a HTTP SEND or GET action on predefined URL with or without authentication
- Enable business logic to take a HTTPS SEND or GET action on predefined URL with or without authentication
- Enable business logic to determine whether the current location of an alarm is within a specific geographic boundary/area
- Simulate an alert and follow the step-by-step execution of the business logic prior to application of business logic in production environment
- Enable business logic to call another child business logic policy as a part of the main business logic activity
- Enable business logic activity to aggregate Really Simple Syndication (RSS) or ATOM feeds, filter the feeds and create corresponding alert in the PSIM system
- Enable business logic to change the alarm context to that of another alarm
- Enable business logic to lock a specified door, relative door defined in an area or sensor group, or multiple doors defined in an area or group
- Enable business logic to open a specified door, relative door defined in an area or sensor group, or multiple doors defined in an area or group
- Enable business logic to open momentarily a specified door, relative door defined in an area or sensor group, or multiple doors defined in an area or group

- Enable business logic policies to be saved, loaded and reused as necessary as business logic templates
- Ability for simulate alarms through business logic designer
- Enable multiple business logic policies to be deployed and to be processing at any one time
- Ability to schedule business logic policies to run at specified times of the day, days of the week, monthly, or yearly within a specified or endless time range.

- Ability to collapse multiple duplicate alarms to reduce alarm clutter
  - Ability for administrator to apply collapsing policies through PSIM administrative user interface
  - Ability to assign different collapsing policies to be assigned to different security zones and locations
  - Ability for alarms to be collapsed based on time duration, matches to sensor name, severity, and alert description regular expression

        - Allow user to view number of collapsed alerts through the operational user interface
        - Allow user to view the collapsed alerts and collapsed alerts details through the operational interface if required
    - Ability to set up automated escalation policies for different areas and locations
        - Escalate alarm if no activity is taken on alarm within predefined time period
        - Escalate alarm to predefined groups or users
        - Take actions on escalated alarms
        - Re-escalate alarm if no activity is taken on escalated alarm with new groups or users and actions.

- **Automated Sensor Updates**
    - Ability to automatically add newly found subsystem sensors as a new sensor PSIM system
    - Ability to automatically add the newly found sensor to a corresponding monitoring area
    - Ability to automatically apply a business logic policy to the newly found sensor

- **Permission Administration**

  The PSIM solution shall have the following permission administration capabilities:
    - Ability to assign the following permissions to maps and security areas
        - Operators' permission to perform all functions within that client software. These users cannot access the Administrator Console.
        - Administrator permission to access both the Operator Console and the Administration Console. This allows them to perform the same actions as Operators, as well as create, configure, modify and view the entire PSIM system.

- **Communications with Security Subsystems**

  The PSIM solution shall have the following communication capabilities with security subsystems:
    - Ability to view alarms and events in PSIM system from subsystems such as access control, video analytics, video management system, intrusion systems, etc.
    - Ability to send alarm status updates (acknowledgements, closing, deletion, etc.) from PSIM systems to each underlying subsystem
    - Ability to send action commands to underlying subsystems to take action such as move PTZ cameras, unlock/lock ACS doors, etc.
    - Ability to take or receive other alarms through an open web services interface.
    - Support multiple NVR/DVR vendors/models simultaneously
    - Support multiple Physical Access Control Systems simultaneously
    - Support multiple Video analytics Systems simultaneously

- Support multiple Intercom Systems simultaneously
- Support multiple other subsystems simultaneously
- Integrate with News Feed via RSS
- Integrate Simple Network Management Protocol SNMP traps in to PSIM solution
- Integrate Windows Management Instrumentation WMI alerts in to PSIM
- Integrate Syslog alerts in to PSIM

o **High Availability Capabilities**

The PSIM solution shall have the following high availability capabilities:

- Ability for redundancy and data Integrity
  - ❖ Database redundancy
    - Structured Query Language SQL Server Failover Cluster for Microsoft SQL Server 2005
    - Database Mirroring Solution for SQL 2005
  - ❖ Web services redundancy
    - Services can be setup to run on multiple computers
  - ❖ Server components redundancy
    - Microsoft cluster solution can be used for any and all servers
  - ❖ Operator and Administrator consoles
    - Stateless user interface and ability to run multiple consoles simultaneously
- Ability for fault tolerance
  - ❖ Support redundant server configuration with hot swappable power supplies, cooling fans, Peripheral Component Interconnect PCI slots, and hard drives in minimum Redundant Array of Independent Disks RAID-5 configuration
- Ability for system failover
  - ❖ Ability for multiple operators including those from remote locations to simultaneously log in to the system and have full control of monitoring and access of data for detection, assessment, notification, entry control, communication
  - ❖ Ability for operator to reconnect to a redundant database in case of the main database system failure. This feature requires specific underlining hardware, OS and database.
  - ❖ Ability to view maps from secondary site
    - The user interface component is stateless and multiple consoles can run simultaneously
  - ❖ Ability to view alarms from secondary site
    - The user interface component is stateless and multiple consoles can run simultaneously

- **Security Functionality**

  The PSIM solution shall have the following security capabilities:

  - Ability to secure system through password and privilege protection provided by the operating system(s) using Windows authentication and by Microsoft SQL Server using SQL Server authentication.
  - Ability to communicate among major components utilizing SOAP (Simple Object Access Protocol). SOAP is a protocol for exchanging XML-based messages over a computer network, and the communication can be configured as HTTP or HTTPS for a more secure environment.
  - Ability to communicate over Secure Sockets Layer (SSL)

- **System Operations**

  The PSIM solution shall have the following system operations capabilities:

  - Ability to support unattended Operation
    - PSIM server services run even if a user is not logged in
    - PSIM server to return to normal activity after reboot without administrator intervention
  - Ability for administrator without database administration skills to configure and set up system
  - Ability for system to be easy to use and administer

- **Performance**
  - Ability to support over 20,000 configured sensors in the PSIM console
  - Ability to support over 10,000 open alerts in the console
  - Ability to support over 100 PSIM operations consoles from a single PSIM server
  - Ability to support alert bursts of over 500 alerts per second
  - Ability for business logic policies to be deployed in less than 10 seconds for 20,000 sensors

- **Installation**
  - Ability for all components of PSIM solution to be installed through self-extracting installation files
  - Ability for new subsystem integrations to be installed without having to reinstall the base PSIM solution
  - All installation files should be self-guided Graphical User Interface (GUI)-based wizards allowing installation parameters to be entered during the installation
  - PSIM system shall have a GUI-based integration manager that allows
    - One or more integration with subsystem to be configured
    - Multiple instances of subsystem to be configured
    - Parameters for integrated subsystem to be specified

- ❖ Connectivity and calls to subsystems to be automatically checked
- ❖ Integration with subsystem to be removed

- PSIM system shall have a GUI-based services configuration wizard that allows each of the PSIM services and components to be configured.
- Ability for PSIM database, services and web servers to all be installed on a separate servers if necessary
- Ability for PSIM system to be upgraded to the PSIM version while maintaining all previously configured components - the maps, policies, sensors, and response workflow.

o **Documentation and Help**

The PSIM solution shall have the following documentation and help files

- PSIM installation guide
- PSIM administrator guide
- PSIM user/operator guide
- Subsystem integration installation guide
- Online context sensitive help

HARDWARE REQUIREMENTS AND INTERFACES

The PSIM software shall run on industry-standard computer platforms and software, and support video cameras which comply with industry standards.

o **Server Operating System**

- The PSIM server application shall support Microsoft Windows Server 2003 with SP1 or higher
- The PSIM server application shall support Windows Vista
- The PSIM server application shall support Microsoft Windows Server 2003 with 32- and 64-bit modes
- The PSIM server application shall support Microsoft Windows Server 2003 R2 with 32- and 64-bit modes
- The PSIM server application shall support Microsoft Windows 2008 with 32- and 64-bit modes
- The PSIM server application shall support Microsoft Windows 2008 R2 with 32- and 64-bit modes

o **Client Operating System**

- The PSIM client software shall support Microsoft Windows XP Professional SP2 or higher
- The PSIM client software shall support Microsoft Windows Server 2003 with SP1 or higher

- The PSIM client software shall support Windows Vista
- The PSIM client software shall support Microsoft Windows Server 2003 with 32- and 64-bit modes
- The PSIM client software shall support Microsoft Windows Server 2003 R2 with 32- and 64-bit modes
- The PSIM client software shall support Microsoft Windows 2008 with 32- and 64-bit modes
- The PSIM client software shall support Microsoft Windows 2008 R2 with 32- and 64-bit modes

o **Server Relational Database**

- The PSIM system shall support Microsoft SQL Server 2005 with 32- and 64-bit modes
- The PSIM system shall support Microsoft SQL Server 2008 with 32- and 64-bit modes

o **Hardware**

- The PSIM server software shall be able to be installed on a server system with minimum of Intel Core 2 Duo 2.0 GHz processor, 2GB memory, 100GB hard drive free space
- The PSIM workstation software shall be able to be installed on a workstation system with minimum of Intel Core 2 Duo 2.0 GHz processor, 1GB memory, 50GB hard drive free space

o **System Vulnerability Checks**

- The PSIM system shall be tested by security compliance software and vulnerable assessment tools, such as tools from Symantec, McAfee and Microsoft.

o **Network Standards**

- The PSIM system shall be compatible with IEEE TCP/IP and 802.3 Ethernet series standards. Network bandwidth to be determined by others based on the number and types of video cameras, video frame sizes and frame rates, video recording requirements, number of simultaneous users, and other factors.

o

4.7.2 Provision of performance specifications for ancillary facilities and utilities needed for Computer Monitoring Security System

4.7.2.1 AC Power System requirements and power budget for CMS equipment

CMS Security Operations Center (SOC) Equipment

1. DVR (Qty 24)	90-250VAC	3,120 Watts max
2. PSIM Server (Qty of 2)	90-250VAC	1,405 Watts max
3. Video Wall Power Supply/UPS	90-250VAC	4,900 Watts max

Coast Guard Island Thermal Camera Tower

1. Camera & Wireless Link	90-250VAC	500 Watts

4.7.3 Preparation of Procurement Documentation for Purchase and Installation of Computer Monitoring Security System

The purchasing and contracting documentation in Appendix A4 was prepared for use in the acquisition and implementation of the recommended components of the CMS.

4.7.4 Preparation of terms of reference for purchase and installation of Computer Monitoring Security System

The following terms of reference are an integral part of the procurement documentation for the Computer Monitoring Security (CMS) system.

4.7.4.1 Contractor terms of reference

Scope of Work

The Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun) intends to procure a turn-key Computer Monitoring Security System (CMS). The CMS shall provide improved security monitoring of the Port of Buenaventura's port terminals and facilities.

This Scope of Work shall define the contractor's responsibilities for the implementation of the CMS.

The CMS shall comprise the hardware and software of a new Physical Security Information Management (PSIM) system, a new Pelco CCTV headend to replace the existing legacy Panasonic headend due to discontinued equipment being installed and needing replacement; new video display wall to provide imagery from the PSIM dashboard and CCTV headend; new operator console workstations to facilitate the Security Operations Center (SOC) upgrade; installation of a new Pelco video management system (VMS) and software to facilitate more control of the existing CCTV infrastructure; new Pelco Ethernet controllers for the operators to work with the new VMS; the installation of a single PTZ camera between the coffee warehouse and post office areas to cover those blind spots; and the installation of a new

thermal IR cameras on the existing Coast Guard Island tower to provide for the waterside protection of the port.

6.3 Site Survey and design finalization

The contractor shall conduct a site survey to confirm the CMS system design. Upon completion of the site survey, the contractor shall develop an installation material list (cables, hardware, etc) for items not included with the CMS equipment. The contractor shall engage local support services for the installation phase. These services shall include (but not be limited to) electricians, mechanics, riggers, carpenters, and transportation support.

The contractor shall identify all permits and variances needed to commence the CMS installation and assure these are in place and approved prior to the commencement of work.

The contractor is advised to procure professional security escort services for the duration of the work.

6.4 CMS SOC Center Equipment

The contractor shall supply the CMS SOC equipment and installation material (identified during the site survey). The equipment list is as follows:

6.4.1 CMS Rack Mount Equipment

The CMS shall be installed in a fully integrated 19-inch equipment rack in the SOC server room that houses the main CMS servers, network appliances, power conditioner/Uninterruptible Power Supply (UPS) and supporting components. The equipment rack shall be no less than 44U (rack units) with closed side panels and locking front and rear perforated access doors. The rack equipment shall include:

a) CMS PSIM Server (Quantity of Two)
   - PowerEdge R410:
     - PowerEdge R410 Chassis w/up to 4 Cabled HDs, Quad-Pack LED Diagnostics
   - Processor:
     - Intel® Xeon® E5520, 2.26Ghz, 8M Cache, Turbo, HT, 1066MHz Max Mem
   - Additional Processor:
     - Intel® Xeon® E5520, 2.26Ghz, 8M Cache, Turbo, HT, 1066MHz Max Mem
   - Memory:
     - 8GB Memory (4x2GB), 1333MHz, Dual Ranked UDIMMs for 2 Processors, Mirror
   - Operating System:
     - Windows Server®2008SP2, Standard x64, Incl Hyper-V™, Incl 5 CALs
   - Hard Drive Configuration:
     - RAID 5 for PERC S100 Controller, 3-4HDDs
   - Hard Drives (Multi-Select):
     - 1TB 7.2K RPM SATA 3.5" Cabled Hard Drive
   - Power Supply:
     - Power Supply, Redundant, 500W
   - 1st Hard Drive:

    - HD Multi-Select
  - Internal Optical Drive:
    - DVD+/-RW ROM, SATA, Internal
  - Hardware Support Services:
    - 3 Year ProSupport for IT and NBD On-site Service
  - Server Software:
    - OS: Windows Server 2008 (64-bit)
    - DB: SQL Server 2008 R2 (64-bit)
    - Backup: Customer/Partner choice
    - AV: Customer/Partner choice
    - ASP.Net version 1.1.4322 or newer
    - .NET Framework 1.1 with SP1 and latest patches
    - .NET Framework 2.0 with SP1
    - .NET Framework 3.0
    - Proximex Surveillint Dashboard Software

b) Video Manager Server
Rack mount server no greater than 3U
- Quad Core Intel® Xeon® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- Proximex Surveillint Dashboard Software

c) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 48-port

d) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Provides standby power for up to 15 minutes while emergency power system activates.
- Network connection for monitoring and access to event logs via browser application

6.4.2 CMS SOC Console

The CMS Security Operations Center (SOC) Console shall provide three (4) operator positions; Supervisor; and one National Police station. The console workstations shall include work surface and space for client computer hardware.

a) The console shall be the Wright-Line Profile Console Series with two 84” units (4 operators), one 72” unit for Supervisor, and two 48” units (for National Police and Raymond operator).

b) The equipment cabinet for the servers, DVRs, etc. shall be NetShelter SX 42U 750mm Wide x 1070mm Deep Enclosure or equal. Each will be equipped with dual power strips with switchable ports and IP addressable.

c) CMS Client, National Police Operator Workstation
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Pelco Control Point Client Software
- Dual head video graphics card
- Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
- Desktop Keyboard/Mouse with KVM switch
- Pelco CCTV Camera Controller

d) Video Manager Client, Operator Workstations 1-5 (5 = Raymond Location)
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Proximex Surveillint Dashboard Software
- Pelco Control Point Client Software
- Dual head video graphics card
- Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
- Desktop Keyboard/Mouse with KVM switch
- Pelco CCTV Camera Controller

e) CMS Video Manager Client, Supervisor Workstation
Rack mount PC no greater than 3U

- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Proximex Surveillint Dashboard Software
- Pelco Control Point Client Software
- Dual head video graphics card
- Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
- Desktop Keyboard/Mouse with KVM switch
- Pelco CCTV Camera Controller

6.4.3 CCTV Video Headend

The CCTV video headend will be replaced as part of this project. The existing headend is a Panasonic system that has outdated equipment and software and will not facilitate any migration path towards IP based cameras or systems. The new headend equipment will be housed in empty expansion space within the SOC server room. This will require installing (24) Pelco RealVue or equal Digital Recorders (32 Channels each). The existing GE transceivers from the central camera patch bay will continued to be used and the existing connections to the SX850 Matrix Switchers will need to be disconnected and reconnected into the Pelco video servers units during cutover. Once the cutover is complete, the legacy switchers can be removed out of the racks to provide future equipment.

A rack mount KVM and slide out keyboard/monitor will be required in the racks with the new servers.

Two redundant PSIM servers will be installed in these racks.

The Clarity Matrix video wall power supplies and UPS units will be installed in a standalone cabinet in the server room. The monitors do not house power supplies or fan units, which is intentional to reduce heat and fan noise in the populated room. Power and network cables will be routed from the power supply rack to the LCD's.

6.5 Coast Guard Island Remote Camera Site

The contractor shall supply Coast Guard Island Remote camera Site equipment and installation material (identified during the site survey). The equipment list is as follows:

6.5.1 Coast Guard Island Equipment Rack

The Coast Guard Island Thermal cameras will be mounted on the existing tower, and the power and communications equipment will be located in a 19-inch rack assembly in the tower equipment shelter. The rack will include:

a) Maintenance LCD Monitor/Keyboard/Pointing device
Rack mount, 1U slide out monitor/keyboard assembly.
- 17-inch TFT monitor
- 8-port KVM switch
- 105 keys, keyboard and touch pad

b) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 8-port or better

c) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

6.5.2 Back-up Emergency Power

The Coast Guard Island camera site shall include a back-up emergency power system that provides automatic change-over capability in the case of a loss of primary AC power. The emergency back-up power system shall operate for up to 12-hours without refueling. The emergency back-up power system shall be designed for 50% excess capacity to account for future growth. This is included in the VTS Radar project and the security system will connect to this system.

6.6 Waterside Thermal Camera System

The waterside camera system already includes one existing cameras that provides a patrol up/down the wharf. An additional 4 cameras will be installed on the existing tower at Coast Guard Island, two more on the Southernmost lighting tower inside the Property near Pekin Gate; another two cameras will be installed at the northernmost lighting tower at the edge of the property.

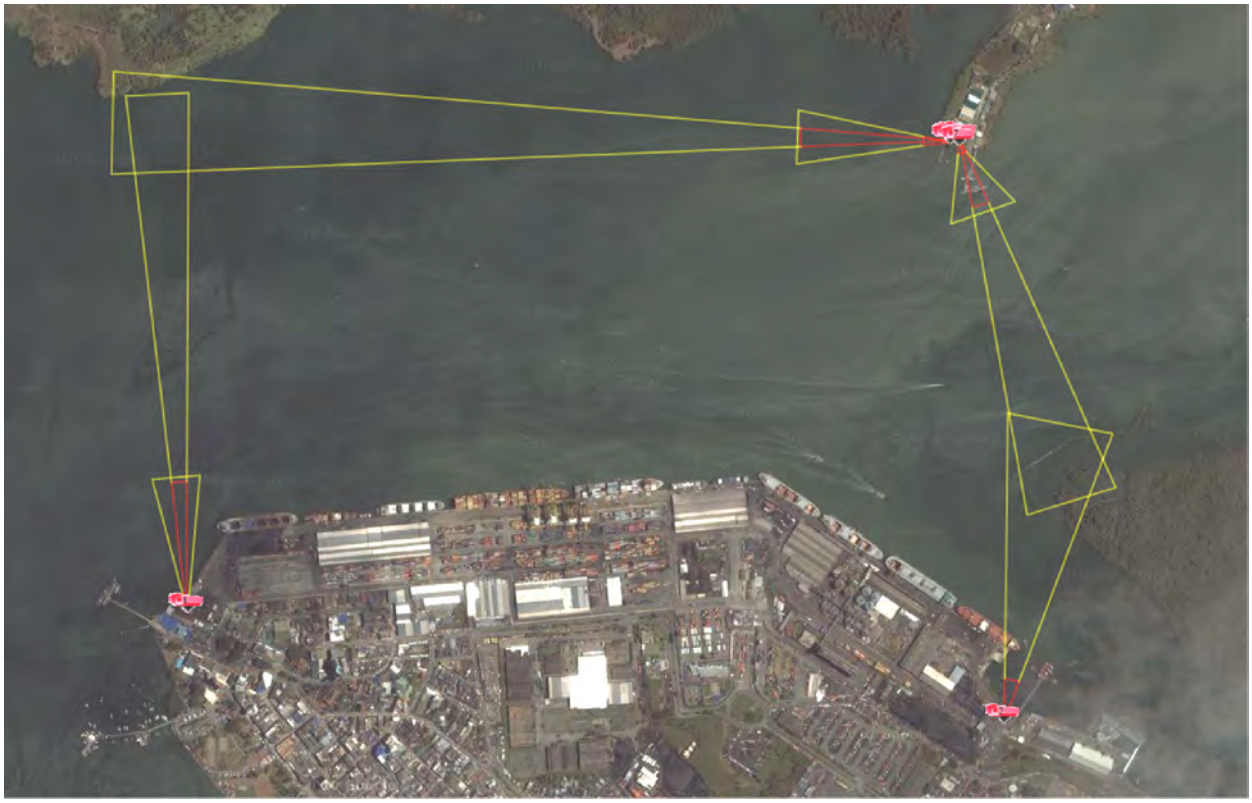


Figure 4-9 Limits of protection zone with thermal cameras

6.6.1 SightLogix SightSensor Thermal Cameras

Part Number	Imager Detection Range	Automated Detection Range *	FOV	Interface	Power
SL-SS-NS100-000	220m (720ft)	90m (300ft)	50°	Ethernet	24V AC/DC
SL-SS-NS200-000	310m (1020ft)	130m (430ft)	36°		
SL-SS-NS300-000	560m (1840ft)	230m (750ft)	20°		
SL-SS-NS400-000	780m (2560ft)	330m (1080ft)	14°		
SL-SS-NS800-000	1.6Km (5250ft)	660m (2170ft)	7°		
SL-SS-NS100-300	220m (720ft)	90m (300ft)	50°	Ethernet	Power Over Ethernet Plus (PoE+)
SL-SS-NS200-300	310m (1020ft)	130m (430ft)	36°		
SL-SS-NS300-300	560m (1840ft)	230m (750ft)	20°		
SL-SS-NS400-300	780m (2560ft)	330m (1080ft)	14°		
SL-SS-NS800-300	1.6Km (5250ft)	660m (2170ft)	7°		
SL-SS-NS100-015	220m (720ft)	90m (300ft)	50°	5.8 GHz Wireless	24V AC/DC
SL-SS-NS200-015	310m (1020ft)	130m (430ft)	36°		
SL-SS-NS300-015	560m (1840ft)	230m (750ft)	20°		
SL-SS-NS400-015	780m (2560ft)	330m (1080ft)	14°		
SL-SS-NS800-015	1.6Km (5250ft)	660m (2170ft)	7°		

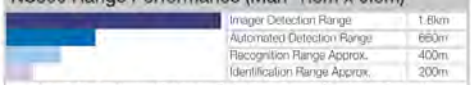
Accessories

- **SightMonitor** – GPS-based target display and coordination software. *Refer to the SightLogix SightMonitor® Datasheet.*
- **SightTracker** – GPS-based PTZ controller. Refer to the *SightLogix SightTracker™ Datasheet.*
- **Heavy-duty Mounts and Cables.** Refer to the *SightLogix Accessories Datasheet.*

***Automated Detection Range**

Range measurement method for automated detection range of a man

NS800 Range Performance (Man 1.8m x 0.5m)



Note: 660m Automated Detection Range is unique to SightLogix' Products. Alternate products typically have one-third SightLogix' Automated Detection Range.

6.7 Point to Point Wireless Network

The point –to-point wireless system shall provide Fast Ethernet connectivity between the Guard Island Camera Site with the SOC. The electronic components shall be encased in a robust outdoor enclosure that can withstand temperatures from -40° F to +140° F (-40° C to +60° C) and winds up to 202 mph (325 kph). The contractor shall provide all mounting accessories, cables, conduits and fixtures necessary to mount the antenna units on the towers and connect the units to the communications rack at the base of the existing tower network switch. The contractor shall assure antenna configuration and location provides suitable path performance between sites to maintain a mean aggregate data rate of not less than 150 Mbps and a link availability of 99.99999%. Since the microwave path is over water, the contractor shall design the link to minimize the negative effects of multi-path propagation. The contractor shall supply and install the Motorola PTP-48600 or an equivalent system with the following specifications:

6.7.1 Coast Guard Island to SOC Link

a)	Frequency:	4.710 – 4.940 GHz
b)	Channel Size:	Configurable to 5, 10, or 20 MHz
c)	Channel Selection:	By Dynamic Frequency Selection or manual intervention; automatic selection on start-up and continual adaptation to avoid interference
d)	Transmit Power: dBm	Varies with modulation mode and settings from +27 to +22
e)	System Gain Margin:	Minimum 42 dB or better
f)	Receiver Sensitivity:	Adaptive, varying between -98 to -60 dBm
g)	Modulation:	Dynamic; adapting between BPSK and 256 QAM
h)	Error correction:	FEC
i)	Duplex scheme:	Time Division Duplex (TDD) and Half Duplex Frequency Division Duplex (HD-FDD), Dynamic or Fixed ratio
j)	Antenna:	Integral with Outdoor Unit, appropriate Gain for 1.4 nm path length
k)	Security and Encryption:	128/256-bit AES Encryption
l)	Ethernet protocol:	IEEE 802.3

m)	User data throughput:	Dynamically variable up to 150 Mbps at the Ethernet (aggregate): 5 MHz Channel: up to 48 Mbps 10 MHz Channel: up to 100 Mbps 20 MHz Channel: up to 150 Mbps
n)	Latency (typical one way):	<2 ms in 20 MHz Channel <3 ms in 10 MHz Channel <5ms in 5 MHz Channel
o)	QoS:	802.1p (2 Levels)
p)	Ethernet Interface:	10/100/1000 Base T (RJ-45)
q)	BIT LED Indicators:	Power status, Ethernet link status and activity
r)	System Management:	Web or SNMP
s)	Installation:	Built-in audio and graphical assistance for link optimization
t)	Connection:	Distance between outdoor unit and primary network connection up to 100 meters
u)	Dimensions:	Outdoor Unit (equal or less than):Width 370mm, Height 370mm, Depth 105mm Indoor Unit (equal or less than): Width 250mm, Height 40mm, Depth 80mm
v)	Weight:	Outdoor Unit (equal or less than): 5.5kg Indoor Unit (equal or less than): 0.86 kg
w)	Ingress Protection:	Outdoor Unit: IP65 Indoor Unit: IP53

6.7.2 Wireless Network Physical and Environmental Requirements

The point-to-point wireless network equipment shall meet the following physical and environmental requirements:

a)	Operating Temperature:	-40°C to +60°C
b)	Humidity:	100% Condensing
c)	Wind Speed:	202 mph (325 kph)

d) Power Source: 90-240 VAC 50/60Hz

e) Power Consumption: 55 W

6.8 PTZ Camera Installation

A new PTZ camera is to be installed at the intersection between the Post Office and the Coffee Warehouse to provide surveillance over that blind spot. The contractor will install the camera and connect to the closest serviceable network hub location. Assume fiber optic and 24VAC line will be installed to that location.

Figure 4-10 New PTZ camera location between Adpostal and Coffee warehouses

6.9 Maintenance Plan

Due to the remote location and challenges associated with operating in Colombia, some of the primary considerations for any system are maintainability and availability of critical spare parts. It is extremely important that the system be relatively maintenance free and provide for plug-and-play operations. As part of the offer, the contractor shall provide the following:

- Sample maintenance plan
- Periodic maintenance requirements
- Mean Time Between Failure (MBTF)
- Lowest replaceable units

- All long lead time items
- Life cycle component compatibility
- Suggested spare parts list with pricing details

During the initial Warranty period, the contractor shall provide routine and preventive maintenance actions. During the warranty, the contractor shall provide two hour service response (during normal working hours) and 24/7 phone response.

6.10 Training

The contractor shall provide a training plan and syllabus for a "train the trainer" course. The contractor shall develop and provide lesson plans, course material, and manuals for operator and maintenance training.

Training shall be conducted for Operators, Supervisors and Maintainers. This training shall consist of both classroom and live operational system training. The availability of the staff to be trained is dependent on being available during their normal shifts. Classroom training should be kept to a minimum with most of the training being performed "live" in the SOC. The recommended training class duration is as follows:

- Operator Training 7 days
- Supervisor Training 7 days
- Maintainer Training 7 days
- On-Site Operational Support 14 days after system is accepted.

4.7.4.2 Scope of Work for CMS for SPRBun and the various parties involved in the work

The following scope of work should be used for the procurement and installation of the CMS system.

A. SPRBun Team

Identify SPRBun personnel to coordinate the CMS implementation project. The following individuals should be identified and assigned:

1. Project Manager: Responsible for the oversight of the project, the coordination of all resources, and reporting to SPRBun management on the progress of the project.
2. Project Director: Responsible for the approval of all purchases, agreements with third parties, and contracts with vendors/contractors.
3. Purchasing Agent: Responsible for the procurement of all equipment and services. This function may be performed by the Project Manager if allowed by the Port's internal procedures.
4. Network Engineer: Responsible for the installation and configuration of the CMS equipment and software. If a network engineer is not on staff, see section D. below: Identify and Engage Local Contractors.

B. Site Survey / Preparation

The Project Manager will coordinate a site survey the CMS location (SOC and Coast Guard Island) listed in this proposal to ensure the equipment as recommended can be accommodated and all power and communication services are in place or can be implemented. This survey must take place prior to ordering equipment and services.

1. Security Operations Center (SOC)
    a. Server Room Space: Ensure adequate space is available for the equipment.
    b. Power: Ensure power requirements as specified are in place.
    c. Antenna Location: Identify suitable location for the wireless antenna from the Coast Guard Island to the roof of the facility.
    d. Conduit: Ensure that an appropriate conduit from the roof to the server room is available for the antenna cable runs.
    e. Network connectivity: Ensure network facilities are adequate to support the additional network connections for the CMS.

2. Coast Guard site

    a. Approvals: Obtain necessary approvals from the Coast Guard to place a wireless antenna on the existing tower at its facility and store the equipment in the equipment room at the base of the tower.

    b. Antenna Location: Identify suitable location for the placement of the wireless antenna on tower. Antenna must be mounted on the tower if available with a clear line of sight to the harbor and channel.

    c. Equipment Space: Ensure that the Coast Guard can dedicate a secure location in the building for the equipment in the equipment room at the base of the tower.

    d. Power: Make sure power requirements as specified are in place at the equipment location.

    e. Conduit: Ensure that an appropriate conduit from the tower to the equipment location is available for the wireless antenna cable run.

The Project Manager will confirm that each of the sites can accommodate the specified equipment, and forward the final list of equipment to the Purchasing Agent.

C. Equipment Acquisition

The Purchasing Agent will contact vendors to ascertain the availability of equipment and confirm pricing. The Purchasing Agent must work with the Project Manager and the Project Director in the event that pricing and availability of equipment has changed since the drafting of this proposal.

The project team may need to adjust budgets or purchasing decisions based on availability and current pricing. The scope of the purchase may also be altered based on the site survey listed in A. above. A final purchasing plan should be drafted for approval by the Project Director.

Once all necessary approvals have been received, the Purchasing Agent will place orders with the vendors. The Purchasing Agent will report to the Project Manager on the anticipated delivery status.

D. Identify and Engage Local Contractors

Several of the CMS components will require local contractors/personnel to install, and in the future, maintain equipment. The Port of Buenaventura may have personnel on staff that can perform the tasks; otherwise the Project Manager will need to coordinate efforts to identify the necessary resources. Once identified, the Purchasing Agent will finalize agreements with the contractors and schedule service.

1. Identify and engage a local contractor who is certified on the installation of wireless antenna equipment, installation/configuration of PSIM systems, and integration of multiple security

systems, installation of rack mount equipment and DVR setup, and video wall displays. The contractor must also be capable of installing antenna equipment on rooftops and radio towers. This includes the following tasks:

a. Mount the wireless antennas and thermal cameras, mount PTZ camera

b. Mount lightning arresting equipment in conjunction with the installation

c. Complete cable installations between the security equipment

d. Test connectivity of the equipment

e. Make adjustments to based on testing results if needed

Approximate Rate: US$ 2400 / day (US$300 / hour)

2. Network Engineer: If not on staff, identify and engage a network/systems engineer for the installation and testing of security and wireless equipment at the SOC and installation of the communications equipment at the Coast Guard station. The network engineer should be contracted for the installation, configuration, and testing of the network IP based security equipment.

Approximate Rate: US$ 1400 / day (US$175 / hour)

The Network Engineer should have strong background in or certified on:

a. General network infrastructure design and best practices
b. Network router and firewall design and configuration
c. Microsoft Windows Server operating systems
d. TCIP and other networking protocols
e. General server and PC hardware installation skills

E. Install Equipment

The following details the installation plan of the equipment. In general, there are very few prerequisites for the installation of equipment and services – any will be noted below. The Project Manager will coordinate all installation times with the team and will work with the Purchasing Agent for the hiring and scheduling of contractor resources.

1. Wireless Antennas, Thermal Cameras. PTZ Camera

a. Required Personnel: Security contractor, Network Engineer, Project Manager

b. Tasks:

i. Project Manager will coordinate the installation schedule with the contractor. Providing that all equipment has been received.

ii. Project Manager will obtain necessary approvals from the Coast Guard to install on the scheduled day(s).

iii. Security contractor will install the headend equipment, cameras and wireless equipment and run cables to the appropriate termination locations.

iv. During the install, the Network Engineer should be on site to ensure that all network devices are operating correctly.

2. PSIM Server/Software/Event Trigger Development

   a. Required Personnel: Security Engineer/Integrator, Network Engineer, Project Manager

   b. Tasks

      i. Project Manager will coordinate the installation schedule with the contractor. The PSIM installation should be coordinated with the CCTV headend and video wall implementation.

      ii. The security contractor/integrator should coordinate the PSIM installation with the CCTV headend and video wall implementation.

      iii. The Network Engineer will connect PSIM equipment, setup and install PSIM software.

      iv. The security contractor/integrator will coordinate the event triggering development with Port Security personnel to achieve the desired popup window for the operators to follow. This activity takes approximately 3 weeks to collect the information and another 6-8 weeks to incorporate into the PSIM software. Then this is fine tunes during system testing and training.

3. CCTV Headend Upgrade

   a. Required Personnel: Project Manager, Network Engineer, Security Contractor/Integrator

   b. Optional Personnel: System trainer (see Training below)

   c. Tasks

i. The Security Contractor/Integrator will install the new cabinets, DVR's, System Management Servers, and Video Management Servers in the SOC Server Room. This includes rack mounting the equipment, installing cabling, loading software, and connecting to power.

ii. The Network Engineer will install the network switches/routers to connect the headend to the network LAN.

The installation may be coordinated with an on-site trainer from the product vendor.

iii. The Security Contractor/Integrator will provide the new client workstations which includes loading the software for those workstations. The Network Engineer will configure the workstations to connect to the LAN.

iv. The Security Contractor/Integrator will connect the new Headend system to the new video wall as described below.

4. Operator Control Room Upgrade

a. Required Personnel: Project Manager, Security Contractor Personnel

b. Tasks

i. The Project Manager will coordinate the timing when the Security Contractor installation staff can commence installing the video wall and replacing the operator consoles.

ii. The Security Contractor installation staff will move the existing monitor racks towards the operators to provide enough clearance behind to install the video wall. The wall is very low profile and requires only limited space to work around. The frames are set up, the monitors set in place, and then the cables from the server room including two category 6 cables and the power cable will be routed to each monitor. The category 6 cables connect to the power supply/controller cabinet.

Once the video wall is in place, the screens are then activated. The Security Contractor will then duplicate the images on the CRT monitors onto the new video wall temporarily until the PSIM system is ready to migrate over to the wall. All other controls will still be made available to ensure the contractor can continue to function normally. The CRT racks are then to be removed. The operator position at Raymond will receive new LCD monitors and will be integrated into the new system.

iii. Next, the operator consoles will be replaced. The Security Contractor will remove one table that supports two operators and a new console is installed in its place. Power, data and telephone cabling is routed to the new furniture. New monitors on swing arms are attached to the core panel. Client workstation with keyboard/mouse is installed. Task lighting is installed. New phone handsets are installed. The Network Engineer will connect the workstations to the LAN. The new Ethernet Controller will be installed to control the CCTV system. This process occurs for all operator/supervisor and National Police workstations including Raymond.

iv. The intention is to complete the video wall installation in ~7 days. The operator consoles will be replaced over the course of 3 days.

c. The Project Manager will report to the Project Director on the progress of the installation.

5. Staffing

The following staff should be considered for the maintenance and daily operation of the CMS/PSIM system and network. These positions may overlap with or can be filled by the CMS personnel.

The following positions are recommended to be filled:

1. System Administrator (1.5 Full-Time Equivalent personnel): A system administrator is recommended for the maintenance of the CMS/PSIM. If the Network Engineer listed above is a SPRBun employee, this person can serve in this role. In addition, a second individual should be trained for this function to ensure continual coverage during vacations and absences, and to ensure the transfer of knowledge based in the event of employee turnover. These staff members must be available for off-hours support.

   Approximate annual salary: US$60,000 per employee

2. Operational Personnel (Minimum – 18): Six operations staff is necessary per shift for the daily operation and monitoring of the Port security systems (4 SOC operators, 1 Raymond Operator, 1 Supervisor). These individuals can also serve as CMS watch-standers. The operations staff should have the following qualifications/skills:

   a. Experience in port operations and security. Experience with or certification in the operation of CMS/PSIM type systems will be required through vendor training.

   b. Familiar with or trained in basic security rules and best practices. Previous experience in security or law enforcement is desired (i.e. National Police, military, law enforcement).

Based on a 24/7 operation, the following staffing schedule can be used as a baseline:

a. Monday – Sunday, all shifts: 4 SOC operators/1 Raymond Operator
b. One part-time operator to cover vacations and absences

Approximate annual salary: US$40,000-US$50,000 per employee

4.7.5 Preparation of Final Capital Cost Estimate for Computer Monitoring Security System and Additional Systems

4.7.5.1 Capital Cost Estimate for CMS

Table 4-2 Estimated Costs for Computer Monitoring Security System

Component	Sub-total	Total (US$)
PSIM H/W and S/W		
Server S/W		
Surveillint Server Software	$15,000.00	
Surveillint Backup Server S/W	$7,500.00	
Dell PowerEdge 410 Server (x2)	$4,000.00	
Client S/W		
Surveillint Client (5-Pack)	$13,125.00	
ADV Ops Surveillint Client (per seat)	$5,000.00	
Administrator Client License	$7,500.00	
Sensor Based Integration Models		
Physical Access Control System	$20,000.00	
Video Management System	$35,000.00	
EZ-Track Video Pursuit S/W	$10,000.00	
Sensor Pack 2000 (Up to 2000 Sensors)	$122,500.00	
Perimeter Intrusion Detection Module	$37,500.00	
Labor/Travel ODC's		
Engineering Services	$60,000.00	
Configuration/Installation	$135,975.00	
Training	$63,455.00	**$536,555.00**
SOC Video Wall		
Clarity Matrix MX46LVideo Wall 3x8 Config (24 Units)	$165,000.00	
Clarity Matrix Cable Sets (24 Units)	$6,000.00	
Clarity Matrix Floor Stands	$10,000.00	
Labor/Travel ODC's		
Engineering Services	$6,600.00	
Configuration/Installation	$9,065.00	
Training	$5,439.00	
Electrical Wiring Services (Labor and Materials)	$1,500.00	**$202,104.00**
SOC Operator Workstations		
Operator Workstation PC (5 Units)	$10,000.00	
Supervisor Workstation PC (1 Units)	$2,000.00	
National Police Workstation PC (1 Unit)	$1,500.00	
Administrator Workstation PC (1 Units)	$2,000.00	
Labor/Travel ODC's		
Configuration/Installation	$5,439.00	**$20,939.00**
Computer Monitoring Security System (Security)	**TOTAL**	**$738,659.00**

4.7.5.2 Capital Cost Estimate for Ancillary Security Upgrades

Table 4-3 Estimated costs for Ancillary Security Upgrade

Component	Sub-total	Total (US$)
Ancillary Security Systems		
Point-to-Point High Speed Wireless Network Link Equipment		
SOC to Coast Guard Island Link	$25,316.00	
Coast Guard Island Thermal IR CCTV Camera System		
SightSensor Thermal (LWIR Range 650m) (2 Units)	$87,990.00	
SightSensor Thermal (LWIR Range 250m) (2 Units)	$57,190.00	
Equipment Cabinet w/Switch/UPS	$1,500.00	
Port Property Thermal IR CCTV Camera System		
SightSensor Thermal (LWIR Range 650m) (2 Units)	$87,990.00	
SightSensor Thermal (LWIR Range 250m) (2 Units)	$57,190.00	
Cables for Cameras Installed (Power and Ethernet) (8 Units)	$12,000.00	
SightMonitor S/W - GPS Target mapping and configuration.	$2,750.00	
Geo-Reflected Aerial Photo Map	$880.00	
New PTZ Camera for Coffee Warehouse/Post Office Coverage		
Pelco Spectra IV PTZ Day/Night Camera	$1,600.00	
Labor/Travel ODC's		
Engineering Services	$21,880.00	
Configuration/Installation	$12,691.00	
Training	$3,626.00	
Electrical Wiring Services (Labor and Materials)	$4,800.00	
Ancillary Security Systems	**TOTAL**	**$377,403.00**

4.7.5.3 Capital Cost Estimate for Operator Console Upgrades

Table 4-4 Estimated Costs for Operator Console Upgrades

Component	Sub-total	Total (US$)
SOC Operator Console Upgrade		
Wright-Line 84" Profile Series Console (2 Units)	$5,900.00	
Wright-Line 60" Profile Series Console (1 Unit)	$2,850.00	
Wright-Line 48" Profile Series Console (2 Units)	$3,925.00	
Labor/Travel ODC's		
Engineering Services	$1,200.00	
Configuration/Installation/Demolition	$5,439.00	
Electrical Wiring Services (Labor and Materials)	$1,200.00	
SOC Operator Console Upgrade	**TOTAL**	**$20,514.00**

4.7.5.4 Capital Cost Estimate for CCTV Headend Upgrade

Table 4-5 Estimated Costs for CCTV Headend Upgrade

Component	Sub-total	Total (US$)
CCTV Headend Upgrade		
Pelco DSR324000 4TB 32 Channel Video Recorder (24 Units)	$384,000.00	
Pelco Keyboard Controller	$19,200.00	
Sennetech SCT-1069 Code Translator (16 Units/4 PTZ each)	$41,280.00	
Dell Server (x2)	$4,000.00	
Equipment Cabinet - APC 3150 w/Dual PDU, KVM/Mon/Kybd (6 Units)	$24,000.00	
UPS for New Headend Equipment Only - 15 Min Backup	$8,000.00	
Labor/Travel ODC's		
Engineering Services	$40,000.00	
Configuration/Installation	$81,585.00	
Training	$12,691.00	
Electrical Wiring Services (Labor and Materials)	$6,000.00	
CCTV Headend Upgrade	**TOTAL**	**$620,756.00**

The priced equipment list summarizes estimates based on catalog prices for each sub-system. This estimate used mid-range equipment prices. The very high prices may be 20-30% higher and the low

prices may be 10-20% lower. What are shown are estimated turn-key costs (An Integrator or Prime Contractor who would bid this project would include General and Administrative costs, Systems Integration costs, Program Management costs, Installation costs, spares and overall fee). The total costs of the project would be in the $1.6-2.0M range to include all the work shown. There would also be some local content which would add to the total overall costs. The use of in-country qualified contractors could reduce the overall labor costs to the project.

4.7.6 Preparation of Operating Cost Estimates for Computer Monitoring Security System

4.7.6.1 Operating Cost Estimates for CMS

The operating costs for the CMS are broken down into the following categories:

- Annual Labor for the CMS Operators and Supervisors
- Annual Labor and material costs for the Maintenance Plan
- Annual costs for support services associated with the operation of the CMS

The local labor costs for the various labor categories are not available for this report, so a best estimate of labor categories and labor hours will be presented here.

a) CMS Operators and Supervisors annual costs
It is calculated that the CMS SOC with four SOC Operator Console positions, one Raymond Operator Console and one Supervisor Console position will require a total of 21 persons to provide 24/7/365 coverage including additional staff to cover vacations, sick leave, etc . This is further broken down to 5 Supervisors, each requiring 1,847 hours per year for a total of 9,235 man-hours, and 16 Operators for a total of 11,082 man-hours per year.

b) Maintenance Plan annual costs
   - An initial investment of spare parts inventory would require an expenditure of US$40,000.00
   - Annual sustainment of spares and consumables… $5,000.00 per year
   - Labor costs associated with scheduled and preventative maintenance… CMS Service Technician/Engineer…. 240 man hours per year
   - CMS Software... annual maintenance (from vendor)… $25,000 per year

c) Support services
   - It is assumed that all CMS facilities and locations are on government owned facilities and, accordingly, no rental or lease costs for these facilities are needed.
   - The CMS SOC will require Internet access, so the inclusion a high speed Internet service provider must be considered as part of the operating costs
   - The CMS equipment requires commercial power, so the cost of electrical service must

be included in the annual operating cost budget. The following identifies the estimated (worse case) electrical consumption requirements of the CMS equipment by site:

- CMS SOC Site 57,500 kWh per year
- Coast Guard Island Radar Site 8,510 kWh per year
- Total 65,010 kWh per year

4.7.7 Preparation of Implementation Program for Computer Monitoring Security System

4.7.7.1 Implementation Program for CMS

The contractor shall prepare and submit an implementation plan and schedule that assures the completion of the CMS within a 12-month period. The contractor shall use the following schedule and milestones as guidance when preparing the final implementation plan.

CMS Implementation Schedule

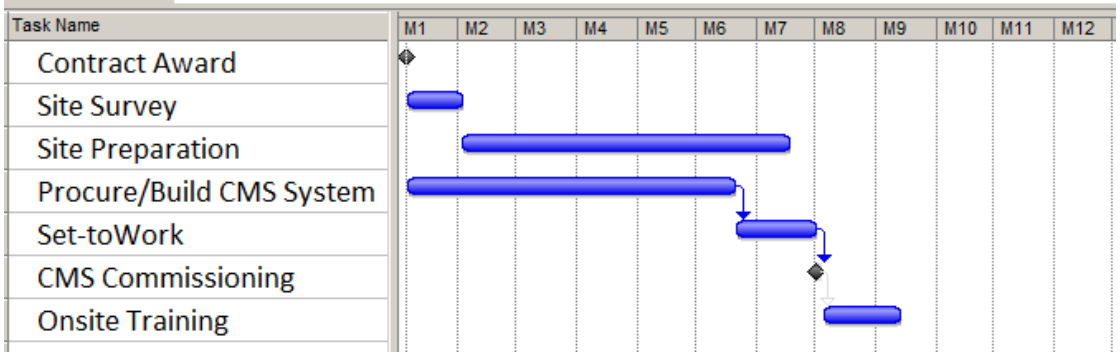


Figure 4-11 Implementation Schedule for Computer Monitoring Security System (CMS)

A4 Procurement documentation for Computer Monitoring Security System

Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun)

REQUEST FOR PROPOSALS

FOR

Computer Monitoring Security System (CMS) for the Port of Buenaventura Colombia

Submission Deadline: **TBD**

Local Time - TBD

Submission Place: **TBD**

SEALED PROPOSALS SHALL BE CLEARLY MARKED AND RECEIVED PRIOR TO THE TIME AND DATE SPECIFIED ABOVE. PROPOSALS RECEIVED AFTER SAID TIME AND DATE WILL NOT BE ACCEPTED OR CONSIDERED.

