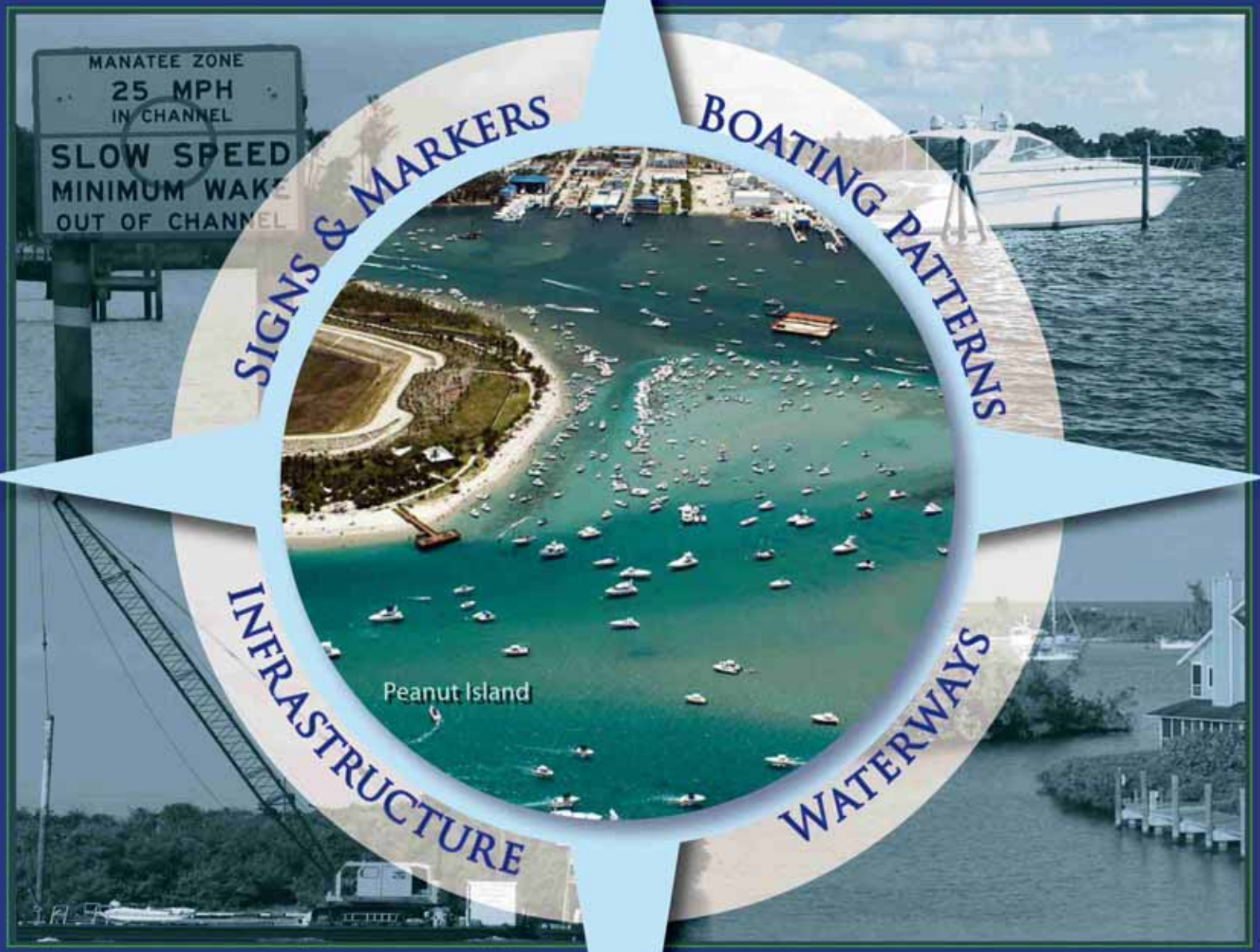
Palm Beach County Vessel Traffic Study



Palm Beach County Vessel Traffic Study

Prepared for:

Florida Fish and Wildlife
Conservation Commission
Division of Law Enforcement, Boating and Waterways Section

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Acknowledgements

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Table of Contents

List of Figures

List of Tables

Abbreviations, Acronyms and Definitions

ArcMap is a component of ESRI's ArcGIS Geographic Information System (GIS) software suite. It is developed as client software specifically for the Microsoft Windows environment, to enable processing and presentation of geospatial data.

Beaufort Scale (an empirical measure for describing wind velocity mainly on observed sea conditions).

Boating and Waterway Management Program (BWMP)

Coast Guard Boating Accident Report Database (BARD)

Decision Support System (DSS)

Department of Highway Safety and Motor Vehicles (DHSMV)

Digital Orthophoto Quarter Quadrangles (DOQQ)

Digital Video Disc (DVD)

Environmental Systems Research Institute (ESRI)

Fish and Wildlife Research Institute (FWRI)

Florida Administrative Code (FAC)

Florida Department of Highway Safety and Motor Vehicles (DHSMV)

Florida Fish and Wildlife Conservation Commission (FWC)

Florida Inland Navigation District (FIND)

Florida Sea Grant (FSG)

Florida Statute (FS)

Geographic Information System (GIS)

Global Positioning System (GPS)

Idle Speed, No Wake (ISNW)

Intracoastal Waterway (ICW)

Land Boundary Information System (LABINS)

Level of Service (LOS)

Maritime Property (a vessel and/or its contents)

Mean Low Water Level (MLW)

National Geodetic Vertical Datum of 1929 (NGVD29)

National Waterway Network (NWN)

Numeric Speed Limit (NSL)

Ports and Waterways Safety Assessment (PAWSA)

Post, Buckley, Schuh & Jernigan (PBS&J)

Quality Control (QC)

Slow Speed, Minimum Wake (SSMW)

United States Army Corps of Engineers (USACE)

United States Coast Guard (USCG)

Vector files (points, lines, curves, and polygons used to represent features in computer graphics).

Executive Summary

The Florida Fish and Wildlife Conservation Commission (FWC