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1 INTRODUCTION

This solicitation is for technical proposals from qualified firms to provide a Computer Monitoring Security System (CMS) for the Port of Buenaventura Colombia. The CMS will provide intelligent monitoring of all security systems at the Port of Buenaventura port terminal facilities. The CMS will also provide security and surveillance of waterways adjacent to the main navigable waters and port facilities.

1.1 PROJECT OBJECTIVE

The objective of the CMS is to improve security domain awareness to enhance the safety and security of the Port of Buenaventura, its waterways, personnel and installations. This will improve the overall safety and security posture of the port. Section 5 details the Terms of Reference (TOR) for this RFP and Annex 1 provides the detailed Scope of Supply.

1.2 PROPOSALS TO BE SUBMITTED

Technical and financial proposals are solicited from interested and qualified firms. The administrative and technical requirements as detailed throughout the RFP will apply. Specific proposal format and content requirements are detailed in Section 3. Upon detailed evaluation of technical and financial proposals, one firm will be selected for contract negotiations.

1.3 CONTRACT FUNDED BY THE SOCIEDAD PORTUARIA REGIONAL DE BUENAVENTURA (SPRBun)

The negotiated contract will be funded by SPRBun in accordance with the terms and conditions to be negotiated with the winning firm.

1.4 REFERENCE DOCUMENTS

a. International Convention for the Safety of Life at Sea (SOLAS).
b. The International Ship and Port Facility Security Code (ISPS Code)

2 INSTRUCTIONS TO OFFERORS

2.1 PROJECT TITLE

The project is called "Computer Monitoring Security System of the Port of Buenaventura in Colombia."

2.2 DEFINITIONS

The following definitions and terms are used in this RFP.

- The term "Request for Proposals" means this solicitation of a formal technical and financial proposal including qualifications statement.
- The term "Offeror" means the firm, including any and all subcontractors, which responds to the RFP and submits a formal proposal, and which may or may not be successful in being awarded this procurement.

2.3 EXAMINATION OF DOCUMENTS

Offerors should carefully examine and address all items specified in this RFP. Failure to adhere to this format may disqualify an Offeror from consideration.

Submission of a proposal shall constitute evidence that the Offeror is free of any uncertainty with respect to conditions which would affect the execution, and completion of the project.

2.4 RESPONSIBILITY FOR COSTS

Offeror shall be fully responsible for all costs incurred in the development and submission of the proposal or any other cost incurred by Offeror prior to issuance of an agreement or contract. Neither SPRBun nor the Government of Colombia, assume any contractual obligation as a result of the issuance of this RFP, the preparation or submission of a proposal by an Offeror, the evaluation of proposals, or final selection.

The Contractor is responsible for compliance with export licensing requirements, if applicable, in the performance of the Terms of Reference (TOR) and Scope of Supply.

2.5 CONFIDENTIALITY

SPRBun will use best efforts to preserve the confidentiality of any proprietary or confidential information marked as such by the Offeror.

2.6 ECONOMY OF PROPOSALS

Proposal documents should be prepared simply and economically, providing a comprehensive and concise description of the Offeror's capabilities to satisfy the requirements of the RFP. There is no necessity for expensive bindings, colored displays, or other promotional material unless such material is absolutely pertinent to the proposal. Emphasis should be placed on completeness and clarity of content.

2.7 CONDITIONS REQUIRED FOR PARTICIPATION

Firms may utilize subcontractors from Colombia and are encouraged to do so to the extent practical. The Offer's proposal shall indicate the extent of local contractor participation as a percentage of the overall offer.

2.8 LANGUAGE OF PROPOSAL

All proposal documents shall be prepared and submitted in either English or Spanish.

2.9 PROPOSAL SUBMISSION REQUIREMENTS

The Cover Letter in the proposal must be addressed to:

TBD

An original (1) and three (3) copies of your proposal, in either English or Spanish, must be received at the above address no later than **TBD** local time, on **TBD**.

Proposals may be sent by mail, overnight courier, or hand-delivered. Whether the proposal is sent by mail, courier or hand-delivered, the Offeror shall be responsible for actual delivery of the proposal to the above address before the deadline. Any proposal received after the deadline will be returned unopened. Upon timely receipt, all proposals become the property of SPRBun.

2.10 PACKAGING

Proposals shall be individually wrapped, sealed, and labeled for content including "original" or "copy number x". The original and three (3) copies shall be collectively wrapped and sealed, and clearly marked for content.

2.11 AUTHORIZED SIGNATURE

The proposal must contain the signature of a duly authorized officer or agent of the Offeror empowered with the right to bind the Offeror.

2.12 EFFECTIVE PERIOD OF PROPOSAL

The proposal shall be binding upon the Offeror for ninety (90) days after the proposal due date. Offeror may withdraw or modify this proposal at any time prior to the due date upon written notification signed in the same manner and by the same person who signed the original proposal.

2.13 EXCEPTIONS

Firms agree by their response to the RFP to abide by the procedures set forth therein. Material modifications in the TOR, Scope of Supply or responsibilities of the parties will not be accepted.

Any exceptions in the proposal shall be clearly identified, and shall include the scope of such exception, and its impact, on the procurement. SPRBun shall make final determination as to the responsiveness of such exceptions and their acceptability.

2.14 OFFEROR QUALIFICATIONS

As provided in Section 3, Offerors shall submit evidence that they have relevant past experience.

2.15 RIGHT TO REJECT PROPOSALS

SPRBun reserves the right to reject any and all proposals and to accept or reject any or all of the items in the proposal, and to award the contract in whole or in part if it is deemed in the best interest of SPRBun.

2.16 PRIME CONTRACTOR RESPONSIBILITY

Offerors have the option of subcontracting parts of the services they propose. The Offeror's proposal must include a description of any anticipated subcontracting arrangements, including the name, address, and qualifications of consultants and subcontractors. The successful Offeror shall cause appropriate provisions of its contract with SPRBun to be inserted in all subcontracts ensuing to ensure fulfillment of all contractual provisions by subcontractors.

2.17 AWARD

An award resulting from this RFP shall be made to the Offeror which offers the best combination of qualifications and price. However, SPRBun reserves the right to reject any and all proposals, and will be the sole authority for determining if a proposal has satisfactorily met the requirements of this RFP.

2.18 COMPLETE SERVICES

The successful Offeror shall be required to (a) furnish all supplies, supervision, transportation, and other execution accessories, services, and facilities; (b) provide and perform all necessary labor; and (c) in accordance with good technical practice, with due diligence, and in accordance with the requirements,

stipulations, provisions and conditions of this RFP and the resultant contract, execute and complete all specified work to the satisfaction of SPRBun.

2.19 INVOICING AND PAYMENT

Deliverables under the contract shall be completed on a schedule to be agreed upon in a contract with SPRBun. The Contractor may submit invoices to SPRBun to the attention of the designated Project Director in accordance with a schedule to be negotiated and included in the contract. Upon approval of each invoice, the SPRBun will process payment to the Contractor. The financial proposals will be submitted in U.S. dollars, Colombian pesos or a combination of these currencies. The payment currency will be negotiated with the winning firm.

2.20 WARRANTY

Offerors shall include a One Year Warranty as the baseline offer. The Warranty begins upon successful completion Commissioning and acceptance. Offerors shall propose optional two year and three year warranty.

3 PROPOSAL FORMAT AND CONTENT

To expedite proposal evaluation, and to assure that each proposal receives the same orderly review, all proposals must follow the format described in this section.

Proposals shall include a Table of Contents and all sections and pages appropriately numbered. Offerors are encouraged to submit concise and clear responses to the RFP. Proposals shall contain all elements of information requested without exception. Instructions regarding the required scope and content are given in this section. SPRBun reserves the right to include any part of the selected proposal in the final contract.

Offerors shall submit one (1) original and three (3) copies in either English or Spanish.

The following is required for each proposal:

- Transmittal Letter
- Cover/Title Page
- Table of Contents
- Introduction and Executive Summary
- Company Information
- Organizational Structure, Management Plan, and Key Personnel
- Technical Approach and Work Plan
- Experience and Qualifications
- Price Proposal
- Miscellaneous (product cut-sheets, brochures, etc)

Detailed requirements and directions for the preparation of each section are presented below.

3.1 INTRODUCTION AND EXECUTIVE SUMMARY

An Executive Summary should be prepared describing the major facts or features of the proposal, including any conclusions, assumptions, and generalized recommendations the Offeror desires to make.

Offerors are requested to make every effort to limit the length of the Executive Summary to a maximum of three (3) pages.

3.2 COMPANY INFORMATION

3.2.1 Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), similar information must be provided for each subcontractor. Offerors are requested to limit the length of the each Company Profile to one (1) page per firm.

1. Name of firm and business address, including telephone and fax numbers.

2. Year established (include former firm names and year established, if applicable).

3. Type of ownership and parent company, if any.

4. Project Manager's name, address, telephone and fax number, if different from (1).

5. Certified copy of Articles of incorporation and Certificate of Good Standing issued by responsible entity

6. Latest balance sheet of assets and liabilities

3.2.2 Offeror's Authorized Negotiator

Provide name, title, address, telephone and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

3.2.3 Negotiation Prerequisites

1. Discuss any impact that all current or anticipated commitments may have on the ability of the Offeror or its subcontractors to complete the project as proposed and within the project schedule.

2. Identify any specific information which is needed from SPRBun before commencing contract negotiations.

3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL

Describe the Offeror's proposed project organizational structure. Discuss how the project will be managed including the principal and key staff assignments for this project. Identify the Project Manager who will be the individual responsible for this project. The Project Manager must have the responsibility and authority to act on behalf of the Offeror in matters related to the proposed project.

Provide a listing of personnel (including subcontractors and consultants) to be engaged in the project, with the following information for key staff: position in the project; pertinent experience; résumé; and other relevant information. If subcontractors are to be used, the organizational relationship between the firms must be described. A manpower schedule and the level of effort for the project period, by activities and tasks as detailed under the work plan shall be submitted. A statement confirming the availability of the proposed project manager and key staff over the duration of the project must be included in the proposal.

3.4 TECHNICAL APPROACH AND WORK PLAN

Describe in detail the proposed technical approach and work plan. Discuss the project requirements as perceived by the Offeror. Include a brief narrative of tasks within each activity series. Note specifically any task activities included or excluded which may differentiate Offeror's technical approach from others. Begin with the information gathering phase and continue through delivery and approval of all required reports.

Prepare a detailed schedule of performance that describes all activities and tasks within the work plan, including periodic reporting or review points, incremental delivery dates, and other project milestones.

Based on the work plan and previous project experience, explain when and where Offeror will require support from SPRBun. Detail the amount of staff time required by SPRBun or participating agencies and any work space or facilities needed.

Offerors may elect to propose alternative approaches and/or activities and tasks if it is felt they will provide technical, schedule, or other advantages to SPRBun. The Offeror should cite the applicability of alternative approaches/activities to achievement of project objectives and the projected advantages to be gained through their use. To assure that all proposals will be comparable and any alternatives will be evaluated against a relevant background, each Offeror must provide a full response to the RFP as written before any full or partial alternative is proposed. Alternatives must be clearly identified as such.

3.5 EXPERIENCE AND QUALIFICATIONS

Provide a discussion of the Offeror's experience and qualifications that are relevant to the objectives and TOR. If a subcontractor(s) is being used, similar information must be provided for the prime and

each subcontractor firm proposed for the project. Relevant experience and qualifications of key staff proposed shall be provided including letters of commitment from the individuals proposed concerning their availability for contract performance.

Not more than six (6) relevant and verifiable project references must be provided, which shall include the following information:

- Project name
- Name and address of client (indicate if joint venture)
- Client contact person (name/ position/ e-mail / current phone and fax numbers)
- Period of Contract
- Description of services provided
- Dollar amount of Contract
- Amplifying information (optional)

Offerors are strongly encouraged to include in their experience summary primarily those projects that are similar to or larger in scope than the project described in this RFP.

3.6 PRICE PROPOSAL

Offerors shall submit a firm, fixed price proposal that is broken down as follows:

A. Site Survey
B. Site Preparation
C. Procure, build, delivery and install CMS equipment components
D. Factory Acceptance Testing
E. Site Acceptance Testing and Commissioning
F. On-site Operator and Maintainer Training
G. Two (2) Year Spare Parts
H. Optional Two Year Warranty
I. Optional Three Year Warranty

4 DELIVERY SCHEDULE

SPRBun has developed the following delivery schedule for the Computer Monitoring Security System (CMS). The Offeror shall identify compliance with this schedule in the proposal and if an accelerated schedule can be offered, it should be detailed in the proposal along with all dependencies.

CMS Implementation Schedule

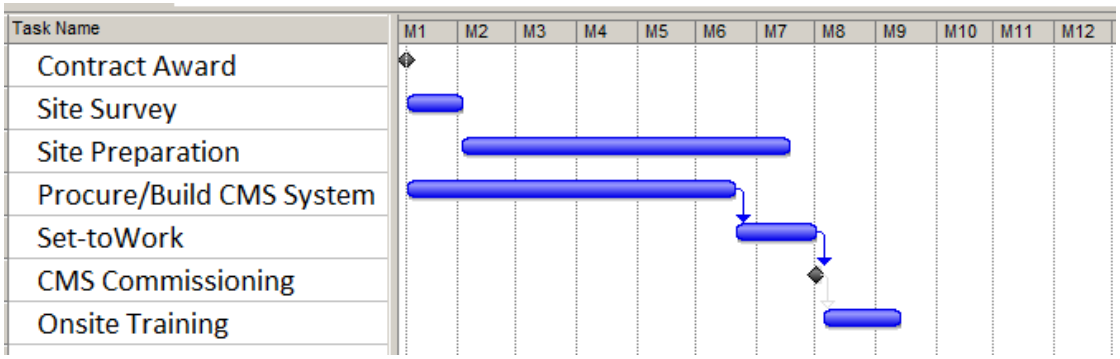


Figure A4-1 Implementation Schedule for Computer Monitoring Security System

5 AWARD CRITERIA

Individual proposals will be initially screened by a SPRBun Procurement Selection Committee. The Committee will then conduct a final evaluation and ranking of qualified Offerors, and SPRBun shall promptly initiate contract negotiations with the best qualified Offeror. If a satisfactory contract cannot be negotiated with the best qualified Offeror, negotiations will be terminated. Negotiations shall then be undertaken with the second most qualified Offeror, and so forth.

The selection of the Contractor will be based on the following criteria:

- Demonstrated understanding of the project and proposed method of approach.
- Overall organization, completeness, and quality of work plan including cohesiveness, conciseness, and clarity of response.
- Commitment of time of key team members to this project.
- Project team experience.
- Lead team members' competency, especially the Project Manager, in relation to the assignments (with particular consideration to the qualifications, experience, availability, accessibility, expertise, and recent experiences relevant to this project).
- Demonstrated analytical ability with projects similar in nature to this project.
- Length of time that the company has been legally constituted.
- Technical Experience
- Demonstrated knowledge and awareness of design, installation and integration of CMS, CCTV, Access Control Systems, Intrusion Detection Systems, Video Wall Display Systems, PSIM Integration and Network systems, in addition to experience in the design of border/port monitoring and control systems.
- Price
- Technical and financial capability of the bidder and ability to perform

Proposals which do not include all requested information may be considered non-responsive.

6 TERMS OF REFERENCE

6.1 Concept of Operations

This solicitation is for technical proposals from qualified firms to provide a Computer Monitoring Security System (CMS) for the Port of Buenaventura Colombia. The CMS will provide intelligent monitoring of all security systems at the Port of Buenaventura port terminal facilities. The CMS will also provide security and surveillance of waterways adjacent to the main navigable waters and port facilities.

The objective of the CMS is to improve security domain awareness to enhance the safety and security of the Port of Buenaventura, its waterways, personnel and installations. This will improve the overall safety and security posture of the port.

The project is to provide an intelligent security monitoring system that will utilize all source “sensors” (Closed Circuit Television (CCTV) cameras, intrusion detection system, access control systems) to facilitate a single platform for all security event reporting and tracking. Presently, there is integration between the standalone systems but the level of automated intelligence is primitive compared to newer technology systems that are implemented at other Ports.

The implementation of a Physical Security Information System (PSIM) is designed to:

1. Collect information from all sensor points within the security system
2. Establish conditions from each sensor to determine when to trigger an alert
3. Coordinate between the separate systems on how to detect and alert an event
4. Coordinate on how the operator needs to respond to that alert
5. Facilitate record archiving of each event

Sensor Points: All devices connected to the security system are capable as being considered a “sensor”. This includes CCTV images, video motion detection, perimeter intrusion systems (wire or microphone), access control readers, door contact switches, motion sensors, etc. This collection of “sensors” creates broader security coverage when combined together into one single platform: the PSIM.

Establish Trigger Conditions: Once all the sensors are added into the PSIM database, coordinating the sensors that apply to a strategic location or area is then performed. The “traps” that are set will generate an event alarm if certain conditions are met. Establishing what those conditions are define what the trigger will consist of. A door left open may trigger an alarm if left open for too long causing a Pan Tilt Zoom (PTZ) camera to pan to that location and issuing a visual alarm to the operator.

Coordination between Systems: A door left open may trigger an alarm if left open for too long causing a PTZ camera to pan to that location and issuing a visual alarm to the operator. This is system coordination that is further controlled using the PSIM.

Operator Response: In most cases when an event occurs, each operator has some general guidance as to how to address that specific event. However, it is also common where one operator may address the event one way while another operator may address it differently. When configuring the PSIM, each event should have specific steps to be followed by every operator so that it is always handled the same way.

Record Archiving: When the event occurs, a popup window lists each step the operator is to follow. As each step is performed, the system is archiving that data (video images, recordings, names/dates/times, etc. and that event is then archived for later retrieval containing all pertinent information about that event.

As part of the PSIM solution, information must be sent to the operators and is usually posted on the video wall for one of the operators to address. The video wall is used in operations centers as it provides a single point of information and tracks multiple events for the operators to reference and for supervisors to oversee. Most video walls incorporate Graphical User Interface (GUI) maps of facilities or areas and add sensor points on the map for quick identification by implementing a green or red status to reflect whether a sensor is up/down, engaged in an event, or other conditions. Video images from strategic locations provide continuous surveillance and access control conditions at any particular location can be displayed. For future considerations, the VTS system can be added to the display wall as information content as well as weather channel, news channels, etc.

6.1.1 CMS Functionality

The System shall provide a layered approach to the monitoring of security conditions of the port terminal areas of the port of Buenaventura. CMS shall provide the primary detection and tracking capabilities and real-time data from these subsystems is combined and processed for presentation to operators and stakeholders.

The Security Operations Center shall contain operator console positions for four operators and one National Police representative. Each operator display position shall present PSIM dashboard information or CCTV information on their personal displays. Each operator position shall have the ability to independently change views, scales and display attributes without affecting other display views.

Each operator shall have the ability to control and view each system camera. The system shall provide the operator with the ability to “slew-to-cue”, point the camera to any geographic location. The system

shall provide the operator the ability to "slew-to-track", attached the camera to tracked target for automatic camera following. The operator shall have the ability to initiate a DVR recording on any camera.

The system shall allow external stakeholder access to limited data via a web-browser interface. This information shall include lists and geographic view of all sensors in the system.

The system shall support secure, full remote access of PSIM dashboard, camera, ACS and IDS data for special authorized users (i.e. law enforcement, national defense).

6.1.2 Site Layout

- The Security Operations Center (SOC) is located in the Administration Building – 2nd Floor. An additional, single operator station is located above the employee entrance at Raymond. This is where the new CMS headend will be located and will be co-located with the existing CCTV, Access Control System (ACS), and Intrusion Detection System (IDS) headend equipment.

- Coast Guard island
  - The Offeror shall provide and install a 50 ft tower for the high performance small target detection radar and surveillance camera
  - The Offeror shall provide an emergency back-up power system to provide operating power for the Coast Guard Island radar and camera equipment

The Scope of Work (Annex 1) shall further define the contractor's responsibilities for the implementation of the CMS.

6.2 General performance requirements for the System

6.2.1 Thermal IR Performance Specification

A. SUMMARY

The thermal video detection system consists of intelligent surveillance cameras which receive long wavelength infrared (LWIR) radiated energy to detect objects that violate a site's alarm policies. The system provides long-range automated outdoor perimeter and buffer zone protection, operating in all weather conditions and geographical locations. The system integrates camera control, image stabilization, advanced image processing, and geo-spatial based object tracking to minimize false and nuisance alarm rates. Direct processing of video at the imager level analyzes video and provides access to the full dynamic range of the camera core, increasing the amount of image data available for

processing and providing enhanced sensitivity. In its maximum range configuration, the system detects inbound vehicle-sized objects up to 1,600 meters and humans up to 650 meters.

B. SECTION INCLUDES

1. SL-SS-NS series Global Positioning System (GPS) Analytic Target Sensor - Thermal
2. (LWIR)SL-SM-CS Sensor co-ordination and map-based target GPS display software

C. LABOR AND MATERIALS

Unless otherwise provided in the Drawings and Specifications, the Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the Work.

D. REFERENCES

1. Conformity for Europe (CE)
2. Consultative Committee for International Radio (CCIR)
3. Electronic Industry Association (EIA)
4. Federal Communications Commission (FCC)
5. Institute of Electronic and Electrical Engineers (IEEE)
6. International Electrotechnical Commission (IEC)
7. International Organization for Standardization (ISO)
8. National Television System Committee (NTSC)
9. Phase Alternation by Line (PAL)
10. Underwriters Laboratories Inc. (UL)
11. Underwriters Laboratory Canada (ULC)
12. Factory Mutual (FM)
13. National Electrical Manufacturers Association (NEMA)
14. European Committee for Electro Technical Standardization (CENELEC)

E. DEFINITIONS

1. No Substitutes: The exact make and model number identified in this specification shall be provided without exception.
2. Or Equal: Any item may be substituted for the specified item provided that in every technical sense, the substituted item provides the same or better capability and functionality
3. Or Approved Equal: A substitute for the specified item may be offered for approval by the Owner. The proposed substitution must, in every technical sense, provide the same or better capability and functionality as the specified item. Such requests for approval shall be submitted in accordance with the provisions, and must be obtained within the time frames outlined.

F. DRAWINGS AND SPECIFICATIONS

1. Contractor shall be provided three (3) sets of the Drawings and Specifications for his use. Additional sets, if requested by Contractor, shall be furnished to the Contractor for the actual cost of reproduction.
2. Contractor shall carefully study the Drawings and Specifications, and shall at once report any error, unforeseen circumstances, inconsistency or omission he may discover.

G. SUBMITTALS

1. General: Submittals shall be made in accordance with the Conditions of the Contract and Submittal Procedures Section.
2. Shop Drawings and Schematics: Shall depict the thermal video detection system in final proposed “as built” configuration. The following must be provided:
   I. Connection diagrams for interfacing equipment.
   II. List of connected equipment.
   III. Locations for all major equipment components to be installed under this specification.
3. Product Data: The following shall be provided:
   I. Technical data sheets.
   II. A complete set of instruction manuals.
4. Quality Assurance Submittals: A final test report shall be submitted to indicate that every device was tested successfully in a system test.

H. DELIVERY, STORAGE AND HANDLING

1. General: Delivery, storage, and handling of thermal video detection system shall be in accordance with the manufacturer's recommendations.
2. Ordering: The manufacturer's ordering instructions and lead-time requirements must be followed to avoid installation delays.
3. Delivery: The thermal video detection system shall be delivered in the manufacturer's original, unopened, undamaged container with identification labels intact.
4. Storage and Protection: The thermal video detection system shall be stored in a temperature environment of-30° to +70°C (-22° to 158°F) and protected from mechanical and environmental conditions as designated by the manufacturer.
    i. A sunshield shall be provided for protection from the direct rays of the sun to reduce internal housing temperatures.
    ii. Where icing is to be expected, a window heater with automatic thermostat control and remote shutoff override shall be provided.

I. PROJECT/SITE CONDITIONS

1. Temperature Requirements: Products shall operate in an environment with an ambient temperature range of -30° to +60°C (-22° to 140°F).

J. WARRANTY

Manufacturer shall warrant the thermal video detection system to be free from defects in material or workmanship for a period of at least one year. Maintenance releases for embedded firmware shall be supported for a minimum of one year.

M. ACCEPTABLE MANUFACTURER

1. SightLogix or equal

    Sight Logix Inc.
    745 Alexander Road
    Princeton, NJ 08540
    Phone +1 609.951.0008
    Fax +1 609.951.0024

www.sightlogix.com

2. Substitutions: Or Equal
3. All modules shall be supplied from a single manufacturer

GENERAL SYSTEM DESCRIPTION

The thermal video detection system consists of an imager, complete with lens optics, built-in video analytics processing, embedded software, and environmental NEMA 4X nitrogen-purged housing. The system detects targets that violate security rules and specifies their GPS position, allowing synchronization with other system elements, including pan-tilt-zoom (PTZ) surveillance cameras and video management and situational awareness software packages.

THERMAL VIDEO DETECTION SYSTEM

1. The system shall receive infrared energy in the wavelength range of 8 – 14 micron emanating from potential objects of interest within the detection zone of the camera via an un-cooled Vanadium Oxide (VOx) microbolometer detector.
2. The system shall provide built in electronic motion stabilization to negate the effects of wind and vibration and allow undiminished operation of the video processor.
3. The system shall electronically factor out the effects of motion in a background environment of land, sky, or water in order to allow detection of foreign objects.
4. The system shall provide discrimination of small objects in a background of scene clutter by requiring no more than sixteen (16) scene pixels for object detection.
5. Data security: The system shall be capable of providing data security through AES encryption of system metadata, and control information; authentication (basic and digest log-in); and system tamper alarms. SSL protocol shall be used for trusted external communications to other system devices.
6. GPS Registration: The system shall use a geo-registration technique to capture the Global Positioning System (GPS) location of detected objects, and provide for communication of this information to other system elements providing tracking and display capability.
7. The system shall provide the following analytic capabilities:
    a. Modes: motion zone, multi-mode tripwire, directional zone violation, loitering, to and from zone

b. Target information: height, width, speed, direction, aspect-ratio and absolute GPS position.

8. Zone configuration and requirements:

a. The system's field of view shall be able to be divided into a collection of independent zones or regions, each with the ability to specify different alert criteria. Zones shall be capable of being designated as alarm or mask types.

b. Each alarm type zone shall be able to be associated with a set of rules that specify more precisely the conditions under which alarms are generated. These rules must allow restricting alarms by time, by tripwire, by previous path, or by target attributes such as the target's size, speed, direction, and shape (aspect ratio). (See paragraph 2.02 G.)

c. Zone alarm triggers: The following shall be elements of zone alarm trigger criteria:

I. Object moving within zone (default).

II. Configuration for response to analytic criteria referenced in paragraph 2.02 G.

III. Multiple per zone trigger criteria.

9. The system shall support MPEG-4 and MJPEG compression, dual streaming, up to 30 frames per second.

10. The system shall have the ability for the data to stream at a Constant Bit-rate (CBR) or Variable Bit-Rate (VBR) with independent bit-rate settings for detection and non-detection conditions.

11. The system will provide a standard 10/100 Ethernet interface and optional 802.11 a/b/g interface.

12. The system shall allow for configurable bandwidth from 64 kbps to 8 Mbps, supporting satellite, cellular, wireless, and full broadband communication

13. The system shall be housed in a NEMA 4X nitrogen-purged enclosure.

14. The system shall use a rugged, multi-contact sealed Mil-C electrical connector that supports connectivity for power and data signals in a single unit and provides the means for removal from the enclosure for maintenance and installation.

15. The system shall not require any supplemental cooling and shall be available with supplemental heating.

16. The system shall be available with multiple lens combinations (see paragraph 2.03 - System Performance) providing acceptable trade-offs of field of view versus detection distance.

SYSTEM PERFORMANCE

1. Detection Reliability: The system shall reliably detect up to 64 human pedestrian targets in under one second, with each target occupying as few as 16 pixels, anywhere in the field of view, while simultaneously enduring a total physical imager movement of less than 100 pixels (shake from wind gusts, etc.) at a frequency of up to one hertz.
2. Object Tracking: The system shall be able to reliably track 64 objects simultaneously.
3. Field of View (FOV) and human detection distance: The system, when configured with appropriate lens and imager, shall detect objects directly approaching, with size as specified in paragraph 2.03 A, at the following minimum distances within the given field of view:

FOV (degrees)	Distance (meters)	Distance (feet)
50	90	295
36	130	425
20	230	755
14	330	1080
7	660	2165

4. Temperature range: The system shall operate in an environment with an ambient temperature range of -30° to +60°C (-22° to 140°F).

SPECIFICATIONS

A. Imager:

Detector:	Un-cooled VOx Microbolometer
Detector Pitch	38 micron
Spectral Response	8-14 micron
Picture Elements	320 (H) x 240 (V)Lens (fixed):
Lens - Field of Views	7°, 14°, 20°, 36°, 50° available
Dynamic Range	16 bit digital sensor interface
NETD	< 85mK
Focus Adjustment	Fixed focus

B. Network:

Ethernet Compliance:	
Wired:	IEEE 802.3, 802.3i, 802.3u
Wireless:	IEEE 802.11 a/b/g (optional)
Interfaces:	
Wired:	RJ45
Wireless:	Integral (optional)
Data Rate:	64 kbps to 8 Mbps
Operating Mode:	Full-duplex
Network Protocols:	Internet Protocol (IP), User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Dynamic Host Control Protocol (DHCP), Address Resolution Protocol (ARP), Interior Gateway Management Protocol (IGMP) 3.0, Domain Naming System (DNS), Hypertext Transfer Protocol (HTTP and HTTPS), Real-Time Transport Protocol (RTP), Real-Time Streaming Protocol (RTSP), Network Time Protocol (NTP), Secure Shell (SSH), Secure Socket Layer/Transport Layer Security (SSL/TLS),Service Location Protocol (SLP)

C. Video Output

Compression Type:	MPEG-4– ISO/IEC 14496-2:1999 (Simple Profile, Advanced Simple Profile) MJPEG
Bit Rate Profile:	Constant (CBR) or variable bit rate (VBR)
Resolution:	320x240
Frame Rate (frames per second):	1, 2, 3, 4, 5, 6, 8, 10, 15, 20, 25, 30

D. Electrical

Voltage:	24 VAC/DC +/- 10%
Connector (power & data)	26 pin Mil-C
Power:	20 watts nominal
	60 watts w/optional heater

E. Mechanical

Weight:	6.8 kg (15 lbs.)
Dimensions:	47.3 cm L x 16.2 cm W x 16.8 cm H
	(18.6” x 6.4” x 6.6”)
Enclosure:	NEMA 4X (IP66 compliant)
Nitrogen purge pressure	10 psi
Mounting:	3 x ¼-20 tpi bolts

F. Environmental

Operating Temperature:	-30° to +60°C (-22° to 140°F)
Storage Temperature	-30° to +70°C (-22° to 158°F)
Relative Humidity:	0 to 100%
Emissions:	FCC Part 15, Class A

G. COMPATIBLE SYSTEM ELEMENTS

H. Tracking System: The system shall be capable of communicating with a tracking system, providing target GPS coordinates to allow PTZ camera positioning unit and continual target tracking.

a. Communication shall be via industry standard XML over a HTTP/HTTPS interface and include real time reports of objects tracked, camera name, serial number, firmware version, GPS position, bearing, and vital operating information.

b. Tracked object parameters shall include current time, alarm state, creation time, GPS position, size, heading, speed, aspect ratio, and alarm zone.

I. Display System:

a. Display system shall display topological position and field of view of all video detection system units, overlaid on a geo-positioned aerial image of the surveillance area. This aerial image can be in standard image formats (e.g. JPEG)

b. Display system shall plot GPS locations of all security violations overlaid on a geo-located aerial image of the surveillance area in real time via red dot markings.

6.2.2 PTZ Camera Performance Specifications

Pelco Spectra IV or equal:

A. GENERAL

A. All equipment and materials used shall be standard components that are regularly manufactured and used in the manufacturer's system.

B. All systems and components shall have been thoroughly tested and proven in actual use.

C. All systems and components shall be provided with the availability of a toll-free (U.S. and Canada), and an international number, 24-hour technical assistance program (TAP) from the manufacturer. The TAP shall allow for immediate technical assistance for either the dealer/installer or the end user at no charge for as long as the product is installed.

D. All systems and components shall be provided with a one-day turnaround repair express and 24-hour parts replacement. The repair and parts express shall be guaranteed by the manufacturer on warranty and nonwarranty items.

B. INDOOR/OUTDOOR CAMERA DOME SYSTEM

A. The indoor/outdoor camera dome system shall provide a 100Base-TX network interface for live streaming to a standard Web browser.

B. The indoor/outdoor camera dome system shall be a discreet camera dome system consisting of a dome drive with a variable speed/high speed pan/tilt drive unit with continuous 360° rotation; 1/4-inch high resolution color, monochrome, or color/black-white CCD camera; motorized zoom lens with optical and digital zoom; auto focus; and an enclosure consisting of a back box, lower dome, and a quick-install mounting.

C. The indoor/outdoor network positioning camera shall support standard IT protocols.

D. The indoor/outdoor network positioning camera shall use a standard Web browser interface for remote administration and configuration of camera parameters. The browser interface shall support multi-screen remote monitoring for up to 16 cameras on the same virtual local area

network (VLAN) and provide PTZ control including preset and pattern and on-screen display (OSD) for access to camera programming.

E. The indoor/outdoor network positioning camera shall feature open architecture connectivity for third-party software recording solutions allowing integration into virtually any IP-based system. It is also compatible with Endura and Digital Sentry® video management systems. As with all Pelco IP camera solutions, Spectra® IV IP is Endura Enabled™ to record, manage, configure, and view multiple live streams.

F. The indoor/outdoor fixed dome system shall meet or exceed the following design and performance specifications.

C. ELECTRICAL SPECIFICATIONS

A. Ports	RJ-45 for 100Base-TX Auto MDI/MDI-X Autonegotiate/Manual setting
B. Cabling	Cat5 cable or better for 100Base-TX
C. Input Voltage	18 to 32 VAC; 24 VAC nominal 22 to 27 VDC; 24 VDC nominal
D. Input Power	
1. 24 VAC	23 VA nominal (without heater); 73 VA nominal (with heater)
2. 24 VDC	0.7 A nominal (without heater); 3 A nominal (with heater)
E. Alarm Outputs	
1. 35X SE, 27X SE	7
2. 23X SL	1
F. Auxiliary Outputs	
1. 35X SE, 27X SE	2
2. 23X SL	1

D. VIDEO SPECIFICATIONS

A. Video Encoding	H.264 base profile, MPEG-4, MJPEG
B. Video Streams	2, simultaneous
C. Frame Rate	Up to 30, 25, 24, 15, 12.5, 12, 10, 8, 7.5, 6, 5, 4, 3, 2, 1 (dependent upon coding, resolution, and stream configuration)
D.	Available Resolutions

*Recommended

Resolution			MJPEG		H.264 Base Profile		MPEG-4	
W	H	Format	Max IPS	Rec* Bit Rate	Max IPS	Rec* Bit Rate	Max IPS	Rec* Bit Rate
704	480	NTSC	30 ips	5.4 Mbps	30 ips	1.9 Mbps	30 ips	2.0 Mbps
352	240	NTSC	30 ips	1.3 Mbps	30 ips	0.5 Mbps	30 ips	0.6 Mbps
704	576	PAL	25 ips	5.4 Mbps	25 ips	1.9 Mbps	25 ips	2.0 Mbps

E. Web User Interface	Pelco Device Utility interface for viewing HTTP, requires Java Runtime Environment (JRE™)
F. Supported Protocols	TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, RTSP, NTP, IPv4, SNMP, QoS, HTTP, HTTPS, LDAP (client), SSH, SSL, SMTP, FTP, mDNS (Bonjour®) and
G. Users	20 simultaneous using unicast; unlimited using multicast H.264 or MPEG-4 802.1x (EAP)
H. Software Interface	Web browser view and setup, up to 16 cameras
I. Pelco System Integration	Endura® 1.5 or later (MPEG-4) or Endura® 2.0 or later (H.264); Digital Sentry® 4.2 IP bundle 3 or later; DX8100 Series 2.0 or later; and DVR5100 version 1.5.4 or later
J. Open IP Integration	Pelco IP camera API
K. Minimum Web Browser Requirements	
1. Processor	Intel® Pentium® 4 microprocessor 1.6 GHz
2. Operating System	Microsoft® Windows® XP, Windows Vista®, or Mac® OS X 10.4 or later
3. Memory	512 MB
4. Network Interface Card	100 Mbps or greater
5. Web Browser*	Internet Explorer® 7.0 or later, Mozilla® Firefox® 3.0 or later
6. Monitor	1024 x 768 pixels resolution, 16- or 32-bit pixel color resolution

*Internet Explorer is not supported by Mac OS X 10.4.

E. DOME DRIVE

A. The variable speed/high speed pan/tilt dome drive unit shall meet or exceed the following design and performance specifications.

1. Pan Speed	Variable between 400° per second continuous pan to 0.1° per second
2. Vertical Tilt	Unobstructed tilt of +2° to –92°
3. Manual Control Speed	Pan speed of 0.1° to 80° per second, and pan at 150° per second in turbo mode. Tilt operation shall range from 0.1° to 40° per second
3. Automatic Preset Speed	Pan speed of 400° and a tilt speed of 200° per second
4. Presets	
a. 35X SE, 27X SE (Models)	256 positions with a 20-character label available for each position; configurable camera settings, including selectable auto focus modes, iris level, LowLight™ limit, and backlight compensation for each preset; command to copy camera settings from one preset to another; and preset configuration through control keyboard or through dome system on-screen menu
b. 23X SL (Model)	64 positions with a 20-character label available for each position; configurable camera settings, including selectable auto focus modes, iris level, and backlight compensation for each preset; command to copy camera settings from one preset to another; and preset programming through control keyboard or through dome system on-screen menu
c. Preset Accuracy	± 0.1°
d. Proportional Pan/Tilt Speed	Speed decreases in proportion to the increasing depth of zoom
8. Automatic Power Up	
a. 35X SE, 27X SE (Models)	User-selectable to the mode of operation; the dome will resume when power is cycled, including an automatic return to position or function before power outage

b. Zones	8 zones with up to 20-character labeling for each, with the ability to blank the video in the zone
c. Motor Drive	Cogged belt with 0.9° stepper motor
d. Motor Operating Mode	Microstep to 0.015° steps
e. Motor	Continuous duty and variable speed, operating at 18 to 32 VAC, 24 VAC nominal
f. Limit Stops	
a. 35X SE, 27X SE (Models)	Configurable for manual panning, auto/random scanning, and frame scanning
g. Inner Liner	Rotating black ABS liner inside a sealed lower dome
h. Alarm Inputs	
a. 35X SE, 27X SE (Models)	Ability to control 7 alarm inputs
b. 23X SL (Model)	Ability to control 1 alarm input
i. Alarm Outputs	
a. 35X SE, 27X SE (Models)	Ability to control 1 auxiliary Form C relay output and 1 open collector auxiliary output
b. 23X SL (Model)	Ability to control 1 auxiliary Form C relay output
j. Alarm Output Configuration	Auxiliary outputs can be alternately configured to operate on alarm
k. Alarm Action	Individually configured for 3 priority levels, initiating a stored pattern or going to a preassigned preset position
l. Resume after Alarm	After completion of alarm, dome returns to previously configured state or its previous position
m. Window Blanking	
a. 35X SE, 27X SE (Models)	8, four-sided user-defined shapes, each side with different lengths; window blanking setting to turn off at user-defined zoom ratio; window blanking set to opaque gray or translucent smear; blank all video above user-defined tilt angle; blank all video below user-defined tilt angle
b. 23X SL (Model)	4, four-sided user-defined shape, each side with different lengths; window blanking setting to turn off at user-defined zoom ratio; window blanking set to opaque gray or translucent smear; blank all video above user-defined tilt angle; blank all video below user-defined tilt angle
n. Patterns	
a. 35X SE, 27X SE (Models)	8 user-defined configurable patterns including pan/tilt/zoom and preset functions, and pattern configuration through control keyboard or through dome system on-screen men

b. 23X SL (Model)	1 user-defined configurable pattern1 including pan/tilt/zoom and preset functions, and pattern configuration through control keyboard or through dome system on-screen menu
o. Pattern Length	User-defined length based on dome memory
p. Internal Clock	Internal system clock, user configurable for 12- or 24-hour day format and mm/dd/yy or dd/mm/yy calendar format
q. Scheduler	Internal scheduling system for configuration presets, patterns, window blanks, alarms, and auxiliary functions based on internal clock settings
r. Autosensing	Automatically sense and respond to protocol utilized for controlling the unit whether Coaxitron® or RS-422 Pelco P or Pelco D protocols
s. Menu System	Built-in setup of configurable functions and multiple languages including English, French, Italian, Spanish, Portuguese, German, Russian, Turkish, Polish, and Czech
t. Auto Flip	Rotates dome 180° at bottom of tilt travel
u. Password Protection	Configurable settings with optional password protection
v. Clear	Clear individual, grouped, or all configured settings
w. Freeze Frame	Freeze current scene of video during preset movement
x. Display Setup	User-definable locations of all labels and displays and user-selectable time duration of each display
y. Azimuth/Elevation/Zoom	On-screen display of pan/tilt locations and zoom ratio
z. Compass Display	On-screen display of compass heading and user-definable compass setup
aa. Camera Title Overlay	20 user-definable characters on the screen camera title display
bb. Video Output Level	User-selectable for normal or high output levels to compensate for long video wire runs
cc. Dome Drive Compatibility	All dome drives are compatible with all back box configurations
dd. RJ-45 Jack	Contains a plug-in jack on the dome drive for control and setup of the unit, the uploading of new operating code and language file updates, and is compatible with personal computers
ee. Remote Data Port	
	Compatibility Ability to set up and control unit, and upload new operating code and language file updates through the easily accessible optional remote data port; remote data port is also compatible

	with personal computers
ff. Power Consumption	Maximum 70 VA

F. The high resolution CCD camera shall meet or exceed the following design and performance specifications.

Color/Black-White Optic System (35X)

1. Image Sensor	1/4-inch EXview HAD™ CCD
2. Scanning System	Interlace/Progressive selectable
3. Effective Pixels	
a. NTSC	768 x 494
b. PAL	752 x 582
4. Horizontal Resolution	
a. NTSC	>540 TVL
b. PAL	>540 TVL
5. Lens	f/1.4 (focal length, 3.4~119 mm; 35X optical zoom, 12X digital zoom)
6. Configurable Zoom Speeds	3.2, 4.6, or 6.6 seconds
7. Horizontal Angle of View	55.8° at 3.4 mm wide zoom, 1.7° at 119 mm telephoto zoom
8. Focus	Automatic with manual override
9. Sensitivity at 35 IRE	
a. NTSC/EIA	0.55 lux at 1/60 sec (color) 0.018 lux at 1/2 sec (color) 0.00018 lux at 1/2 sec (B-W)
b. PAL/CCIR	0.45 lux at 1/50 sec (color) 0.015 lux at 1/1.5 sec (color) 0.00015 lux at 1/1.5 sec (B-W)
10. Synchronization System	Internal/AC line lock phase adjustable through remote control, V-sync
11. White Balance	Automatic with manual override
12. Shutter Speed	
a. NTSC	1/2~1/30,000
b. PAL	1/1.5~1/30,000
13. Iris Control	Automatic with manual override
14. Gain Control	Automatic/ off
15. Video Output	1 Vp-p, 75 ohms
16. Video Signal-to-Noise	>50 dB
17. Type of Lighting	Menu selection of indoor or outdoor lighting for optimum camera performance
18. Wide Dynamic Range	128X

19. Motion Detection	User-definable motion detection settings for each preset scene, can activate auxiliary outputs, and contains three sensitivity levels per zone
20. Electronic Image Stabilization	Electronic compensation for external vibration sources that cause image blurring; user selectable for 2 frequency ranges, 5 Hz (3~7 Hz) and 10 Hz (8~12 Hz)
21. Image Enhancement	Electronic improvement of sharpness of objects, lines or text in high contrast areas

<u>Color/Black-White Optic System (27X)</u>

1. Image Sensor	1/4-inch EXview HAD™ CCD
2. Scanning System	Interlace/Progressive selectable
3. Effective Pixels	
a. NTSC	768 x 494
b. PAL	752 x 582
4. Horizontal Resolution	
a. NTSC	>540 TVL
b. PAL	>540 TVL
5. Lens	f/1.4 (focal length, 3.4~91.8 mm; 27X optical zoom, 12X digital zoom)
6. Configurable Zoom Speeds	3.2, 4.6, or 6.6 seconds
7. Horizontal Angle of View	55.8° at 3.4 mm wide zoom, 2.3° at 91.8 mm telephoto zoom
8. Focus	Automatic with manual override
9. Sensitivity at 35 IRE	
a. NTSC/EIA	0.55 lux at 1/60 sec (color) 0.018 lux at 1/2 sec (color) 0.00018 lux at 1/2 sec (B-W)
b. PAL/CCIR	0.45 lux at 1/50 sec (color) 0.015 lux at 1/1.5 sec (color) 0.00015 lux at 1/1.5 sec (B-W)
10. Synchronization System	Internal/AC line lock phase adjustable through remote control, V-sync
11. White Balance	Automatic with manual override
12. Shutter Speed	
a. NTSC	1/2~1/30,000
b. PAL	1/1.5~1/30,000
13. Iris Control	Automatic with manual override
14. Gain Control	Automatic/ off
15. Video Output	1 Vp-p, 75 ohms
16. Video Signal-to-Noise	>50 dB

17. Type of Lighting	Menu selection of indoor or outdoor lighting for optimum camera performance
18. Wide Dynamic Range	128X
19. Motion Detection	User-definable motion detection settings for each preset scene, can activate auxiliary outputs, and contains three sensitivity levels per zone

Color/Black-White Optic System (23X)

1. Image Sensor	1/4-inch EXview HAD™ CCD
2. Scanning System	2:1 interlace
3. Effective Pixels	
a. NTSC	768 x 494
b. PAL	752 x 582
4. Horizontal Resolution	
a. NTSC/PAL	>540 TVL
5. Lens	f/1.6 (focal length, 3.6~82.8 mm; 23X optical zoom, 12X digital zoom)
6. Configurable Zoom Speeds	2.9, 4.2, or 5.8 seconds
7. Horizontal Angle of View	54° at 3.6 mm wide zoom, 2.5° at 82.8 mm telephoto zoom
8. Focus	Automatic with manual override
9. Sensitivity at 35 IRE	
a. NTSC/EIA	0.65 lux at 1/60 sec (color) 0.15 lux at 1/60 sec (B-W)
b. PAL/CCIR	0.55 lux at 1/50 sec (color) 0.12 lux at 1/50 sec (B-W)
10. Synchronization System	Internal/AC line lock phase adjustable through remote control, V-sync
11. White Balance	Automatic with manual override
12. Shutter Speed	
a. NTSC	1/2~1/30,000
b. PAL	1/1.5~1/30,000
13. Iris Control	Automatic with manual override
14 Gain Control	Automatic/ off
15. Video Output	1 Vp-p, 75 ohms
16. Video Signal-to-Noise	>50 dB

6.2.3 Video Wall Displays

Planar Systems – Clarity Matrix 46 inch LCD Display or Equal

Figure A4-2 Planar Systems Video wall for traffic monitoring

Matrix Specifications	
Specification List	Diagonal Size: 46 Inches Resolution: 1366 x 768 or better Aspect ratio (W:H) : 16:9 Technology: Commercial-grade direct view LCD Tiled image-to-image gap (min.) : 7.3 mm or better Brightness (maximum) : 700 candelas or nits Response time (typical) : 8ms or better Contrast ratio (full field) : 3000:1 or better Full viewing angle : 178° Colors : 16.7 million Backlight type : CCFL Backlight life (1/2 brightness) : 50,000 Hrs Mounted depth : 4.5" wall to front of screen Acoustic noise : Fan-less operation Heat load : 680 BTU per hour at 500 nit Operating temperature range : 5°-35°C Operating humidity range : 20-80% RH non-condensing Backlight control : Individual and wall control Backlight sensing and reporting : At display level Display module position sensing : Auto-sensing integrated Power consumption : 275-350 watts per panel (Approximately) Redundancy: 1+1 redundant power supplies for full 8 panels (Optional) Power supply voltage: 100-230V AC ± 10%, 50 to 60 Hz Power status: Diagnostics LEDs, health monitoring and alerts Safety regulations: Complies with EN60950, FCC Class A, CISPR22/85, CE,

6.2.4 Video Recorder 32 Channel H.264 Performance Specification

Pelco DS RealVue Xpress Hybrid Video Recorder with 4TB Storage

SYSTEM

Operating System	Windows® XP Professional
User Interface	DS ControlPoint
Internal Storage	500 GB, 1 TB, 2 TB, or 4 TB

VIDEO/AUDIO

Video Standards	NTSC/PAL	
Video Encoding	MPEG-4	
Video Decoding	iVEX, MPEG-4, MJPEG, wavelet, H.264	
Video Resolutions		
(Analog Cameras)	NTSC	PAL
D1	720 x 480	720 x 576
2CIF	704 x 240	704 x 288
CIF	352 x 240	352 x 288
Analog Camera Inputs	8, 16, or 32	
IP Camera Resolution	Up to 10 Megapixels	
IP Camera Capacity	16	
Recording Rate per Channel	30 ips (NTSC), 25 ips (PAL)	
Audio Channels	Up to 16	
Codec	MPEG1 Layer 2	
Bits Per Second	32 to 192 Kbps	
Sampling Frequency	32 kHz	

AUXILIARY INTERFACES

PTZ Interface	RS-232, RS-422, RS-485
Network	10/100/1000Base-T
Alarm Inputs	16 dry contact
Relay Output	1 Form C

MECHANICAL

Connectors

BNC	Video inputs and outputs
Terminal Blocks	Input triggers, audio inputs, RS-422/RS-485, output relays
Dual-DB15, RCA	Video inputs (unused)
USB	4 high-speed USB 2.0 ports; connect mouse and keyboard
DB15	VGA port
RJ-45	Dual 10/100/1000 Megabit Ethernet ports
6-Pin Mini-DIN	PS/2 mouse and keyboard
Audio Connectors	Miniature phono plug for line in (unused), line out, and microphone in (unused)
DB25	Printer

Optional I/O Connectors

Audio Levels	
Input	Line-level input
Output	Line-level output
Audio Connectors	Terminal block
Audio Inputs	Up to 16
Trigger Connectors	Terminal block
Trigger Inputs	TTL, dry contact to GND
Outputs	Form C relay, contact closure
RS-422/RS-485	Terminal block

ENVIRONMENTAL

Operating Temperature	50° to 95°F (10° to 35°C)
Storage Temperature	–40 to 149°F (–40 to 65°C)
Operating Humidity	20% to 80%, noncondensing
Operating Altitude	-50 to 10,000 ft (–15 to 3,048 m)
Operating Vibration	0.25 G at 3 Hz to 200 Hz at a sweep rate of 0.5 octave/min.

REMOTE PC CLIENT REQUIREMENTS

CPU Speed	Intel Core2 Quad Q9400 2.66 GHz (4 cores)
VGA Card	NVIDIA® GeForce® 9600 GT (512 MB, minimum)
Memory	4 GB RAM

CERTIFICATIONS

- CE, Class A
- FCC, Class A
- UL Listed

6.2.5 PTZ Camera Code Translator Performance Specifications

Sennetech SCT-1069 Camera Control Code Translator

The SCT-1069 is a Pelco to Panasonic control code translator designed to permit control of Panasonic cameras from Pelco controllers. It receives Pelco RS-422 commands and transmits the appropriate commands in Panasonic RS-485 code format. There are four independent Panasonic outputs.

Internal configuration switches allow the translator to work with Pelco "P" code or "D" code.

Input and output connections are made with mating screw terminal connectors. Front panel LEDs indicate status of power, receive, and transmit.

There is an optional 19" rack mount panel (one rack unit high).

Version 1.1 adds an auto iris command and a switch for sending old Panasonic code.
Version 1.3 changes the menu cursor commands to accomodate the CM9760 keyboard.
Version 1.5 Adds capability of sending Pansaonic menu cursor commands using Pelco goto preset commands.

SPECIFICATIONS

Size:	19"W x 1.75H x 5.45D
Weight:	1.5 lb
Power:	9Volt to 18Volt AC or DC at .75 Watts
Indicators:	Front panel LEDs: Power, Rx, & Tx
Biphase input:	(1) 3-pin mating screw terminal
Panasonic Outputs:	(4) 3-pin mating screw terminal

6.2.6 Keyboard with PTZ Control

PELCO KBD-5000 or Equal

TECHNICAL SPECIFICATIONS

A. The keyboard shall be compatible with all distributed, network-based video products. One keyboard can control all system cameras through a video console display or DVR display.

B. The keyboard controls are located on three modules in the keyboard. Modules shall be capable of rotating to suit user preferences. The keyboard modules shall include a variable speed, vector-

solving joystick for precise pan/tilt/zoom (PTZ) control, jog/shuttle for playback control and pattern control, a keypad for camera and monitor control, and a built-in speaker. The keyboard shall have LED buttons that work in conjunction with the feature being used.

C. The keyboard shall be part of an integrated system and shall be configured so any number of keyboards can be added to the system. When combined with user interfaces (UIs), network video recorders (NVRs), encoders, digital video recorders (DVRs), and video consoles, the keyboard forms an integral part of a complete network-based video control system.

D. The keyboard shall meet or exceed the following design and performance specifications.

POWER SUPPLY SPECIFICATIONS

A.	Input Voltage	100-240 VAC, 50/60 Hz
B.	Output Voltage	12 VDC
C.	Power Output	20 W
D.	Input Connector Type	Universal, interchangeable
E.	Output Connector Type	2.5 mm screw-on barrel

KEYBOARD BASE SPECIFICATIONS

A.	Keyboard Interface	USB 2.0
B.	Cable	USB, captive, 16.4 ft (5.0 m)
C.	Input Voltage	12 VDC
D.	Input Current	1.3 A (maximum)
E.	Upstream Port	USB 2.0 (USB type B connector)
F.	Downstream Port	2x USB 2.0 hi/full/low speed (USB type A connector)
G.	Audio Output	Embedded speaker or plug-in headset, 0.5 W into 8-ohm load per channel
H.	Audio Input	Plug-in microphone, mono (30 to 350 mVp-p); or line input, stereo (0.35 to 2.0 Vp-p)

KEYBOARD MODULE SPECIFICATIONS

A.	Keyboard Keypad	0 to 9 keys, camera, monitor, and multiple view keys
B.	Joystick	Fully proportional pan/tilt, variable speed; with zoom, iris, and focus controls
C.	Jog/Shuttle	Proportional, fast forward, reverse, and video transport; menu navigation on VCD5000 video console display
D.	Module Connectors	3 (1 for each module), USB 1.1 mini-USB

PHYSICAL SPECIFICATIONS

A.	Dimensions	7.86” D x 14.76” W x 4.6” H (19.96 x 37.54 x 11.68 cm)
B.	Unit Weight	2.68 lb (1.22 kg)

ENVIRONMENTAL SPECIFICATIONS

A.	Ambient Temperature	70° to 74°F (21° to 23°C
B.	Operating Temperature	32° to 104°F (0° to 40°C)
C.	Operating Humidity	Up to 96%

6.2.7 Operator Workstations

Wright-Line Profile Series

Core

The core serves as the primary structural foundation for the console system with heavy-duty 14 gauge and 16 gauge CRS (cold rolled) steel. Overall construction is an open frame to maximize service access to interior of the core and to minimize any barriers to internal cabling and wiring. The base of the core (area of core parallel to flooring) and the top of the core is permeated with multiple cable ports to permit vertical cable management from core to (optional) attached walls. The sides of the core (perpendicular to floor) are permeated with similar portals to permit lateral cabling among cores. Portals measure 3-inches and 4-inches in diameter and are trimmed with a plastic sleeve to create a smooth, uniform surface. The core is available in (4) nominal sizes: 36, 48, 60 and 72 with an overall height of 28-30 inches to correlate to standard seated height applications. The core depth is approx. 6-inches deep to maximize internal cable management.

The core load rating is 1200-lbs based on a double-sided application and 750-lbs for a single-sided configuration. The core includes (2) adjustable glide feet to properly level unit. The face of the Core includes mounting points to accept cantilevered work surfaces. The core is a self-supporting unit with the stabilization of core-mounted feet or integrated docking stations for technology hardware.

The core accepts steel panels or skins to finish the exposed face of the core. These panels are easily removed by hand and permit service access to the interior of the core. Steel skins include a vent pattern to permit heat dissipation. The core accepts additional cores to create a continuous run of cores without breaks or interruptions. Additional cores shall attach mechanically without creating floor creep. The cores also accept connectors to create angled configurations based on 15-degree and 45-degree angles with a bolt-on vertical column that minimizes floor space consumption and permit continuous lateral

cable management among cores. These connectors are available with concave and convex shape building options.

Core finish is epoxy powder-coated with a uniform application over all steel surfaces.

Work surface

Work surfaces are cantilevered tops that attach directly to a core and supported by (2) steel support brackets. The surface shall be mounted approx. 29-inches from the floor and provide clearance underneath the surface for optional keyboard platform accessories, personal storage modules or pedestals and optional storage for CPUs and rack mount hardware. The top is constructed of 45-lb particleboard construction with a decorative laminate finish on the top and an equivalent backer sheet on the underside of the top. Top thickness is 1.2-inch thick with a fully radiused bullnose front edge for comfort. The top is available in 30-in. and 36-in. depths and in widths to match core sizes: 36, 48, 60 and 72. Work surfaces shall be BIFMA rated to 300 lbs. (evenly distributed).

In additional to linear shapes, work surfaces styles also match the availability of concave and convex shaped workstation configurations. Work surface tops offer shapes to correlate to 15-degree and 45-degree angles.

Monitor Wall

A monitor wall is a vertical surface to support the attachment of ergonomic arms and user-supplied LCD Flat Panels. The framework is 14 gauge and 16 gauge CRS steel. This wall mechanically attaches directly to the top of a core to vertically stack and build viewing levels. The display wall is 12-inches to minimize vertical space consumption and maintains a sight line within room architecture. The wall matches the depth (6-inches) and width size of cores (36 - 72 wide) for space planning and appearance purposes. The wall includes an integrated 6063-T6 aluminum slatwall segment to accept mounting interfaces of monitor arms and optional filing accessories. The Flat Panel Display (FPD) wall includes multiple 3-inch and 4-inch portals to permit lateral and vertical pathways for cabling and wiring within a Profile unit. The base of each wall includes one (1) to two (2) removable raceway covers for accessibility to the interior of the display wall. These removable covers are trimmed with soft plastic edging or extrusions to permit seamless entry of cabling and wiring from the desktop into the display wall. A steel top trim finishes the exposed top portion of a display wall and shall be removable by hand. Top trim is constructed of steel with a dome shape to compliment system lines and includes an integrated vent pattern for heat dissipation.

The monitor wall gangs laterally to adjacent walls to create a continuous run of walls without breaks or interruptions. The walls also accept connectors to create angled configurations based on 15-degree and 45-degree standards with a bolt-on vertical column that minimizes desktop space consumption and permit continuous lateral cable management among walls. These connectors are available with concave and convex shape building options.

Monitor wall finish is epoxy powder-coated with a uniform application overall steel and aluminum surfaces.

6.2.8 Physical Security Information Management System (PSIM)

Proximex Surveillint™

- **PHYSICAL SECURITY INFORMATION MANAGEMENT (PSIM) GENERAL DESCRIPTION**

  - Contractor shall furnish and install Physical Security Information Management system (PSIM) for handling all security operations-related tasks and improve work efficiency without changing the existing security systems' functionality from a centralized workstation.

  - The system shall be able to integrate, connect and correlate information from security data and information from the following security subsystems.
    - CCTV management and control systems
    - Digital video recording systems
    - Physical access control systems
    - Intrusion Detection Systems
    - Badge management systems
    - Video analytics systems
    - Response Systems
    - Chemical/biological detection systems
    - Radioactivity detection systems
    - Phone Systems
    - Intercom systems
    - Motion detection systems
    - Radar systems
    - Location based device systems (RFID, GPS devices, etc)
    - Computer Aided Dispatch Systems
    - Notification Systems
    - Building Management Systems
    - IT Systems Management Systems
    - Other related systems

- The system shall be able to display alarms from security subsystems based on predefined policies and business logic.
- The system shall enable the operator to quickly visualize the environment and assess alarm by reviewing related security information
- The system shall enable the operator to take action by sending an email, printing a report, dispatch with necessary information, etc.

PSIM PERFORMANCE AND OPERATING REQUIREMENTS

- **General PSIM Display Functionality**

  The PSIM solution shall have the following general display functionality:

  - View and handle multiple alarms at one time
  - View multiple video windows at one time. Operators shall be able to resize and move video windows.
  - View windows in a single monitor, across multiple monitors or video walls
  - Access, display and manage events/alarms and related security data and information from subsystem based on priority and authority level.
  - View and manage detailed response procedures and tasks
  - Enable a single operator or multiple operators to monitor and control commands from connected subsystems, including all operational capabilities for detection, assessment, notification, entry control, and communications
  - Provide the rapid annunciation and display of alarms to facilitate evaluation and assessment
  - Enable different graphical user interface “skins” to be customized to provide a different look ‘n feel.

- **Map Display**

  The PSIM solution shall have the following map display functionality

  - View security environment through geospatial or fixed composite computer generated (JPEG, BMP, AutoCAD, etc.) map
  - Allow user to interactively drill down to specified security zones and sub-zones
  - Allow user to view sensor and related name from map console
  - Allow resources and objects to be tracked on map with geo-referenced “breadcrumb” trail.
  - Allow all resources, objects, sensors and elements on the map to be geo-referenced such that they have a real world coordinate.

- Visually display a camera sensor with related camera orientation, camera range and camera field of view angle
- Visually display an alarming sensor on map
- Visually differentiate sensor alarm severities on map through different color and icon identifiers
- Immediately view alarm details (including description, video, etc.) and investigate the alarm from the map
- Allow user to choose camera from map to view live video
- Allow user to choose camera and take live video image snapshot and save to file from any camera
- Allow user to choose camera from map to move PTZ cameras
- Allow user to choose camera icon from map to view recorded video from console
- Allow user to choose camera to play, pause, stop, fast-forward, rewind, and play recorded video from preset time
- Allow user to choose camera and take recorded video image snapshot and save to file or print from any live or recorded video
- Allow user to take action on Access Control door from console to open unlock door, relock door, allow momentary access for door, lock down door, release lock down
- Allow user to take query Access Control door from console to get last 5 activities for door, get activities for door in the last 5 minutes, get door activities for last hour, get door activities for the last day, etc.
- Allow user to view badge photo ID from door activity results
- Allow user to jump from one map to the next with a single click of a mouse with map links
- Allow map information "layers" to be displayed/hidden on items such as,
  - Sensor names
  - Sensors
  - Sensor range (camera – orientation, range, field of view angle)
  - Security areas and zones
  - Perimeter ranges
  - Resource tracks
- Allow user to zoom in/out on different regions of map graphic

o **Navigation**

The PSIM solution shall have the following navigational display functionality:

- Allow user to navigate maps in a hierarchical list or tree based security zones or logical groups

- Allow user to navigate to a map or security zone through the map interface and through a graphical hierarchical tree view
- Allow user to quickly navigate to an open alarm through a hierarchical tree and related map.
- Allow user to navigate to search by sensor name and be directed to related graphical map
- Allow user to sort hierarchical tree by name of zone or area
- Visually indicate in the hierarchical tree/list if a sensor in a security zone is in an alarm state.
- Visually display the number of open alarms in a security zone or area in the hierarchical tree
- "Bubble up" the visual indication of the highest severity alarm to the next higher level in hierarchical tree.

o **Search and Trace Capabilities**

- Allow user to search and find sensor(s) names with text "wildcards"
- Allow user to search and find security zones and areas names with text "wildcards"
- Allow user to search and find alert ID to quickly find alert and alert details
- Allow user to search and trace all user activity related to a specific badge ID or user name
- Allow user to search and trace all user activity related to a specific user name

o **Video Display**

The PSIM solution shall have the following video display functionality:

- View live or recorded video from resizable and movable windows
- View live or recorded video from any monitor connected to PSIM workstation
- Display the same video controls irrespective of video system manufacturer
- Ability to perform video controls for video systems from PSIM workstation:
  - Play, fast-forward, rewind, pause, and specify time to play recorded video
  - Take a video still image (snapshot) from live or recorded video
  - Export video for user specified time and duration
  - Move PTZ cameras (if available)
- View Video in Video Matrix
  - Display in 1x1, 2x2, 3x3 and 4x4 window formats
  - Enable predefined video windows to be displayed in matrix
  - Enable operator to specify video windows to be displayed in matrix

        - Enable matrix settings to be saved per user
        - View either live or recorded video can be displayed in the video matrix window.
        - Enable video snapshot to be taken and saved from any window pane in the matrix view
    - Rotate video in "virtual" video guard tour
        - Rotate through multiple video views based on predefined video camera sequence and duration.
        - Enable the user to pause the rotation of video and resume the video rotation again
        - Enable times between new video to be adjusted
        - Enable both live video and recorded video to be played through the video guard tour.
        - Enable alarms to be generated from any video pane
    - Enable user to only view and control video for which they have been assigned permissions by the administrator
    - Manually create an alarm from the live or recorded video with specified severity and description

- **Summary Dashboard**
    - Provide alarm summary of each monitoring zone or monitoring area in graphical chart format
    - Display the following charts per global area, monitoring zone or monitoring area
        - Open Alert Count by Monitoring Zone/Monitoring Area
        - New vs. Viewed (Opened Alerts)
        - Open Alert Count by Alert Severity
        - Highest Severity Alert
    - Enable Monitoring Zone or Monitoring area default to Summary view dashboard or to a map when the zone or area is selected.

- **Sensor List View**
    - Provide a tabular list of sensors in each monitoring area
    - Enable each column in the table to be sorted
    - Enable each column to be filtered based on criteria
    - Enable actions to be taken on each sensor similar to the icon on the map
        - For video cameras, choose the camera to view live video, recorded video, launch tracking capability, generate alert

- For access control door choose the door to unlock door, relock door, allow momentary access for door, lock down door, release lock down, get last 5 activities for door, get activities for door in the last 5 minutes, get door activities for last hour, get door activities for the last day, etc.

- **Alarm Display**

  The PSIM solution shall have the following alarm display functionality:

  - Display real time, dynamic, iconic status of alarm point indications, overlaid onto a computer generated or GIS graphic map of the detection area and zone
  - Display textual alarm description alarm status, severity, activity, operator actions, tasks and procedures, and time/date status.
  - Allow users to view digital video scenes, automatically or manually, related to alarm for both live and recorded video
  - Allow users to handle alarms based on priority
  - Allow users to handle and view multiple alarms in individual windows or in a list
  - Allow users to view alarm notification in system tray
  - Allow users to view alarm notification and alarm summary in alert list window pane
  - Allow users to view alarm notification in the hierarchical tree view
  - Allow users to view alarm in a specific security zone and associated with specific sensor on the map
  - Allow users to view a list of alarms associated to a sensor on the map
  - Sort alarms list status by time/date
  - Sort alarm list by severity (i.e. highest severity on top)
  - Sort alarm list by alarm type
  - Sort alarm list by location
  - Allow users to choose which columns (details) are shown in the alarm list
  - Allow users to scroll through multiple queued alarms
  - Display associated queued video with each alarm
  - Filter alarms by severity, status, sensor name, alert types
  - Group alarms by type, location, sensor, etc.
  - Subgroup alarms by type, location, sensor, etc.
  - Have the same “look and feel” for different alarms generated or alarms generated from different systems
    - All alarm details are displayed in the same places and information is consistent
    - Video windows and controls are in the same place and can be displayed with the same controls

- Notes are in the same location for different alarm types
- Acknowledgement of alarms can be performed in the same way for different alarms types
- Vendor specific information is displayed in the same portion of the user interface

o **Alarm Handling**

The PSIM solution shall have the following alarm handling functionality:

- Ability to display alarm condition through visual display and audible tone
- Ability to simultaneously handle multiple alarms from multiple workstations
- Ability to prioritize and display multiple alarms and status conditions according to pre-defined parameters such as alarm type, location, sensor, severity, etc.
    - Display the highest priority alarm and associated video in the queue as default, regardless of the arrival sequence
    - Place subsequent alarm in a queue according to predefined priorities without covering up or higher priority alarm
- Ability to automatically present an integrated window of the incident and access to the following incident related information and actions with a single mouse click or less
    - Related queued recorded video
    - Related live video from related camera
    - Related video PTZ controls (if camera is PTZ)
    - Related local map image with location of alarm
    - Related door activity
    - Related alarm notes
    - Acknowledge/close alarm
    - Take a visual image snapshots of live or recorded video to be printed, saved to disk or saved as a part of the alarm
    - Vendor specific sensor information (i.e. video analytics alarms may generate marked up images, etc.)
- Ability to automatically display related response instructions and tasks for each alarm
    - Tasks in checklist format
    - When tasks have been updated
    - Completion progress
    - Provide option to require operator to complete specific task(s) before alarm can be acknowledged or closed

- Ability to acknowledge or close alarms from central console and updates to be synchronized with related alarming security subsystems
- Ability to enter notes during the alarm and notes information to be shared with other users of the system
- Ability to view historical alarms that have been closed or acknowledged in the system to view activity, video, etc. (for duration of video being captured in the system)
- Ability to automatically stamp note entries with time/date and operator user name
- Enable new alerts to automatically open alert details window when alerts are received or for alerts to remain in the alerts list until a user clicks on the alert.
- Ability to generate comprehensive alarm report within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability to print comprehensive alarm report within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability to email comprehensive alarm report within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability to send comprehensive alarm report to wireless mobile device within 30 seconds of alarm occurrence including alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available)
- Ability for operator to quickly export associated video upon alarm occurrence.
- Ability to automatically and manually escalate alarms
    - Automatically escalate alarms if alarm is not addressed within a predefined time frame. Enable alarm to be escalated to new group or user and actions to be taken.
    - Operator can escalate and redirect alarm directly from the PSIM workstation while working on the alarm
    - Alarms can be redirected or escalated to pre-configured user group or user.
- Enable operator to generate a new alarm from map
    - Automatically capture the alarm time and date
    - Automatically capture the location of the alarm on the map
    - Enable operator to specify severity, alarm type, and alarm description
    - Enable appropriate response tasks to be associated with the alarms
    - Enable other operators to see and handle alarm similar to other alarm types
- Enable operator to generate a new video alarm while watching live or recorded video

        - Automatically capture the alarm time and date
        - Automatically capture the location of the alarm
        - Automatically capture video image snapshot and link to related video
        - Enable operator to specify severity and alarm description
        - Enable other operators to see and handle alarm similar to other alarm types
        - Enable appropriate response tasks to be associated with the alarms
    - Provide multiple alarm details display types based on operator experience
        - Simple view which defaults to alarm details and response tasks where operator chooses icons to view additional information such as video, notes, etc
        - All-in-one detailed views to provide operator with all relevant information at one time
    - Enable administrator to configure pop-up message if response tasks have not been completed for alarms before they are acknowledged or closed
    - Enable different sound types and sound files to be associated with different alarm types
    - Enable electronic voice playback of alarm and alarm description

- **Historical Alarm Handling**

  The PSIM solution shall have the following historical alarm handling functionality:

    - Ability to view historical alarms details even after the alarm has been acknowledged or closed.
    - Ability to sort alarms according to date/time, severity, type, sensor ID or location.
    - Ability to group alarms according to date/time, severity, type, sensor ID or location.
    - Ability to view associated alarm description, time/date, severity, location, maps, door activity (if available), video image snapshots (if taken), and response instructions (if available) and related queued video from time of alarm.

- **Auditing**

  The PSIM solution shall have the following auditing capabilities:

    - Ability to store and log all activities related to alarm
        - When alarm is created in PSIM system
        - When alarm is viewed by operator
        - When alarm is acknowledged, closed, or deleted
        - Actions taken on related sensor resources
        - Video snapshot images taken by operator
        - Notes entered by operator for alarm

        - Reports generated
    - Ability to display all activities while alarm is open
    - Ability to display all activities after alarm is acknowledged or closed
    - Ability to display activities on monitor and print report
    - Ability to export alarm report in various formats including pdf, jpeg, html, txt, and mht formats

- **Alarm Reporting**

  The PSIM solution shall have the following alarm reporting capabilities:

    - Ability to generate a full incident report within 30 seconds of the alarm being generated.
    - Ability to display report on monitor and print report
    - Ability to select information to be included in report at time of report generation.
        - Details of alarm including severity, time/date, description and location
        - Map of surrounding area associated with alarm
        - Associated door activity and badge holder information if access control alarm
        - Captured video image snapshots
        - Response instructions
        - Alarm activities (audit trail)
    - Ability to export alarm report in various formats including pdf, jpeg, html, txt, and mht formats
    - Ability to generate an alarm incident package including the full incident report and exported video from the incident in a specific folder location.

- **Trend Reporting**

  The PSIM solution shall have the following trend reporting capabilities:

    - The PSIM system shall allow generation of security trend reports to provide insight for proactive in resource planning and pinpoint specific problem areas and sensors.
        - Alarm Count Daily Report
        - Alarm Count Hourly Report
        - Alarm Detail Report
        - Alarm Response Time by Alarm Type Report
        - Operator Alarm Count Report
        - Operator Alarm Response Time Report
        - Operator End of Shift Report
        - Top X Alarm Response Time Report

        - Top X Alarms by Alarm Type Report
        - Top X Alarms by Area Report
        - Top X Alarms by Sensor Report
        - Top X False Alarms by Sensor Report
        - Top X Simulated Alarms By Sensor Report
    - Ability to display report on monitor and print report
    - Allow reports to be generated and filtered based on different criteria including
        - Time
        - Date
        - Area/Location(s)
        - Sensor(s)
        - Alarm type and source
        - Alarm severity
        - Simulated alarms
    - Create predefined report templates based on different criteria
    - Ability to customize the look and feel of the report
        - Chart Type
        - Enable/Disable Chart
        - X-Axis and Y-Axis labels
        - Color Scheme
    - Ability to save report templates to be reused at a later time
    - Ability to export report in various formats including pdf, jpeg, html, txt, and mht formats

- **Video Tracking**

  The PSIM solution shall have the following video tracking capabilities:

    - When operator is viewing video from an existing camera, automatically display video from adjacent cameras
        - Select the direction of movement to show adjacent video
        - Follow a suspect/object moving from one camera view to the next camera view by selecting one of the next camera views
        - Simultaneously watch current field of view while also viewing video from adjacent cameras
        - Should not require operator to memorize or enter in camera names/IDs or times.

        - Support live or recorded video
        - Fast-forward, rewind, pause or stop recorded video
        - Ability to track suspect/object forwards and backwards (if supported by video management system)
    - Ability to automatically build a track report when the operator moves from one camera to the next camera
        - Record camera ID and name
        - Record time and date
        - Record and update video still image
    - Ability to replay the path of the object suspect including
        - Camera ID and name
        - Time and date
        - Video still image
        - Animated map with associated camera location on map
        - Breadcrumb trail showing the path of the object/suspect from camera to camera
        - Recorded video for each video track
    - Ability to generate 'track' report including camera IDs, video snapshots, times/dates, and map locations
    - Ability to export report in various formats including pdf, jpeg, html, txt, and mht formats

- **Device Tracking**

  The PSIM solution shall have the following device tracking capabilities:

    - Track latitude and longitude or geospatial location of devices or objects (e.g. GPS enabled cellular phones, RFID devices, etc.)
    - Allow devices to be associated with resources for resource tracking
    - Enable multiple devices to be simultaneously tracked
    - Enable device locations to be displayed in the PSIM geospatial map
    - Enable details of devices to be called up from the map
    - Enable tracked objects to be displayed/hidden
    - Enable multiple objects to be tracked, but only show tracks of object when the object enters an alarm area/zone.
    - When object enters alarm area/zone, show alarm details and geo-referenced breadcrumb tracks leading up to the alarm

- When object enters alarm area allow real-time updates of geo-referenced breadcrumb trail.

o **Resource Tracking**

The PSIM solution shall have the following resource tracking capabilities:

- Track latitude and longitude or geospatial location of resources (e.g. people, vehicles, water vessels, etc.) if associated with location based device
- Enable multiple resources to be simultaneously tracked
- Enable resource locations to be displayed in the PSIM geospatial map if associated with location based device
- Enable details of resources to be called up from the map
- Enable tracked resources to be displayed/hidden
- Enable search and find tracked objects by name.
- Automatically display the location of the resource on the map with single mouse click

o **Mobile Device Support**

The PSIM solution shall have the following wireless/cellular mobile device capabilities:

- Provide mobile operator in-context alarm information including all alarm details on mobile device
- Enable mobile operator the ability to view all alarms assigned to him/her on mobile device.
- Enable mobile operator to enter notes on the mobile device to be updated with central PSIM system
- Enable the mobile operator to view and update alarm on mobile device when wireless connectivity is lost and for information to be synchronized when wireless connectivity is reestablished
- Ability for mobile operator to receive escalated alarm on mobile device.
- Ability for mobile operator to create a new alarm in to the PSIM solution based on a photo taken by mobile device.
- Enable mobile operator to pull up cardholder information/credentials by entering in name or employee badge ID on mobile device.
- Enable mobile device to communicate securely with PSIM system

o **Data Integration**

The PSIM solution shall have the following data integration capabilities:

- Enable the bi-directional management of data sharing among security subsystems such as

- CCTV management and control systems
- Digital video recording systems
- Physical access control systems
- Intrusion Detection Systems
- Badge management systems
- Video analytics systems
- Response Systems
- Chemical/biological detection systems
- Radioactivity detection systems
- Phone Systems
- Intercom systems
- Motion detection systems
- Location-based device systems (RFID, GPS devices, etc)
- Computer Aided Dispatch Systems
- Notification Systems
- Radar Systems
- IT Systems
- Building Management Systems

– Provide an open web services-based Application Programming Interface (API) and Software Development Kit (SDK) to enable other systems to be easily integrated with the PSIM solution. The PSIM API and SDK will
  - Enable a vendor subsystem to raise new alarms in to the PSIM solution
  - Enable a vendor subsystem to deliver alarm details in to the PSIM solution
  - Enable the PSIM solution to browse a list of sensors (doors, alarm points, etc.) and add the sensors to the appropriate maps, sensor groups, monitoring areas, etc.
  - Enable the PSIM solution and the vendor subsystem to synchronize alarm status updates in real time
  - Provide the PSIM system to take actions on the vendor system such as retrieving ACS door information, control ACS doors, move cameras, etc.
  - Enable object or resource geo-coordinate locations to be associated with the alarm or resource and tracked on the PSIM map
  - Enable a vendor system to retrieve escalated, correlated PSIM alarm detail information
  - Enable the PSIM console to be launched through a programmatic command

- Enable a particular video window in the PSIM console to be displayed through a programmatic command
- Launch a particular alarm window and alarm details in the PSIM console to be displayed through a programmatic command.

o **Other Users**

The PSIM solution shall have the following user capabilities:

- Enable multiple users to access system simultaneously
- Enable multiple users to handle the same alarm at one time
- Enable single or multiple users to view and manage alarms in defined areas
- Enable changes (acknowledge/close/escalate/add comment) by one user to be seen by other users

o **Permissions and Groups**

The PSIM solution shall have the following user and group permission capabilities:

- Ability to utilize Windows security and Microsoft SQL Server security (Windows Authentication or SQL Server Authentication)
- Ability to provide multiple security groups and roles:
  - Operators – to access operational functionality in the user interface.
  - Administrators – to access both the operational functionality and administrative and system related configuration functionality in the user interface.
  - Power Users – to access operational functionality and some limited administrative functionality
  - Video Viewer – to access video console only, and granted scope of hierarchy only
  - Mobile Operator – to access alarms via PDA or SmartPhone
- Ability to create new users with login and passwords and assign users to the appropriate security groups
- Ability to search and auto-filter user lists to find specific users
- Ability to assign security groups/roles to
  - View individual security zones and maps
  - View alarms in specific security zones and locations
  - View and control sensors in specific security zones and locations
  - Configure system including maps, sensors, policies, permissions, users
- Ability to grant or revoke the permission of the following functionalities to each security group/role

- Access Administration Console
- Access Operation Console
- Access Video Console
- Access Mobile PDA or SmartPhone
- Access Business Logic Console
- Access Alert Manager
- Access Video Tracking / Pursuit
- Access Report Wizard
- Acknowledge Alert
- Close Alert
- Delete Alert
- View Alert Details
- View Deleted Alerts
- Print Alert Details
- Export Alert Details
- Email Alert Details
- Add Notes to Alert Details
- Export Video
- Video Snapshot
- Create Video Alert
- Run a Report
- Save a Report
- Save a Report as a New Report
- Print a Report
- Export a Report
- Access Preferences
- Identify a person via badge ID or image
- Limit access to recorded video to customizable timeframe
-

o **System Administration**

The PSIM solution shall have the following system administration capabilities:

- Allow systems administration functionality to be configured through a graphical user interface
- Ability to configure alarm policies and properties through user interface

- Ability to configure maps through user interface
- Ability to configure sensor locations through user interface
- Ability to configure sensor properties through user interface
- Ability to establish user access and permission levels through user interface
- Ability to create new users, logins and passwords specific for each user through user interface
- Ability to configure security zones through user interface
- Ability to easily add/remove/edit sensors as a part of a security zone through user interface
- Ability to configure all alarm priorities, text and graphics information, locate display alarm points, video displays/video recording and playback characteristics, password management, report generation and configuration and other related information
- Ability to archive, retrieve database via database tools

o **Configuration Wizard and Setup**

The PSIM solution to be able to be configured through a GUI based configuration wizard.

- Ability to have entire PSIM solution configured and functional through the configuration wizard
- Ability to have a checklist of items that need to be completed for each step
- Ability to have a progress meter to view progress of installation
- Ability to stop and resume the configuration at a later time
- Ability to view configuration tips and tricks
- Ability to link to the specific PSIM configuration screen for setup if required

o **Map Administration**

The PSIM solution shall have the following map administration capabilities:

- Ability to import map images from AutoCAD, BMP, JPEG and other standard image files
- Ability to geospatially reference maps and sensors on maps to real-world coordinates
- Ability to logically group maps and organize hierarchically
- Ability to add sensors to map, such as cameras and ACS doors, etc,
- Ability to display camera properties on map such as camera orientation, camera field of view angle, and camera range.
- Ability to represent different sensors types with different icons
- Ability to create security zones on map represented by polygon shapes to allow the operator to visually distinguish the different regions

- Ability to apply permissions to maps such that different groups and authority levels can only see the maps for which they have privileges to view
- Ability to display only security maps, sensors and alerts associated with security zone
- Ability to create links on the map to move back to the previous map views, move to another map, adjacent map (left, right, up, down, custom link), or go to the top level map with a single click of a button
- Ability to search and auto-filter security zones and areas to find specific zones/areas in large environments

o **Sensor Administration**

The PSIM solution shall have the following sensor administration capabilities:

- Ability to sustain frequent additions/removal/changes to sensors and sensor properties
- Ability to easily accommodate new sensor types such as access control alarms, intrusion alarms, video systems, etc. which may be added at a later date
- Ability to browse sensor subsystem for related sensor name or ID to add the sensor to the PSIM system
- Ability to update maps and graphical elements through graphical user interface
- Ability to define properties and details of sensors
  - Name
  - Description
  - Location
  - Position
  - Camera Specific - Field of view angle, distance, direction, type
  - Mapping to subsystem
- Ability to create sensor groups such that related sensors such as access control sensor and camera sensor can be in a sensor group to display appropriate video when alarm occurs or to correlate multiple alarms together in the group
- Allow more than one of the same type of sensor (camera, access control, intrusion alarm, etc.) to be added to the same group such that multiple cameras can be displayed per alarm or multiple alarms from similar devices can be correlated.
- Ability to search and auto-filter sensor lists to find specific sensor(s) in large sensor lists
- Ability to bulk import sensors and sensor configuration from xml, excel, or CSV file
- Ability to bulk monitoring area names with members from xml, excel, or CSV file
- Ability to bulk export sensor configurations for any sensor types

- **Alarm Policies and Business Logic Administration**

The PSIM solution shall have the following ability to handle the workflow alarms through Visio-like graphical user interface:

- Ability to be create an alarm policy to raise alarm in the PSIM system by defining conditions through configurable GUI-based business logic designer
  - Ability to match keywords or text from the alarming subsystem's event description to raise an alarm using criteria including exact match, exact NOT match, contains match, wildcard match and regularly expression match (such as forced door alarm, denied access, door open too long, etc.)
  - Ability to optionally match alarming subsystem's event status, event severity, and sensor type
  - Ability to customize the alarm description the PSIM system to use the exact description from the Event Source, a predefined Alert Description, or any customer description.
  - Ability to customize the alarm severity in the PSIM system based on the type of alarm subsystem event
- Ability to apply the alarm policy across all alarm subsystems or only selected alarm subsystems with a single alarm policy
- Ability to apply any alarm policy to one or more monitoring area(s) or zone(s) without having to reapplying the policy multiple times.
- Ability to apply any alarm policy to one or more sensors without having to reapply the policy multiple times.
- Ability to assign specific actions for each alarm
  - Email
  - Command line action
  - Correlation and fusion of additional incident related information
  - Alarm escalation
- Ability to automatically correlate related data and information to be displayed in real-time for each alarm and related rule
  - Correlate data or information from any security subsystem such as related live video, related recorded video, door activity, door commands, operator response instructions, map location, badge images, etc.
  - Automatically display information in real-time when an alarm is generated.
  - Display all correlated information together in attached windows when an alarm is generated.
  - Automatically display related response instructions and tasks for each alarm and related rule

- Ability to assign and apply business logic policy to specific sensors and or security zones
- Ability to create business logic policy to support multi-decision, multi-action workflow for any alarm through a drag and drop GUI-based designer
- Enable the following activities to be included in the business logic policy:
  - Enable business logic activity to display live video
  - Enable business logic activity to display recorded video based on a relative time offset from the alarm time
  - Enable business logic activity to display door activity based on configurable amount of time and/or events
  -
  - Enable business logic decisions based on time of day
  - Enable business logic decisions based on severity
  - Enable business logic decisions based on location
  - Enable business logic decisions based on regular expression text matches
  - Enable business logic decisions based on security threat level
  - Enable business logic activity to escalate alarm after predefined time
  - Enable business logic activity to generate a new alarm
  - Enable business logic activity to make a call
  - Enable business logic activity to send email
  - Enable business logic activity to take action on sensor subsystem (ACS, camera commands, etc.)
  - Enable a custom Microsoft Powershell activity to be created and included in the business logic flow
  - Enable business logic to correlate multiple alarms together and take follow on action such as auto-acknowledging/closing prior alarms, creating new alarms, etc.
  - Enable business logic to activity to generate a report
  - Enable business logic to escalate an alert to notification service
  - Enable business logic to execute a web services call
  - Enable business logic to execute ODBC database call
  - Enable business logic to invoke an external method call
  - Enable business logic to generate a report on an incident in multiple report formats and with different customizable information
  - Enable business logic to automatically send report to a predefined email

- Enable business logic to take a HTTP SEND or GET action on predefined URL with or without authentication
- Enable business logic to take a HTTPS SEND or GET action on predefined URL with or without authentication
- Enable business logic to determine whether the current location of an alarm is within a specific geographic boundary/area
- Simulate an alert and follow the step-by-step execution of the business logic prior to application of business logic in production environment
- Enable business logic to call another child business logic policy as a part of the main business logic activity
- Enable business logic activity to aggregate RSS or ATOM feeds, filter the feeds and create corresponding alert in the PSIM system
- Enable business logic to change the alarm context to that of another alarm
- Enable business logic to lock a specified door, relative door defined in an area or sensor group, or multiple doors defined in an area or group
- Enable business logic to open a specified door, relative door defined in an area or sensor group, or multiple doors defined in an area or group
- Enable business logic to open momentarily a specified door, relative door defined in an area or sensor group, or multiple doors defined in an area or group

- Enable business logic policies to be saved, loaded and reused as necessary as business logic templates
- Ability for simulate alarms through business logic designer
- Enable multiple business logic policies to be deployed and to be processing at any one time
- Ability to schedule business logic policies to run at specified times of the day, days of the week, monthly, or yearly within a specified or endless time range.

- Ability to collapse multiple duplicate alarms to reduce alarm clutter
  - Ability for administrator to apply collapsing policies through PSIM administrative user interface
  - Ability to assign different collapsing policies to be assigned to different security zones and locations
  - Ability for alarms to be collapsed based on time duration, matches to sensor name, severity, and alert description regular expression
  - Allow user to view number of collapsed alerts through the operational user interface

        - Allow user to view the collapsed alerts and collapsed alerts details through the operational interface if required
    - Ability to set up automated escalation policies for different areas and locations
        - Escalate alarm if no activity is taken on alarm within predefined time period
        - Escalate alarm to predefined groups or users
        - Take actions on escalated alarms
        - Re-escalate alarm if no activity is taken on escalated alarm with new groups or users and actions.

- **Automated Sensor Updates**
    - Ability to automatically add newly found subsystem sensors as a new sensor PSIM system
    - Ability to automatically add the newly found sensor to a corresponding monitoring area
    - Ability to automatically apply a business logic policy to the newly found sensor

- **Permission Administration**

  The PSIM solution shall have the following permission administration capabilities:
    - Ability to assign the following permissions to maps and security areas
        - Operators' permission to perform all functions within that client software. These users cannot access the Administrator Console.
        - Administrator permission to access both the Operator Console and the Administration Console. This allows them to perform the same actions as Operators, as well as create, configure, modify and view the entire PSIM system.

- **Communications with Security Subsystems**

  The PSIM solution shall have the following communication capabilities with security subsystems:
    - Ability to view alarms and events in PSIM system from subsystems such as access control, video analytics, video management system, intrusion systems, etc.
    - Ability to send alarm status updates (acknowledgements, closing, deletion, etc.) from PSIM systems to each underlying subsystem
    - Ability to send action commands to underlying subsystems to take action such as move PTZ cameras, unlock/lock ACS doors, etc.
    - Ability to take receive other alarms through an open web services interface.
    - Support multiple Network Video Recorder (NVR)/Digital Video Recorder (DVR) vendors/models simultaneously

- Support multiple Physical Access Control Systems simultaneously
- Support multiple Video analytics Systems simultaneously
- Support multiple Intercom Systems simultaneously
- Support multiple other subsystems simultaneously
- Integrate with News Feed via RSS
- Integrate SNMP traps in to PSIM solution
- Integrate WMI alerts in to PSIM
- Integrate Syslog alerts in to PSIM

o **High Availability Capabilities**

The PSIM solution shall have the following high availability capabilities:

- Ability for redundancy and data Integrity
  - ❖ Database redundancy
    - SQL Server Failover Cluster for Microsoft SQL Server 2005
    - Database Mirroring Solution for SQL 2005
  - ❖ Web services redundancy
    - Services can be setup to run on multiple computers
  - ❖ Server components redundancy
    - Microsoft cluster solution can be used for any and all servers
  - ❖ Operator and Administrator consoles
    - Stateless user interface and ability to run multiple consoles simultaneously
- Ability for fault tolerance
  - ❖ Support redundant server configuration with hot swappable power supplies, cooling fans, PCI slots, and hard drives in minimum RAID-5 configuration
- Ability for system failover
  - ❖ Ability for multiple operators including those from remote locations to simultaneously log in to the system and have full control of monitoring and access of data for detection, assessment, notification, entry control, communication
  - ❖ Ability for operator to reconnect to a redundant database in case of the main database system failure. This feature requires specific underlining hardware, OS and database.
  - ❖ Ability to view maps from secondary site
    - The user interface component is stateless and multiple consoles can run simultaneously

- ❖ Ability to view alarms from secondary site
  - The user interface component is stateless and multiple consoles can run simultaneously

o **Security Functionality**

The PSIM solution shall have the following security capabilities:

- Ability to secure system through password and privilege protection provided by the operating system(s) using Windows authentication and by Microsoft SQL Server using SQL Server authentication.
- Ability to communicate among major components utilizing SOAP (Simple Object Access Protocol). SOAP is a protocol for exchanging XML-based messages over a computer network, and the communication can be configured as HTTP or HTTPS for a more secure environment.
- Ability to communicate over Secure Sockets Layer (SSL)

o **System Operations**

The PSIM solution shall have the following system operations capabilities:

- Ability to support unattended Operation
  - ❖ PSIM server services run even if a user is not logged in
  - ❖ PSIM server to return to normal activity after reboot without administrator intervention
- Ability for administrator without database administration skills to configure and set up system
- Ability for system to be easy to use and administer

o **Performance**

- Ability to support over 20,000 configured sensors in the PSIM console
- Ability to support over 10,000 open alerts in the console
- Ability to support over 100 PSIM operations consoles from a single PSIM server
- Ability to support alert bursts of over 500 alerts per second
- Ability for business logic policies to be deployed in less than 10 seconds for 20,000 sensors

o **Installation**

- Ability for all components of PSIM solution to be installed through self-extracting installation files
- Ability for new subsystem integrations to be installed without having to reinstall the base PSIM solution

- All installation files should be self-guided GUI-based wizards allowing installation parameters to be entered during the installation
- PSIM system shall have a GUI-based integration manager that allows
  - One or more integration with subsystem to be configured
  - Multiple instances of subsystem to be configured
  - Parameters for integrated subsystem to be specified
  - Connectivity and calls to subsystems to be automatically checked
  - Integration with subsystem to be removed
- PSIM system shall have a GUI-based services configuration wizard that allows each of the PSIM services and components to be configured.
- Ability for PSIM database, services and web servers to all be installed on a separate servers if necessary
- Ability for PSIM system to be upgraded to the PSIM version while maintaining all previously configured components - the maps, policies, sensors, and response workflow.

o **Documentation and Help**

The PSIM solution shall have the following documentation and help files

- PSIM installation guide
- PSIM administrator guide
- PSIM user/operator guide
- Subsystem integration installation guide
- Online context sensitive help

HARDWARE REQUIREMENTS AND INTERFACES

The PSIM software shall run on industry-standard computer platforms and software, and support video cameras which comply with industry standards.

o **Server Operating System**

- The PSIM server application shall support Microsoft Windows Server 2003 with SP1 or higher
- The PSIM server application shall support Windows Vista
- The PSIM server application shall support Microsoft Windows Server 2003 with 32- and 64-bit modes
- The PSIM server application shall support Microsoft Windows Server 2003 R2 with 32- and 64-bit modes

- The PSIM server application shall support Microsoft Windows 2008 with 32- and 64-bit modes
- The PSIM server application shall support Microsoft Windows 2008 R2 with 32- and 64-bit modes

o **Client Operating System**

- The PSIM client software shall support Microsoft Windows XP Professional SP2 or higher
- The PSIM client software shall support Microsoft Windows Server 2003 with SP1 or higher
- The PSIM client software shall support Windows Vista
- The PSIM client software shall support Microsoft Windows Server 2003 with 32- and 64-bit modes
- The PSIM client software shall support Microsoft Windows Server 2003 R2 with 32- and 64-bit modes
- The PSIM client software shall support Microsoft Windows 2008 with 32- and 64-bit modes
- The PSIM client software shall support Microsoft Windows 2008 R2 with 32- and 64-bit modes

o **Server Relational Database**

- The PSIM system shall support Microsoft SQL Server 2005 with 32- and 64-bit modes
- The PSIM system shall support Microsoft SQL Server 2008 with 32- and 64-bit modes

o **Hardware**

- The PSIM server software shall be able to be installed on a server system with minimum of Intel Core 2 Duo 2.0 GHz processor, 2GB memory, 100GB hard drive free space
- The PSIM workstation software shall be able to be installed on a workstation system with minimum of Intel Core 2 Duo 2.0 GHz processor, 1GB memory, 50GB hard drive free space

o **System Vulnerability Checks**

- The PSIM system shall be tested by security compliance software and vulnerable assessment tools, such as tools from Symantec, McAfee and Microsoft.

o **Network Standards**

- The PSIM system shall be compatible with IEEE TCP/IP and 802.3 Ethernet series standards. Network bandwidth to be determined by others based on the number and

types of video cameras, video frame sizes and frame rates, video recording requirements, number of simultaneous users, and other factors.

6.2.9 AC Power System requirements and power budget for CMS equipment

CMS SOC Equipment

6.2.9.1	DVR (Qty 23) Watts max	90-250VAC	3,120
6.2.9.2	PSIM Server (Qty of 2) Watts max	90-250VAC	1,405
6.2.9.3	Video Wall Power Supply/UPS Watts max	90-250VAC	4,900

Coast

Guard Island Thermal Camera Site

1.	Camera & Wireless Link	90-250VAC	500 Watts

ANNEX 1 – Scope of Work

ANNEX 1: Scope of Work

The Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun) intends to procure a turn-key Computer Monitoring Security System (CMS). The CMS shall provide improved security monitoring of the Port of Buenaventura's port terminals and facilities.

This Scope of Work shall define the contractor's responsibilities for the implementation of the CMS.

The CMS shall comprise the hardware and software for a new Physical Security Information Management (PSIM) system, a new Pelco CCTV headend to replace the existing legacy Panasonic headend due to discontinued equipment being installed and needing replacement; new video display wall to provide imagery from the PSIM dashboard and CCTV headend; new operator console workstations to facilitate the Security Operations Center (SOC(upgrade; installation of a new Pelco video management system (VMS) and software to facilitate more control of the existing CCTV infrastructure; new Pelco Ethernet controllers for the operators to work with the new VMS; the installation of a single PTZ camera between the coffee warehouse and post office areas to cover those blind spots; and the installation of a new thermal IR cameras on the existing Coast Guard Island tower to provide for the waterside protection of the port.

6.3 Site Survey and design finalization

The contractor shall conduct a site survey to confirm the CMS system design. Upon completion of the site survey, the contractor shall develop an installation material list (cables, hardware, etc) for items not included with the CMS equipment. The contractor shall engage local support services for the installation phase. These services shall include (but not be limited to) electricians, mechanics, riggers, carpenters, and transportation support.

The contractor shall identify all permits and variances needed to commence the CMS installation and assure these are in place and approved prior to the commencement of work.

The contractor is advised to procure professional security escort services for the duration of the work.

6.4 CMS SOC Center Equipment

The contractor shall supply the CMS SOC equipment and installation material (identified during the site survey). The equipment list is as follows:

6.4.1 CMS Rack Mount Equipment

The CMS shall be installed in a fully integrated 19-inch equipment rack in the SOC server room that houses the main CMS servers, network appliances, power conditioner/Uninterruptible Power Supply (UPS) and supporting components. The equipment rack shall be no less than 44U (rack units) with closed side panels and locking front and rear perforated access doors. The rack equipment shall include:

a) CMS PSIM Server (Quantity of Two)
Rack mount server no greater than 3U
- Quad Core Intel® Xeon® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows Server 2008 or equal
- Proximex Surveillint Dashboard Software

b) Network Switch
Rack mount, no greater than 1U
- 100/1000GB, 48-port

c) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Provides standby power for up to 15 minutes while emergency power system activates.
- Network connection for monitoring and access to event logs via browser application

6.4.2 CMS SOC Console

The CMS SOC Console shall provide three (4) operator positions; Supervisor; and one National Police station. The console workstations shall include work surface and space for client computer hardware.

a) The console shall be the Wright-Line Profile Console Series with two 72” units (4 operators), one 60” unit for Supervisor, two 48” units (for National Police and Raymond operator).

b) The equipment cabinet for the servers, DVRs, etc. shall be NetShelter SX 42U 750mm Wide x 1070mm Deep Enclosure or equal. Each will be equipped with dual power strips with switchable ports and IP addressable.

c) CMS Client, National Police Operator Workstation
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor

[Type text]

- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Pelco Control Point Client Software
- Dual head video graphics card
- Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
- Desktop Keyboard/Mouse with KVM switch
- Pelco CCTV Controller

d) Video Manager Client, Operator Workstations 1-5 (5 = Raymond Location)
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Pelco Control Point Client Software
- Dual head video graphics card
- Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum
- Desktop Keyboard/Mouse
- Pelco CCTV Controller

e) CMS Video Manager Client, Supervisor Workstation
Rack mount PC no greater than 3U
- Quad Core 2 Duo® 3.0GHz or equal processor
- 4GB RAM
- 150GB Hard drive
- DVD Drive
- Gigabit Ethernet
- Operating System: Microsoft® Windows XP Professional or equal
- Pelco Control Point Client Software
- Proximex Surveillint Dashboard Software
- Dual head video graphics card
- Desktop TFT Monitor, 20-inch wide screen
- Capable of 1280 x 1024 resolution, minimum

[Type text]

- Desktop Keyboard/Mouse with KVM switch
- Pelco CCTV Controller

6.4.3 CCTV Video Headend

The Closed Circuit Television (CCTV) video headend will be replaced as part of this project. The existing headend is a Panasonic system that has outdated equipment and software and will not facilitate any migration path towards IP based cameras or systems. The new headend equipment will be housed in empty expansion space within the SOC server room. This will require installing (23) Pelco RealVue Video Recorders or equal (32 Channels each). The existing GE transceivers from the central camera patch bay will continued to be used and the existing connections to the SX850 Matrix Switchers will need to be disconnected and reconnected into the new video recorders units during cutover. Once the cutover is complete, the legacy switchers can be removed out of the racks to provide future equipment.

A rack mount KVM and slide out keyboard/monitor will be required in the new video server racks.

Two redundant PSIM servers will be installed in these racks.

The Clarity Matrix video wall power supplies and UPS units will be installed in a standalone cabinet in the server room. The monitors do not house power supplies or fan units which are intentional to reduce heat and fan noise in the populated room. Power and network cables will be routed from the power supply rack to the LCD's.

6.5 Coast Guard Island Remote Camera Site

The contractor shall supply Coast Guard Island Remote camera Site equipment and installation material (identified during the site survey). The equipment list is as follows:

6.5.1 Coast Guard Island Equipment Rack

The Coast Guard Island Thermal cameras will be mounted on the existing tower, and the power and communications equipment will be located in a 19-inch rack assembly in the tower equipment shelter. The rack will include:

a) Maintenance LCD Monitor/Keyboard/Pointing device
   Rack mount, 1U slide out monitor/keyboard assembly.
   - 17-inch TFT monitor
   - 8-port KVM switch
   - 105 keys, keyboard and touch pad

b) Network Switch
   Rack mount, no greater than 1U
   - 100/1000GB, 8-port or better

c) Power Conditioner/UPS
Rack mount unit, no greater than 4U
- Online, double conversion UPS to provide protection against line fluctuations and transients. Standby power for up to 15 minutes while emergency power system activates (radar antenna motor not required to connect to UPS).
- Network connection for monitoring and access to event logs via browser application

6.5.2 Back-up Emergency Power

The Coast Guard Island camera site shall include a back-up emergency power system that provides automatic change-over capability in the case of a loss of primary AC power. The emergency back-up power system shall operate for up to 12-hours without refueling. The emergency back-up power system shall be designed for 50% excess capacity to account for future growth. This is included in the VTS Radar project and the security system will connect to this system.

6.6 Waterside Thermal Camera System

The waterside camera system already includes one existing cameras that provides a patrol up/down the wharf. An additional 4 cameras will be installed on the existing tower at Coast Guard Island, two more on the Southernmost lighting tower inside the Property near Pekin Gate; another two cameras will be installed at the northernmost lighting tower at the edge of the property.

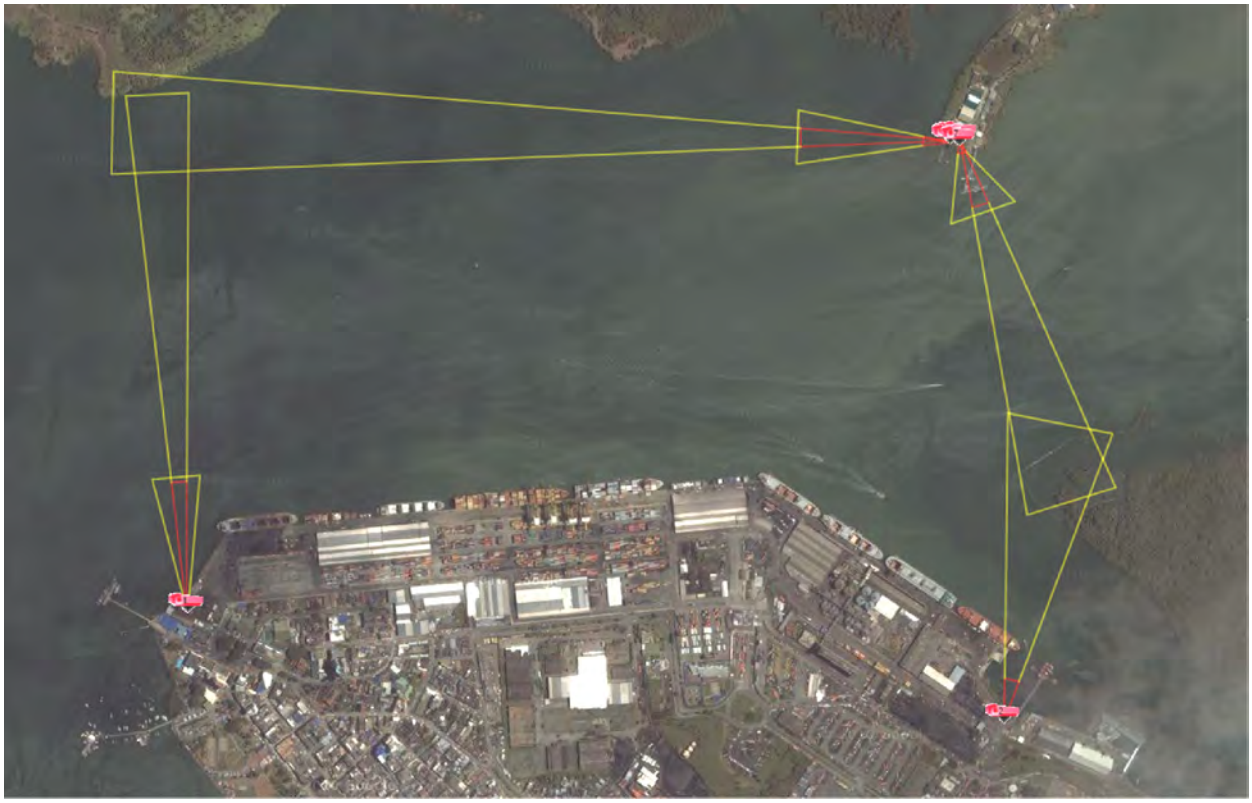


Figure A4-3 Limits of protection zone with thermal cameras

6.6.1 SightLogix SightSensor Thermal Cameras

Part Number	Imager Detection Range	Automated Detection Range *	FOV	Interface	Power
SL-SS-NS100-000	220m (720ft)	90m (300ft)	50°	Ethernet	24V AC/DC
SL-SS-NS200-000	310m (1020ft)	130m (430ft)	36°		
SL-SS-NS300-000	560m (1840ft)	230m (750ft)	20°		
SL-SS-NS400-000	780m (2560ft)	330m (1080ft)	14°		
SL-SS-NS800-000	1.6Km (5250ft)	660m (2170ft)	7°		
SL-SS-NS100-300	220m (720ft)	90m (300ft)	50°	Ethernet	Power Over Ethernet Plus (PoE+)
SL-SS-NS200-300	310m (1020ft)	130m (430ft)	36°		
SL-SS-NS300-300	560m (1840ft)	230m (750ft)	20°		
SL-SS-NS400-300	780m (2560ft)	330m (1080ft)	14°		
SL-SS-NS800-300	1.6Km (5250ft)	660m (2170ft)	7°		
SL-SS-NS100-015	220m (720ft)	90m (300ft)	50°	5.8 GHz Wireless	24V AC/DC
SL-SS-NS200-015	310m (1020ft)	130m (430ft)	36°		
SL-SS-NS300-015	560m (1840ft)	230m (750ft)	20°		
SL-SS-NS400-015	780m (2560ft)	330m (1080ft)	14°		
SL-SS-NS800-015	1.6Km (5250ft)	660m (2170ft)	7°		

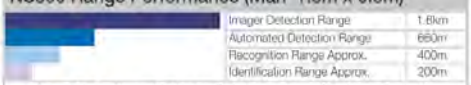
Accessories

- **SightMonitor** – GPS-based target display and coordination software. *Refer to the SightLogix SightMonitor® Datasheet.*
- **SightTracker** – GPS-based PTZ controller. Refer to the *SightLogix SightTracker™ Datasheet.*
- **Heavy-duty Mounts and Cables.** Refer to the *SightLogix Accessories Datasheet.*

***Automated Detection Range**

Range measurement method for automated detection range of a man

NS800 Range Performance (Man 1.8m x 0.5m)



Note: 660m Automated Detection Range is unique to SightLogix' Products. Alternate products typically have one-third SightLogix' Automated Detection Range.

[Type text]

6.7 Point to Point Wireless Network

The point –to-point wireless system shall provide Fast Ethernet connectivity between the Guard Island Camera Site with the SOC. The electronic components shall be encased in a robust outdoor enclosure that can withstand temperatures from -40° F to +140° F (-40° C to +60° C) and winds up to 202 mph (325 kph). The contractor shall provide all mounting accessories, cables, conduits and fixtures necessary to mount the antenna units on the towers and connect the units to the communications rack at the base of the existing tower network switch. The contractor shall assure antenna configuration and location provides suitable path performance between sites to maintain a mean aggregate data rate of not less than 150 Mbps and a link availability of 99.99999%. Since the microwave path is over water, the contractor shall design the link to minimize the negative effects of multi-path propagation. The contractor shall supply and install the Motorola PTP-48600 or an equivalent system with the following specifications:

6.7.1 Coast Guard Island to SOC Link

a)	Frequency:	4.710 – 4.940 GHz
b)	Channel Size:	Configurable to 5, 10, or 20 MHz
c)	Channel Selection:	By Dynamic Frequency Selection or manual intervention; automatic selection on start-up and continual adaptation to avoid interference
d)	Transmit Power: dBm	Varies with modulation mode and settings from +27 to +22
e)	System Gain Margin:	Minimum 42 dB or better
f)	Receiver Sensitivity:	Adaptive, varying between -98 to -60 dBm
g)	Modulation:	Dynamic; adapting between BPSK and 256 QAM
h)	Error correction:	FEC
i)	Duplex scheme:	Time Division Duplex (TDD) and Half Duplex Frequency Division Duplex (HD-FDD), Dynamic or Fixed ratio
j)	Antenna:	Integral with Outdoor Unit, appropriate Gain for 1.4 nm path length
k)	Security and Encryption:	128/256-bit AES Encryption
l)	Ethernet protocol:	IEEE 802.3

m)	User data throughput:	Dynamically variable up to 150 Mbps at the Ethernet (aggregate): 5 MHz Channel: up to 48 Mbps 10 MHz Channel: up to 100 Mbps 20 MHz Channel: up to 150 Mbps
n)	Latency (typical one way):	<2 ms in 20 MHz Channel <3 ms in 10 MHz Channel <5ms in 5 MHz Channel
o)	QoS:	802.1p (2 Levels)
p)	Ethernet Interface:	10/100/1000 Base T (RJ-45)
q)	BIT LED Indicators:	Power status, Ethernet link status and activity
r)	System Management:	Web or SNMP
s)	Installation:	Built-in audio and graphical assistance for link optimization
t)	Connection:	Distance between outdoor unit and primary network connection up to 100 meters
u)	Dimensions:	Outdoor Unit (equal or less than):Width 370mm, Height 370mm, Depth 105mm Indoor Unit (equal or less than): Width 250mm, Height 40mm, Depth 80mm
v)	Weight:	Outdoor Unit (equal or less than): 5.5kg Indoor Unit (equal or less than): 0.86 kg
w)	Ingress Protection:	Outdoor Unit: IP65 Indoor Unit: IP53

6.7.2 Wireless Network Physical and Environmental Requirements

The point-to-point wireless network equipment shall meet the following physical and environmental requirements:

a)	Operating Temperature:	-40°C to +60°C
b)	Humidity:	100% Condensing
c)	Wind Speed:	202 mph (325 kph)

[Type text]

d) Power Source: 90-240 VAC 50/60Hz

e) Power Consumption: 55 W

6.8 PTZ Camera Installation

A new Pan Tilt Zoom (PTZ) camera is to be installed at the intersection between the Post al Warehouse and the Coffee Warehouse to provide surveillance over that blind spot. The contractor will install the camera and connect to the closest serviceable network hub location. Assume fiber optic and 24VAC line will be installed to that location.

Figure B4-4 New PTZ camera location between Adpostal and Coffee warehouses

6.9 Maintenance Plan

Due to the remote location and challenges associated with operating in Colombia, some of the primary considerations for any system are maintainability and availability of critical spare parts. It is extremely important that the system be relatively maintenance free and provide for plug-and-play operations. As part of the offer, the contractor shall provide the following:

- Sample maintenance plan
- Periodic maintenance requirements
- Mean Time Between Failure (MBTF)
- Lowest replaceable units

[Type text]

- All long lead time items
- Life cycle component compatibility
- Suggested spare parts list with pricing details

During the initial Warranty period, the contractor shall provide routine and preventive maintenance actions. During the warranty, the contractor shall provide two hour service response (during normal working hours) and 24/7 phone response.

6.10 Training

The contractor shall provide a training plan and syllabus for a "train the trainer" course. The contractor shall develop and provide lesson plans, course material, and manuals for operator and maintenance training.

Training shall be conducted for Operators, Supervisors and Maintainers. This training shall consist of both classroom and live operational system training. The recommended training class duration is as follows:

- Operator Training 7 days
- Supervisor Training 7 days
- Maintainer Training 7 days
- On-Site Operational Support 14 days after system is accepted.

5.0 Review of Cargo Inspection

The review of the cargo inspection procedures of the various entities is presented in Section 1.5. As noted in that document, the following entities are involved in the review and clearance of cargo at the Port of Buenaventura:

National Directorate of Taxes and Customs of Colombia (DIAN);
National Institute of Food and Drug Monitoring (INVIMA);
Colombian Agricultural Institute (ICA);
Fiscal Customs Police (POLFA); and
National Antinarcotics Police, Narcotics Directorate (DIRAN).

DIAN has among its functions the administration of customs duties and other taxes on foreign trade, including the collection, control, settlement, dispute, collection, enforcement and all other aspects related to compliance with customs requirements.

INVIMA exercises its function of inspection, monitoring and control of food for human consumption and verifying the sanitary conditions in which they are processed.

ICA is responsible for monitoring and issuing sanitary and food safety policies for the pork, poultry, cattle and agricultural industries.

POLFA, in relation to the direction and administration of the armed apparatus that supports the tasks associated with control and customs control, tax and exchange, has as its functions, among others, planning, organizing, monitoring and supporting the customs control to prevent smuggling, billing as determined by DIAN, tax and customs control, transfer and delivery of goods seized by DIAN, and directing in collaboration with DIAN intelligence work.

The National Antinarcotics Police's functions include monitoring the export cargo to ensure that no narcotics have been introduced.

According to the policy established by the Ministry of Commerce y Tourism, DIAN INVIMA and ICA perform joint inspections at the Port. The Antinarcotics Police conducts inspections of exports in other locations separate from the imports.

5.1 Procedures and practices of cargo inspection

The procedure used by DIAN for imports described in Section 1.5 of the Task 1 report can be summarized as follows:

1) The Sociedad Portuaria Regional de Buenaventura (SPRBun) enters data on on-the cargo;
2) The customs broker presents imports declarations;
3) The customs broker pays taxes in the bank;
4) DIAN perform cargo profiling, using the system based on various factors, including type of merchandise, country of origin and importer. Based on this profile, the container or cargo is selected for:
- Physical inspection;
- Non-intrusive inspection with scanners, or
- Inspection of documents only or automatic clearance.

The merchandise is selected by the SIGA system. MUISCA feeds SIGA. SIGA is the Integrated Customs Management System. MUISCA is the Unique Model of Entry and Automated Control Service. DIAN does not use MUISCA directly to determine which cargo to inspect.

Apart from the DIAN, the other bodies responsible for inspection of containers (INVIMA, ICA, etc.) require different levels of control in regard to basic consumer products, ensuring that products are shipped in accordance with the manifest or other declarations, the product is not expired, or that shipment of the product meets the requirements (refrigerated, etc.).

The process of the National Police for containers comprises the following steps:

1) The exporter delivers a letter of responsibility of the exporter attesting that the cargo does not include narcotics, explosives, illicit items, prohibited items, munitions, war materials and their components or other items and that they are prepared in adequate conditions of security and protected from unlawful intervention. The signer is authorized in the Chamber of Commerce.

2) The police do a review of the seals as the export container enters the Port. Seals are compared with the letter of the exporter.

3) A schedule is made with the Customs brokers.

4) A profiling is made, which determines whether the container will be subject to physical inspection or inspection of documents. The profiling factors included: type of cargo, destination, exporter, customs agent and operator. Based on a study or risk profile, the option to follow is determined:

- If the risks are classified as low, the documents only can be reviewed;

- If the risks are greater, a physical inspection can be performed, or

- If the containers are of less risk, non-intrusive inspection with a scanner can be performed

5.2 Facilities and Equipment

5.2.1 Imports

The inspection facility for imports is located in the former Free Zone. As noted in Section 1.5, outside the perimeter wall of the port, there is located adjacent property known as "Free Zone", which is largely leased to other carriers. The former Free Zone includes the area of inspection of cargo containers. Containers are selected by various entities, DIAN, ICA and INVIMA. All containers to be inspected must be delivered and unloaded in the inspection area by 7:00 am each morning.

The opening of each container is opened should be attended by a representative of the owner of containers and DIAN. The manifest is verified with the identification numbers of containers for transport to ensure the proper container is delivered.

After opening the container, the DIAN inspector oversees a team of workers (all wearing the same color shirt and one team per container), as they unload the goods inside the container. Once the products to be inspected have been removed from the container, the content is checked against the declaration, invoice and import record. Once the initial inspection is made, the team opens closed boxes or wrapped articles to verify the contents and quantity of contents (number of plates, cups, toys, etc.). The manifest is checked to verify the actual number of content. Once the count is completed, workers re-pack the goods inside the container. After the cargo is re-packed, the container is sealed again and ready for transport to the yard for transport to the consignee, once the customs broker has made the payments in the bank. In general, inspection begins at 8:00 am, takes 4 to 6 hours and usually ends by noon.

The inspection operation conducted in the Free Zone was observed during its maximum operation at 8:00 am. The area was severely congested with forklift operations, manual loading of the cargo, the inspectors, the National Police and port personnel. The crews were often waiting for an inspector to be available to answer questions or to conduct their inspection.

5.2.2 Exports

The facilities and equipment for inspection of exports consist of the PARE export gate, where the letters of responsibility and container seals are checked, and several inspection facilities:

- Containers Bay (Bahía) – The Bahía facility is a dock height inspection facility adjacent to the PARE gate where containers are inspected by the National Police and other entities. It handles approximately 18 containers per day. The facility facilitates taking cargo out of the containers

for inspection. There is a parking area adjacent to the Bahía facility, which can serve as a parking area for containers called out at the gate for inspection. However, containers are often brought back from the container yards inside the port to the inspection area.

- Containers scanner – There is one container scanner, a mobile Chinese X-ray scanner, which handles approximately 8 containers per day.

Shed – The shed handles 14 per day - Cargo is inspected in the shed including cargo carried within the port, loose cargo, consolidated in the port.

- Chatarra (Scrap) – There is another facility for chemicals which handles 2 containers per day.

- INVIMA - 4 containers a day are inspected jointly with the National Police.

- DIAN - 6 containers per day are inspected in conjunction with the National Police.

- ICA - 1 container a day is inspected in conjunction with the National Police.

In the case of coffee, export bags and bulk cargo are inspected in the warehouse by police with rods (varillas) to penetrate the sacks of coffee. Export sugar is also inspected in the warehouse by police.

The National Police have their own system for profiling cargo and determining which containers will be subject to physical inspection, non-intrusive inspection by scanning, or examination of documents.

5.3 Conclusions and Recommendations

There are several keys to optimizing efficiency in port operations while at the same time minimizing security risks. Foremost among these is the ability of the various partners in the supply and transportation chains, including government agencies, to share early, accurate electronic information about the cargoes moving through the ports.

For imported cargoes, the government agencies, port/terminal operators, and importers need to know what shipments are arriving on which vessel and the estimated date that ship is going to arrive at its port of cargo discharge. The steamship operator or local ship agent will be the primary source of that information. For exports, the process is reversed: exporters need to provide information to the terminal operator and ocean carriers, as well as government inspectors, on which shipments will arrive at the port for loading onto an outbound vessel and when.

When automation of information flow is maximized, there is greater visibility into the supply chain. In addition, each partner in the transportation chain can more effectively schedule resources, and the terminal operator can more efficiently stage cargo, when cargo information is provided as early in the process as possible.

Based on a review of the procedures currently in place, following are a series of recommendations for inspecting cargoes moving through the Port of Buenaventura.

Recommendations

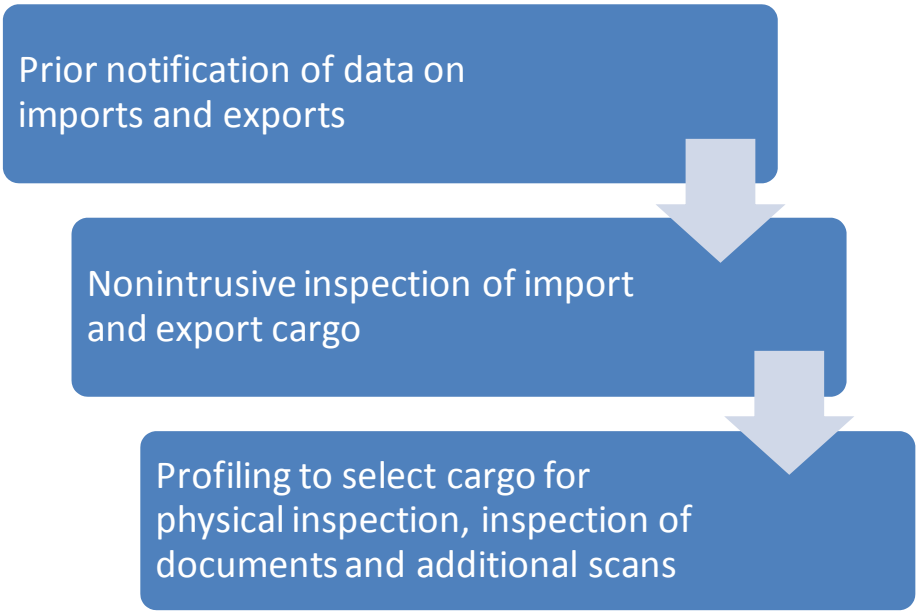


Figure 5-1 Recommendations for cargo inspection

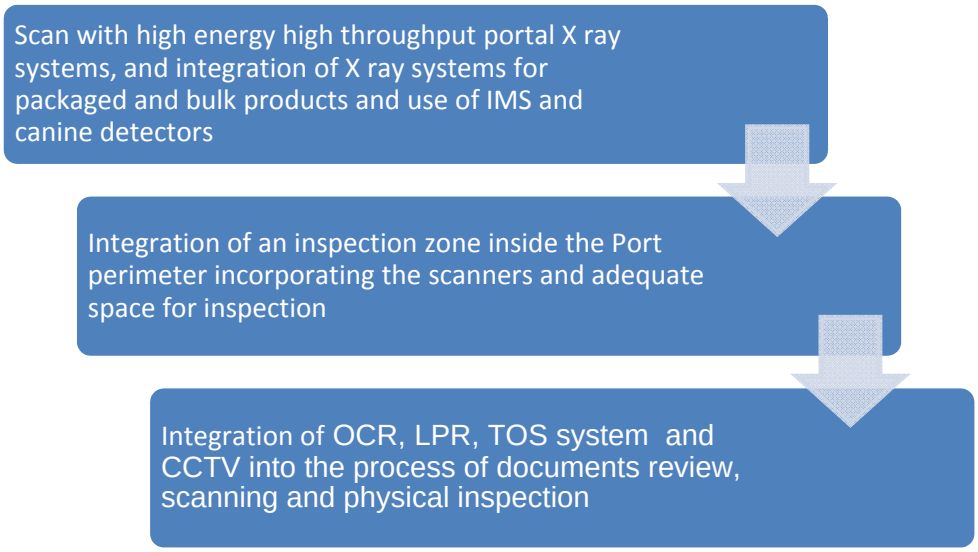


Figure 5-2 Recommendations for cargo inspection - continued

The inspection process and the operation of the terminal can be improved by:

1 The acquisition or development of better software and databases for the cargo profiling for the entities involved in order to select the cargoes for inspection of documents, non-intrusive inspection or physical inspection;

2 The integration of information systems to facilitate pre-screening of cargo, either import or export to be inspected before their arrival at the port;

3 The non-intrusive inspection of cargo, both import and export, together with the integration of a number of suitable container scanners to allow non-intrusive inspection of the cargo and use of non-intrusive inspection to select cargoes for inspection using scanners, physical inspection or inspection of documents. The scan should include vehicles, including trucks, tractors, automobiles and chassis, as well as containers.

This differs from the current practice of selecting cargo using software based on documents and databases for physical inspection, non-intrusive inspection or inspection of documents only. The non-intrusive inspection is used for full and empty containers both in and out of the Port to review content before deciding the need for further inspection.

4 The use of fixed portal-type scanners, which can provide a much higher throughput, of 150 to 195 vehicles per hour. Mobile scanners provide a throughput of 20 to 25 vehicles per hour, and gantry-

type fixed scanners throughput are not much better. Fixed scanners can be provided in buildings with adequate shielding, increasing personnel safety, reducing the time to set up a scan by clearing personnel from the area, and increasing throughput and productivity. X-ray scanners with sufficient penetration are an essential tool for scanning. Greater penetration is facilitated by having adequate shielding in a fixed housing and structure.

Figure 5-3 SAIC VACIS IP6500 Full Scan Integrated full scan cargo inspection system: High energy 6.5 MeV X-ray system penetrates more than 318 mm (12.5 inches) of steel at a speed of 13 km / h, scans up to 150 containers per hour with a minimum controlled access area and up to 300 containers per hour with a somewhat larger area, as they drive through without stopping and has an operating footprint of 9 x 7 mm including the exclusion zone, offers organic vs. inorganic material discrimination, radiation detection and includes an OCR identification component

Figure 5-4 ASE&E Omniview gantry high energy multiple view inspection system: 6 MeV system penetrates 400 mm of steel and scans 28 trucks per hour, offers optional Z Backscatter multiview imaging

Figure 5-5 AS&E Sentry Portal High energy high throughput cargo inspection system: High energy drive-through system penetrates 300 mm (12 in) of steel and has a throughput of 150 trucks per hour and can be combined with Z Backscatter technology

Figure 5-6 L3 CX Portal: high energy cargo screening system with optional dual energy organic vs. inorganic material discrimination allows drivers to remain in the cab while scanning

Figure 5-7 L3 CX Gantry: high penetration system configurable with a range of energy levels offers optional dual energy organic vs. inorganic material discrimination

Figure 5-8 Smiths Detection Heimann HCVG Gantry scanner: 3.5, 4 or 4/6 MeV systems provide steel penetration up to 400 mm (15.7 in) and a throughput of 28 trucks per hour with a minimal footprint available with optional high performance viZual technology for organic vs. inorganic material discrimination and optional automatic radiation detection (ARD)

Figure 5-9 Smiths Detection Heimann HCVP Portal scanner: 4 and 6MeV X-ray scanning systems provide steel penetration of up to 300 mm (11.8 in) and a throughput of 195 trucks per hour and a scanning speed of 7 km/hr with a small footprint available with optional high performance viZual technology for organic vs. inorganic material discrimination and optional automatic radiation detection (ARD)

Figure 5-10 Rapiscan G60 Gantry scanner: 6 MeV gantry scanner available with optional drive-through portal scan mode, drive-through CabScan mode, organic vs. inorganic material separation and radiation detection

Figure 5-11 Rapiscan Eagle P60 Portal Scanner: 6 MeV X-ray scanning system with a scan throughput of more than 100 vehicles per hour available with optional CabScan mode to scan the drivers cab; a P45 model with 4.5 MeV is also available

Figure 5-12 SAIC VACIS XPL Automobile scanning system with switched energy X-ray technology to scan vehicle and occupants without stopping

Z Backscatter Van™ Mobile Screening System

AS&E's Z Backscatter Van™ (ZBV) is a low-cost, extremely maneuverable screening system built into a commercially available delivery van. The ZBV allows for immediate deployment in response to security threats, and its high throughput capability facilitates rapid inspections. The system's unique "drive-by" capability allows one or two operators to conduct X-ray imaging of suspect vehicles and objects while the ZBV drives past.

Figure 5-13 AS&E Z Backscatter van (ZBV): Highly mobile unit provides drive by scanning capability available with optional radiation detection technology (RDT) AS&E's Z Backscatter Van (ZBV) is a low-cost, extremely maneuverable screening system built into a commercially available delivery van. The ZBV allows for immediate deployment in response to security threats, and its high throughput capability facilitates rapid inspections. The system's unique "drive-by" capability allows one or two operators to conduct X-ray imaging of suspect vehicles and objects while the ZBV drives past.

The ZBV Reveals Contraband and Threats Undetected by Other Systems:

- Car and truck bombs
- Explosives, plastic weapons, and other organic threats
- Radioactive threats, including nuclear devices and dirty bombs
-
- Illegal drugs
- Stowaways, such as illegal immigrants and terrorists
- Trade fraud items, such as alcohol, tobacco, and other legal goods smuggled to evade duties

Container scanners should include these features:
High energy High throughput X-ray
Drive through – to scan vehicles as they transit the scanner without stopping.
Material discrimination - organic vs. inorganic with color display.
Full vehicle scanning – including cabin and occupants.
Radiation detection.
Integrated OCR – to positively identify containers when they are scanned.
Safety – with a small footprint and exclusion zone.

5 Additional technologies should be incorporated in the cargo scanning, which can detect the specific contents of containers. X ray technology is limited in its ability to detect the contents of drums or other containers, and discern the difference between innocuous substances and narcotics or explosives. The technologies may include the following:

Dual Ion Mobility Spectrometry (IMS) technology is used in equipment such as in an Ionscan 500 DT, which utilizes a sample wand which is wiped over the surface to be inspected and then placed in a chamber for analysis. The equipment can detect chemicals and powders, including explosives in the picogram range and narcotics in the sub-nanogram range. Explosives which can be detected include RDX, PETN, NG, TNT, HMX, TATP and others. Narcotics which can be detected include cocaine, heroin, amphetamine, methamphetamine, MDA, THC and others.

Figure 5-14 Smiths Detection IONSCAN 500 DT narcotics and explosives detector

Detection dogs, which can sniff drugs or explosives.

X-Ray Systems for packaged products, such as the Rapiscan Eagle 1000, or bulk product inspection, such as the Bulk 960, which are able to scan materials such as bagged or bulk coffee, should also be used to detect the presence of contraband. These systems are able to inspect products for correct weight, metal or other foreign objects.

Figure 5-15 Rapiscan Eagle 1000 Palletized cargo scanner

Figure 5-16 AS&E Gemini 100100 breakbulk cargo inspection system

6 Package and pallet scanners should be integrated to inspect bags and packages within the containers. Palletized cargo scanners can be used after unloading the cargo of a container in which

suspicious areas are seen with the container scanners or if the cargo is too much dense to properly scan with a container scanner. For export containers, for example, the container should be scanned and also each of the bags contained within the container, in the case of palletized cargo. Package scanners work with a conveyor to allow efficient scanning of all bags of coffee, sugar and other products for the presence of contraband such as panels of cocaine.

7 The availability of more space in inspection areas to facilitate the logistics of waiting, unloading, inspection and re-stow;

8 The addition of space dedicated to scanning sufficient to allow the waiting of the containers in line in front of scanners, as in a gate;

9 The integration of an inspection area within the perimeter of the Port to better handle the cargo that is currently moving between the Port and the inspection area in the former Free Zone;

10 The placement of scanners that can check a container in a sequential manner when the container is identified in a gate with the optical character recognition system (OCR). Scanner systems are also available that integrate OCR scanners to read the identification of each container or vehicle scanned. License plate reader (LPR) systems should also be incorporated. This will facilitate positive identification of the containers or vehicles which are scanned.

11 The integration of CCTV and its monitoring by operators and video analysis in conjunction with the OCR system to remotely observe trucks and containers passing through the gates and scanners and which are transferred to the scanners and the inspection area.

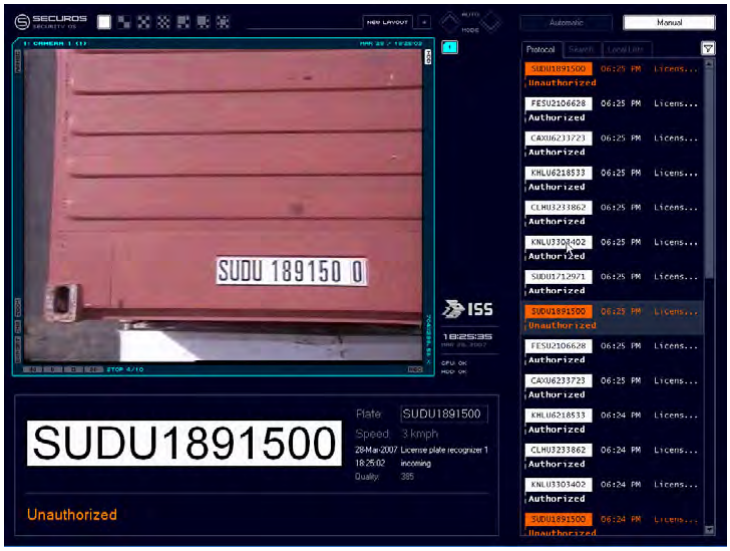


Figure 5-17 Intelligent Security Systems SecurOS Cargo optical character recognition (OCR) system

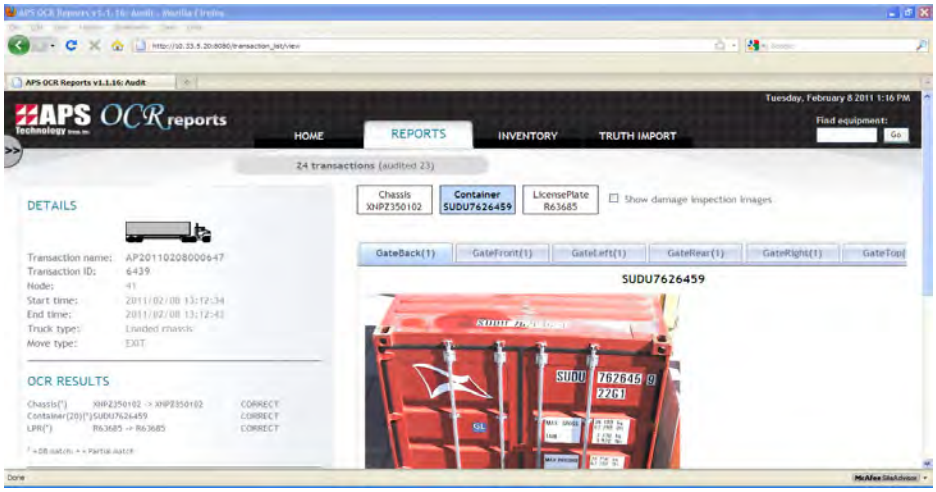


Figure 5-18 APS Technology Group OCR system

12 The integration to the aforementioned systems with the terminal operating system (TOS) to ensure control of the container yards and gates, and its efficient coordination with the inspection process.

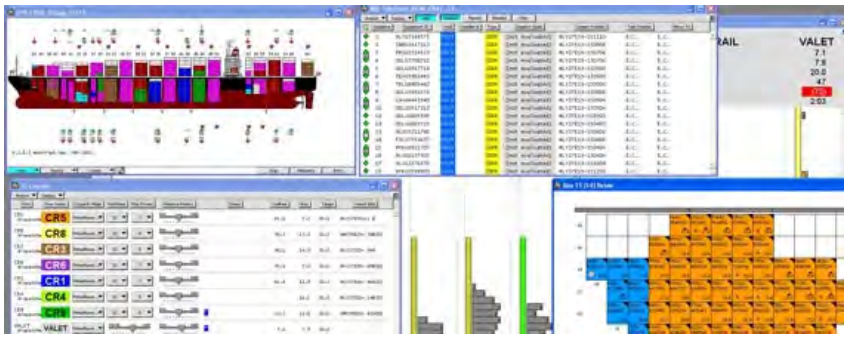


Figure 5-19 Navis SPARCS TOS system

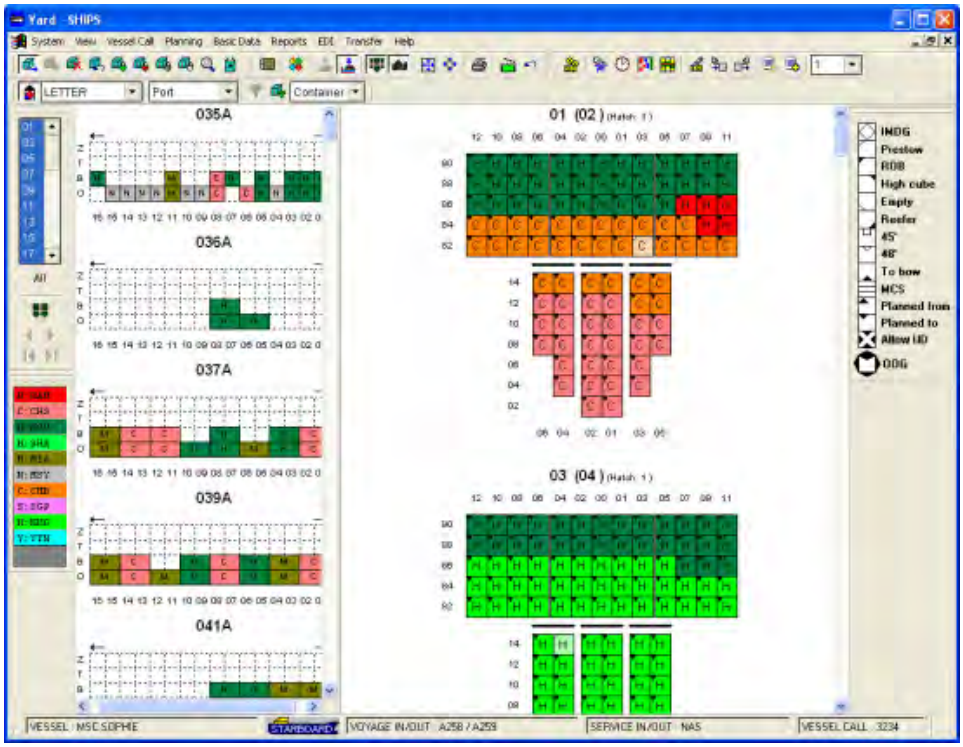


Figure 5-20: COSMOS Container Terminal Control System (CTCS) SHIPS module yard and vessel view

13 A program to allow 24 hour a day operation with the equipment that facilitates it.

14 An integrated centralized commercial data management system for both imports and exports should be developed to capture information on cargoes. This would replace the existing separate MUISCA and SIGA systems to a single integrated and centralized commercial data management system. This system would combine the functions currently handled by both the MUISCA and SIGA systems. The system would serve as the primary collection and distribution point for data used to conduct cargo targeting/profiling as well as to calculate tariffs and taxes and provide information on cargo clearance status. Such a system could be used to capture information on all shipments arriving into the country via ocean, air, rail or truck. However this document will focus on ocean cargoes.

15 The system should be designed to accept incoming manifest/bill of lading/container information and outbound shipment data as well as transmit information to others with a need or a right to have access to it. This would include various government agencies, and the system should also communicate with private sector maritime-related businesses, such as importers/exporters, ship agents, trucking companies, banks, etc., as well as operators of other modes of transportation, such as air cargo and truck transport.

16 The system should also capture incoming information from the importer (broker) or exporter with specific declaration, invoice, and other appropriate data, and thus provide an early tariff/tax calculation function. The banks can use the same system to provide updates on tax payment status. Ultimately, when importer data for a shipment is matched against the manifest information and appropriate taxes are paid, and presuming no inspection holds are placed on the cargo, the system would generate an electronic "cargo release" message.

17 To populate the manifest component of the system, the government could require that ocean carriers provide import cargo manifest in electronic format in advance of vessel arrival. Because of the "24-hour Rule" promulgated by U.S. Customs and Border Protection (CBP) in 2003, which the European Union adopted, many ocean carriers can provide information on each container 24 hours prior to loading at the port of export. This time frame may be more than needed by the Colombian government, which may elect to require the information 96, 72, or even 48 hours prior to vessel arrival.

18 The current procedure of having Sociedad Portuaria Regional de Buenaventura (SPRBun) enter the data on the cargo when it is received from the shipping company would be changed. Instead, the ocean carriers would be responsible for providing their information directly to the integrated Customs system in advance of vessel arrival. If it is not now the current procedure, each vessel's shipping manifest should be transmitted electronically to Customs prior to vessel arrival. Customs would then have the time to review the documents and pre-select, before vessel arrival, containers to be inspected. Containers could then be taken off the vessel and driven directly to the Customs inspection area; thus, eliminating the double handling required to first place the containers in the yards stacks and then retrieve them for inspection. The former Free Zone is outside the port. The segregated yard and Customs inspection area should be inside the port.

19 To minimize costs, the government could dictate that the information be transmitted in the format currently used by the existing SIGA system; however it may be worthwhile to review and adopt international standards, such as the United Nations/Electronic Data Interchange For Administration, Commerce and Transport (UN/EDIFACT).

Obtaining manifest information electronically in advance of vessel arrival will not only minimize the time and cost associated with data entry by the Port, but it will allow the government agencies to complete their profiling earlier in the process. This would provide an opportunity to send advance notification to the terminal operator and importer when shipments are going to be inspected. It would also ensure inspectors have the information they need to verify the contents of the container, pallet, etc, before they arrive for inspection rather than waiting for paper documents to accompany the shipment.

20 When a shipment is targeted for inspection, the inspector should enter this information into the system (e.g. "Examination [Type] required.") This "cargo status" information can be shared electronically with both the Port and others who have a right to it, such as the importer or trucking company. This will allow both the inspectors and Port to effectively schedule resources. It will allow the terminal to segregate any shipments which require inspection on arrival and facilitate processing of those which are not being inspected. It will also allow the importer or agent to more effectively schedule surface transportation to the ultimate inland destination. Transportation partners could receive instant messages when a shipment has been selected for inspection, or they should be able to generate a report for a list for any given day.

21 Once the agencies know which inbound shipments they want to target, they could schedule inspections dates/times with the terminal. This would help alleviate the congestion currently experienced during the morning inspection window, significantly improving overall safety. It could also reduce costs and improve efficiency; for example, if an importer knows a shipment will be inspected later in the morning, it may not be necessary to keep a truck waiting from the early morning hours.

22 Another opportunity to improve efficiency and reduce security risks associated with transporting uninspected shipments is to designate an area within the port for inspections. If such a facility were designated, terminal personnel could take responsibility for staging the cargo. This would decrease the amount of time moving shipments before they are inspected.

23 Unlike exports, imports do not currently have a secure dock height inspection facility to simplify access to the container interior and moving cargo on and of the container for inspection. If terminal space is available, having an on-terminal secure dock height Customs Inspection Facility would increase efficiency by eliminating the additional cost and time required to transit containers to off-site inspection facilities.

24 When an examination is completed, the inspector can update the system -- using hand held equipment or a computer terminal onsite at the Port -- to reflect the current status. This tells the transportation partners the shipment is now available for pickup from the pier. It would also allow the inspectors to record the new seal number into the data management system. This will help ensure the container is not tampered with between pick up at the pier and delivery at the next destination.

25 The Port could also require that trucks schedule appointments for cargo pickup. While this would initially create additional work for the trucking company, it will also help the Port more effectively stage cargo. For example, shipments to be picked up during a specific time frame could be offloaded to a particular location, minimizing the need to move equipment back and forth. From a cargo security perspective, it would also provide a record of what trucks were on the facility at any given time.

26 If appropriate, the Port can also update the system to include date/time the shipment left the facility. This information would provide the importer with information on when to expect arrival of the shipment at its next destination. It would also serve as an indication of when custody of the merchandise passed from the terminal to the trucking company.

27 The percentage of containers being inspected at this location appears to be somewhat higher than is the case in the some other countries, such as United States. The incorporation of better software for cargo profiling, or selecting containers for inspection, coupled with an increased use of non-intrusive inspection technologies and examination of documents, can reduce the requirement for physical inspection of containers, with the concomitant costs and delays to the cargo.

28 Information contained in the letter of responsibility for export cargo should be transmitted in advance via the data management system; technologies for electronic signatures are widely available. This would again allow for advance targeting for physical inspections, and providing the inspecting agencies a tool to more effectively schedule resources. It would also allow the inspector to review a series of containers against a seal list versus individual documents.

29 For cargo deemed to be low-risk, this would eliminate the need for an inspector to physically examine documentation; all data reviews could be done electronically.

30 For physical or non-intrusive examinations, it is recommended that information that an inspection is required be entered into data management system, but that it should not be provided in advance to the exporter. If appropriate, this information could be shared with the Port, allowing for appropriate movement of the shipment to the inspection area, saving time for the inspectors. However, performing the inspections when the containers arrive at the port would eliminate the need for positioning the containers for later inspection, as well as the reason for sharing information on which containers were selected and better assure the integrity of the inspection process.

31 If possible, all export examinations should take place within the same area and within a designated area within the port complex. This will decrease the time, costs, and security risks associated with moving goods around the Port. As with the imports, such exams could be scheduled in advance to improve efficiency. Coupled with a truck driver appointment system, this would eliminate backups at the terminal gate, and minimize the instance of moving cargo multiple times. The cargo should be inspected when it arrives at the Port, rather than being brought back from a yard inside the port later.

32 Once examinations are complete, information that cargo is cleared for export should be entered into the system.

33 As with imports, consideration should be given to implementing an appointment system for trucks dropping off shipments for export.

34 The police monitor all activity from arrival at the port gate to sealing of the bag/container. The police also carry out operations aboard the ship to check cabins, decks, holds and engine rooms. A thermal camera on Coast Guard Island is available to monitor the ships while in Port. The survey of

the inspection process did not include a discussion of the monitoring of the ship before sailing, particularly from the water side, to prevent unauthorized access. This document assumes that access control procedures as required by the International Ship and Port Security (ISPS) Code are in place. If not, the Port may want to consider additional monitoring of the vessel while in port.

35 All personnel with access to the cargo should be included in the port and transportation worker identification data base, and their movements in and out of the Port and within the port area should be monitored using the HandKey, PIN codes and a worker identification card system.

36 The containers and vehicles awaiting inspection as well as the inspection process itself, both for imports and for exports, should be monitored using closed circuit television (CCTV) to provide continuous verification regarding introduction or removal of any contraband, and this should be integrated with the optical character recognition (OCR), license plate readers (LPR) and terminal operating system (TOS) to ensure that all containers and equipment are positively identified throughout the inspection process.

5.4 Equipment Pricing

The following pages provide pricing data for scanners published by SAIC effective November 2010 and for vapor trace and backscatter vans from available sources. It should be noted that the prices shown are U.S. Government prices and do not include export, shipping, installation, civil works and utilities. Equipment may require export licensing. Equipment and technology are subject to U.S. Export Administration Regulations. Diversion contrary to U.S. law is prohibited. This technology may not be exported, re-exported, resold, transferred or transshipped without prior authorization by the U.S. government.

Appendix A5 Pricing of cargo inspection systems

VACIS® X-ray Imaging Systems
VACIS® IP6500 Integrated Inspection System

Product Code	Description	GSA Price
VIP6500-1000	VACIS IP6500 Base System High-energy x-ray system for vehicles and cargo, in a compact fixed-portal configuration. The base system includes: - High-energy x-ray imaging portal - Server hardware and software for integration and storage of scanning images and data - Operator and image-analysis workstation (hardware and software) - Vehicle sensors, traffic controls, test meters, and other ancillary equipment	$2,040,188
VIP6500FS	VACIS IP6500 FullScan Base System High-energy x-ray system for vehicles and cargo, in a compact fixed-portal configuration, with extended scanning capabilities. The base system includes: High-energy x-ray imaging portal - Server hardware and software for integration and storage of scanning images and data - Operator and image-analysis workstation (hardware and software) - Vehicle sensors, traffic controls, test meters, and other ancillary equipment. The system offers the following extended scanning capabilities: - Scanning down to ground level - Scanning vehicle occupants - Material discrimination	$2,418,000
VACIS® IP6500 Integrated Inspection System Maintenance		
VIP6500-M1-C	First year Maintenance for IP6500 Systems within the US (CONUS)	$180,866
VIP6500-M2-C	Second year Maintenance for IP6500 Systems within the US (CONUS)	$198,910
VIP6500-M3-C	Third year Maintenance for IP6500 Systems within the US (CONUS)	$199,405
VIP6500-M1-OC	First year Maintenance for Fixed VACIS Systems outside the US (OCONUS)	$250,421
VIP6500-M2-OC	Second year Maintenance for Fixed VACIS Systems outside the US (OCONUS)	$262,942
VIP6500-M3-OC	Third year Maintenance for Fixed VACIS Systems outside the US (OCONUS)	$276,089

Appendix A5 Pricing of cargo inspection systems

VACIS® IP6500 Training and Software

Product Code	Description	GSA Price
TRN-RADSAFTYC	Radiation Safety Training within the US (CONUS) Maximum of 12 participants – Radiation worker safety training for individuals preparing to work on VACIS products. The eight-hour training gives basic understanding of radiation, terminology, measurement, dose, and how to meet ALARA.	$9,975
TRN-RADSAFTYOC	Radiation Safety Training outside the US (OCONUS) Maximum of 12 participants – Radiation worker safety training for individuals preparing to work on VACIS products. The eight-hour training gives basic understanding of radiation, terminology, measurement, dose, and how to meet ALARA.	$13,965
TRN-RADAWARE	Radiation Awareness Training Maximum of 12 participants - A four-hour course given to individuals working around VACIS products. The course explains how VACIS products have been designed as the industry's lowest radiation dose gamma imaging systems. The course includes basic radiation terminology, how workers are monitored for dose, and how to insure that individual safety is maintained while in proximity to VACIS products.	$7,980
TRN-RADMGR	Manager Radiation Training Maximum of 12 participants - Gives managers the tools to effectively deal with workers, the press, and concerned individuals about having radioactive material in the workplace. Discusses in plain language that VACIS uses small radioactive sources in very safe, controlled situations. The course also covers commonly asked questions, and gives answers that convey the high level of safety for VACIS products.	$7,980
TRN-VRR/PL/R-C	Fixed VACIS System Operator Training within the US (CONUS) Maximum of 8 participants	$27,930
TRN-VRR/PL/R-OC	Fixed VACIS Operator Training outside the US (OCONUS) Maximum of 8 participants	$41,895
TRN-VOPREINFOR-C	VACIS Operator Reinforcement	$12,469

	Training within the US (CONUS) Maximum participants same as type of operator training	
TRN-VOPREINFOR-OC	VACIS Operator Reinforcement Training outside the US (OCONUS) Maximum participants same as type of operator training	$20,948

VACIS® M6500 Mobile X-ray Imaging System

Product Code	Description	GSA Price
VM6500-1000	**VACIS M6500 Mobile Imaging System –** A rugged, flexible mobile inspection system that provides high image quality and throughput in a variety of operational scenarios. Using a low-power 6.5 MeV x-ray source, the system provides high penetration, resolution and contrast sensitivity with minimal shielding and a small operational footprint. The system can scan stationary targets while moving forward or in reverse, or can remain stationary while vehicles drive through. In stationary mode, the system can scan up to 150 containers per hour. The system is built on a standard 40foot truck chassis and can travel at normal traffic speeds. The system is entirely self-contained and can be readied for use in 10 minutes.	$2,400,000
VACIS® M6500 Training and Software		
TRN-RADSAFTYC	Radiation Safety Training within the US (CONUS) Maximum of 12 participants – Radiation worker safety training for individuals preparing to work on VACIS products. The eight-hour training gives basic understanding of radiation, terminology, measurement, dose, and how to meet ALARA.	$9,975
TRN-RADSAFTYOC	Radiation Safety Training outside the US (OCONUS) Maximum of 12 participants – Radiation worker safety training for individuals preparing to work on VACIS products. The eight-hour training gives basic understanding of radiation, terminology, measurement, dose, and how to meet ALARA.	$13,965
TRN-RADAWARE	Radiation Awareness Training Maximum of 12 participants - A four-hour course given to individuals working around VACIS products. The course explains how VACIS products have been designed as the industry's lowest radiation dose gamma imaging systems. The course includes basic radiation	$7,980

	terminology, how workers are monitored for dose, and how to insure that individual safety is maintained while in proximity to VACIS products.	
TRN-RADMGR	Manager Radiation Training Maximum of 12 participants - Gives managers the tools to effectively deal with workers, the press, and concerned individuals about having radioactive material in the workplace. Discusses in plain language that VACIS uses small radioactive sources in very safe, controlled situations. The course also covers commonly asked questions, and gives answers that convey the high level of safety for VACIS products.	$7,980
TRN-VMO1WKC	One week Operator Training Course for mobile VACIS systems at sites within the US (CONUS) Maximum of 12 participants	$32,419
TRN-VMO1WOC	One week Operator Training Course for mobile VACIS systems at sites outside the US (OCONUS) Maximum of 12 participants	$44,888
TRN-VOPREINFOR-C	VACIS Operator Reinforcement Training within the US (CONUS) Maximum participants same as type of operator training	$12,469
TRN-VOPREINFOR-OC	VACIS Operator Reinforcement Training outside the US (OCONUS) Maximum participants same as type of operator training	$20,948

Integrated Container Information System (ICIS)

Integrated Container Information System (ICIS) V1.5 Software License

ICIS Lane Upgrade – ICIS and OCR hardware and software for one lane with existing VACIS and/or RPM

Product Code	Description	GSA Price
ICIS1L	ICIS Subsystem ICIS Server (processors, storage, equipment rack) 4 ICIS Viewer workstations 1 client license (10 seats) for the current version of ICIS software (Server, Viewer, utilities) Other Equipment OCR portal (cameras, lighting, mounting structures, OCR processor hardware and software) Network hardware Traffic control devices Spare equipment Services Site survey Civil works design and concept of operations Installation and commissioning services Factory and Site Acceptance Testing ICIS operator training course	$1,000,000
One-Year Maintenance Program for ICIS Lane		
ICIS1L-M1	One-year maintenance program Covers ICIS, OCR, RPM (SAIC or third-party) 24/7 Help Desk with 2-hour response On-site problem resolution Semi-annual preventive maintenance Remote problem detection and support Hardware repair and replacement Software updates for SAIC-supplied equipment	$65,000

Pallet VACIS® System

Pallet VACIS® System		
Product Code	**Description**	**GSA Price**
VPLCO-1000	Pallet VACIS Co - A high-resolution, non-invasive gamma imaging system intended for use in the inspection of cargo on pallets, boxes, air cargo containers, and other cargo up to eight feet tall. The system includes a heavy duty conveyor system capable of transporting weights of up to 5,000 pounds. Included are the Cobalt-60 gamma source with fail safe shutter, NaI detector array, central power unit, PC-based control and imaging system, and numerous safety features. See technical specification 414636 for a complete description.	$980,543
Pallet VACIS® System - Booth		
VPLOPT-CB	Command and Control Center for Pallet VACIS system. Includes climate-controlled HVAC, overhead fluorescent lighting, window blinds to reduce glare, 2 adjustable operator chairs, junction box for phone and network, multiple AC outlets, smoke alarm, fire extinguisher, first aid kit, and file cabinet with file hangers. See technical specification 414247 for a complete description.	$27,930
Pallet VACIS® System - Maintenance (TPN 09-0148 Rev. 2)		
VFS-M1-C	First year Maintenance for Fixed VACIS Systems within the US (CONUS)	$79,800
VFS-M2-C	Second year Maintenance for Fixed VACIS Systems within the US (CONUS)	$83,790
VFS-M3-C	Third year Maintenance for Fixed VACIS Systems within the US (CONUS)	$87,980
VFS-M1-OC	First year Maintenance for Fixed VACIS Systems outside the US (OCONUS)	$94,763
VFS-M2-OC	Second year Maintenance for Fixed VACIS Systems outside the US (OCONUS)	$99,501
VFS-M3-OC	Third year Maintenance for Fixed VACIS Systems outside the US (OCONUS)	$104,476

VACIS® Cobalt Source Upgrade

VACIS® Cobalt Source Upgrade – Upgrade Options Per Source

Description	
Option 1	Includes new source holder, new cobalt capsule, and disposal of old cobalt capsule. With this option, VACIS system downtime is minimal (no more than 1 day).
Option 2	Includes refurbished source holder, new cobalt capsule, and disposal of old cobalt capsule. With this option, VACIS system downtime is minimal (no more than 1 day).
Option 3	Includes new cobalt capsule and disposal of old cobalt capsule. With this option, VACIS system will be down from the time the old source holder is removed and sent to SAIC to the time this same source holder is returned with a new cobalt capsule and reinstalled (approximately 3 months).

VACIS® Cobalt Source Upgrade - Mobile VACIS and

Appendix A5 Pricing of cargo inspection systems

Product Code	Description	GSA Price
VACIS® Cobalt Source Upgrade - Portal VACIS		
CSU-VPCOP1-NOLS	Portal VACIS - Option 1 - labor and shipping not included	$121,111
CSU-VPCOP1-LNSC	Portal VACIS - Option 1 - including labor and shipping (CONUS)	$136,437
CSU-VPCOP1-LNOSOC	Portal VACIS - Option 1 - including labor (OCONUS), shipping not included	$131,114
CSU-VPCOP2-NOLS	Portal VACIS - Option 2 - labor and shipping not included	$52,542
CSU-VPCOP2-LNSC	Portal VACIS - Option 2 - including labor and shipping (CONUS)	$67,868
CSU-VPCOP2-LNOSOC	Portal VACIS - Option 2 - including labor (OCONUS), shipping not included	$62,545
CSU-VPCOP3-NOLS	Portal VACIS - Option 3 - labor and shipping not included	$29,272
CSU-VPCOP3-LNSC	Portal VACIS - Option 3 - including labor and shipping (CONUS)	$48,531
CSU-VPCOP3-NOLSOC	Portal VACIS - Option 3 - including labor (OCONUS), shipping not included	$47,684
VACIS® Cobalt Source Upgrade - Relocatable VACIS		
CSU-VFSOP1-NOLS	Relocatable VACIS - Option 1 - labor and shipping not included	$105,612
CSU-VFSOP1-LNSC	Relocatable VACIS - Option 1 - including labor and shipping (CONUS)	$120,938
CSU-VFSOP1-LNOSOC	Relocatable VACIS - Option 1 - including labor (OCONUS), shipping not included	$115,614
CSU-VFSOP2-NOLS	Relocatable VACIS - Option 2 - labor and shipping not included	$49,402
CSU-VFSOP2-LNSC	Relocatable VACIS - Option 2 - including labor and shipping (CONUS)	$64,728
CSU-VFSOP2-LNOSOC	Relocatable VACIS - Option 2 - including labor (OCONUS), shipping not included	$59,404
CSU-VFSOP3-NOLS	Relocatable VACIS - Option 3 - labor and shipping not included	$29,272
CSU-VFSOP3-LNSC	Relocatable VACIS - Option 3 - including labor and shipping (CONUS)	$48,531
CSU-VFSOP3-NOLSOC	Relocatable VACIS - Option 3 - including labor (OCONUS), shipping not included	$47,684
VACIS® Cobalt Source Upgrade - Pallet VACIS		
CSU-VPLOP1-NOLS	Pallet VACIS - Option 1 - labor and shipping not included	$134,233
CSU-VPLOP1-LNSC	Pallet VACIS - Option 1 - including labor and shipping (CONUS)	$149,559
CSU-VPLOP1-LNOSOC	Pallet VACIS - Option 1 - including labor (OCONUS), shipping not included	$144,236

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CSU-VPLOP2-NOLS	Pallet VACIS - Option 2 - labor and shipping not included	$55,395
CSU-VPLOP2-LNSC	Pallet VACIS - Option 2 - including labor and shipping (CONUS)	$70,721
CSU-VPLOP2-LNOSOC	Pallet VACIS - Option 2 - including labor (OCONUS), shipping not included	$65,397
CSU-VPLOP3-NOLS	Pallet VACIS - Option 3 - labor and shipping not included	$29,272
CSU-VPLOP3-LNSC	Pallet VACIS - Option 3 - including labor and shipping (CONUS)	$48,531
CSU-VPLOP3-NOLSOC	Pallet VACIS - Option 3 - including labor (OCONUS), shipping not included	$47,684

Source, Science Applications International Corporation (SAIC), GENERAL SERVICES ADMINISTRATION,FEDERAL SUPPLY SERVICE, AUTHORIZED FEDERAL SUPPLY SCHEDULE PRICE LIST, Federal Supply Schedule 84, Part VI, Section A, FSC Class(es): 6665, LAW ENFORCEMENT, SECURITY, FACILITIES MANAGEMENT, AND EMERGENCY/DISASTER RESPONSE, Contract Number: GS-07F-0210J, Contract Period: 5/1/09 through 4/30/14, Business Size: Large Mod PO-0052 Effective Nov. 18, 2010 SAIC is a FORTUNE 500® scientific, engineering and technology applications company that uses its deep domain knowledge to solve problems of vital importance to the nation and the world, in national security, energy and the environment, critical infrastructure, and health. For more information, visit www.saic.com. SAIC: From Science to Solutions®

Appendix A5 Pricing of cargo inspection systems

X-ray ZBV Z Backscatter van	September 2011	US$1,100,000
Ion Scanner / Vapor tracer	August 2008	$26,764

Source: U.S.-Mexico Border Cooperation, Under the Mérida Initiative, Non-Intrusive Inspection Equipment, U.S. Embassy Mexico, September, 2011

Container / Vehicle Inspection Systems Comparison

		PORTAL SYSTEM	PORTAL SYSTEM	PORTAL SYSTEM	PORTAL SYSTEM
Company		**AS&E**	**SAIC**	**SAIC**	**OSI / Rapiscan**
Model		**Sentry Portal**	**VACIS IP6500 (non-Fullscan)**	**VACIS Fullscan IP6500**	**Eagle Portal P60**
Description		7.5 MeV High throughput Portal	6.5 MeV High throughput Portal	6.5 MeV High throughput Portal	6.0 MeV High throughput Portal
Penetration (no scan speed provided unless noted)		300mm (12 in) steel	318mm (12.5 in) steel at 13km / hr	318mm (12.5 in) steel at 13km / hr	300mm steel
Throughput		Up to 150 trucks per hour	More than 150 trucks with minimum exclusion area or other vehicles per hour up to 300 per hour with larger controlled access area	More than 150 trucks with minimum exclusion area or other vehicles per hour up to 300 per hour with larger controlled access area	Up to 180 trucks per hour
Throughput / images		High throughput/high quality images	High throughput/high quality images	High throughput/high quality images	High throughput/high quality images
Relocation		Not quickly relocateable (2 weeks)	Not quickly relocateable (1 month)	Not quickly relocateable (1 month)	Not quickly relocateable (1 month)
Website		www.as-e.com	http://www.saic.com/products/security/	http://www.saic.com/products/security/	http://www.rapiscansystems.com/en/products/cvi/productsrapiscan_eagle_p60
Required number of operators		1-2 operators, image operators not provided	1-2 operators	1-2 operators	1 check in officer, 1 operator and 2 inspectors; additional inspectors required for high throughput
Image Quality					\
	Resolution	</-5mm Wire resolution	</-5mm Wire resolution	</-5mm Wire resolution	
	Contrast	3%	3%	3%	
	Material discrimination	Integrate with Backscatter		Included	Available option
System Features	**Energy / Source**	7.5 MeV Betatron high energy X ray source with available Z backscatter option	6.5 MeV High energy X-ray imaging and spectroscopic radiation detection	6.5 MeV High energy X-ray imaging and spectroscopic radiation detection with material discrimination and full vehicle scanning bumper to bumper and roof to tires including occupants	6.0 MeV linear accelerator X-ray generator; 6.0 MeV dual energy linear accelerator X-ray generator required for material separation option; low energy X-ray generator required for CabScan option to scan occupied cab and occupants; gamma or gamma and neutron radiation detection available as options
	# of Views	Single	Single	Single	Single
	Scan Speed	12 kph	3 - 16 kph	3 - 16 kph	8 kph
	Physical size footprint	25 square meters	9 m x 7 m	9 m x 7 m	Not available.
	Scan Tunnel Size / FoV	3.0m W x 4.9m H	Not available.	Not available.	
	Scanning Method / Transport Type	Drive through Portal	Drive through Portal	Drive through Portal	Drive through Portal
	Chassis	none	none	none	none
	Relocatability	2 weeks	1 month	1 month	1 month
	Set up time	None	None	None	None
	System options (not image enhancements)	Integrate with Radiation portal, Container ID, CCTV, Single monitor, Handheld Isotope ID device, Z Portal, Networking, operator assist	Includes Radiation Portal and OCR	Integrate with Radiation Portal and OCR ready	Integrate with Radiation Portal and OCR ready
	Operating temperature	-20C to 50C	\	Not available.	Not available.
	Work in harsh environments	Rain, snow, winds, blowing sand	Rain, snow, winds, blowing sand	Rain, snow, winds, blowing sand	Rain, snow, winds, blowing sand
Radiation / Exclusion Zones	Exclusion zone	600 square meters max	8 m x 5 m	9 m x 7 m	Available with radiation shielding walls
	Radiation safety	Very low ambient radiation dose. Extremely safe for operators and drivers, falls well below radiation safety requirements for NCRP and ICRP. <0.006uSv per scan scattered dose to driver; 2.9uSv to cargo	Extremely low radiation dose for safety and small size. Meets international and USA safety standards	Low radiation dose for safety and small size. Meets international and USA safety standards	Meets radiation safety requirements. Meets international and USA safety standards
Software Features	Image enhancement features	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest
	Image save and restore	Auto save	Auto save	Auto save	Auto save
	Database	SQL Database	SQL Database	SQL Database	SQL Database
	Printer	Color Laser	Color Laser	Color Laser	Color Laser
	Networking	Optional	Optional	Optional	Optional
Execution / Support	Lead time	4 months	4 months	4 months	4 months
	Warranty	1 year parts and labor	1 year parts and labor	1 year parts and labor	1 year parts and labor

Container / Vehicle Inspection Systems Comparison

	PORTAL SYSTEM	PORTAL SYSTEM	PORTAL SYSTEM	PORTAL SYSTEM
Company	**AS&E**	**SAIC**	**SAIC**	**OSI / Rapiscan**
Model	**Sentry Portal**	**VACIS IP6500 (non-Fullscan)**	**VACIS Fullscan IP6500**	**Eagle Portal P60**
Comments	High energy X-ray source deeply penetrates dense objects while minimizing scattered radiation Container locating subsystem informs system when leading edge of container has reached beam planes after cab and driver has passed so beam is switched on safely Well below radiation safety requirements of NCRP/ICRP. Z Backscatter option offers multidimensional views and material discrimination for detecting well hidden contraband and the ability to scan entire vehicle including cab and driver Radiation detection available as an option	OCR component automatically identifies containers	OCR component automatically identifies containers Material discrimination distinguishes light organic material from dense inorganic material. High quality gray scale and pseudocolor image. Radiation detection Bumper to bumper roof to near pavement scan including cab and occupants	High energy X ray easily penetrates dense material Material separation option available to help the inspector find low density contraband such as narcotics and explosives. The Eagle P60 is the only P series product available with this optional capability. Drive through mode with available CabScan option to scan occupied cab and occupants Automated ID number capture option available Concrete radiation shielding walls availa Diesel electric generator available as an option. Base system is shore powered. Optional hot weather kit extends operation to 55 degrees C

Container / Vehicle Inspection S

		PORTAL SYSTEM	PORTAL SYSTEM	MOBILE SYSTEM	MOBILE SYSTEM
Company		**Smiths Detection**	**L3**	**SAIC**	**OSI / Rapiscan**
Model		**HCVP**	**CX Portal**	**VACIS M6500**	**Eagle Mobile M60**
Description		6.0 MeV High throughput Portal	Unknown	High Energy Mobile Truck (over road)	High Energy Mobile Truck (over road)
Penetration (no scan speed provided unless noted)		Up to 300mm (11.8 in) steel	Unknown	300mm steel	300mm steel
Throughput		Up to 195 trucks per hour		150 trucks and containers per hour	25/hour
Throughput / images		High throughput/high quality images	High throughput/high quality images	High throughput / high quality images	Very low throughput
Relocation		Not quickly relocateable (1 month)	Not quickly relocateable (1 month)	Some degree of mobility - High maintenance / delicate / needs regular recalibration	Some degree of mobility - High maintenance / delicate / needs regular recalibration
Website		http://www.smithsdetection.com/HCVP.php	http://www.sds.l-3com.com/cargoscreen/CX-Portal.htm	http://www.saic.com/products/security/	www.rapiscan.com
Required number of operators		Minimum crew requirements 1 traffic receptionist, 1 system operator, 8 image operators depending on throughput	Unknown	2 onboard inspectors;	2 onboard inspectors;
Image Quality					
	Resolution		Unknown	1mm wire	1mm wire
	Contrast		Unknown	1-2%	1-2%
	Material discrimination	Available option			Dual Energy Option
System Features	**Energy / Source**	High energy X-ray imaging with material discrimination and optional radiation detection		High energy X-ray	6.0 MeV linear accelerator
	# of Views	Single	Single	Single	Single
	Scan Speed	7 km/4 mph	Unknown	"Normal"	0.13, 0.27, 0.4m/s
	Physical size footprint	Minimal	Unknown	"Tight Spaces"	Min 500 square meters depending on length of scan track
	Scan Tunnel Size / FoV			Not available.	2.8m W x 4.6m H
					M60 - up to 5m tall with option
	Scanning Method / Transport Type	Drive through Portal	Drive through Portal	Mobile truck with forward and reverse scanning. Some drive through options available with lowered penetration and resolution	Mobile truck with forward and reverse scanning. Some drive through options available with lowered penetration and resolution
	Chassis	none	none	Mack	Mack or Mercedes
	Relocatability	1 month	1 month	Built to be mobile - Calibration annually	Mobile but may need recalibration at new site
	Set up time	None	None	30 minutes for boom deployment	30 minutes for boom deployment
	System options (not image enhancements)	Integrate with Radiation Portal and OCR ready	Integrate with Radiation Portal and OCR ready	Integrate with Radiation Portal and OCR ready	Dual-Energy available on M60, Radioactive material detection, shore power, operator assist, container ID
	Operating temperature	-20°C to +40°C (-4°F to +104°F)	-20C to 50C	Not available.	-20 to 55C
	Work in harsh environments	Rain, snow, winds, blowing sand	Rain, snow, winds, blowing sand	Rain, snow, winds, blowing sand	Severe weather kits as option extras
Radiation / Exclusion Zones	Exclusion zone	Not available.	Not available.	Not available.	1420 square meters (as per CBP)
	Radiation safety	Unknown but meets international and USA safety standards	Unknown but meets international and USA safety standards	Low power radiation beam, dose to driver entirely from scattered radiation is equivalent to 1 min of normal background radiation; dose to operators and bystanders is even lower. Unknown but meets international and USA safety standards	Unknown but meets international and USA safety standards
Software Features	Image enhancement features	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest
	Image save and restore	Auto save	Auto save	Auto save	Auto save
	Database	SQL Database	SQL Database	SQL Database	SQL Database
	Printer	Color Laser	Color Laser	Color Laser	Color Laser
	Networking	Optional	Optional	Optional	Optional
Execution / Support	Lead time	4 months	unknown	unknown	unknown
	Warranty	1 year parts and labor	unknown	unknown	unknown

Container / Vehicle Inspection S

		PORTAL SYSTEM	PORTAL SYSTEM	MOBILE SYSTEM	MOBILE SYSTEM
Company		**Smiths Detection**	**L3**	**SAIC**	**OSI / Rapiscan**
Model		**HCVP**	**CX Portal**	**VACIS M6500**	**Eagle Mobile M60**
Comments		Optional viZual technology provides material discrimination of organic and inorganic material with colorization based on atomic number		Brings high quality X-ray imaging to temporary or remote locations.	High energy X ray easily penetrates dense material
				In motion scanning of entire vehicles bumper to bumper or parked scanning of containers in the normal flow of checkpoint traffic.	Material separation option available to help the inspector find low density contraband such as narcotics and explosives.
				Available with radiation detection option.	Drive through portal scan mode and available CabScan options to scan occupied cab and occupants
				Available with OCR container identification.	Automated ID number capture option available
		ble as an option			Drive by scanning of stationary unoccupied vehicles

Container / Vehicle Inspection S

MOBILE SYSTEM

Company		**AS&E**
Model		**MobileSearch HE**
Description		High Energy Mobile Truck (over road)
Penetration (no scan speed provided unless noted)		typical penetration of over 300mm (12 in) steel
Throughput		25/hour
Throughput / images		Very low throughput
Relocation		Some degree of mobility - High maintenance / delicate / needs regular recalibration
Website		www.as-e.com
Required number of operators		2 onboard inspectors;
Image Quality		
	Resolution	</-5mm Wire resolution
	Contrast	3%
	Material discrimination	Integrate with Backscatter
System Features	**Energy / Source**	4.5 MeV/Backscatter 225 keV
	# of Views	Single
	Scan Speed	0.4 m/s, 0.3 m/s, 0.2 m/s
	Physical size footprint	Min 500 square meters depending on length of scan track
	Scan Tunnel Size / FoV	3.0m W x 4.9m H
	Scanning Method / Transport Type	Mobile truck with forward and reverse scanning. Some drive through options available with lowered penetration and resolution
	Chassis	Ford
	Relocatability	Built to be mobile - Calibration annually
	Set up time	30 minutes for boom deployment
	System options (not image enhancements)	Container ID, CCTV, Single monitor, Networking, operator assist
	Operating temperature	-30C to 55C
	Work in harsh environments	Rain, snow, winds, blowing sand
Radiation / Exclusion Zones	Exclusion zone	1152 square meters
	Radiation safety	<0.006uSv per scan scattered dose to driver; 2.9uSv to cargo
Software Features	Image enhancement features	Zoom, reverse video, edge enhance, pseudo color, high contrast, density expand, sharpen, auto enhance, region of interest
	Image save and restore	Auto save
	Database	SQL Database
	Printer	Color Laser
	Networking	Optional
Execution / Support	Lead time	4 months
	Warranty	1 year parts and labor

Container / Vehicle Inspection S

MOBILE SYSTEM

Company		**AS&E**
Model		**MobileSearch HE**

Comments

Z backscatter offers ability to detect organic threats

In Z Backscatter only mode, system can scan occupied vehicles

6.0 Interim Report and Meeting Summary

The interim presentation of the Feasibility Study for the Port of Buenaventura Operational and Security Enhancement Project in Colombia was carried out from August 2 to 4, 2011. The presentation was carried out by Larry Boorstein, Project Manager and Richard Wechsler, Senior Security Specialist, both of AECOM, with Fernando Buitrago, Ports and Logistics. The meeting was attended by representatives of Sociedad Portuaria Regional de Buenaventura (SPRBun), the National Anti-narcotics Police (Policía Nacional Antinarcóticos) and the Buenaventura Specialized Container Terminal (Terminal Especializada de Contenedores de Buenaventura, S.A.) (TECSA).

The AECOM team presented the results of the following study tasks:

1. Data Collection and Review of Existing Conditions

2. Development of a Vessel Traffic System

3. Development of an Optical Character Recognition (OCR) System

4. Development of a Computer Monitoring Security System

5. Review of Cargo Inspection

Meetings and presentations were carried out including the following officials:

<u>SOCIEDAD PORTUARIA REGIONAL DE BUENAVENTURA (SPRBun):</u>

My (r) Gilberto Ocampo,	Director of Security
Edison Díaz,	Manager of Operations
Ana Mercedes Cano R.,	Manager of Human Talent
Yolima Martínez,	Legal Director
Julio César Orobio Obando,	Manager of Maintenance and Equipment
Héctor Medina,	Commercial Manager and Service to the Client
Patricia Salgado,	Manager of Information Technology
Roberto Castañeda,	Port Facilities Protection Officer (OPIP)
Alexander Micolta Sabid,	Assistant to the General Management
Carlos A. Rodríguez G.,	Attorney Legal Directorate

Jorge Meneses, Systems Analyst

NATIONAL ANTI-NARCOTICS POLICE:

Cte. Juan Quiroga, Commander Anti-narcotics

TERMINAL ESPECIALIZADA DE CONTENEDORES DE BUENAVENTURA, S.A. (TECSA) (Specialized Container Terminal of Buenaventura):

Juan C. Cedilla, Manager

Edgar Estupian

The following day, AECOM staff conducted a meeting to review the presentation on the Vessel Traffic System with:

GENERAL MARINE DIRECTORATE (DIRECCIÓN GENERAL MARÍTIMA) (DIMAR):

CF Juan Carlos Roa Cubaque, Frigate Captain, Captain of the Port of Buenaventura.

The Captain commented that the vessel traffic control and surveillance system of Buenaventura is being developed as a pilot project. It involves the renovation of the VTS radars under the Coast Guard. The Atlas VTS system is nearly obsolete. DIMAR has built two new stations in Barranquilla and Cartagena. The military high command has decided to optimize resources, in that DIMAR will be responsible for the buildings and the Coast Guard for the equipment. He stated that information on the vessels is already send 12 hours in advance for the Anti-narcotics, 24 hours in advance for the National Customs and Tax Directorate (DIAN), and 24 hours in advance for SPRBun.

The consultants carried out an additional visit to the Security Control Center of the Port of Buenaventura with Javier Geraldo Fonseca, Director of Operations of the Integrated System of Electronic Security (SISE) of the firm G4S.

Afterwards, the consultants conducted a meeting with:

SPRBun

Ing. Domingo Chinea Barrera General Manager of Sociedad Portuaria

The following comments were noted:

L-3 and Smiths Detection should be added to the matrix of scanners. The Manager expressed the opinion that it would be less costly to add a module to Cosmos to automate the gates than to purchase a new Navis system which incorporates the required module. He expressed the opinion that the port should have more intelligence and less inspection. He indicated that no port which participates in

illegal activities supports an intelligence activity. He expressed concern with delays to the port in case of increasing inspection.

Upon returning to Bogotá, the specialists conducted a meeting with:

DIMAR

CN Marco Olier Mendoza,	Ship Captain Chief of the Division of Captaincies
Diana Garavito,	Maritime Traffic Control

During the meeting, we were informed that the Directorate of Telematics (Dirección de Telemática) (DITEL) of the National Navy (Armada Nacional), headed by Frigate Captain Luís Fernando Berbeo Calderón, Director of Telematics would be in charge of the acquisition of the Vessel Traffic System. The DIMAR staff stated that for 3 years a project has been carried out for integration of DIMAR and the Coast Guard (Guardacostas) in the area of traffic. DIMAR has installed Vessel Traffic Systems in Barranquilla and Cartagena. The Vessel Traffic Control Center of Buenaventura is foreseen for the year 2012, and others such as Coveñas, Tumaco, Turbo, Santa Marta and San Andrés for 2013 to 2014.

Comments and suggestions were obtained from members of the Sociedad Portuaria and others present.

7.0 Development and Environmental Impacts

The Port of Buenaventura, located in the province of Valle de Cauca, is the public port of the greatest cargo movement in the Colombian Pacific and also the country's number one public port. Buenaventura is a key focus for Colombia's international maritime trade and with the rapid growth of the countries of the Pacific Rim. This position has been strengthened in recent decades.

The Sociedad Portuaria Regional Buenaventura (SPRBun)'s Security and Operations Enhancement Project ("the Project") will result in a number of technological advancements for the Port of Buenaventura ("the Port") in Colombia. If implemented, the Port will achieve the following operational and security improvements:

- A **Vessel Traffic System (VTS)** and Automatic Identification System (AIS) to improve navigational safety and monitoring of all vessels off the coast of Buenaventura and in the main channel of Buenaventura, due to the expanding capacity of SPRBun facilities and planned new terminals ;
- An **Optical Character Recognition (OCR**) system to record the designations of trucks and markings on the containers and to improve the efficiency of container gates. SPRBun plans to integrate this information into the Terminal Operating System (TOS) and install OCR equipment in all gates for entry and exit of containers; and
- New cargo review inspection procedures, practices, facilities, equipment and reporting systems;
- A **Computer Monitoring Security System (CMS**) for monitoring of the network of Closed Circuit Television (CCTV) and access control and intrusion detection systems (covering the fence on the perimeter of the port and waterfront area).

AECOM analyzed the potential development impacts that could result if the Project is fully implemented and concluded the following:

7.1 Analysis of key impact on the host country

- **Infrastructure Improvements:** To fully implement the proposed technological upgrades, the total required capital investment is estimated to be US$7.1 million. In addition, incremental annual operating costs are estimated to be US$2.0 million (or a cumulative value of US$9.9 million over the five year operating timeframe analyzed). To estimate the economic benefits retained in Colombia, assumptions regarding the sourcing of materials and labor were applied to capital costs and operating expenditures. Based on these assumptions, total direct and indirect spending in Colombia on capital costs could reach **US$0.5 million**. Total direct and indirect wages earned by Colombian residents associated with the construction and installation activities are estimated to be approximately **US$ 11.9 million** (cumulative value over five years, excluding inflation). In total, the Security and Operations Enhancement Project could generate up to **US$12.4 million** in direct and indirect economic benefits within the Colombian national economy over five years.
- **Market Oriented Reform:** The proposed investment in improved port operations will serve to serve to spur a number of market-oriented reforms that will bring the Port of Buenaventura up to the security standards of the United States Government, thereby opening the port to valuable trade routes linking Colombia directly to US markets.
- **Job Creation Benefits:** The estimated one-time capital expenditures and ongoing annual operating expenditures are expected to generate approximately 49 average annual direct FTEs over a five year operating timeframe. The wage spending associated with the direct jobs are expected to generate additional indirect jobs. Assuming an economic multiplier of 1.5 times the direct economic benefits, the Project is expected to create an additional 25 FTEs, or a total annual direct and indirect job creation potential of 74 FTEs.
- **Training Benefits:** Improvements in technology inherently require job training. It is estimated that a total of US $215,810 will be expended on training activities for Operators, Supervisors and Maintainers to fully implement the Vessel Traffic, Optical Character Recognition, and Computer Monitoring Security Systems. It is estimated that this level of funding will benefit the existing employees, some of which will be retrained and reassigned to staff the 37 new positions required to fully maintain and operate the Project's technological upgrades.
- **Technology Transfer and Productivity Enhancements:** The proposed investment in Vessel Traffic System (VTS), Optical Character Recognition (OCR) System, and Computer Monitoring Security System (CMS) will result in key technological advancements that will serve to facilitate international foreign trade between Colombia and key international markets.

Other: The current system used to calculate duties and taxes relies on a foundation of manual data entry to the computerized system. By implementing the OCR technology (OCR), the Government of Colombia will have a more accurate inventory of trade cargo in real time. The non-intrusive inspection (NII) with scanners, cargo control with OCR, and monitoring of vessels with Vessel Traffic System (VTS) will help control the contraband, including explosives, narcotics and other restricted materials, and evasion of laws, taxes and tariffs. In total, the Project is expected to yield substantial positive development impacts in Colombia. The following discussion provides the detailed assumptions and calculations supporting these key findings.

7.1.1 Infrastructure Impacts

The Port of Buenaventura's current operations generate substantial economic activity within the region and for the Government of Colombia. The port is composed of a set of docks, patios, warehouses and other multipurpose facilities handling containers, bulk cargo, vehicles and general cargo. SPRBun holds the concession for the port's main terminal. Sociedad Portuaria Regional Buenaventura S.A., established in 1991, is a public / private enterprise, governed by private law, with 83% of its shares belong to private entrepreneurs made up of importers, exporters, port operators, shipping lines, unions, former port employees and individuals. 15% is in public hands made up of the City of Buenaventura and 2% for the Ministry of Transport. Within the SPRBun terminal, several operators run the terminals and warehouses for containers and bulk. The operators include the Terminal Especializada de Contenedores de Buenaventura, S.A. (Specialized Container Terminal of Buenaventura) (TECSA) Comercializadora Internacional de Azúcar y Mieles, S.A. (International Trading Sugar and Molasses) (CIAMSA), Portuaria de Cementos Asociados, S.A. (Associated Port Cement) (CEMAS) and the Federación Nacional de Cafeteros de Colombia (National Federation of Coffee Growers of Colombia).

AECOM analyzed the physical or financial infrastructure improvements that may result if the Project were implemented to develop an estimate of the anticipated scale of economic benefits that would result from one-time construction/installation and annual ongoing operations.

Each of the proposed improvements will result in investments in materials and wages. To evaluate the potential impact of implementation of the Security and Operations Enhancement Project, AECOM analyzed the capital and operating budgets for each distinct activity

Ongoing operations will also generate recurring economic benefits for a broad range of maintenance and training investments. The equipment replacement, maintenance, and repair may vary from year to year. Although spare equipment has been recommended for the initial order, the Project will also generate spending on replacement of the spares as they are used. The project will require materials and equipment spending on the following items :

Figure 7- 1: Summary of Key Infrastructure Investments / Systems Upgrades

Vessel Traffic Control System (VTS)	Computer Security Monitoring System (CSMS)
Control Center Equipment Radar Equipment Network Point to Point Wireless Link Equipment Spare Parts AIS System AIS Web Software Installation and Training	PSIM Hardware & Software SOC Video SOC Workstations Supplemental Updates Operator Console Updates CCTV Updates Spare Parts
Optical Character Recognition System (OCR)	
Port OCR Systems, Containers Communication Conductor Kiosks License Plate Recognition Stations Preparation, Installation and Startup Activities Preparation Civil Work and Wiring COSMOS Data Integration or equivalent TOS Management and Staff Training Travel and Incidentals	

To evaluate the development impacts of the infrastructure investments detailed in Figure 7- 1, AECOM analyzed the estimated capital investment and ongoing annual operating expenditures required to fully implement the Project. Investments related to materials, supplies, software were allocated to capital investment. Investments related to staffing, training, and other labor-related expenditures were allocated to wages (labor or job creation impacts).

Figure 7-2: Total Estimated Annual Project Investment (Capital and Operating Costs)

	Year 1	Year 2	Year 3	Year 4	Year 5	Cumulative
Maritime Vessel Traffic System (VTS)						
Capital Costs	$3.0	$-	$-	$-	$-	$3.0
Annual Operating Costs	$0.5	$0.5	$0.5	$0.5	$0.5	$2.3
Optical Character Recognition System (OCR)						
Capital Costs	$2.3	$-	$-	$-	$-	$2.3
Annual Operating Costs	$0.3	$0.3	$0.3	$0.3	$0.3	$1.7
Computer Monitoring Security System (CMS)						
Capital Costs	$1.8	$-	$-	$-	$-	$1.8
Annual Operating Costs	$1.2	$1.2	$1.2	$1.2	$1.2	$5.9
Total Capital Costs	$7.1	$-	$-	$-	$-	$7.1
Total Annual Operating Costs	$2.0	$2.0	$2.0	$2.0	$2.0	$9.9
Total Project Investment /1	**$9.1**	**$2.0**	**$2.0**	**$2.0**	**$2.0**	**$17.0**

1/ Total capital costs and operating expenditures include investment activity in Colombia and abroad.

Total estimated capital investment of US$7.1 million and cumulative operating expenditures of US$9.9 million (over five years) were adjusted to reflect economic benefits retained in Colombia. For the purpose of this analysis, it is assumed that the majority of spending associated with one-time capital investment and ongoing operations will be directed outside of Colombia, with up to 20% of the remaining capital investment eligible for local participation by the host country.

AECOM applied assumptions regarding the anticipated source of materials and labor for each spending category to measure the potential one-time and annual ongoing development impact in Colombia and determined that the majority of spending is likely to occur outside of the host country (95% foreign/5% domestic). Likewise, it is assumed that the majority of jobs created by the one-time capital investment in the Project will be held by foreign labor sourced from outside of Colombia (93% foreign/7% domestic). It is assumed that 100% of the labor created by annual ongoing operating expenditures will be comprised of Colombian nationals. These assumptions were applied to the estimate of total direct and indirect jobs created by the Project to estimate the impact to the host country (refer to the Annex for detailed calculations and assumptions).

Figure 7-3: Share of Economic Benefits Retained in Colombia

	One-Time Impacts (Capital)	Annual Ongoing Impacts (Operating)
Spending Impacts - Materials Purchases	**5%**	**5%**
Labor Impacts – Wages	**7%**	**100%**

A summary of the anticipated development impacts to occur in the host country is detailed in the following discussion.

7.1.1.1 Direct Economic Benefits – One-Time Capital Investment

It is estimated that the total one-time spending on materials and equipment in Colombia will be **US$0.2 million**. Wages associated with the construction and installation activities will be approximately **US$0.2 million**, or a total one-time capital investment of **US$0.4 million**.

7.1.1.2 Direct Economic Benefits – Ongoing Annual Operating Expenditures

For the purpose of this project, AECOM evaluated a five-year operating timeframe (or roughly the estimated useful life of the majority of the equipment, software, and other materials associated with the VTS, AIS, OCR, and CMS improvements).

It is estimated that the total one-time spending on materials and equipment will be **US$0.1 million**. Wages associated with the construction and installation activities will be approximately **US$ 7.8 million** or cumulative operating expenditures of **US$7.9 million** over five years, excluding inflation.

7.1.1.3 Indirect Economic Benefits – Capital Investment and Ongoing Annual Operating Expenditures

Direct economic impacts are expected to generate additional indirect economic benefits through the multiplier effect, or the associated upstream and downstream spending in the domestic economy of Colombia in the form of business and payroll spending on the capital and operating expenditures required to fully implement the Project. For the purpose of this analysis, a multiplier of 1.5 times the direct benefits is applied across spending and job creation categories to develop a high-level, order-of-magnitude estimate of the total economic benefits that could result if the Project is fully implemented.

Based on these assumptions, total direct and indirect spending on capital improvements could reach **US$0.5 million**. Total direct and indirect wages associated with the construction and installation activities are estimated to be approximately **US$ 11.9 million** (cumulative value over five years,

excluding inflation). In total, the Security and Operations Enhancement Project could generate up to **US$12.5 million** in direct and indirect economic benefits within the Colombian national economy.

The following **Error! Reference source not found.** provides a detailed summary of these results.

Figure 7-4: Summary of Cumulative Five-Year Development Impacts in Colombia

Cumulative Five-Year Impacts	One-Time Impacts (Capital)	Ongoing Impacts (Operating)	Total Direct Economic Impacts /1	Indirect Economic Impacts	Total Economic Impacts
Economic Multiplier			1.0	0.5	1.5
Spending Impacts - Materials Purchases					
Maritime Vessel Traffic System (VTS)	$39,447	$9,500	$48,947	$24,473	$73,420
Optical Character Recognition System (OCRS)	$114,210	$87,355	$201,565	$100,783	$302,348
Computer Monitoring Security System (CMS)	$78,636	$19,501	$98,136	$49,068	$147,204
Total	**$232,293**	**$116,355**	**$348,648**	**$174,324**	**$522,972**
Labor Impacts – Wages					
Maritime Vessel Traffic System (VTS and AIS)	$99,295	$2,110,457	$2,209,752	$1,104,876	$3,314,627
Optical Character Recognition System (OCRS)	$41,784	$-	$41,784	$20,892	$62,675
Computer Monitoring Security System (CMS)	$24,486	$5,685,457	$5,709,942	$2,854,971	$8,564,914
Total	**$165,564**	**$7,795,913**	**$7,961,478**	**$3,980,739**	**$11,942,216**
TOTAL DEVELOPMENT IMPACTS (US$ Millions)	**$397,857**	**$7,912,269**	**$8,310,126**	**$4,155,063**	**$12,465,188**

7.1.2 Market Oriented Reform

The proposed improvements will have an impact on the Colombia's trade and on exports to the United States. To ensure that the US has the capability to monitor and protect cargo coming into the USA, new trade agreements with Colombian Government require that the merchandise undergo a specific cargo inspection process in its last port of call prior to entry into the US to comply with drug enforcement and anti-terrorism protocols.

The proposed investment in improved port operations will serve to serve to spur a number of market-oriented reforms that will bring the Port of Buenaventura up to the security standards of the United States Government, thereby opening the port to valuable trade routes linking Colombia directly to US markets.

The Port of Buenaventura must transition from its current Ports monitoring system to be competitive in the global trade market. The decision to transition to electronic monitoring is a key policy changes that will directly generate increased trade flow and ensure that Colombia will retain its competitive share of the global trade market.

The current system was installed more than 15 years ago; it is considered outdated, lacking adequate integrated systems mapping, cargo data collection/monitoring, and security protocols. The purpose of the Project is to transition the Port of Buenaventura from monitoring and evaluation by human eye to an operation driven by world-class technology.

Currently, the Port has five different shared entrance/exits points for incoming/outgoing cargo. The process is currently operated by a labor-intensive, paperwork-driven operating structure. The cargo arrives to the port where it is unloaded. Each container must be inspected, vetted through US Customs/ the Department of Agriculture, and subsequently transported back to the port for subsequent shipping.

All locations are currently staffed with personnel with a single dedicated function for tracking or monitoring cargo. There is also an off-site Free Zone, essentially where container inspections pulled aside to be inspected. All cargo must be inspected manually to conduct the required inventory assessment and subsequently repackaged. The labor requirements are intensive; current Port operations require staffing by the National Police, Immigrations personnel, serial code trackers, key persons, tax calculation personnel, accounting personnel, and agricultural products monitors for a national database for Colombia to track sugar, cocoa, beans, as the goods are processed in to containers.

The proposed VTS, OCR, and CMS improvements will serve to bring the Port operations up to international standards. As an example, the OCR system will record the designations of trucks and markings on the containers and to improve the efficiency of container gates. SPRBun plans to integrate this information into the Terminal Operating System (TOS) and install OCR equipment in all gates for entry and exit of containers.

Once the OCR system is implemented, many of the same operations will take place and will require the same labor support, but it will enable more accurate container tracking. The plan calls for the Port to install OCR readers throughout the Port to track standard traffic flow and document the cargo into a container mapping system. This system will ensure that Port operators always know where any container is located at any given time. Although the OCR system will automate current functions, it is not expected to change the labor required to process the inventory controls.

7.1.3 Human Capacity Building

The Port of Buenaventura is a major employer in the region. Based on the feasibility study's field work, AECOM prepared a summary profile of the types of jobs required to support the Port's current operations.

Figure7- 5: Profile of Current Port of Buenaventura Employment (Full-Time Equivalents)

	Shifts	Staff per Shift	Total Staff
Security Control Center			
Security Operator	4	7	28
Security Operator Monitor/ Supervisor	4	5	20
Coordinator of Security Services	4	1	4
National Police Representative	4	1	4
Permanent Editor	4	1	4
Video Editor	4	1	4
Raymond Gate Security			
Security Monitoring Operator	4	1	4
Internacional de Seguridad			
Physical Security Officer	4	1	180
Control Room Operator			
TECSA Container Inspector - outbound	4	1	4
TECSA Container Inspector - inbound	4	1	4
TECSA Container Inspector – Import	4	1	4
SPRBun Inspector – Land Entry and Exit	4	1	4
TECSA Container Inspector – Maritime Exit and Export	4	1	4
T ESCA Plan Shipments	4	2	8
	4	5	
Port of Buenaventura Cargo Clearance	4	1	
National Directorate of Taxes and Customs	4	1	
National Institute of Food and Drug Monitoring	4	1	
Colombian Agricultural Institute	4	1	
Fiscal Customs Police (POLFA);	4	1	
National Antinarcotics Police	1	180	

Based on the proposed construction investment, AECOM evaluated the potential job creation that may be created during the installation/construction phase if the Project were implemented as recommended.

It is expected that many of the existing personnel will be retrained and retained to operate the new systems:

- Current personnel responsible for monitoring ship traffic will be retrained or replaced by new staff operating VTS and AIS systems.
- It is likely that the AIS staffing requirements and costs will be shared with the VTS system.
- Existing staff responsible for operating the gates and serving in clerking functions will be retrained or replaced by computer monitoring operators for the automated gate system and OCR system (human checks will still be required for instances when the OCR doesn't pick up the license plates and container markings automatically).
- Current security contractors and National Police staffing at the main control center will be re-trained or replaced to watch the monitors with the CMS and video analytics, to operate the auxiliary control center at the Raymond Gate and, and to provide physical security.
- Existing personnel responsible for inspecting cargo (Customs, Food and Medicine and Agriculture and National Police) and operating the single mobile scanner (National Police) will be hired or re-trained to operate additional scanners in order to scan all of the cargo.

Given that it is unknown how many current staff will be retrained and retained through the Project's implementation phase, the analysis of employment impacts provides a summary of the total staff required to operate the proposed new VTS, OCR, and CMS systems. As such, these jobs are not considered "net new" to Colombia.

The estimated one-time capital expenditures will generate wage spending that is expected to create approximately **7 direct FTE jobs** (based on a 40-hour work week and 52 work weeks per year). Over the five-year operating timeframe analyzed, investments in maintenance, training, and other staffing activities could generate up to **32 direct annual FTEs**.

Taking an annual average of the one-time jobs over five years and adding to the annual ongoing jobs created from operations, the total annual job creation potential of the Project is expected to be approximately **39 FTEs**.

The wage spending associated with the direct jobs are expected to generate additional indirect jobs. Assuming an economic multiplier of 1.5 times the direct economic benefits, the Project is expected to create an additional **29 FTEs**, or a total annual direct and indirect job creation potential of **59 FTEs**.

Figure 7-6: Direct and Indirect Job Creation Impacts (Full-Time Equivalents)

	Full-Time Equivalent Staff	Average Annual Wage (US$) /1	Gross Annual Wages (US$)
Vessel Traffic System (VTS) /2			
System Administrator/Supervisor	2.0	45,000	90,000
Operator	10.2	31,250	320,000
IT Maintenance Technician	0.3	43,750	10,938
Maintenance Technician	0.1	10,000	1,154
Subtotal	**12.6**		**422,091**
Computer Monitoring Security System (CMS)			
System Administrator/Supervisor /3	1.50	75,000	112,500
Operator	18.00	17,778	320,000
IT Maintenance Technician	0.25	43,750	10,938
Maintenance Technician	0.12	10,000	1,154
Subtotal	**19.9**	**45,792**	**909,673**
Total Direct On-Site FTEs/Gross Annual Wages	**32.5**		**1,331,764**

1/ Average annual salary plus 25% fringe benefit factor.

2/ VTS positions may overlap with or fulfill Automated Identification of Ships (AIS) staffing requirements.

Figure 7-7: Summary of Cumulative Five-Year Employment Impacts in Colombia

Cumulative Five-Year Employment Impacts /1	One-Time Impacts (Capital)/2	Annual Ongoing Impacts (Operating)/3	Total Direct Economic Impacts /2	Indirect Economic Impacts	Total Economic Impacts
Economic Multiplier			1.00	0.50	1.50
Labor Impacts - Wages					
Maritime Vessel Traffic System (VTS)	$99,300	$2,110,500	$2,209,800	$1,104,900	$3,314,700
Optical Character Recognition System (OCR)	$41,800	$-	$41,800	$20,900	$62,700
Computer Monitoring Security System (CMS)	$24,500	$5,685,500	$5,710,000	$2,855,000	$8,565,000
Total Host Country Impact	**$165,600**	**$7,796,000**	**$7,961,600**	**$3,980,800**	**$11,942,400**
Labor Impacts - Jobs (Full-Time Equivalents)					
Maritime Vessel Traffic System (VTS)	4	13	17	8	25
Optical Character Recognition System (OCR)	2	-	2	1	3
Computer Monitoring Security System (CMS)	1	20	21	10	31
Total Jobs Created in Colombia	**7**	**32**	**39**	**20**	**59**

1/Figures are rounded, US$.
2/ Jobs created from one-time capital investment derived from share of spending on labor, divided by estimated average annual wage of US$25,000 (including fringe benefits).
3/ Jobs created from annual ongoing operations are based on actual staffing requirements indicated by the feasibility study.

7.1.3.1 Job Training Impacts

Improvements in technology inherently require job training. It is estimated that a total of US $215,810 will be expended on training activities to fully implement the Project.

Figure 7-8: Total Estimated Training Budget

Training Impacts – Total Investment Value	US $
Maritime Vessel Traffic System (VTS)	28,600
Optical Character Recognition System (OCRS)	130,600
Computer Monitoring Security System (CMS)	56,610
Total	**215,810**

It is estimated that this level of funding will benefit the existing employees, some of which will be retrained and reassigned to staff the 37 new positions required to fully maintain and operate the Project's technological upgrades.

VTS Training

Training shall be conducted for Operators, Supervisors and Maintainers. This training shall consist of both classroom and live operational system training. The recommended training class duration is as follows:

Operator Training 3 day

Supervisor Training 3 day

Maintainer Training 5 days

AIS System Training

AIS system training will be offered to staff to boost experience in port operations and security and to provide certification in the operation of VTS type systems. Training will also be offered to staff to ensure they have an understanding of basic navigation rules and best practices.

Training for CMS

Training shall be conducted for Operators, Supervisors and Maintainers. This training shall consist of both classroom and live operational system training. The recommended training class duration is as follows:

- Operator Training 7 days

- Supervisor Training 7 days
- Maintainer Training 7 days
- On-Site Operational Support 14 days after system is accepted.

The desired outcome of the training is to ensure that Colombian nationals will have developed the required skills to operate and maintain the VTS, OCR, and CMS system.

7.1.4 Technology Transfer and Productivity Enhancement

As described in the discussion of market oriented reforms, the Project will result in the implementation of several advanced technologies and processes that will generate much needed efficiency gains. The proposed investment in Vessel Traffic System (VTS), Optical Character Recognition (OCR) System, and Computer Monitoring Security System (CMS) will result in key technological advancements that will serve to facilitate international foreign trade between Colombia and key international markets.

The proposed technological upgrades will ensure that the goods that are duly supported by documentation are actually those that have been shipped, thereby avoiding illegal practices such as fictitious exports. Moreover, online validations enable the Export Declaration to be obtained in one day and with a digital signature. Other benefits technological and productivity enhancements that will result from installation of the **Optical Character Recognition (OCR) System** include:

- Advance electronic receipt of information.
- Elimination of physical documents.
- Controlling the entry and exit of empty containers.
- Automation of the transhipment mode.
- Strengthening of customs inspection.
- Facilitation of procedures.
- Electronic transmission (system to system, prevalidators, web services, and web).
- Technological platform up to international standards for the exchange of information (e.g., XML Files).
- Traceability that allows activities to be tracked and provides transparency in the operation.

Along with the OCR technology, the **Vessel Tracking System (VTS)** will ensure that inventory is accurately tracked and that the shipper is paying the correct amount of taxes when due. This

technology component will serve a second security check and balance, improving the quality and volume of data in real time.

The VTS will improve navigational safety and monitoring of all vessels off the coast of Buenaventura and in the main channel of Buenaventura, due to the expanding capacity of SPRBun facilities and planned new terminals. Once the he radar system is installed at strategic locations around the port itself, it will enable Port security to:

1) Track vessels when coming into port (traffic)
2) Track illegal vessels to better combat drug trafficking and other illicit activities

Information will be supplied back to the Port for security and port operations purposes. This added level of security will enable the Port to improve cargo inspection procedures, practices, facilities, and equipment and reporting systems.

The **Computer Monitoring Security System (CMS)** will create a network management center or command center, where all pertinent trade cargo information is collected, analyzed and monitored. Its sole purpose is for use by the security department to effectively combine the CCTV video to an overarching access control system (card readers, door contacts, etc.) and an intrusion detection system (e.g., a microphone-based perimeter fence line cable sensitive to any noise/vibrations to monitor for security breech throughout the port system). The computer monitoring system will enable Port security personnel to integrate the existing manual systems and improve situational management control.

7.1.5 Other Potential Impacts

AECOM evaluated other developmental impacts or benefits that may result from the Project, and determined that the most likely impact will be enhanced revenue flows to the Government of Colombia.

The Colombian National Taxes and Customs Directorate (Dirección de Impuestos y Aduanas Nacionales, or “DIAN”) has among its functions the administration of customs duties and other taxes on foreign trade, including the collection, control, settlement, dispute, collection, enforcement and all other aspects related to compliance with customs requirements

The current system that the entire country uses to calculate taxes relies on a foundation of manual tabulation, monitoring, and evaluation. By implementing the OCR technology (OCR), the Government of Colombia will have a more accurate inventory of trade cargo in real time. From the point a product is logged onto a shipping manifest and is placed in a shipping container, the inventory must be manually entered into a tracking system to ensure accountability for those who are responsible for monitoring the container. This is the current mechanism for issuing a tax levy to a shipper, who subsequently pays tax on those goods.

In a system of manual data entry, mistakes can be made. It is highly unlikely that the current system accurately captures the full value of the contents of every container. The OCR system will ensure that as soon as container is loaded, the inventory is recorded accurately and that it exits the gate to the market without illicit activity (theft, terrorism, etc.).

Annex 7-1 – Detailed Calculations and Assumptions: Vessel Traffic System (VTS)

Vessel Tracking System	Total	Labor	Materials	Labor	Materials	% Imported Goods/ Labor	% Local	% Eligible for Local Participation	Local Labor	Local Materials	Total Local
Control Center Equipment	$547,950	30%	70%	$164,385	$383,565	75%	25%	5%	$8,219	$19,178	$27,398
Radar Equipment Punta Soldado	$318,250	30%	70%	$95,475	$222,775	4%	96%	19%	$18,331	$42,773	$61,104
Coast Guard Island Equipment	$197,900	30%	70%	$59,370	$138,530	75%	25%	5%	$2,969	$6,927	$9,895
Network Wireless Point to Point Link Equipment	$55,506	30%	70%	$16,652	$38,854	95%	5%	1.0%	$167	$389	$555
Subtotal - VTS Hard Costs	$1,119,606			$335,882	$783,724				$29,685	$69,266	$98,952
Additional Soft Costs (Turn-Key Costs) /1	$1,380,394	30%	70%	$414,118	$966,276	95%	5%	1.0%	$4,141	$9,663	$13,804
Subtotal - VTS Hard and Soft Costs	$2,500,000								$33,827	$78,929	$112,756
AIS System											
AIS System Components	$28,200	30%	70%	$8,460	$19,740	75%	25%	5%	$423	$987	$1,410
Coast Guard station	$7,400	30%	70%	$2,220	$5,180	70%	30%	6.0%	$133	$311	$444
Punta Soldado site	$7,600	30%	70%	$2,280	$5,320	70%	30%	6.0%	$137	$319	$456
Spare Parts	$22,000	0%	100%	$-	$22,000	70%	30%	6.0%	$-	$1,320	$1,320
AIS Web Software	$240,000	30%	70%	$72,000	$168,000	70%	30%	6.0%	$4,320	$10,080	$14,400
Shipping	$5,000	30%	70%	$1,500	$3,500	95%	5%	1.0%	$15	$35	$50
Installation	$17,000	30%	70%	$5,100	$11,900	70%	30%	6.0%	$306	$714	$1,020
Training	$28,600	100%	0%	$28,600	$-	95%	5%	1.0%	$286	$-	$286
Subtotal - AIS	$355,800			$120,160	$235,640				$5,620	$13,766	$19,386
VTS & AIS Spare Parts	$110,000	0%	100%	$-	$110,000	70%	30%	6.0%	$-	$6,600	$6,600
Total Capital Costs	**$2,965,800**			**$870,160**	**$2,095,640**				**$39,447**	**$99,295**	**$138,742**

Annex 7-1 – Detailed Calculations and Assumptions: Vessel Traffic System (VTS), continued

Labor/1	FTEs	Salary	Avg Annual Salary	Total	Labor	Materials	Labor	Materials	% Imported Goods/ Labor	% Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
System Administrators / Supervisors (FTEs)	2	$36,000	$45,000	$90,000	100%	0%	$90,000	$-	0%	100%	100%	$90,000	$-	$90,000
Operators (FTEs)	10	$25,000	$31,250	$320,000	100%	0%	$320,000	$-	0%	100%	100%	$320,000	$-	$320,000
IT Maintenance Technician (FTEs)	0.3	$35,000	$43,750	$10,938	100%	0%	$10,938	$-	0%	100%	100%	$10,938	$-	$10,938
Maintenance Technician	0.1	$8,000	$10,000	$1,154	100%	0%	$1,154	$-	0%	100%	100%	$1,154	$-	$1,154
Subtotal - Labor	12.6			**$422,091**			**$422,091**	**$-**				**$422,091**	**$-**	**$422,091**

1/ Assumes that the same staff operates the VTS and AIS.

Materials & Supplies	US$	Labor	Materials	Labor	Materials	% Imported Goods/ Labor	% Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
Parts & Supplies	$5,000	0%	100%	$-	$5,000	75%	25%	5%	$-	$250	$250
AIS Equipment Replacement	$7,000	0%	100%	$-	$7,000	75%	25%	5%	$-	$350	$350
Software Maintenance	$25,000	0%	100%	$-	$25,000	75%	25%	5%	$-	$1,250	$1,250
High Speed Internet	$1,000	0%	100%	$-	$1,000	75%	25%	5%	$-	$50	$50
Subtotal - Materials and Supplies	**$38,000**			**$-**	**$38,000**				**$-**	**$1,900**	**$1,900**
Total Annual Operating Expenditures	**$460,091**								**$422,091**	**$1,900**	**$423,991**

Annex 7-1 – Detailed Calculations and Assumptions: Vessel Traffic System (VTS), continued

Vessel Traffic System (VTS and AIS) Summary of Capital Costs and Operating Expenditures (USD Millions)/1

	Total Project Impacts (Foreign/Domestic)						Development Impacts in Host Country					
	Year 1	Year 2	Year 3	Year 4	Year 5	Cum	Year 1	Year 2	Year 3	Year 4	Year 5	Cum
Total One – Time Capital Costs	3.0					3.0	0.1					0.1
Annual Operating Expenditures	0.5	-	-	-	-	0.5	0.0	-	-	-	-	0.0
Total	**3.4**	**-**	**-**	**-**	**-**	**3.4**	**0.2**	**-**	**-**	**-**	**-**	**0.2**
	-						-					
Capital Costs	-						-					
Labor	0.9	-	-	-	-	0.9	0.1	-	-	-	-	0.1
Materials	2.1	-	-	-	-	2.1	0.0	-	-	-	-	0.0
Total	**3.0**	**-**	**-**	**-**	**-**	**3.0**	**0.1**	**-**	**-**	**-**	**-**	**0.1**
	-						-					
Operating Expenditures	-						-					
Labor	0.4	0.4	0.4	0.4	0.4	2.1	0.4	0.4	0.4	0.4	0.4	2.1
Materials	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**2.3**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**2.1**
	-						-					
Total Capital Costs and Operating Expenditures, Allocated to Labor and Materials			-						-			
Labor	1.3	0.4	0.4	0.4	0.4	3.0	0.5	0.4	0.4	0.4	0.4	2.2
Materials	2.1	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
Total	**3.4**	**0.5**	**0.5**	**0.5**	**0.5**	**5.3**	**0.6**	**0.4**	**0.4**	**0.4**	**0.4**	**2.3**

1/ Total capital costs and operating expenditures include investment activity in Colombia and abroad.

Annex 7-2 – Detailed Calculations and Assumptions: Optical Character Recognition System (OCR)

Capital Costs	Units	Cost/Unit	Total Investment	Labor	Materials	Labor	Materials	% Imported Goods	%Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
Port OCR Systems, Containers	12	125,000	$1,500,000	40%	60%	$600,000	$900,000	75%	25%	5%	$30,000	$45,000	$75,000
Communication Conductor Kiosks	15	25,300	$379,500	10%	90%	$37,950	$341,550	4%	96%	19%	$7,286	$65,578	$72,864
License Plate Recognition Stations	5	13,730	$68,650	10%	90%	$6,865	$61,785	75%	25%	5%	$343	$3,089	$3,433
Preparation, Installation and Startup	1	$228,600	$228,600	90%	10%	$205,740	$22,860	95%	5%	1.0%	$2,057	$229	$2,286
Preparation Civil Work, Wiring	1	N/A		80%	20%	$-	$-	70%	30%	6.0%	$-	$-	$-
COSMOS Data Integration or equivalent TOS	1	$22,110	$22,110	100%	0%	$22,110	$-	75%	25%	5%	$1,106	$-	$1,106
Management and Staff Training	1	$88,600	$88,600	100%	0%	$88,600	$-	95%	5%	1.0%	$886	$-	$886
Travel & Incidentals	1	$42,000	$42,000	25%	75%	$10,500	$31,500	95%	5%	1.0%	$105	$315	$420
Total Capital Costs			**$2,329,460**			**$971,765**	**$1,357,695**				**$41,784**	**$114,210**	**$155,994**

Annex 7-2 – Detailed Calculations and Assumptions: Optical Character Recognition System (OCR), continued

Labor	FTEs	Salary	Average Annual Salary /1	Total	Labor	Materials	Labor	Materials	% Imported Goods	% Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
Supervisors (FTEs)	-	$-	$-	$-	100%	0%	$-	$-	0%	100%	100%	$-	$-	$-
Operators (FTEs)	-	$-	$-	$-	100%	0%	$-	$-	0%	100%	100%	$-	$-	$-
IT Maintenance Technician (FTEs)	-	$-	$-	$-	100%	0%	$-	$-	0%	100%	100%	$-	$-	$-
Maintenance Technician	-	$-	$-	$-	100%	0%	$-	$-	0%	100%	100%	$-	$-	$-
Subtotal - Labor	-			**$-**			**$-**	**$-**				**$-**	**$-**	**$-**

Materials & Supplies	US$	Labor	Materials	Labor	Materials	% Imported Goods/Labor	%Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
Recurring Costs (Annual) (15% of Capital)	**$349,419**	**0%**	**100%**	$-	$349,419	75%	25%	5%	$-	$17,471	$17,471
Total Annual Operating Expenditures	**$349,419**			**$-**	**$349,419**				**$-**	**$17,471**	**$17,471**

Annex 7-2 – Detailed Calculations and Assumptions: Optical Character Recognition System (OCR), continued

Optical Character Recognition System (OCR) Summary of Capital Costs and Operating Expenditures (USD Millions)/1

	Total Project Impacts (Foreign/Domestic)						Development Impacts in Host Country					
	Year 1	Year 2	Year 3	Year 4	Year 5	Cum	Year 1	Year 2	Year 3	Year 4	Year 5	Cum
Total One – Time Capital Costs	2.3	-	-	-	-	2.3	0.2	-	-	-	-	0.2
Annual Operating Expenditures	0.3	0.3	0.3	0.3	0.3	1.7	0.0	-	-	-	-	0.0
Total	**2.7**	**0.3**	**0.3**	**0.3**	**0.3**	**4.1**	**0.2**	**-**	**-**	**-**	**-**	**0.2**
Capital Costs												
Labor	1.0	-	-	-	-	1.0	0.0	-	-	-	-	0.0
Materials	1.4	-	-	-	-	1.4	0.1	-	-	-	-	0.1
Total	**2.3**	**-**	**-**	**-**	**-**	**2.3**	**0.2**	**-**	**-**	**-**	**-**	**0.2**
Operating Expenditures	-	-	-	-	-	-	-	-	-	-	-	-
Labor	-	-	-	-	-	-	-	-	-	-	-	-
Materials	0.3	0.3	0.3	0.3	0.3	1.7	0.0	0.0	0.0	0.0	0.0	0.1
Total	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**1.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**
Total Capital Costs and Operating Expenditures, Allocated to Labor and Materials												
Labor	1.0	-	-	-	-	1.0	0.0	-	-	-	-	0.0
Materials	1.7	0.3	0.3	0.3	0.3	3.1	0.1	0.0	0.0	0.0	0.0	0.2
Total	**2.7**	**0.3**	**0.3**	**0.3**	**0.3**	**4.1**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**

1/ Total capital costs and operating expenditures include investment activity in Colombia and abroad.

Annex 7-3 – Detailed Calculations and Assumptions: Computer Monitoring Security System (CMS), continued

Capital Costs	Total	Labor	Materials	Labor	Materials	% Imported Goods	% Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
PSIM Hardware & Software	$536,555	40%	60%	$214,622	$321,933	75%	25%	5%	$10,731	$16,097	$26,828
SOC Video	$202,104	10%	90%	$20,210	$181,894	4%	96%	19%	$3,880	$34,924	$38,804
SOC Workstations	$20,939	10%	90%	$2,094	$18,845	75%	25%	5%	$105	$942	$1,047
Supplemental Updates	$377,403	50%	50%	$188,702	$188,702	95%	5%	1.0%	$1,887	$1,887	$3,774
Operator Console Updates	$20,514	10%	90%	$2,051	$18,463	70%	30%	6.0%	$123	$1,108	$1,231
CCTV Updates	$620,756	25%	75%	$155,189	$465,567	75%	25%	5%	$7,759	$23,278	$31,038
Spare Parts	$40,000	0%	100%	$-	$40,000	95%	5%	1.0%	$-	$400	$400
Total Capital Costs	**$1,818,271**			**$582,868**	**$1,235,403**				**$24,486**	**$78,636**	**$103,121**

Annex 7-3 – Detailed Calculations and Assumptions: Computer Monitoring Security System (CMS), continued

Annual Opera	Full-Time Equivalents (FTEs)	Salary	Average Annual Salary /1	Total	Labor	Materials	Labor	Materials	% Imported Goods	% Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
System Admi	1.5	$60,000	$75,000	$112,500	100%	0%	$112,500	$-	0%	100%	100%	$112,500	$-	$112,500
Operator	18	$45,000	$56,250	$1,012,500	100%	0%	$1,012,500	$-	0%	100%	100%	$1,012,500	$-	$1,012,500
IT Maintenan	0.25	$35,000	$43,750	$10,938	100%	0%	$10,938	$-	0%	100%	100%	$10,938	$-	$10,938
Maintenance	0.12	$8,000	$10,000	$1,154	100%	0%	$1,154	$-	0%	100%	100%	$1,154	$-	$1,154
Subtotal / We	19.9	$45,792	**$57,240**	**$1,137,091**			**$1,137,091**	**$-**				**$1,137,091**	**$-**	**$1,137,091**
					Labor	Materials	Labor	Materials	% Imported Goods/ Labor	% Local	% Eligible for Local Participation	Local Labor	Local Materials	Total
Software Maintenance		n/a	n/a	$25,000	0%	100%	$-	$25,000	75%	25%	5%	$-	$1,250	$1,250
Service High Speed Interne		KWh	Cost/kWh/Yr	$10,000	0%	100%	$-	$10,000	0%	100%	20%	$-	$2,000	$2,000
Electric Power (kWh/year)		65,010	0.05	$3,251	0%	100%	$-	$3,251	0%	100%	20%	$-	$650	$650
Subtotal				**$38,251**			**$-**	**$38,251**				**$-**	**$3,900**	**$3,900**
Total Annual Operating Exp				**$1,175,342**			**$1,137,091**	**$38,251**				**$1,137,091**	**$3,900**	**$1,140,991**

1/ Wage investment includes fringe benefits at 25% of gross annual wage.

Annex 7-3 – Detailed Calculations and Assumptions: Computer Monitoring Security System (CMS), continued

Computer Monitoring Security System (CMS) Summary of Capital Costs and Operating Expenditures (USD Millions)/1

	Total Project Impacts (Foreign/Domestic)						Development Impacts in Host Country					
	Year 1	Year 2	Year 3	Year 4	Year 5	Cum	Year 1	Year 2	Year 3	Year 4	Year 5	Cum
Total One –	1.8	-	-	-	-	1.8	0.1	-	-	-	-	0.1
Annual Oper	1.2	1.2	1.2	1.2	1.2	5.9	1.1	-	-	-	-	1.1
Total	**3**	**1.2**	**1.2**	**1.2**	**1.2**	**7.7**	**1.2**	**-**	**-**	**-**	**-**	**1.2**
Capital Costs												
Labor	0.6	-	-	-	-	0.6	0	-	-	-	-	0
Materials	1.2	-	-	-	-	1.2	0.1	-	-	-	-	0.1
Total	**1.8**	**-**	**-**	**-**	**-**	**1.8**	**0.1**	**-**	**-**	**-**	**-**	**0.1**
Operating Expenditures												
Labor	1.1	1.1	1.1	1.1	1.1	5.7	1.1	1.1	1.1	1.1	1.1	5.7
Materials	0	0	0	0	0	0.2	0	0	0	0	0	0
Total	1.2	1.2	1.2	1.2	1.2	5.9	1.1	1.1	1.1	1.1	1.1	5.7
Total Capital Costs and Operating Expe												
Labor	1.7	1.1	1.1	1.1	1.1	6.3	1.2	1.1	1.1	1.1	1.1	5.7
Materials	1.3	0	0	0	0	1.4	0.1	0	0	0	0	0.1
Total	**3**	**1.2**	**1.2**	**1.2**	**1.2**	**7.7**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	**5.8**

1/ Total capital costs and operating expenditures include investment activity in Colombia and abroad.

7.2 Preliminary Review of Environmental Impacts

In this section we display the preliminary review results of the environmental impacts that may occur in the implementation of the recommendations drawn from the "Feasibility Study for the Operational and Security Enhancement Project for the Port of Buenaventura in Colombia."

We assessed the impacts according to the local requirements under the legal environmental standards in force in Colombia, specifically in the city of Buenaventura, where the Buenaventura Regional Port Association (Sociedad Portuaria Regional de Buenaventura-SPRBUN) (for its name in Spanish) is located; as well as with reference to the Performance Standards issued by the International Finance Corporation (IFC), a World Bank affiliate.

This review allowed us to identify the potential negative impacts as well as the required environmental impact mitigation measures in development of the subject matter projects.

Likewise, we reviewed whether these projects required an environmental license and, if the case may be, we identified the procedures to file its request with the environmental authority.

The environmental impact assessment was based on the identification and clearing of the environmental impacts that may occur during the construction and operation of the four security systems at the SPRBUN.

7.2.1 Description

With USTDA funding, SPRBUN S.A. selected the services of the firm AECOM to conduct the feasibility study for the operational and security enhancement project that has resulted in the submission of four reports with their corresponding recommendations:

1. Development of the vessel traffic system.

2. Development of the OCR system.

3. Development of the computerized security system.

4. Revision of the cargo/container inspection system (scanner).

Following is a summary of the operational and security enhancement projects.

7.2.1.1 Development of a Vessel Traffic System

We are proposing the installation of radars at Punta Soldado, Vessel Traffic Control Station on northwest near the Port of Isla Cascajal near the Edificio Capitanía de Puerto (DIMAR) (DIMAR Port Captainship Building) and at Isla Guardacostas (Coast Guard Island), which shall be integrated in a network with control centers at the captainship building (See Section. 2. Development of the Vessel Traffic System (VTS) & AIS.

The equipment to be installed shall be mounted on existing structures (towers) on which telecommunications equipment is operated at Punta Soldado and at the new Vessel Traffic Control Station on the Northwest of Cascajal Island, a 5-story building with a 2-story control center on top under construction

For the Isla de Guardacostas, a 50-foot high tower needs to be built; this tower will be located on the property where the Marine Infantry River Brigade buildings are located, on the upper part where a portion of land currently exists in grass and near the buildings with concrete floors. This is considered as a minor civil work and shall not affect watersheds, forests or significant vegetable cover.

7.2.1.2 Development of an OCR System

We are proposing the implementation of an OCR (Optical Character Recognition) system and an automatic gate system (AGS), which require the installation of equipment and the construction of minor civil works in the current access areas at the SPRBUN Port. (See report No. 3. Development of an OCR System).

Portals shall be built in the port access gates where cameras, sensors, a lighting system, connection boxes and driver identification kiosks shall be installed.

The minor civil works are those corresponding to the necessary works to provide for electricity services and system networks, such as ditches, ducts, bollards, portals, etc., which shall be built on the concrete plaques of the SPRBUN access areas,

7.2.1.3 Development of a Computerized Security System

We are proposing enhancements in the computerized security system through the replacement of the CCTV header equipment; the replacement of the operator consoles and the installation of thermal cameras at the (Coastguard Isle) Isla de Guardacostas, on an existing tower and the

conditioning of a control room under the tower. (See report No. 4. Development of a Computerized Monitoring Security System). The activities that are to be developed shall lead to minor civil works.

7.2.1.4 Container Inspection

A series of recommendations are proposed to optimize Cargo Inspection, such as: enhancements in operational procedures, Software purchases allowing information sharing; to install fixed scanners for the inspection of 100% of the Container; improving the security system based on a closed circuit TV system (see report No. 5. Revision of cargo inspection).

The installation of fixed scanners to inspect 100% of the containers requires conducting low impact minor civil works to condition current spaces with the installation of the recommended scanners. The activities shall entail the execution of minor civil works.

7.2.2 Institutional & Legal Framework

7.2.2.1 Institutional

The institutional framework related to the Project involves the following national, regional & local government agencies:

7.2.2.1.1 Transportation Ministry

Its primary objective is to formulate and adopt policies, plans, programs, projects and economic regulations in what refers to transportation and the technical transportation and transit regulation for land, ocean, river and railroad transportation (Article 1 Decree 2053 of 2003). Its functions are ruled by Law 489 of 1998, Article 59, and of course by the provisions of Article 2, Decree 2053 of 2003 that among other things, consider the establishment of policies for the development of infrastructure through systems such as concession agreements or other ways of private or mixed capital involvement. The Ministry together with the ascribed entities and the General Maritime Directorate of the National Defense Ministry, DIMAR (Buenaventura Port Captainship Office), integrate the Transportation Sector.

7.2.2.1.2 Ministry of the Environment & Sustainable Development

This Ministry was recently established as the Environment & Sustainable Development Ministry (former Environment, Housing & Territorial Development Ministry MAVDT), through Law 99 of 1993; and in 2002, Law 790 was passed expanding its functions, and in addition attributing to it the formulation capacity of policies relative to the use of land and urban order; drinking water and basic sanitation; and urban and territorial development. After this, through Decree 216 of 2003 MAVDT was restructured and some objectives were attributed to it, including contributing to and promoting sustainable development through the formulation and adoption of policies, plans, programs and projects, as well as the regulation of environmental matters, and access to renewable natural resources.

The projects: development of the OCR system; development of a computerized security system and review of cargo inspection (scanners) are to be executed at the SPRBUN facilities, and must therefore, meet the environmental requirements of the Environment Management Plan issued by the Environment & Territorial Development Ministry (MADS, for its name in Spanish), for the correct operation of SPRBUN.

MADS oversees the compliance with the commitments established by the SPRBUN Environmental Management Plan, according to Res. 1419 of 2010, whereby the change to the Environmental Management Plan for Civil Works and Deepening Dredging was approved.

Decree 2820 of 2010, establishes that MADS is the jurisdictional authority to grant the environmental license for the construction and operation of deep water ports such as SPRBUN.

7.2.2.1.3 Valle del Cauca Regional Autonomous Corporation- CVC (for its name in Spanish).

CVC is a government agency having an administrative and financial autonomy and its own equity and legal personality, in charge in its area of jurisdiction, of the environment and renewable natural resources; as well as of timely enforcing and applying the legal provisions in force, the administration, management and use thereof, according to the regulations, guidelines and rules issued by MADS. CVC is the entity ruling all aspects related to the Pacific Region's environmental matters, included in which is the management of the Buenaventura Bay watersheds, included in which are the direct discharges of the river drainage into the Port and domestic waste waters.

The Vessel Traffic System Development Project shall be performed in areas managed by government agencies such as the Port Captainship, the Army and the Navy that have telecommunications equipment currently operating in Punta Soldado, Isla Guardacostas and the Port Captainship Office.

7.2.2.1.4 Ministry of Social Protection

This Ministry sets the standards and guidelines in what refers to social security and protection. Its main objectives are to prescribe, adopt, direct, coordinate, execute, control and track the Social Protection System provided for by Law 789 of 2002, within the general guidelines under law, the development plans and the National Government guidelines.

7.2.2.2 Legal Framework

Colombia's environmental regulations have seen an important development in the last three decades, especially after the 1972 Stockholm Convention whose principles were adopted in the Code of Renewable Natural Resources & Environmental Protection (Decree Law 2811 of 1974). In 1991, the new Political Constitution re-scoped the environmental protection action increasing it to the collective rights category and granting it protection mechanisms by the citizens, in particular through a class action and, exceptionally, through the use of the 'tutela' (suit in protection of fundamental rights) and enforcement actions. Law 99 of 1993 established the National Environmental System (SINA, for its name in Spanish) and created the Environment Ministry as its ruling agency. The environmental assessments and the process of environmental licensing are currently ruled by Law 99 of 1993, Decree 1753 of 1994, Decree 1220 of 2005 and Decree 2820 of 2010.

7.2.2.2.1 Environmental License

Decree 2820 of the Environment & Sustainable Development Ministry (MADS) whereby Title VIII of Law 99, 1993 is ruled on environmental licenses, establishes the activities requiring an environmental license, "Article 7°, Projects, works and activities subject to an environmental

license shall be only those listed in articles 8 and 9 hereunder. The environmental authorities may not establish or impose Environmental Management Plans on projects other than those established hereunder or resulting from the application of the transitional regime."

"Article 8°, Jurisdiction of the Environment, Housing & Territorial Development Ministry. This Ministry shall grant or reject at its own judgment the environmental license for the following projects, works or activities:"

"6. In the maritime and port sector:

a) the building or expansion and operation of deep water sea ports.

b).Dredging for the deepening of the sea port access channels and maintenance dredging whose volume exceeds 1,000,000m3/year,

c) Stabilizing beaches and coast accesses.

Therefore, the projects subject matter of this preliminary environmental review are not subject to an environmental license.

On the other hand, as the projects are to be developed in the SPRBUN facilities they must comply with the Environmental Management Plan requirements approved by MADS.

MADS enforces compliance with the commitments established in the SPRBUN Environmental Management Plan according to Resolution 1419 of 2010, whereby the changes were approved to the Environmental Management Plan for Civil Works and Deepening Dredging.

The SPRBUN Environmental Management Plan provides for a management plan where the following measures are considered: prevention, mitigation and/or offsetting for minor civil works, solid waste management, hazardous waste management, just to mention a few.

7.2.2.2.2 Environmental Guidelines

The Environmental guidelines are tools having the objective to plan, develop and track the management in the sector, as a minimum technical benchmark, applicable to the development of projects, works or activities. These guidelines were developed by MAVDT in consensus with the deputies from the productive sectors and adopted through Resolution 1023 of 2005 that among other things includes:

Environmental Guidelines for Port Terminals

7.2.2.2.3 Environmental Compliance Status

The SPRBUN Environmental Management Plan is approved by Resolution 1419 of 2010, whereby the environmental management plan was approved for Civil Works & Deepening Dredging.

The projects aiming at enhancing the port operations and security shall be performed within the SPRBUN facilities because they are closely linked to the environmental aspects considered in the Environmental Management Plan, approved by MADS and must be executed under this environmental framework.

The SPRBUN environmental management plan has environmental measures for civil works including the following:

Environmental Management Card No. 1. Installation of work camps

Environmental Management Card No. 2. Reduction of atmospheric emission impact during the construction phase.

Environmental Management Card No. 3. Solid Waste Management

Environmental Management Card No. 4. Debris Management

Environmental Management Card No. 5. Design & Construction of Seismic-resistant Structures.

Environmental Management Card No. 6. Construction Stage Checklist

7.2.3 Preliminary Review Of The Environmental Impact & Project Mitigation Measures

This section presents a review of the most significant impacts and mitigation measures associated to the scenarios where the project is performed; these shall be analyzed in the context of the operational scenario, including the current operation and the future operations at activity completion. The impacts and mitigation measures for the Project and its activities are analyzed under the environmental impact criteria.

7.2.3.1 Environmental Impact Assessment

Following we identify, describe and assess the potential effects and impacts that the activities for the implementation of the four security systems may cause on the biotic, physical and social components in the project's influence area.

7.2.3.2 Environmental Impact Assessment Methodology

To identify the environmental impacts that may potentially be generated by the installation and operation of the four security systems, we conducted a preliminary evaluation of environmental impacts to eliminate those impacts not correlated with the assessed stages or activities.

Once the environmental impacts were assessed we evaluated the building with the double entry "Leopold" Matrix placing on the rows the project works or activities potentially causing environmental impacts and, in the columns we placed the environmental elements susceptible of suffering such impacts.

The crossing of those elements allowed identifying in principle those activities inherent in each security system with some type of effect (either positive or negative) on the physical, biotic and social aspects.

7.2.3.2.1 Selection of indicators and environmental attributes

Environmental impacts identified in the impact identification matrix were scored based on the following attributes:

Magnitude (M)

The degree of magnitude is given by the product between the affected area (extension) and the impact reversibility characteristics. The magnitude is assigned values from 1-9.

Extension (E)

It refers to the impact area of the component in geographical terms and may be:

Regional (3): impacting areas out of the influence area

Local (2). When the impact is only suffered within the project influence area

Spot (1): when the impact occurs only in the place where the activity is developed

Reversibility (R)

It refers to the capacity the affected area has to naturally retake its original state. It is classified as: Reversible (RE), Recoverable (R) and Irreversible (IR).

Reversible (1): once the activity causing it ends, the affected component recovers its initial state.

Recoverable (2): it may recover its initial state through an environmental measure.

Irreversible (3): when the affected component cannot be recovered even after the activity ends.

Table 7-9: Values taken by Magnitude

Reversibility	Extension		
	1	2	3
1	1	2	3
2	2	4	6
3	3	6	9

Source: Vanegas & Bohórquez, (2005)

Where Magnitude is High when values are from 6 to 9; Medium, with values from 3 to 6 and Low, with values below 3.

Intensity

Intensity is an impact defined as the degree of impact measured by the product between impact duration and occurring likelihood.

Duration (D)

Duration is defined as the permanence of the impact in the affected environmental element or component. It may be: short (1), long (2) and/or permanent (3).

Where:

Short term: are impacts whose action ends when the activity generating them ends.

Long term: are impacts that remain in time even after project ends, but they recover with time.

Permanent: are impacts that remain in time after producing changes in the area's environmental conditions.

Occurring Likelihood (PO, for its name in Spanish)

Defined as the assurance of an impact occurring or not and it is classified in: high (3) if the likelihood is 100%, Medium (2) if the likelihood of occurring exists but pertinent measures are taken, Low (2) when the likelihood is minimum.

Table 7-10: Values assigned for Intensity

Duration	Occurring Likelihood		
	1	2	3
1	1	2	3
2	2	4	6
3	3	6	9

Source: Vanegas & Bohórquez, (2005)

Where Intensity is High, if the values are from 6 to 9; Medium, with values from 3 to 6 and Low, for values under 3

Table 7-11: Attribute Rating

Attribute	Rating	Symbol	Value
Extension (E)	Spot	P	1
	Local	L	2
	Regional	R	3
Duration (D)	Short	C	1
	Long	L	2
	Permanent	P	3
Occurring Likelihood (PO)	Low	B	1
	Medium	M	2
	High	A	3
Reversibility (R)	Reversible	RE	1
	Recoverable	R	2
	Irreversible	IR	3
	Synergic	S	2
	Very synergic	MS	3

Source: Vanegas & Bohórquez, (2005)

7.2.3.2.2 Impact Hierarchy

Once impacts are rated, these were classified by hierarchy according to the significance value of the impact that was defined as follows: IM = M * I (ranging from 1 to 81).

Table 7-12: Value of Impact Significance

Intensity	Magnitude					
	1	2	3	4	6	9
1	1	2	3	4	6	9
2	2	4	6	8	12	18
3	3	6	9	12	18	27
4	4	8	12	16	24	36
6	6	12	18	24	36	54
9	9	18	27	36	54	81

Source: Vanegas & Bohórquez, (2005)

Impact significance (IM): is classified as:

High, values from 36 to 81

Medium, values from 18 to 35

Low, below 18

Following are the Environmental Impact Assessments for each one of the security projects to be implemented at SPRBUN.

Table 7-13: Environmental Impact Assessment Matrix VESSEL TRAFFIC

VESSEL TRAFFIC SYSTEM			CONSTRUCTION																					OPERATION					
			material transport			Land movement			camp construction			System installation			production of domestic & industrial solid waste			Production of domestic & industrial liquid waste			production of hazardous waste			equipment maintenance			vehicle transport		
ASPECTS			M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM
physical media	water	Marine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
		Run off	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	soil	soils	0	0	0	1	1	1	2	2	4	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
		topography	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	Atmosphere	atmospheric emissions	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		environmental noise	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biotic	Flora	Land Vegetation	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	Fauna	Land Fauna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Socioeconomic		Local Economy	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	0	0	0
		Job generation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	0	0	0
		Production of goods & services	2	2	4	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	2	2	4	0	0	0
		Lost-time accidents	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0

Table 7-14: Environmental Impact Assessment Matrix OCR SYSTEM (Optical Character Recognition)

OCR SYSTEM			CONSTRUCCIÓN																															OPERACIÓN								
			change of land usage			transport of materials			land conditioning			earth movement			camp construction			System installation			production of domestic & industrial solid waste			production of domestic & industrial liquid waste			production of hazardous waste			system operation			equipment maintenance			vehicle transportation		
ASPECTS			M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM
physical media	water	Marine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Run off	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	soil	soils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
		topography	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atmosphere	atmospheric emissions	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
		environmental noise	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Biotic	Flora	Land Vegetation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fauna	Land Fauna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Socioeconomic		Local Economy	0	0	0	2	2	4	2	2	4	2	2	4	0	0	0	9	1	9	2	2	4	0	0	0	0	0	0	9	4	36	2	2	4	2	2	4	2	2	4	4
		Job generation	0	0	0	2	2	4	2	2	4	2	2	4	0	0	0	1	1	1	2	2	4	0	0	0	0	0	0	1	2	2	2	2	4	2	2	4	2	2	4	4
		Production of goods & services	0	0	0	2	2	4	2	2	4	2	2	4	0	0	0	9	1	1	2	2	4	0	0	0	0	0	0	9	4	36	2	2	4	2	2	4	2	2	4	4
		Lost-time accidents	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0

Table 7-15: Environmental Impact Assessment Matrix COMPUTERIZED SECURITY SYSTEM

DEVELOPMENT OF A COMPUTERIZED SECURITY SYSTEM			CONSTRUCTION																											OPERATION								
			change of land usage			transport of materials			land conditioning			earth movement			camp construction			System installation			production of domestic & industrial solid waste			production of domestic & industrial liquid waste			production of hazardous waste			system operation			equipment maintenance			vehicle transportation		
ASPECTS			M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM	M	–	IM
physical media	water	Marine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Run off	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	soil	soils	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
		topography	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atmosphere	atmospheric emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
		environmental noise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Biotic	Flora	Land Vegetation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fauna	Land Fauna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Socioeconomic		Local Economy	0	0	0	2	2	4	0	0	0	0	0	0	0	0	0	9	1	9	2	2	4	0	0	0	0	0	0	9	4	36	2	2	4	2	2	4
		Job generation	0	0	0	2	2	4	0	0	0	0	0	0	0	0	0	1	1	1	2	2	4	0	0	0	0	0	0	1	2	2	2	2	4	2	2	4
		Production of goods & services	0	0	0	2	2	4	0	0	0	0	0	0	0	0	0	9	1	1	2	2	4	0	0	0	0	0	0	9	4	36	2	2	4	2	2	4
		Lost-time accidents	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0

Table 7-16: Environmental Impact Assessment Matrix CARGO/CONTAINER INSPECTION SYSTEM

CARGO/CONTAINER INSPECTION SYSTEM			CONSTRUCTION																															OPERATION								
			change of land usage			transport of materials			land conditioning			earth movement			camp construction			System installation			production of domestic & industrial solid waste			production of domestic & industrial liquid waste			production of hazardous waste			system operation			equipment maintenance			vehicle transportation		
ASPECTS			M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM	M	I	IM
physical media	water	Marine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Run off	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	soil	soils	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
		topography	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atmosphere	atmospheric emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		environmental noise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biotic	Flora	Land Vegetation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fauna	Land Fauna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Socioeconomic		Local Economy	0	0	0	2	2	4	2	2	4	0	0	0	0	0	0	9	1	9	2	2	4	0	0	0	0	0	0	9	4	36	2	2	4	2	2	4
		Job generation	0	0	0	2	2	4	2	2	4	0	0	0	0	0	0	1	1	1	2	2	4	0	0	0	0	0	0	1	2	2	2	2	4	2	2	4
		Production of goods & services	0	0	0	2	2	4	2	2	4	0	0	0	0	0	0	9	1	1	2	2	4	0	0	0	0	0	0	9	4	36	2	2	4	2	2	4
		Lost-time accidents	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0

Table 7-17: Environmental Impact Assessment Matrix VESSEL TRAFFIC SYSTEM

VESSEL TRAFFIC SYSTEM			CONSTRUCTION							OPERATION	
			material transport	Land movement	camp construction	System installation	production of domestic & industrial solid waste	Production of domestic & industrial liquid waste	production of hazardous waste	equipment maintenance	vehicle transport
ASPECTS			IM	IM	IM	IM	IM	IM	IM	IM	IM
physical media		Marine						1			
	water	Run off	1	1	1		1	1	1		
	soil	soils		1	4		1	1	1		
		topography		1	1		1	1	1		
	Atmosphere	atmospheric emissions	1	1	1						
		environmental noise	1	1	1						
Biotic	Flora	Land Vegetation	1	1			1	1	1		
	Fauna	Land Fauna									
Socioeconomic		Local Economy								4	
		Job generation	1	1	1	1	1	1	1	4	
		Production of goods & services	4	1	1	1				4	
		Lost-time accidents	1	1	1	1				1	

Table 7-18: Environmental Impact Assessment Matrix OCR SYSTEM

OCR SYSTEM			CONSTRUCTION									OPERATION		
			change of land usage	transport of materials	land conditioning	earth movement	camp construction	System installation	production of domestic & industrial solid waste	production of domestic & industrial liquid waste	production of hazardous waste	system operation	equipment maintenance	vehicle transportation
ASPECTS			IM	IM	IM	IM	IM	IM	IM	IM	IM	IM	IM	IM
physical media	water	Marine												
		Run off							1					
	soil	soils							1				1	
		topography												
	Atmosphere	atmospheric emissions		1	1	1								1
		environmental noise		1	1	1								1
Biotic	Flora	Land Vegetation												
	Fauna	Land Fauna												
Socioeconomic		Local Economy		4	4	4		9	4			36	4	4
		Job generation		4	4	4		1	4			2	4	4
		Production of goods & services		4	4	4		1	4			36	4	4
		Lost-time accidents		1	1	1		1				1		

Table 7-19: Environmental Impact Assessment Matrix COMPUTERIZED SECURITY SYSTEM

DEVELOPMENT OF A COMPUTERIZED SECURITY SYSTEM			CONSTRUCTION									OPERATION		
			change of land usage	transport of materials	land conditioning	earth movement	camp construction	System installation	production of domestic & industrial solid waste	production of domestic & industrial liquid waste	production of hazardous waste	system operation	equipment maintenance	vehicle transportation
ASPECTS			IM	IM	IM	IM	IM	IM	IM	IM	IM	IM	IM	IM
physical media	water	Marine												
		Run off												
	soil	soils		1					1				1	
		topography												
	Atmosphere	atmospheric emissions												
		environmental noise												
Biotic	Flora	Land Vegetation												
	Fauna	Land Fauna												
Socioeconomic		Local Economy		4				9	4			36	4	4
		Job generation		4				1	4			2	4	4
		Production of goods & services		4				1	4			36	4	4
		Lost-time accidents		1				1				1		

Table 7-20: Environmental Impact Assessment Matrix CARGO INSPECTION SYSTEM

CARGO/CONTAINER INSPECTION SYSTEM			CONSTRUCTION								OPERATION			
			change of land usage	transport of materials	land conditioning	earth movement	camp construction	System installation	production of domestic & industrial solid waste	production of domestic & industrial liquid waste	production of hazardous waste	system operation	equipment maintenance	vehicle transportation
ASPECTS			IM	IM	IM	IM	IM	IM	IM	IM	IM	IM	IM	IM
physical media		Marine												
	water	Run off							1					
	soil	soils		1					1				1	
		topography												
	Atmosphere	atmospheric emissions												
		environmental noise												
Biotic	Flora	Land Vegetation												
	Fauna	Land Fauna												
Socioeconomic		Local Economy		4	4			9	4			36	4	4
		Job generation		4	4			1	4			2	4	4
		Production of goods & services		4	4			1	4			36	4	4
		Lost-time accidents		1	1			1				1		

7.2.4 Assessment Results:

Following is a description of the assessed environmental impacts with respect to the environmental factors present in the construction and operation of the four security systems.

7.2.4.1 Vessel Traffic System

This system is developed outside the SPRBUN facilities at places managed by government agencies. The island: "Isla Punta Soldado" is located in the Buenaventura Bay, approximately in the following coordinates: 3°48'00'' N & 77°10'45'' W. The transmission towers where the equipment is to be installed are in private areas.

The "Isla Naval" (Isla Guardacostas or Coast Guard Island) is located northeast of the Buenaventura Bay holding a military base consisting of buildings and hangars, where the premises of the Pacific Naval Base, the Coast Guard Station and Marine Infantry Brigades are located.

Taking into account that the VTS Navigation system and the AIS shall be installed in places where other telecommunications towers exist (Punta Soldado & Port Captainship Building) and populated areas (Isla Guardacostas), no significant environmental and social impacts are foreseen, as well as no low seasonality or territorial extension. The environmental impacts in the construction stage are confined to the Isla de Guardacostas and are common to minor civil work construction.

Given the Port's proximity to the city of Buenaventura, no need is foreseen to use foreign manpower and no relocation of workers or land acquisitions are foreseen either; therefore, the social impacts during the building phase are considered as having a low impact.

7.2.4.1.1 Physical Environment

Water Component:

Based on the environmental impact assessment of the vessel traffic, we observe that the activities to be developed in the system implementation area: Punta Soldado; Isla Guardacostas, generate no significant environmental impact to the water component.

During the building phase there may be a minimum environmental impact due to the presence of run offs owed to the characteristic rainfall in the area; it is important to manage carefully any construction materials used as well as the potential land movement generated on account of installing the system and the camp.

During the system's operational stage there are no adverse environmental impacts foreseen.

Soil Component:

The vessel traffic system, in its building stage, may generate a minimum impact to the soil (just in the case of the Isla Guardacostas) at the time of installing the antennas and camps due to the potential land movement; it is important to highlight that no changes shall be made to the land use, due to the fact that at the Isla Guardacostas the place already presents buildings and concrete plaques installed in the Marine Infantry Brigade facilities.

Furthermore, it is necessary to manage domestic and industrial waste water to avoid impacting the soil and surrounding environment.

Atmospheric Component:

The environmental impact regarding atmospheric emissions and noise have been rated as having a minimum environmental impact because only minimum airborne material would be produced during the building stage.

The vessel traffic system operation presents no adverse environmental impact on the atmosphere.

7.2.4.1.2 Biotic Environment:

Flora & Fauna Component:

The vessel traffic system does not significantly affect the flora and fauna components at the place of implementation; if any vegetation is found, a minimum part of the vegetation and organic layer shall be removed. In the Isla de Guardacostas there are some plots with grass and concrete plaques in the spaces where the system's antenna shall be installed.

7.2.4.1.3 Socioeconomic Environment

The implementation and operation of the vessel traffic system has positive impacts on the socioeconomic environment as it shall provide vessels arriving in the port with security, thus ensuring more development and production of goods and services at the Buenaventura Port facilities.

The installation of the system shall positively impact job generation in this area.

7.2.4.2 Optical Character Recognition (OCR) System

7.2.4.1.1 Physical Environment:

Water Component:

The water component shall not suffer adverse environmental impacts as the OCR system installation shall be completed inside the SPRBUN facilities. It is necessary to collect solid waste both during the building and operational stages to avoid the solid wastes coming into contact with potential rain water and being dragged into watersheds.

Soil Component:

The OCR system shall not significantly affect the soil component as it shall be installed inside the SPRBUN facilities; notwithstanding, care must be exerted at system installation and operation to collect and manage industrial solid waste that may be produced.

Atmosphere Component:

It is important to highlight that the installation of this security system shall reduce the emission of atmosphere pollutants, on account of reducing the time of heavy cargo vehicle inspection.

7.2.4.2.2 Biotic Environment:

Fauna & Flora Component:

These components will not be affected due to completing the building and operational stages inside the SPRBUN facilities in areas currently covered with concrete plaques and/or buildings.

7.2.4.2.3 Socioeconomic Environment:

The implementation of the OCR system shall have positive impacts as it shall expedite and provide for the access and inspection mechanisms for people/vehicles entering the Port with a greater throughput; besides this, it shall also generate local development to the Buenaventura municipality and a safer working environment and process optimization.

7.2..4.3 Development of A Computerized Security System

7.2.4.3.1 Physical Environment

Water Component:

The implementation and operation of the computerized security system shall not have any adverse environmental impacts on the water component.

Soil Component:

During the implementation and operation of the system, it is important to avoid production of solid waste and debris, such as cables, light bulbs and other materials used to install the system.

Atmosphere Component:

The implementation and operation of the computerized security system shall not have adverse environmental impacts on the atmosphere component.

7.2.4.3.2 Biotic Environment

Flora & Fauna Component:

The computerized security system shall be installed in the SPRBUN facilities and therefore, no adverse impact will be suffered by this component.

7.2.4.3.3 SOCIOECONOMIC ENVIRONMENT:

Regarding the socioeconomic environment, the computerized security system generates a safer work environment in the Buenaventura Port, generating spaces where the port activities will be optimized, thus enhancing the port's operational efficiency and, it may detect and minimize potential negative aspects or cases of insecurity in the Port.

Due to this aspect, it shall improve the workers' lifestyle and avoid lost-time accidents, theft or delinquency actions and it shall result in economic and social development at a spot and local level.

7.2.4.4 Cargo/Container Inspection System

7.2.4.4.1 Physical Environment:

Water Component:

The cargo/container inspection system shall not have any negative environmental impacts on this component as the installation and operation thereof shall be inside and in the proximity of the SPRBUN.

Soil Component:

The impact that may be generated is the production of solid waste at the time of installing the system as well as during the operation of both the equipment operation and vehicle transportation, and it is therefore necessary to control the production and generate awareness among the personnel in charge of this activity.

Atmosphere Component:

As one of the purposes of implementing this security system is to optimize and expedite the inspection

of vehicles and cargo, there is a positive environmental effect on account of reducing the emission of airborne pollutants by diminishing the time the vehicles are parked outside (lowering fuel consumption).

7.2.4.4.2 BIOTIC ENVIRONMENT:

Fauna & Flora Component:

The system will not affect any of these components; it shall be implemented in areas with vegetation already cleared previously.

7.2.4.4.3 Socioeconomic Environment:

The installation and operation of this system shall have spot and local positive impacts due to optimizing the inspection processes, generating a healthier environment, thus avoiding criminal actions in and out of the Port.

7.2.5 Environmental Performance Standard Review (IFC)

The environmental and social performance according to IFC standards indicates that the implementation of the projects has impacts that must be managed consistently with the following Operational Standards:

PS1. Social & Environmental Management and Assessment System

PS2. Work & Labor Conditions

PS3. Contamination Prevention and Reduction

PS4. Community Health & Security

We have determined that the matters covered by PS5: Land Acquisition & Involuntary Relocation; PS6: Biodiversity Preservation & Sustainable Natural Resources Management; PS7: Indigenous Communities; and PS8: Cultural Legacy are not associated to this project because it shall not entail land acquisition and does not include biodiversity and natural resource management, indigenous communities or cultural patrimony, respectively.

This is a Project that may result in a limited number of environmental and social impacts and these may be avoided or mitigated by adhering to generally accepted operational standards, guides or design criteria.

Below is the environmental assessment of the four security systems with reference to the performance standards issued by the IFC:

Performance Standard 1: Social & Environmental Management and Assessment System

SPRBUN has an Environmental Protection and Occupational Health Division whose environmental management program is based on ISO 14000 & OSHAS 18000 standards; eight inspectors make up the head office covering port operations 24x7, plus two coordinators and one emergency brigade with 28 members.

All the work to be carried out at SPRBUN shall be carried out previous a revision and approval of results, and enforcing compliance by contractors with measures established in SPRBUN's Environmental Management Plan. Everyone is trained in Occupational Health, Safety and Environmental Protection before starting the work; the work must adjust to SPRBUN standards and during the execution thereof workers are supervised by the HSE Department.

Performance Standard 2: Work & Labor Conditions

SPRBUN complies with and demands its contractors to comply with labor and HSE standards according to PS2.

SPRBUN is implementing its Hygiene and Labor Safety program according to the OSHAS 18000 standards.

Performance Standard 3: Prevention & Reduction of Pollution

SPRBUN's Environmental Management Plan mitigations comply with the provisions of PS3 on pollution prevention and reduction.

The projects, especially the OCR system shall allow an expeditious entry of vehicles to the port facilities and shall therefore reduce the waiting time and greenhouse gas emissions.

The project implementation shall not generate significant increases in the pollution due to the port activity.

Compliance by vehicles entering the SPRBUN facilities shall be enforced and regulatory limit compliance fixed by the Colombian government on vehicle gas emissions shall be overseen.

SPRBUN has a hazardous and non-hazardous waste management program, and conducts an onsite recycling activity. It also monitors, noise, air quality and water quality to evaluate the effectiveness of the environmental mitigation measures for its port operations.

Performance Standard 4: Community Health & Safety

The implementation of the four security systems shall be done inside the SPRBUN facilities and does not therefore directly affect the communities.

SPRBUN has a Foundation named: "Fabio Grisales Bejarano" through which it runs social investment programs in Buenaventura and maintains ongoing communication with communities in its area of influence.

Performance Standard 5: Acquisition of Land & Involuntary Relocation

The systems, such as its communication towers, shall be implemented in areas used for the port operations and in the case of the tower that shall be built at Isla de Guardacostas it shall be on national Army land. There is no need to purchase land or relocate the communities.

Performance Standard 6: Biodiversity Preservation & Sustainable Management of Natural Resources

The projects shall be developed in already impacted areas at the SPRBUN facilities; all the areas and their surroundings have buildings and concrete plaque streets. There shall be no impact on the conservation zone or on protected areas.

Performance Standard 7: Indigenous Communities

No indigenous reserves or protected areas holding indigenous communities shall be affected.

Performance Standard 8: Cultural Legacy

Projects shall not impair the area's cultural legacy, as these have a low impact and shall be developed on areas already intervened for the port facilities.

7.2.6 Summary of The Procedures To Grant The Required Environmental Licenses

To execute and operate the four security systems, there is no additional license or change required to the SPRBUN Environment Management Plan, as these activities have a low environmental impact and are not subject to environmental licensing according to Decree 2820 of 2010 issued by MADS.

However, for each of the building and operational stages of the security systems it is necessary to implement measures to manage, mitigate or protect the physical, biotic and socioeconomic components of the environment, as established in the SPRBUN Environmental Management Plan (PMA; for its name in Spanish) designed for the construction stage.

Decree 2820 of the Ministry of the Environment & Sustainable Development, whereby Title VIII of law 99, 1993 on environmental licenses, establishes the activities that require an environmental license: "Article 7°, Projects, works and activities requiring an environmental license: only those projects, works and activities listed in articles 8 and 9 herein shall have an environmental license issued. Environmental authorities may not establish or impose Environmental Management Plans for projects other than those established in the present decree or as a result of applying the transitional regime."

"Article 8°, Jurisdiction of the Ministry of the Environment, Housing & Territorial Development. This Ministry shall grant or reject, at its judgment, the environmental license for the following projects, work or activities:"

"6. In the Ocean & Port scenario:

a) The construction or expansion and operation of deep water sea ports.

b) Deepening dredging works in access channels to deep water sea ports and the

maintenance in volumes exceeding 1,000,000 m3/year.

c) Stabilization of beaches and coastal entries.

Therefore, those projects subject matter of this preliminary environmental review are not subjected to an environmental license requirement/formality.

On the other hand, as the projects shall be carried out in the SPRBUN facilities, they must comply with the Environmental Management Plan approved by MADS.

MADS verifies compliance with commitments established in the SPRBUN Environmental Management Plan according to Resolution 1419 of 2010, whereby the change made to the Environmental Management Plan for Civil Works and Deepening Dredging was approved.

SPRBUN's Environmental Management Plan provides for a management plan where the following measures are considered: prevention, mitigation and/or offsetting for minor civil works, solid waste management and hazardous waste management, among others.

7.2.7 Summary & Results Of The Environmental Management Plan And Measures To Be Taken

Based on the environmental impact assessment to the 4 security systems that are to be implemented by SPRBUN, we conclude that the installation and operation of such systems do not generate environmental impacts of great magnitude. Therefore, they may be managed taking into account the guidelines and actions contained in the SPRBUN Environmental Management Plan.

The most relevant environmental impact shall be the production of a minimum amount of solid waste for which we are proposing the following measures: production control, management, minimization and correct final disposal thereof, according to the actions established in SPRBUN's Environmental Management Plan for Civil Works.

Regarding the socioeconomic aspect, we conclude that it favors the inspection and security activities in the port, generating a better work environment quality at the port, thus diminishing theft, contraband and other criminal activities that may occur. Likewise, it promotes an economic and social development for Buenaventura.

In addition to the above, we confirm that the implementation of the four security systems is not within the ordinary development of the port activities, and therefore, does not require any environmental license or changes to an existing one.

During the development of the activities, it is necessary to comply with the national and local environmental legislation in force as well as with the parameters, programs and measures contained in SPRBUN's Environmental Management Plan.

SPRBUN's Environmental Management Plan has been approved through Res. 1419 of 2010, whereby the Environmental Management Plan for Civil Works and Deepening Dredging was approved.

The proposed projects for the enhancement of port operations and security shall be implemented inside the SPRBUN facilities, and therefore they are closely linked to the environmental aspects contained in the Environmental Management Plan approved by MADS and shall be executed under this environmental framework.

SPRBUN's Environmental Management Plan, provides for environmental measures for civil works that are considered in the environmental mitigation measures that must be followed for the implementation of the four security system projects:

- Environmental Management Card No. 1. Installation of camps
- Environmental Management Card No. 2. Reduction of the impact of greenhouse gas emissions during the building stage.
- Environmental Management Card No. 3. Solid Waste Management
- Environmental Management Card No. 4. Debris Management
- Environmental Management Card No. 5. Design & Construction of Seismic Resistant Structures.
- Environmental Management Card No. 6. Building Stage Checklist

8.0 Final Report and Presentation

8.1 Sources of Funding

This Study has identified a series of improvements and additions to port facilities to accommodate projected growth. These improvement projects can be categorized in four major types:

- Vessel Traffic System (VTS), including Automatic Identification Systems (VTS).
- Optical Character Recognition (OCR) Systems, Automated Gate Systems (AGS) and Terminal Operating System (TOS) upgrades.
- Computer Security Management (CMS) Systems, including Physical Security Information Management Systems (PSIM) Video Cameras and Systems, and Communications.
- Non Intrusive Inspection (NII) Systems, including Scanners.

The Vessel Traffic System (VTS) is to be developed by the General Maritime Directorate (DIMAR), Colombian Coast Guard and Directorate of Telematics (DITEL) of the Colombian Navy. The OCR, AGS TOS, CMS, PSIM are expected to be developed by Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBun). The NII systems (scanners) are to be supplied by SPRBun, but will be administered by and used by the Directorate of National Taxes and Customs (DIAN), the National Police, the Colombian Agricultural Institute (ICA) and the National Institute for Vigilance of Medications and Foods (INVIMA) and meet specifications of the Ministry of Finance (including DIAN, the Ministry of Foreign Trade and the Ministry of Transportation). The funding source alternatives for the project can be expected to depend on which entity is implementing the project.

Financing for the Port of Buenaventura Operational and Security Enhancement Project in Colombia can come from a number of sources depending on the financial and institutional parameters of the project. Key considerations in determining the funding for a specific project include:

- **Ownership**. Certain sources of funding are available only to private sector projects. Likewise, some sources, such as American OPIC funding, are only available to projects with a significant level of ownership by U.S. firms, although it can offer guarantees for U.S. commercial bank lending without this restriction.
- **Sourcing**. The availability of funding from certain sources depends on the origin of the goods and services. For example, U.S. Ex-Im Bank funding requires a significant level of U.S. exports.
- **Cash Flow**. For debt financing, the cash flow generated by the project is the principal source of money to repay the loan. The greater the cash flow in comparison to the total debt, the greater the availability of commercial credit.
- **Recourse**. The parties or facilities that lenders have recourse to. Under various structures, financing for the terminal may be backed by only the terminal's operations and plant, or those of the whole Port or those of outside private sector project sponsors. Increased recourse adds security to the loan, improving lending terms.

- **Guarantees**. Some lending either involves or requires outside guarantees of repayment. Project finance funding often requires guaranteed off-take contracts from the funded projects to insure that the project will make money. Funding of public sector projects often requires that the national government guarantee repayment of the debt.
- **Instrument**. Financing can take several forms including equity investment, debt financing, loan guarantees (to lower borrowing costs), or export funding. Each of these instruments has its own variable features such as repayment term, interest rate, recourse and required guarantees.

The following sources of funding are available for projects like the proposed operational and security enhancement project. Not all of them can be utilized for each possible financial structure discussed above. The following summary states the availability and features of each type of financing.

Inter-American Development Bank (IDB)

Inter-American Development Bank
1300 New York Avenue, N.W.
Washington, D.C. 20577, USA
Tel: (202) 623-1000
Fax: (202) 623-3096

Office in Colombia
Inter-American Development Bank
Carrera 7 N 71-21, Torre B
Piso 19. Edificio Bancafe
Bogotá, Colombia

http://www.iadb.org

The Inter-American Development Bank (IDB) is the oldest and largest regional multilateral development institution, established to help accelerate economic and social development in Latin America and the Caribbean. The IDB has formed a private sector finance group, including development of a new partial risk guarantee instrument, which allows privatized infrastructure projects to attract commercial and institutional funds at better terms and longer tenors. In private sector projects, IDB lends on its own account ("A Loans") and syndicates loans to other, private investors who invest alongside of IDB ("B Loans"). Established in 1959, IDB is the largest source of development financing for Latin America and the Caribbean. Besides loans, IDB provides grants, technical assistance and does research. IDB shareholders are 48 member countries, including 26 Latin American and Caribbean borrowing members, who have a majority ownership of the IDB.

Structured and Corporate Finance Department financing

The Bank makes available up to 10 percent of the total of its non-emergency loans and guarantees to private businesses without requiring a government guarantee. These funds are designated for infrastructure or capital markets projects or export financing operations that meet the IDB Structured and Corporate Finance Department's eligibility requirements. A private sector entity that wishes to submit an infrastructure project, specifically in the energy, water and sanitation, transportation, communications or capital markets sectors, for consideration for financing, should contact the Structured and Corporate Finance Department prior to preparing or submitting a proposal.

IDB's Structured and Corporate Finance Department.

The Structured and Corporate Finance Department (SCF) leads all IDB's non-sovereign guaranteed operations for large-scale projects, as well as those linked to companies and financial institutions. Through its Loan Syndication Program, SCF acts as a catalyst, helping to engage third-party resources by partnering with commercial banks, institutional investors, co-guarantors and other co-lenders for projects with high developmental impact

Private sector projects can also be presented to two other IDB Group institutions: the Multilateral Investment Fund (MIF) or the Inter-American Investment Corporation.

Multilateral Investment Fund (MIF)

The Multilateral Investment Fund (MIF) finances small projects that promote innovative development of the private sector and strengthen micro and small businesses. To request funding from the MIF, the applicant should review the MIF's application process and present a proposal to the representative at the IDB Country Office in the country in which the project will be implemented. After the Country Office has analyzed the proposal, the Representative submits it to the appropriate Country Department at IDB Headquarters for consideration.

Inter-American Investment Corporation (IIC)

Companies that seek medium or long-term financing to expand their operations should review the IIC's application procedures and send a brief description of the company and a detailed business plan to the

representative in the appropriate IIC Regional Office or to the IIC's Corporate Finance Division Chief in Washington, DC. The IIC also provides on its website online and printable versions of its corporate loan application. Financial institutions that are seeking funds to on-lend to small and medium-size enterprises in the region, or are seeking to establish an agency line, should send their latest audited financial statements and a brief proposal for the use of funds to the IIC's Financial Services Division Chief in Washington D.C.

The Inter-American Investment Corporation (IIC) is another investor in private infrastructure that is part of the IDB Group.

IDB and IIC have lent money for privately developed maritime facilities, security and customs such as:

$430 million syndicated loan to Brazil's Embraport project, November 2011

The Inter-American Development Bank (IDB) closed a $430 million syndicated loan with a group of four international commercial participants -- WestLB, HSBC, Caixa Geral, Santander -- to finance the construction, operation and maintenance of a new private mixed-use container and liquids terminal in Brazil's Santos Port, the largest port complex in the region. The loan was granted to Empresa Brasileira de Terminais Portuários S.A. (Embraport), responsible for the project, which is critical in easing congestion and reducing costs in Santos. The transaction involves a 15-year $100 million IDB A loan and a 12-year IDB B loan of $330 million from WestLB, Caixa Geral de Depositos, HSBC and Banco Santander. In parallel, Caixa Economica Federal of Brazil has also approved separate financing for the project totaling R$633 million, funded by BNDES, which alongside the IDB financing, will make up the $786 million (equivalent) global senior debt package.

$53 million loan for Port of Montevideo Modernization Program, Uruguay, 2008

Uruguay will upgrade the Port of Montevideo facilities to enhance the port's efficiency and reduce maritime and river transportation costs with support from a US$40 million loan from the Inter-American Development Bank. The Port of Montevideo is Uruguay's main port and because of its location it is centrally positioned in the South American Common Market (MERCOSUR)-Chile Integration and Development Hub of the Initiative for the Integration of South American Regional Infrastructure (IIRSA). The National Ports Authority, an autonomous agency of the Ministry of Transportation of Uruguay, will carry out the project. The IDB loan is for a 25-year

term with a 4-year grace period, at an adjustable interest rate. Local counterpart funds will total US$13 million.

$10 million loan to improve control, security and customs administration services at Puerto Cortés, Honduras, 2010

Project will support government efforts to make Puerto Cortés a competitive regional logistics hub. Honduras will get a $10 million loan from the Inter-American Development Bank (IDB) to improve control, security and customs services at Puerto Cortés, which handles 81 percent of cargo and 76 percent of vessels entering and leaving Honduras and is the main port in Central America. This project is the first of its kind in Latin America and the Caribbean and aims to improve security and fiscal and parafiscal controls, while facilitating and speeding up the clearance of legitimate trade. To achieve this complex balance between control and facilitation, the project follows the best international practices applied to customs management, and more specifically the recommendations set forth in the SAFE Framework of Standards of the World Customs Organization. After its completion, the project is expected to cut the average clearance time for goods at customs to 6 hours from 19 hours today and double the number of products seized due to illegal activities and contraband. It will allow Puerto Cortés to provide quality low-cost customs services and become a competitive regional logistics hub as container traffic is expected to triple by 2021 at the port.

The IDB financing is comprised of a $7 million, 30-year fixed-rate loan, with a 5.5-year grace period and a 4-year disbursement period; and a $3 million loan with maturity and grace periods of 40 years, a 0.25 percent interest rate and a 4-year disbursement period.

$135 million financing for Puerto Cortés Expansion and Modernization Program, 2010

Project to finance dredging of the port basin and slips; build new container terminal Honduras will expand and modernize Central America's biggest port with $135 million of loans from the Inter-American Development Bank (IDB). The $135 million IDB loan is comprised of a $94 million 30-year fixed-rate loan with a six-year grace period; and a $40.5 million loan from the Bank's Fund for Special Operations, with maturity and grace period of 40 years, and a 0.25% percent interest rate. Both loans, which will finance about 60 percent of the cost of the project, will be disbursed in four years.

U.S. Export Import Bank (Ex-Im Bank)

Export-Import Bank of the United States
811 Vermont Avenue, N.W.
Washington, DC 20571
Tel: (202) 565-3946 (EXIM) or (800) 565-3946 (EXIM)
POC, John Schuster, +1-202-565-3691
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811 Vermont Avenue, N.W.
Washington, DC 20571 USA
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Xiomara Creque-Bromberg, Regional Director Americas / Eastern Europe, Global Business Development
Phone: 202-565-3477
e-mail: xiomara.creque@exim.gov

The Export-Import Bank of the United States (Ex-Im Bank) is the official export credit agency of the United States. Ex-Im Bank's mission is to assist in financing the export of U.S. goods and services to international markets. Ex-Im Bank enables U.S. companies — large and small — to turn export opportunities into real sales that help to maintain and create U.S. jobs and contribute to a stronger national economy. Ex-Im Bank does not compete with private sector lenders but provides export financing products that fill gaps in trade financing. The Bank assumes credit and country risks that the private sector is unable or unwilling to accept. The Bank also help to level the playing field for U.S. exporters by matching the financing that other governments provide to their exporters.

Ex-Im Bank, an independent, self-sustaining federal agency, helps create and maintain American jobs by filling gaps in export financing and strengthening U.S. export competitiveness. In fiscal year 2010, the Bank authorized a record high of approximately $24.5 billion in loans, guarantees and insurance, including more than $5 billion in authorizations for small businesses.

Ex-Im Bank provides working capital guarantees (pre-export financing); export credit insurance; and loan guarantees and direct loans (buyer financing). With more than 77 years of experience, Ex-Im Bank has supported more than $456 billion of U.S. exports, primarily to developing markets worldwide.

Direct loans are extended to the foreign buyer, not to the U.S. exporter. Loan guarantees are provided to banks financing the export sales of a U.S. supplier. The basis of the guarantee transaction is virtually identical to that of the direct loan, and the impact upon the U.S. exporter and the foreign buyer are virtually indistinguishable from a direct loan transaction.

Long-term financing is available for amounts of $10 million or greater and repayment terms of seven years or more. Medium term financing is available for amounts of $10 million or less and less than seven year repayment term.

Actual credit terms are subject to negotiation based upon American origin content in the project. Generally speaking, US content above the minimum thresholds can attract more aggressive terms and re-payment conditions.
Projects backed by financing from Export-Import Bank include:

US$23 million enhanced financing for Mexican airports security

Reveal Imaging Technologies, Inc., Bedford, Mass., and L-3 Communications, New York, N.Y., are selling baggage handling and security inspection systems to Grupo Aeroportuario del Centro Norte (OMA), operator and manager of 13 airports in Mexico, to be installed at seven of the airports: Zihuatanejo, Monterrey, Acapulco, Ciudad Juarez, Culiacan, Chihuahua, and Mazatlan. Under its Transportation Security Exports Program (TSEP), Ex-Im Bank is guaranteeing a medium-term loan from UPS Capital Business Credit® to support the export sale. TSEP offers extended financing terms to encourage the use of U.S.-made products in foreign transportation security projects. Ex-Im Bank's TSEP program offers local cost coverage up to 30 percent of the net contract value, and repayment terms of up to 10 years, for U.S. transportation security exports. The project for equipping all 13 airports requires a total investment of approximately Ps. 500 million, part of which will be financed with debt. Contracting the long-term US$23 million loan from UPS Capital Business Credit is an important step forward in carrying out this major project.

US$1 Billion Ex-Im Bank Preliminary Commitment to Colombia's Ecopetrol

The Export-Import Bank of the United States (Ex-Im Bank) approved a US$1 billion preliminary commitment (PC) to help finance the sale of goods and services from various U.S. exporters to Ecopetrol S.A., Colombia's national oil company. With this preliminary commitment, Ecopetrol (formerly known as Empresa Colombiana de Petroleos S.A.) may request the financing to buy oil field-related equipment and services from U.S. companies large and small. They will use these U.S. products to develop oil and gas reserves, improve existing oil field production and upgrade refineries. The company plans to significantly increase petroleum production to 1 million barrels of oil equivalent per day by 2015. The financing will support projects such as the Cartagena and Barrancabermeja refinery modernization projects, valued at over US $6.5 billion, processing of heavy crude, increasing production capacity, excellent environmental best practices, developing bio-fuels, pursuing the use of clean technologies in the production of gasoline and diesel fuels and upgrading and streamlining production processes. Ecopetrol will have the opportunity to request conversion of the PC into final transactions for medium- and long-term loans and

guarantees during the next two years as it identifies potential U.S. exporters for its projects. The transactions will be submitted to Ex-Im Bank's board of directors for final approval.

International Finance Corporation (IFC)

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Assistant: Nathalia Reyes
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International Finance Corporation (IFC), a member of the World Bank Group, is the largest global development institution focused on the private sector in developing countries. IFC creates opportunity for people to escape poverty and improve their lives. IFC provides financing to help businesses employ more people and supply essential services, by mobilizing capital from others, and by delivering advisory services to ensure sustainable development. Like other multilateral lenders such as IADB, IFC loans on A/B structures combining their own money with syndicated loans from the private sector. In addition, IFC will take equity stakes in private sector companies.

IFC A-loans typically have 7 to 12 year maturities but grace and repayment periods are determined on a case-by-case basis. A-loans are usually limited to 25% of total estimated project costs for new facilities. A-loan amounts range from US$1M to US100M. IFC loans can be made with limited or no recourse to sponsors. IFC will actively underwrite the placement of B-Loans in the international financial markets.

Equity investments by the IFC are generally between 5 and 15% of the total project equity and will not take the largest interest or have an interest of over 35%.

Since Colombia became a member of IFC in 1956, IFC has invested $3.1 billion in the country's private sector, including $844 million in syndications. IFC's strategy in Colombia focuses on infrastructure development through public-private partnerships, which build well-functioning ports, roads, and airports, thus decreasing the cost of doing business.

Representative IFC lending includes:

US$157 million financing for Terminal de Contenedores de Buenaventura, S.A. (TC Buen), Colombia, 2010

Sociedad Portuaria Terminal de Contenedores de Buenaventura ("TCBuen") will construct and operate a new container terminal in the port of Buenaventura, the only significant Pacific coast port in Colombia. The Project will involve the development, engineering, construction, dredging, equipment purchases, and operation of the terminal. Once completed, the terminal will handle about 268,000 TEUs of container traffic each year during its first phase. TCBuen is primary owned by Grupo Marítimo Terminal de Contenedores de Barcelona ("GMTCB") and Grupo Empresarial de Pacifico S.A. ("GEPSA"). GMTCB is Spain's leading terminal operator company, operating 11 terminals around the world. GEPSA is a Colombian developer based in Buenaventura; the group is dedicated to the design, development, and execution of projects in different economic sectors along Colombia's Pacific Coast. The Project is estimated to cost $224 million. The proposed IFC investment comprises an A Loan of $25 million, for IFC's own account, a B Loan of $117 million from syndication banks, and a C Loan of up to $15 million.

US$15.8 million loan for Santa Marta Container Terminal, Colombia, 2010

The Project involves the refurbishment and operation by Santa Marta International Terminal Company, S.A. ("SMITCO") of a container terminal inside the Port of Santa Marta, which is located on the Caribbean coast and is Colombia's third largest port. The Project includes (i) the refurbishment of 2 berths with a combined total length of 322 meters; (ii) the installation of two Post-Panamax Ship-to-Shore cranes, four Rubber Tired Gantries Cranes, and other terminal handing equipment to complement an existing mobile harbor crane; and (iii) the demolition of existing buildings and expansion of the container yard from 4 hectares to 8 hectares. SMITCO is approximately 51% owned by Sociedad Portuaria de Santa Marta ("SPRSM") and approximately 49% owned by an indirect subsidiary of Carrix Inc., a privately held U.S. company and one of the largest container terminal operators and cargo handling companies in the world. The total project cost is estimated to be $50 million. The proposed IFC investment is an up to $15.8 million A loan.

US$60 million loan for Terminal de Contenedores de Cartagena S.A (Contecar) Container Terminal, Colombia, 2008

The $210 million capital expenditure program to be carried out by Terminal de Contenedores de Cartagena S.A (Contecar) is designed to develop Contecar into a world class container port terminal. The facility is projected to have 700 meters of berthing space, five new Super Post Panamax ship to shore gantry cranes, twenty six rubber tired gantry cranes (RTGs), over 17 hectares of RTG operated container yard space, and over 30.000 m2 of warehouses. Contecar, a 22 hectare private port facility is located near to the harbor entrance and industrial area of Cartagena. The project sponsors are SPRC and Cartagena II, sister companies with common shareholders. Cartagena II currently owns 85% of Contecar, with the remaining 15% owned by SPRC. The total capital expenditure program for Contecar over the next four years is estimated at around $210 million. IFC proposes to invest up to $60 million in an A Loan for IFC's own account.

US$675 million loan for Brasil Terminal Portuario, 2011

Brasil Terminal Portuário ("BTP") is developing a container terminal in a brownfield area within the Port of Santos to serve Sao Paulo and surrounding areas in Brazil (the "Project"). The Port of Santos, Brazil's main port is the largest port in Latin America and also one of the most crowded. BTP is indirectly owned 50% by Terminal Investments Limited ("TIL") and 50% by APM Terminals BV ("APMT"). The project is estimated to cost $845 million. The proposed IFC financing is expected to include an investment of up to $140 million for IFC's own account and up to $535 million in the form of a B Loan.

US$17.5 million loan for Port of Caucedo Phase 2, Dominican Republic, 2010

Caucedo Investments Inc. ("CII" or the "Company"), an existing IFC client, operates the Port of Caucedo ("Caucedo") under a ten year concession automatically renewable for four consecutive ten year periods. The capital expenditure program includes the construction of a new 300m quay / Breakwater Berth on the inside face of the Caucedo terminal's breakwater, the acquisition of 2 new mobile harbor cranes for the feeder berth, a 6th quay crane for the main quay and supporting equipment as well as the development of staging yard space on the existing breakwater reclamation. CII is 50% owned by DPI Dominica ("DPI DR") and 50% by Caucedo Development Corporation ("CDC"). DPI DR is 90% owned by DPI Terminals LLC ("DPI") and 10% by Dragados S.P.L. DPI is 100% owned by DP World Americas LLC ("DPW"), whose parent, DP World Ltd, is one of the largest marine terminal operators in the world. Total project cost is estimated at $69 million. The proposed IFC investment is an A Loan of $17.5 million, for IFC's own account.

US$45 million loan for Manzanillo Container Terminal, Mexico, 2004

SSA Mexico Holdings, S.A. de C.V. operates Manzanillo International Terminal. Carrix, formerly known as FRS Service Companies, Inc., is the parent company of SSA Marine, formerly known as Stevedoring Services of America. Established in 1949, SSA Marine is the world's largest privately held container terminal operator and cargo handling company, operating 10 container terminals and approximately 60 non-container port facilities worldwide. Carrix also owns RMS, an operator of 40 rail terminals across the United States, and Tideworks Technology, a software provider for marine terminals. IFC has a long-standing relationship with Carrix, having first financed SSA Marine's Manzanillo International Terminal (MIT) operation in Panama in 1994 and then financing MIT's expansion in 2000. IFC also financed the San Antonio Terminal Internacional S.A. project in Chile in November 2001 in which Carrix is a 51% shareholder. In addition, IFC is currently preparing the legal documents to finalize a $15 million A loan for San Vicente Terminal Internacional S.A., a medium sized port in Chile which is 50% owned by Carrix. Total project cost is estimated at $127.3 million. IFC's proposed investment consists of a loan of up to $45 million for IFC's own account. Citibank N.A. is providing the remaining financing in the form of a 5-year term loan. The Citibank financing is currently being syndicated to other commercial banks.

US$75 million loan for Exolgan, Argentina, 2009

Exolgan S.A. operates the second largest container port terminal in Buenos Aires ("BA"). The terminal is located at the Dock Sud area, about 8 km south of BA. Exolgan is implementing an investment program including (1) dredging, construction and extension of the berths and the container yard, (2) purchase of new equipment and land; and (3) other investments including upgrading IT system and facilities. Exolgan is owned by International Trade Logistics S.A., an Argentine company with three primary businesses: terminal operations (Exolgan), the logistic service, and warehousing service. The project is estimated to cost $102.9 million to finance the investment program and refinance existing debt. The proposed IFC investment comprises an A Loan of $50 million, for IFC's own account, and up to a B Loan of $25 million from syndication banks.

Up to $5.0 million loan for Tecon Salvador S.A., Brazil, 2007

The proposed IFC financing entails a repeat investment in Tecon Salvador S.A. (Tecon Salvador or the company), a container terminal located in the Port of Salvador, in the state of Bahia in North East Brazil. The Port of Salvador comprises 9 berths, of which two are leased to Tecon Salvador, and seven remain under public ownership. It is the largest port in the North East region. Tecon Salvador serves a regional, export-orientated market, mainly concentrated in

Bahia. The proposed new financing will support Tecon Salvador's capital expenditure plans for 2007 and 2008, the most important aspect of which is the purchase of equipment, and accompanying civil works, required in order to optimize operations.
Tecon Salvador is 90% owned by sponsors, Wilson Sons de Administracão e Comercio Ltda (Wilson Sons), through two Wilson Sons subsidiaries. The remaining 10% of Tecon Salvador is held by IFC. Wilson Sons is a Brazilian maritime group, founded in 1837. The total project cost is estimated to approximately $10.0 million, of which IFC would provide up to half in the form of an A-loan, with the remainder provided in the form of a B-loan.

$6 Million loan for Suape International Container Terminal, Brazil, 2002

The project sponsor is ICTSI, a private Philippine company incorporated in 1987 and involved in the management, operation and development of container ports and terminals in the Philippines and Brazil. ICTSI manages and operates the Manila International Container Terminal at the Manila Port that handles about 900,000 TEUs per year, representing 65% of the international container trade in the Philippines. The project company, Tecon Suape S.A., is a special purpose Brazilian company, which was established to build, develop and operate the container terminal at Suape port under a 30-year lease from the Suape Port Authority. The project's objective is to build, develop and operate berths 2 and 3 at the port. The project cost covers the first phase of investments, which includes acquisition and installation of container handling equipment, development of the container yard, construction of office buildings, and installation of computer systems. ICTSI owns 100% of the project company, Tecon Suape S.A. The total project cost is estimated at US$19.5 million. The proposed IFC investment consists of a US$6 million A loan for IFC's own account.

Overseas Private Investment Corporation (OPIC)

Overseas Private Investment Corporation
Applications Officer - Insurance Department
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OPIC is the U.S. Government's development finance institution. It mobilizes private capital to help solve critical world challenges and in doing so, advances U.S. foreign policy. Because OPIC works with the U.S. private sector, it helps U.S. businesses gain footholds in emerging markets catalyzing revenues, jobs and growth opportunities both at home and abroad. OPIC achieves its mission by providing investors with

financing, guarantees, political risk insurance, and support for private equity investment funds. OPIC Financing provides medium- to long-term funding through direct loans and loan guaranties to eligible investment projects in developing countries and emerging markets. By complementing the private sector, OPIC can provide financing in countries where conventional financial institutions often are reluctant or unable to lend on such a basis.

OPIC's Small and Medium-Enterprise Financing is available for businesses with annual revenues under $250 million.

OPIC's Structured Financing focuses on U.S. businesses with annual revenues over $250 million and supports large-scale projects that require large amounts of capital, such as infrastructure, telecommunications, power, water, housing, airports, hotels, high-tech, financial services, and natural resource extraction industries. OPIC can also provide long-term working capital and multiple-year capital expenditure programs. The amount of capital needed for any project can be greater than one financial institution can provide on its own due to per-project limits or diversifications guidelines. As a result, OPIC works with other co-lenders, if necessary, to bring sufficient resources to a given project.

OPIC Financing offers a variety of loan structures to suit the unique needs of the projects it supports.

- Corporate, Project, and Hybrid Loans
- Franchise Loan
- Commercial Bank On-Lending Agreements

In corporate-finance transactions, OPIC makes a loan to the U.S. corporate sponsor of an overseas project. OPIC would look to the ability of the U.S. company to repay the loan and to offer collateral, rather than to the project company. OPIC can structure a corporate finance transaction more easily and generally at less cost than if the borrower and collateral are in a foreign country. The purpose of the financing is still to support the overseas project.

In project-finance transactions, OPIC looks to the overseas project for repayment of the loan. In project finance underwriting, OPIC carefully analyzes the economic, technical, marketing, and financial soundness of the project to determine its creditworthiness. There must be adequate cash flow to pay all operational costs and to service all debt. It is expected that collateral, in the host country and/or in the U.S., will be provided to secure the loan. The project sponsors are expected to support the overseas operation until certain specific tests for physical completion, operational implementation, and financial soundness are met. To the extent that project financing is appropriate, sponsors may not need to pledge their own general credit beyond required completion undertakings.

Hybrid structures, combining elements of corporate finance and project finance, are frequently used. The term "hybrid" emanates from the cash flow and collateral from the domestic parent company and

the project company to craft an acceptable loan structure. Hybrid finance structures can be more costly than corporate finance structures. However, in many cases, the domestic sponsor may already have pledged its assets to its existing local bank. OPIC may see value in the cash flow and collateral overseas that is not seen by a local U.S. bank and thereby obtain sufficient comfort to consider the transaction.

Commercial Bank on Bank Lending arrangements

OPIC partially guaranties U.S. commercial banks' emerging markets medium and long-term loans to businesses or correspondent banks. No U.S. equity or borrower is required for these loans.
A framework agreement is established once OPIC underwrites a bank's credit policies and procedures: Credit underwriting and servicing is delegated to the bank; OPIC approves projects for Statutory issues; OPIC retains discretion whether to risk share on any loan; and the framework sets risk sharing; OPIC covers up to 75 percent of the loan. The term of OPIC loans is typically five to fifteen years following a suitable grace period. OPIC guaranteed loans are backed by the full faith and credit of the U.S. government.

Equity Investments by Private or Public-Private Project Sponsors/Developers

Equity investment is a key part of the financial strategy of any project structure. Equity investment determines ownership and control, promotes commitment to the project and reduces the debt repayment burden on the project. Equity can be contributed in either cash or kind, as appropriate. For example, in a public/private partnership, the Port might contribute existing real estate and facilities in return for an equity interest in the project. Typically, a private or public/private project such as the proposed facilities would have equity investment from all key team members and stake holders. These may include:

The port (SPRBUN);
A private terminal development and operations company;
Key shipping lines calling or potentially calling on the terminal;
Contractors and engineers working on the project;
Financial institution members of the project team;
Institutional investors focused on Latin America and/or private infrastructure;
Local partners; and
Other strategic team players with interests in the success of the project.

SPRBun Investment

SPRBun has the authority to allocate its own funds to develop new facilities, as well as to undertake borrowing for the purpose of investment. The advantage of this type of funding is that it is controlled by

SPRBun and can be programmed for strategic purposes without depending on negotiation with concessionaires or outside parties. Although SPRBUN has the discretion to do this, any investment made should be able to generate a reasonable rate of return over the long term. The ability to finance through equity as well as borrowing of the proposed operational and security improvements will hinge on the financial capacity of the enterprise as well as the anticipated return on investment in the improvement projects. In its audited consolidated financial statements, SPRBUN reported assets of COP 432,026,046,000 (equivalent to USD 215,571,000 at a rate of exchange of USD 0.0005 per USD as of December 31, 2010) and equity of COP 200,984,390,000 (equivalent to USD 100,287,000) as of December 31, 2010. Revenues from operations were COP 193,560,537,000 (equivalent to USD 96,582,300) for the 6 month ended December 31, 2010 and COP 142,159,667,000 (equivalent to USD 70,934,400) for the 6 months ended June 30, 2010. The gross margin was COP 99,950,268,000 (equivalent to USD 49,872,130) for the 6 months ended December 31, 2010 and COP 67,019,130,000 (equivalent to USD 33,441,000) for the 6 months ended June 30, 2010. The results (net income after tax and minority interest) were COP 51,358,477,000 (equivalent to USD 25,626,700) for the 6 months ended December 31, 2010 and COP 33,080,077,000 (equivalent to USD 16,506,200) for the 6 months ended June 30, 2010.

Corporación Andina de Fomento (CAF)

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CAF is a development bank established in 1970 that currently consists of eighteen countries in Latin America, the Caribbean and Europe, as well as fourteen private banks from the Andean region. The

organization promotes a model of sustainable development through credit operations, grants and technical support, and offers financial structuring to public and private sector projects in Latin America. Based in Caracas, Venezuela, CAF has offices in Buenos Aires, La Paz, Brasilia, Bogota, Quito, Madrid, Panama City, Lima and Montevideo.

According to CAF's Mission statement, the organization "promote[s] sustainable development and regional integration through efficient resource mobilization for the timely delivery of multiple, high added value financial services to public and private clients in our shareholder countries. We are a client-oriented competitive financial institution responsive to social needs and supported by highly skilled personnel. "

CAF-development bank in Latin America, closed 2011 with a total approvals for public and private sectors in the order of USD 10,500 million. Products and Services: loans; Structured Finance; syndicated loans; financial advice; Bonds and Guarantees; Partial Guarantees; equity Investments; Treasury services; technical Cooperation; Lines of credit.

Lending in Colombia includes:

US$ 152 million Loan to Urban Transportation Program Colombia

In June 2011, the Corporación Andina de Fomento (CAF) approved a U.S. $ 152 million loan for the Urban Transportation Program in Barranquilla and Monteria and 100 million for the National Guarantee Fund (NGF). With the implementation of the Urban Transport, at the national level involving about a thousand kilometers of urban roads, benefiting about 24 million people living in cities where the projects are developed. The Urban Transportation Program in Barranquilla and Monteria (north), which form part of the National Development Plan of the Government of Colombia, is implemented by the Ministry of Transportation, with the participation of Transmetro SA and Monteria Ciudad Amable S.A.S. total project cost to $ 542 million, of which the CAF contributes with 28%.

US $ 100 million for the Fondo Nacional de Garantías (FNG) in Colombia

In June 2011, the CAF approved U.S. $ 100 million for the FNG. This amount is partially to strengthen a set of guarantees issued by the FNG to extend credit up to $ 800 million "to micro, small and medium enterprises in Colombia.

Government of Colombia

The Government of Colombia (GoC) may be willing to provide investment capital for infrastructure projects of national importance. The provision of improved port facilities on the Pacific such as the Buenaventura facilities would be an example of a project that might qualify. The port plays a critical role in providing efficient, agile and secure transportation logistics to provide access to export markets, economical delivery of imported goods, raw materials and intermediate goods. The Port of Buenaventura Operational and Security Enhancement Project includes important projects which will improve security for Colombia as well as improving collection of Customs and tax revenues.

Private Debt Investors

Funding needs not met by equity investors, multilateral lenders and export assistance programs are usually met be private lenders. These lenders are often organized by one of the multilateral lenders (A/B loans) and involve guarantees on the part of the multilateral lender. As with any loan, cost and terms depend on the cash generating capacity of the project along with the recourse terms and the total indebtedness of the project.

Private debt investors include many large international banks as well as certain investment funds focused on Latin America and/or private infrastructure. Sources of private debt financing can also include vendors to the project.

Wells Fargo

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Structured Trade Finance
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Wells Fargo & Company is an American multinational diversified financial services company with operations around the world. Among the products available for export financing is structured trade finance. According to Wells Fargo,

Structured trade finance (STF) provides your export customers abroad financing on advantageous terms not usually obtained from local banks in many countries and competitive with those offered by other U.S. and foreign exporters (and their banks). Hence, structured trade finance can be a sales tool to differentiate you and help your company grow sales and increase profitability. Exporters often have three major concerns in determining the credit and repayment terms they offer abroad: credit risk, length of time until payment is received, and costs. In typical structured trade finance transactions, the credit risk exporters face is minimal since the only recourse to that exporter is usually limited to its performance risk, or, under some programs, a minimal level of credit risk (e.g. 10% of principal and interest (P+I)). Although at least 30 and up to 60 days or more may be needed to obtain Export-Import (Ex-Im) Bank's* approval for a medium or long-term transaction, once closed and after product shipment, you will be paid promptly after presentation of the required documentation under time frames similar to that of commercial letters of credit (L/Cs). Finally, most typical structured trade finance products allow financing costs to be passed on to foreign buyers.

Exporters can use the services of a specialized trade finance department who can tailor structured trade finance options to meet their needs. For example, a Wells Fargo 5-year Ex-Im Bank insured financing facility generally offers lower interest rates and costs than financing options available to the buyer in his or her local country. This can prevent running the risk of losing a deal by having to ask for payment in advance or a confirmed L/C if U.S. and European competitors offer attractive term financing. There will be no credit risk and be paid promptly after the loan closes, the product is shipped, and you have presented all required documentation to Wells Fargo. Since all costs are paid for by the foreign buyer and loan payment collection is the responsibility of Wells Fargo, you can place your focus back on manufacturing and selling equipment. Structured trade finance facilities are usually insured or guaranteed by the Export-Import Bank of the United States or one of a number of private sector credit insurers. Hence, credit insurance or Export Credit Agency loan guarantees are used to mitigate the risk a bank faces when lending to foreign borrowers. Use of credit insurance and loan guarantees either completely converts the credit risk to that of the insurer or guarantor or reduces the exposure to the foreign buyer to 15% or less of principal – an exposure that is usually held by the exporter. Shipments are typically financed from 60 days to 7 years depending on the product's characteristics and if the foreign buyer is an end-user or distributor.

J.P. Morgan Chase

Global Trade Services, a unit of J.P. Morgan's Treasury Services business, provides market-leading classical trade, structured trade finance, and supply chain management solutions to corporations and financial institutions worldwide. Solutions include letters of credit, open accounts, bank-to-bank reimbursements, secured receivables finance, global trade management, supply chain financing, and syndicated, medium and long term trade loans.

Citibank

Structured Trade Finance

According to Citibank,

> A leader in the delivery of Structured Trade Finance solutions both locally and internationally, Citibank® brings a wealth of expertise to Emerging Market clients through the delivery of term financing usually in connection to the purchase of capital goods and services from OECD countries.
>
> Citibank®'s key competitive advantage is that they can access almost every risk enhancement and subsidy mechanism available globally and combine them into multi-source financing packages.
>
> Structured Trade Finance leverages the use of scarce cross-border medium term credit resources by enhancing bank appetite for extending credit and by mitigating the risk of term financing in these markets.
>
> Citi's Export and Agency Finance (EAF) products serve banks, corporations, and development agencies, primarily in emerging markets in Africa, Latin America, the Middle East, and Asia, and help to address infrastructure development needs in the areas of oil and gas, power, shipping, housing, and energy. EAF delivers significant value for agencies by:
>
> Enabling development banks to do more with their money increasing the amount agencies are able to invest in projects, and allowing agencies to do business in more parts of the world.
>
> Citi has partnered with more than 60 Export Credit Agencies (ECAs), including Ex-Im in the U.S., and Multilateral Finance Institutions (MFIs), lending our global reach to support these institutions' capabilities in many challenging regions of the world.

Bank of America

Trade and Supply Chain

We partner with export credit agencies and secondary market participants to tailor innovative solutions to meet your short- and medium-term export financing needs. Our creative structuring capabilities can help you offer attractive financing to overseas customers and significantly reduce non-payment risks. If you are a U.S.-based exporter, you may qualify for pre-export financing with a 90% guarantee by the Export-Import Bank of the United States (Ex-ImBank).

HSBC

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HSBC Securities (USA) Inc., a registered broker dealer of securities and a Futures Commission Merchant, is also engaged in investment banking underwriting, dealing and brokering of debt and equity securities and futures contracts and is a primary dealer in U.S. Government and federal agency securities. Products and services include: Financing Asset and structured finance; Credit and lending; Debt capital markets; Equity capital markets; Leveraged and acquisition finance; Project and Export Finance; and Shipping services.

Bladex – Foreign Trade Bank of Latin America, Inc. (Banco Latinoamericano de Comercio Exterior, S.A.)

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Bladex is a supranational bank specialized in Latin American foreign trade.
In May 1975, Panama put before the 20th Meeting of Central Bank Governors of Latin America the proposal to create a multinational organization to finance exports in the Region. Approval for the creation of a bank was issued in 1976. Banco Latinoamericano de Exportaciones, S.A. (Bladex) was thus organized in 1977 and established as a corporation in 1978 pursuant to the laws of the Republic of Panama. With headquarters in Panama, the Bank officially began operations on January 2, 1979.

Darby Overseas Investments Ltd.

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Bancoldex

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Bancóldex is the bank for business development and foreign trade. It is a credit institution supervised by the Superintendencia Financiera de Colombia, which operates on the second floor through the network of banks, financial corporations, finance companies, credit unions, financial NGOs and funds used to meet the needs of credit for all companies. Bancóldex funds to micro, small, medium and large businesses in all economic sectors and foreign companies buying goods or services in Colombia. These companies can be natural persons or legal entities. Bancóldex any need for credit financing with companies, with destinations for: working capital, fixed investment, consolidation, corporate liabilities and capitalization. You can apply directly to the bank with which your company works or you can call in Bogotá Bancóldex Multicontact 649 7100 018000 915300 rest of the country where you will learn about working with financial enidades Bancoldex. You can request resources through the Colombian commercial banks, financial corporations, commercial finance companies and other intermediaries supervised by the Superintendencia Financiera de Colombia, who have existing credit limit in Bancoldex. Bancóldex acts by discounting mechanism, channeling their funds through financial institutions.

Bancolombia

Telephone Branch Bancolombia: Medellín - Local: (57-4) 510 90 00 - Bogotá - Local: (57-1) 343 00 00 - Barranquilla - Local: (57-5) 361 88 88 - Cali - Local : (57-2) 554 05 05 – Rest of country: 01800 09 12345 Overseas telephone branches: Spain (34) 900 995 717 – United States (1) 866 379 97 14.

The Bank of Colombia opened its doors in 1875 to meet the needs of financial services that were resulting from the country's economy. At that time was listed as the lead agency in promoting savings of more than a million Colombians. In October 1972, business leaders Antioquia had the idea of a Savings and Loan Corporation who was born on February 14, 1974 as "National Corporation Conavi Savings and Loan." Before the Banking, Luis Alberto Villegas was sworn in as the first Chief Moreno Conavi. As a result of the merger between the National Finance Corporation, which provided services since 1959, and South America SA, Corfinsura born July 1 1993.El September 14, 2004, the major shareholders of Bancolombia, Conavi and discussed the possibility Corfinsura and the desirability of integrating into a single company. Thus began a merger process that had the final endorsement of the Banking Superintendency of Colombia on July 22, 2005.

Table 8-1 Matrix of Alternative Sources of Finance

Source of Funding	Advantages	Disadvantages
Inter-American Development Bank	Lower cost of debt financing.	Additional complication of structure and institutional requirements.
US Export-Import Bank	Lower cost of debt financing for equipment.	Additional complication of limitation on sources of supply.
International Finance Corp.	Lower cost of debt financing.	Additional complication of structure and institutional requirements.
US Overseas Private Investment Corporation	Lower cost of debt due to guarantees.	Additional complication of structure and institutional requirements.
Project Sponsor/Concessionaire Equity	No interest expense to SPRBUN.	Control limited under terms of project or concession agreement.
Private Debt Investment	Reduces equity requirement	Increased cash flow requirement to service interest. Higher rates than multilateral lenders.
SPRBUN Investment	Control by SPRBUN	Potential for investment in non-marketable facilities. Limitation of resources.
Government of Colombia Investment	Potential for investment beyond SPRBUN's own or Concessionaires' resources	Dependent on national government action. Loss of control.

8.2 US sources of supply and value of components

The following pages list US vendors with contact information and information on pricing of individual components.

8.2.1 U.S. vendors

Port and Marine Security Consultants

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USA

Larry Boorstein, Project Manager
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Guernsey
Oklahoma City Corporate Office
5555 North Grand Boulevard
Oklahoma City, Oklahoma 73112-5507

Tel +1-405-416-8100
Fax +1405-416-8111

http://www.chguernsey.com/contact.php

Halcrow
22 Cortlandt Street
31st Floor
New York City
New York
10007
United States of America

Tel: +1 (212) 608 3990
fax: +1 (212) 566 5059
http://www.halcrow.com

McRoberts
Maritime Security
1007 North American Way
Suite 315
Miami, Florida 33132
Telephone +1- (305) 373.0605
Fax +1-(305) 373.0403
Nick Knittel
Senior Vice President
nicholaus.knittel@mcroberts1876.com; nknittel@mcroberts1876.com
http://www.mcrobertsmaritime.com/contact-us.php
http://www.mcrobertsmaritime.com/

Moffatt & Nichol
Corporate Office
3780 Kilroy Airport Way, Suite 750
Long Beach, California 90806
USA
phone: +1-562.590.6500
fax: +1-562.590.6512
business development group
inquiry@moffattnichol.com
Tel +1(562) 590-6500 /
Tel +1(540)-662-6623

www.moffattnichol.com

Parsons
Michael Leue
Director Port and Intermodal Development
Parsons Corporation
100 W Walnut St
Pasadena, CA 91124-0001
United States
1.626.440.2000
michael.leue@parsons.com
www.parsons.com

URS
600 Montgomery Street, 26th Floor
San Francisco, CA 94111-2728 USA
T +1.415.774.2700
F +1.415.398.1905
http://ursglobal.com/markets/infrastructure/maritime.php
http://ursglobal.com/

UNISYS
11720 Plaza America Dr
Reston VA 20190
USA

Tel 1-916-802-8950
e-mail nishant.pillai@unisys.com
http://www.unisys.com

Customs Modernization and Trade Advisory, Border Security, Customs Compliance

Sandler, Travis & Rosenberg, P.A.; Sandler & Travis Trade Advisory Services, Inc.; Washington, D.C. Office
1300 Pennsylvania Avenue
Suite 400
Washington, DC 20004
USA
Tel: (202) 216-9307
Fax: (202) 842-2247

Sean Bresnahan
Senior Contracts Manager
Tel +1-202-549-6773
sbresnahan@strtrade.com
messages@strtrade.com
www.strtrade.com

Vessel Traffic Systems (VTS)

L3 Communications Klein Associates, Inc.
11 Klein Drive
Salem, New Hampshire 03079-1249
USA
Tel 603-893-6131
Fax: 603-893-8807
Web: www.L-3Klein.com
Rick Wetmore
e-mail Rick.wetmore@L-3com.com
Tel. 1-603-893-6131

Lockheed Martin Corporation
MS2 Integrated Defense Technologies
300 M Street, S.E.
Suite 700
Washington, D.C. 20003
USA
www.lockheedmartin.com/ms2/product_contacts

Northrop Grumman
Information Systems
2340 Dulles Corner Blvd.
Herndon, VA 20171
USA
Tel 703-561-3212
http://www.is.northropgrumman.com/

Raymarine
Raymarine Inc.
a FLIR company
9 Townsend West
Nashua, NH 03063
USA
Tel: +1-603 324 7900
Fax: +1- 603 324 7995

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Raytheon Company
870 Winter Street
Waltham, MA 02451-1449
USA
Telephone: +781.522.3000

SSR Engineering, Inc.
2556 W. Woodland Drive
Anaheim, CA 92801
USA
Telephone: +(0)1 714.229.9020
Fax: +(0)1 714.229.9015
info@ssreng.com
www.ssreng.com

AIS

Shine Micro, Inc.
9405 Oak Bay Road, Suite A
Port Ludlow, WA 98365
USA

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Shine Micro, Inc.
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Port Gamble, WA 98364-0340
USA
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Fax +1(360) 437-2483
http://www.shinemicro.com/

Automatic Power Inc.
P.O. Box 230738
Houston, Texas 77223-0738
USA

Physical Address:
213 Hutcheson Street.
Houston, Texas 77003

Tel: +1 713-228-5208
Fax: +1 713-228-3717
http://www.automaticpower.com/

Maritime Exchange of the Delaware River and Bay
240 Cherry St
Philadelphia PA 19106-1906 USA

Michael Fink
e-mail mfink@maritimedelriv.com
Tel. 1-215-925-2615

Harbor Lights
Greater Houston Port Bureau
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Houston, TX 77029
USA
Tel +1-713-678-4300
Fax +1- 713-678-4839
http://www.txgulf.org/harborlights.html

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Forward Looking Infrared Cameras

FLIR Systems, Inc.
Santa Barbara Sales Office
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Goleta, CA 93117
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Tel: + 1 877.773.3547 (Sales)
Tel: + 1 888.747.3547 (Apps)
Fax: + 1 805.685.2711
sales@flir.com

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27700 SW Parkway Ave.
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Fax: + 1 503.498.3153
www.flir.com

OCR / AGS

APS Technology Group, Inc.
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13850 Ballantyne Corporate Place
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Charlotte, NC 28277
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Fax: +1 704.442.5504
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http://www.remprex.com/

SAIC Security and Transportation Technology
2985 Scott Street
Vista, CA 92081
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866.SAF.TRAN (866.723.8726) | sectrans@saic.com
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Terminal Operating Systems (TOS)

NAVIS
1000 Broadway, Suite 150
Oakland, CA 94607-4090
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+1-510- 763-5715
www.navis.com

Tideworks Technology
Sales
206.654.3640 phone
206.382.0443 fax
Contact for Sales
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1131 SW Klickitat Way, Bldg E
Seattle, Washington 98134
USA

Mailing Address
PO Box 24205
Seattle, Washington 98124
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Tideworks Technology — Central/South America
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Ave. Ricardo J. Alfaro y Calle 10, El Paical
Panama City
Republic of Panama
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Information Technology (IT)

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Http://www.hp.com

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http://www.ibm.com/us/en/
http://www.ibm.com/co/es/

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Tel 01 8000 917 555 (CO Nacional)

Dell Inc.
One Dell Way
Round Rock, Texas 78682
United States
http://www.dell.com
1-512- 338-4400

Dell Colombia

Tel 01-800-091-9903

Telecommunications

Motorola Mobility, Inc.
600 North U.S. Highway 45
Libertyville, Illinois 60048
USA
Tel: +1 847 523 5000
http://www.motorola.com/us
http://www.motorola.com/staticfiles/Consumers/CLP/CO-ES/index_CO-ES.html
http://www.motorola.com/Consumers/XA-ES/Home

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Schaumburg, Illinois 60196
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Tel: +1 847 576 5000
www.motorolasolutions.com/
http://www.motorolasolutions.com/XL-ES/Home

Computer Monitoring Security System and Security Systems Integration

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6363 S Fiddler's Green Circle, Suite 1400
Greenwood Village, Colorado 80111 USA
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Fax: +1 (303) 220-7100

Diebold, Incorporated
5995 Mayfair Road
P.O. Box 3077
North Canton, Ohio 44720-8077
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www.johnsoncontrols.com
http://www.johnsoncontrols.com/publish/us/en/products/building_efficiency/security-solutions/global-security.html

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Dick Beard
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Diego Cota, +1 (585) 281-4954, diego@lenel.com

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Pre-Sales Support:

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301 Rt 17 North 10th Floor

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nice.sales@nice.com
http://www.nice.com
http://www.nice.com/situation-management/nice-situator

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Northrop Grumman

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http://www.northropgrumman.com/
http://www.is.northropgrumman.com/by_solution/homeland_security

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Cell +1- (817) 798-7862
http://www.buildingtechnologies.siemens.com

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8219 Leesburg Pike
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Vienna, VA 22182
USA
703.883.3730
703.883.3731 fax

POC Russ Blazer
Manager, Southeast Region
VidSys, Inc
410.713.6065 cell
e-mail rblazer@vidsys.com

http://www.vidsys.com/

Video matrix displays

Planar Systems, Inc. Clarity Matrix
7210 Nw Evergreen Parkway
Hillsboro, OR97124-5827
USA
Lynnette Gracey
Tel +1-323.668.2880
Cell +1- 818.395.4528
e-mail lynnette.gracey@planar.com
Tel. 503-748-1100
controlroom@planar.com
http://www.planarcontrolroom.com/

Barco, Inc /Barco Federal Systems, LLC
3059 Premiere Parkway
Suite 100 (BFS) - Suite 400 (BINC)
30097 Duluth, Georgia
USA
Tel.: +1 678 475 8000
Fax: +1 678 475 8100
http://www.barco.com

Intelligent video cameras

SightLogix, Inc.
745 Alexander Road
Princeton, NJ 08540
USA
Tel +1 609.951.0008
Fax +1 609.951.0024
www.sightlogix.com

Video cameras

PELCO

Schneider Electric Clovis, California Campus

3500 Pelco Way

Clovis, California 93612-5999

USA

(800) 289-9100 USA & Canada

(800) 289-9150 USA & Canada Fax

International Tel +1 (559) 292 1981

International Fax +1 (559) 348 1120

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PELCO Colombia
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Bogotá, Colombia
Tel 57-16482596
Fax 57-16260116
e-mail bogota@pelco.com
http://www.pelco.com/

Video camera code translators

Sennetech, Inc.
6455 W. Bath Rd.
Perry, MI 48872
USA
Tel: +1(517) 675-1150
Fax: +1(517) 675-1151
e-mail: info@sennetech.net
http://www.sennetech.net/

Video analytics

iOmniscient Corporation
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Tel +1-416-778-7553
Tel +1-213-448-0992
Fax +1 416 778 8474
e-mail nigel@iomniscient.com
e-mail info@iomniscient.com
http://omniscient.com

Duos Technologies, Inc.
6622 Southpoint Drive S.,
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Jacksonville, FL 32216
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Fax: 904.296.4103

Sales -
All North American Inquiries:
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All International Inquiries:
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Fax: +1-925-398-2113
Address:
Sales: sales@vigilantvideo.com
http://www.vigilantvideo.com/

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San Jose, CA 95119
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Fax: +1-408-716-7900
e-mail: Info@Intelli-Vision.com
Sales: Sales@Intelli-Vision.com
http://www.intelli-vision.com/company/contact-us

Mango DSP
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83 East Ave.
Norwalk, CT 06851
USA
Tel: +1- (203) 857-4008
Fax: +1-(203) 857-4492
e-mail us@mangodsp.com
US Sales Office: +1-216-861-8600
US Sales Tel: +1-866-68-MANGO
http://www.mangodsp.com

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11710 Plaza America Drive
Reston, VA 20190
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Fax: +1-703-991-0552

info@mateusa.net
www.mateusa.net

Video management systems

Milestone Systems Americas
Milestone Systems Inc.
8905 SW Nimbus Avenue
Suite 400
Beaverton, OR 97008,
USA
Tel: +1 503 350 1100
Toll-free telephone: +1 877 350 1101
Fax: +1 503 350 1199
e-mail info@milestonesys.com
http://www.milestonesys.com/

Access control, credentials, identification and validation

ActivIdentity, Inc.
6623 Dumbarton Circle
Fremont, CA 94555
United States

T +1 800.529.9499 (Toll-Free)
T +1 510.574.0100 (Main)
F +1 510.574.0101
info@actividentity.comDonna Candelori
Director, Corporate Marketing
ActivIdentity
+1 510.574.1783
dcandelori@actividentity.com
www.actividentity.com

Access control

Digital Horizon Solutions
5750 Genesis Ct.
Suite 230
Frisco, TX 75034
USA
Toll Free: +1 888 592 1670
Tel:+1 469 916 1670
e-mail: info@1dhs.com

International Sales
Dennis Geiszler
Vice President of Business Development
Tel +1 408.435.8400
http://www.1dhs.com

Access control and video management systems

Keri Systems, Inc.
2305 Bering Drive
San Jose, CA 95131
USA
Tel: +1-800-260-5265
Tel +1-408-435-8400
Fax: 408-577-1792
Sales Office Mexico, Central and South America and Caribbean
Menhir 642-1
Altamira
Zapopan, 45160, Jalisco
México

Tel: +52 333 826 9113
Tel/Fax: +52 333 834 8266
USA Tel: +1 786-331-8775
Email: kerilasales@kerisys.com
Alejandro Loera Harfush - Gerente de Ventas, Latinoamérica
Mobile: +52 1 333 166 2553
Email: aloera@kerisys.com
http://www.kerisys.com/

Access Control Systems

Honeywell Security Group
Mario Amargo
Bogotá, Colombia
Tel. 571-617-0470
e-mail Honeywell.mc@gmail.com
http://www.security.honeywell.com/

Ingersoll Rand Security Technologies
11819 North Pennsylvania Street
Carmel, IN 46032
Tel: 317-810-3700
Fax: 317-810-3989

South America

Calle Nueva 1820 Huechuraba,
Santiago
Chile
Tel: + 56-2-498-0100
W3.securitytechnologies.com

Consoles and Enclosures

Emcor Enclosures

Crenlo

1600 4th Avenue N.W.

Rochester, MN 55901

507-287-3535 (phone)

507-287-3405 (fax)

http://www.crenlo.com/enclosures/

Wright Line

Eaton 160 Gold Star Blvd.

Worcester, MA 01606

Tel: 508-852-4300

Toll Free: 800-225-7348

Fax: 508-853-8904

E-mail InfoESWorcesterMA@Eaton.com
Latin America, Central/South America & The Caribbean

Carla Hauschildt

Eaton

HC20 Box 10723

Juncos, PR 00777

Tel: (787)547-2627

Fax: (508)365-6042

E-mail carlahauschildt@eaton.com

http://www.wrightline.com/consoles-data-center-furniture.html

Scanners

American Science and Engineering, Inc.

829 Middlesex Turnpike

Billerica, MA 01821 USA

Tel: +1-978-262-8700

Toll-free: (800) 225-1608

Fax: 978-262-8804
John Hooper
Cell +1- 978 761 6267.

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http://www.as-e.com/

L-3 Communications Security & Detection Systems, Inc.
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VACIS nonintrusive inspection systems, OCR and AGS
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NJ 07960
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Fax: +1-973 496 9300
E-mail USA.info@smithsdetection.com
http://www.smithsdetection.com

Smiths Detection, Alcoa
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Tel: +1-865-738-1010
Fax: +1-865-984-0607

http://www.smithsdetection.com/Alcoa.php

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Edificio Business Center 93
Bogotá, D.C., Colombia

Aaron Rabinovich
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Vapor trace and ion detectors

Morpho Detection
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Newark, CA 94560
Tel : +1 510 739 2400
Fax : +1 510 739 6400
Email : info@morphodetection.com
http://www.morpho.com/detection

Control Screening
2 Gardner Road
Fairfield, New Jersey, USA
07004
Phone: 973-276-6000 x284 OR
1-800-231-6414 x284
Fax: 973-276-6166

email: leads@controlscreening.com
www.controlscreening.com

Smiths Detection Inc.
60A Columbia Rd
Morristown
NJ 07960
USA
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Fax: +1-973 496 9300
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Nelson Rozo Interseg Sales Manager
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8.2.2 Cost Estimates for Components

Component	*Sub-total*	*Total (US$)*
Control Center Equipment		**$547,950**
VTS Server		
HarborGuard VTS Server Hardware/Software	$64,400	
HarborGuard IT Security Center Server Hardware/Software	$143,900	
Video Manager Server Hardware/Software	$11,800	
UPS Power Conditioning	$4,500	
Network Appliances	$2,100	
19-inch Rack, integration, accessories	$1,500	
Operator Console		
Emcor Console	$11,900	
Supervisor Workstation HarborGuard VTS Client Hardware/Software	$19,500	
Supervisor Workstation HarborGuard IP Security Center Client Hardware/Software	$6,900	
Operator Position-1 Workstation HarborGuard VTS Client Hardware/Software	$19,500	
Operator Position-1 Workstation Video Manager Client Hardware/Software	$5,200	
Operator Position-2 Workstation HarborGuard VTS Client Hardware/Software	$19,500	
Operator Position-2 Workstation Video Manager Client Hardware/Software	$5,200	
High Resolution VTS Radar		
Series 1000 18X VTS Radar	$85,500	
RadarPro Advanced Radar Processor	$68,400	
19-inch Rack, integration, accessories	$2,100	
Thermal IR Multi-sensor Camera		
FLIR PT-CNV-304 PTZ Multi-sensor Camera	$51,900	
Sensor Interface Box	$3,150	
VHF/DSC Communications	$21,000	
Punta Soldado Radar Equipment		**$318,250**
High Resolution VTS Radar		
Series 1000 18X VTS Radar	$85,500	
RadarPro Advanced Radar Processor	$68,400	

19-inch Rack, integration, accessories	$2,100	
Small Target Detection Radar		
Series 1000 9X Small Target Detection Radar	$38,800	
RadarPro Plus Advanced Radar Processor	$68,400	
Thermal IR Multi-sensor Camera		
FLIR PT-CNV-304 PTZ Multi-sensor Camera	$51,900	
Sensor Interface Box	$3,150	
Coast Guard Island Equipment		**$195,800**
Small Target Detection Radar		
Series 1000 9X Small Target Detection Radar	$38,800	
RadarPro Plus Advanced Radar Processor	$68,400	
Thermal IR Multi-sensor Camera		
FLIR PT-CNV-304 PTZ Multi-sensor Camera	$51,900	
Sensor Interface Box	$3,150	
Radar Tower, 60-ft	$21,250	
Emergency Back-up Power System	$12,300	
Point-to-Point High Speed Wireless Network Link Equipment		**$55,506**
Command Center to Punta Soldado Link	$30,190	
Command Center to Coast Guard Island Link	$25,316	
Subtotal Equipment		**$1,117,506**
General and administrative costs, integration, program management, installation and spares		**$1,382,494**
TOTAL		**$2,500,000**

Table 8-2 Capital Cost Estimates for VTS Equipment

	Subtotal	*Total*
Marine Traffic Control Station		
AIS Base Station	25,000	
Antenna Equipment	US$3200	US$28,200
Coast Guard Station		
AIS Receiver	5,000	
Antenna Equipment	2,400	7,400
Punta Soldado Site		
AIS Repeater	5,000	
Antenna Equipment	2,600	7,600
Spare Equipment	22,000	22,000
AIS web software	240,000	240,000
Shipping	5,000	5000
Installation		
Antenna Contractor	7,200	
Network Contractor	9,800	17,000
Training		
AIS Hardware	15,000	
AIS Software	13,600	28,600
Grand Total		**US$ 355,800**

Table 8-3 Capital Cost Estimates for AIS Option 2

QTY	Description	Unit Cost	Total Amount
Hardware/Software Systems			
12	Gate Portal OCR System for container, LPR	$ 125,000	$ 1,500,000
15	Driver Communication Kiosk System	$ 25,300	$ 379,500
5	License plate recognition stations(kiosk)	$ 13,730	$ 68,650
		Sub Total System	**$ 1,948,150**
Associated Services			
1	System prep, install & commissioning	$ 228,600	$ 228,600
1	Site Preparation, civil works, cabling	N/A	N/A
1	Data Integration with COSMOS or equivalent TOS	$ 22,110	$ 22,110
1	Travel and per diem	$ 42,000	$ 42,000
1	Project management, personnel training	$ 88,600	$ 88,600
		Sub Total Services	**$ 381,310**
		Grand Total	**$ 2,329,460**

Table 8-4 – Rough Order of Magnitude (ROM) Automated Gate System (AGS) pricing for SPRBun

Component	Sub-total	Total (US$)
PSIM H/W and S/W		
Server S/W		
Surveillint Server Software	$15,000	
Surveillint Backup Server S/W	$7,500	
Dell PowerEdge 410 Server (x2)	$4,000	
Client S/W		
Surveillint Client (5-Pack)	$13,125	
ADV Ops Surveillint Client (per seat)	$5,000	
Administrator Client License	$7,500	
Sensor Based Integration Models		
Physical Access Control System	$20,000	
Video Management System	$35,000	
EZ-Track Video Pursuit S/W	$10,000	
Sensor Pack 2000 (Up to 2000 Sensors)	$122,500	
Perimeter Intrusion Detection Module	$37,500	
Labor/Travel ODC's		
Engineering Services	$60,000	
Configuration/Installation	$135,975	
Training	$63,455	**$536,555**
SOC Video Wall		
Clarity Matrix MX46LVideo Wall 3x8 Config (24 Units)	$165,000	
Clarity Matrix Cable Sets (24 Units)	$6,000	
Clarity Matrix Floor Stands	$10,000	
Labor/Travel ODC's		
Engineering Services	$6,600	
Configuration/Installation	$9,065	
Training	$5,439	
Electrical Wiring Services (Labor and Materials)	$1,500	**$202,104**
SOC Operator Workstations		
Operator Workstation PC (5 Units)	$10,000	
Supervisor Workstation PC (1 Units)	$2,000	
National Police Workstation PC (1 Unit)	$1,500	
Administrator Workstation PC (1 Units)	$2,000	
Labor/Travel ODC's		
Configuration/Installation	$5,439	**$20,939**
Computer Monitoring Security System (Security)	**TOTAL**	**$738,659**

Table 8-5 Estimated Costs for Computer Monitoring Security System

Component	Sub-total	Total (US$)
Ancillary Security Systems		
Point-to-Point High Speed Wireless Network Link Equipment		
SOC to Coast Guard Island Link	$25,316	
Coast Guard Island Thermal IR CCTV Camera System		
SightSensor Thermal (LWIR Range 650m) (2 Units)	$87,990	
SightSensor Thermal (LWIR Range 250m) (2 Units)	$57,190	
Equipment Cabinet w/Switch/UPS	$1,500	
Port Property Thermal IR CCTV Camera System		
SightSensor Thermal (LWIR Range 650m) (2 Units)	$87,990	
SightSensor Thermal (LWIR Range 250m) (2 Units)	$57,190	
Cables for Cameras Installed (Power and Ethernet) (8 Units)	$12,000	
SightMonitor S/W - GPS Target mapping and configuration.	$2,750	
Geo-Reflected Aerial Photo Map	$880	
New PTZ Camera for Coffee Warehouse/Post Office Coverage		
Pelco Spectra IV PTZ Day/Night Camera	$1,600	
Labor/Travel ODC's		
Engineering Services	$21,880	
Configuration/Installation	$12,691	
Training	$3,626	
Electrical Wiring Services (Labor and Materials)	$4,800	
Ancillary Security Systems	**TOTAL**	**$377,403**

Table 8-6 Estimated costs for Ancillary Security Upgrade

Component	Sub-total	Total (US$)
SOC Operator Console Upgrade		
Wright-Line 84" Profile Series Console (2 Units)	$5,900	
Wright-Line 60" Profile Series Console (1 Unit)	$2,850	
Wright-Line 48" Profile Series Console (2 Units)	$3,925	
Labor/Travel ODC's		
Engineering Services	$1,200	
Configuration/Installation/Demolition	$5,439	
Electrical Wiring Services (Labor and Materials)	$1,200	
SOC Operator Console Upgrade	**TOTAL**	**$20,514**

Table 8-7 Estimated Costs for Operator Console Upgrades

Component	Sub-total	Total (US$)
CCTV Headend Upgrade		
Pelco DSR324000 4TB 32 Channel Video Recorder (24 Units)	$384,000	
Pelco Keyboard Controller	$19,200	
Sennetech SCT-1069 Code Translator (16 Units/4 PTZ each)	$41,280	
Dell Server (x2)	$4,000	
Equipment Cabinet - APC 3150 w/Dual PDU, KVM/Mon/Kybd (6 Units)	$24,000	
UPS for New Headend Equipment Only - 15 Min Backup	$8,000	
Labor/Travel ODC's		
Engineering Services	$40,000	
Configuration/Installation	$81,585	
Training	$12,691	
Electrical Wiring Services (Labor and Materials)	$6,000	
CCTV Headend Upgrade	**TOTAL**	**$620,756**

Table 8-8 Estimated Costs for CCTV Headend Upgrade

Cost estimate summary				
				USD
VTS and AIS				$2,855,800
OCR				2,329,460
CMS and CCTV				1,778,271
Total				$ 6,963,531

Table 8-9 Cost Estimate Summary

8.3 Final presentation

The final presentation was conducted on February 1, 2012 at the offices of Sociedad Portuaria Regional de Buenaventura, S.A., by Larry Boorstein, Project Manager, together with Fernando Buitrago, Ports and Logistics. The following officials attended the final presentation:

Company	Name	Title
Sociedad Portuaria Regional de Buenaventura, S.A. (SPRBUN) (Port of Buenaventura)	Ing. Domingo Chinea Barrera	General Manager
	My(r) Gilberto Ocampo	Director of Security
	Norberto Castañeda	Port Facilities Protection Officer (OPIP)
	Alexander Micolta S.	Assistant to General Manager
	Jorge A. Gallegos C.	Commercial Manager and SAC
	Tomás F. Quiñones	Deputy Manager of Operations
	Edison Diaz García	Manager of Operations
	Ana Mercedes Cano Rostupo	Management Committee
	Lewis Guette S.	Manager Information Technology
	Alejandro J. Echeverry	Director of Planning
	Sergio H. Velásquez R.	Manager of Engineering
Terminal Especializada de Contenedores de Buenaventura, S.A. (TECSA) (Specialized Container Terminal of Buenaventura)	Héctor Medina C.	General Manager of TECSA

Dirección de Impuestos y Aduanas Nacionales (DIAN) (Directorate of National Taxes and Customs)	Dra. María Constanza Dussán B.	Division Chief Operations Management, DIAN
Instituto de Vigilancia de Medicamentos y Alimentos (INVIMA) (Institute for Surveillance of Medications and Foods)	Alba Liliana Bocanegra H.	Administrative Technician
Instituto Colombiano Agropecuario (ICA) (Colombian Agricultural Institute)	Sigifredo Salgado G.	Chief of Office
Dirección General Marítima (DIMAR) (General Maritime Directorate)	CF Juan Carlos Roa C.	Captain of the Port Buenaventura
Guardacostas Buenaventura (Coast Guard)	Pablo A. Perafan	Commander, Coast Guard Station
Armada (Colombian Navy)	Tk. María Antonia Garcés T.	Chief of Operations Department GAPO
Batallón de Fluvial de Infantería de Marina Nº 80 (BAFLIM80) (Marine Infantry River Battalion 80)	Alberto García D.	Commander, BAFLIM80 (marine infantry battalion)

Señalización Marítima Pacífico (Pacific Marine Signalization)	Germán A. Rojas Hernández	Chief of Marine Signalization
Policía Nacional Aninarcóticos (National Anti-Narcotics Police)	Cte. Alexander Pulido Guzmán	Company Commander
Policía Nacional Antinarcóticos (National Anti-Narcotics Police)	TE Jeison Andrea Varga Acevedo	Chief of the Analysis Room
AECOM	Larry Boorstein	Project Manager
Ports and Logistics	Fernando Buitrago	Advisor, Ports and Logistics

The AECOM team presented the study findings, conclusions and recommendations for the Vessel Traffic System (VTS) and Automated Identification System (AIS), Optical Character Recognition (OCR), Computer Monitoring Security (CMS) system, Cargo Inspection and Scanners, Economic and Environmental Impacts.

Frigate Captain Juan Carlos Roa of DIMAR informed the group that the Ministry of Defense is implementing Vessel Traffic Systems (VTS) in the Caribbean and Pacific regions of Colombia. The systems will also include Global Maritime Distress Signaling System (GMDSS). The General Maritime Directorate (DIMAR) expects to complete the structure of the marine traffic control tower at Buenaventura in one and a half months. Furniture and cabling will be completed in 2 or 3 months, around April or May 2012. The tower has been delayed but is expected to be completed in 12 months, in the coming year.

We provide and facilitate port and logistics services with quality, safety and effectiveness by meeting customer needs, with technology and competent human talent generating returns for shareholders and contributing to sustainable development of Buenaventura.

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The U.S. Trade and Development Agency helps companies create U.S. jobs through the export of U.S. goods and services for priority development projects in emerging economies. USTDA links U.S. businesses to export opportunities by funding project planning activities, pilot projects, and reverse trade missions while creating sustainable infrastructure and economic growth in partner countries.

The professionals of AECOM around the world are united by a common purpose – to create, improve and sustain the built, natural and social environments of the world.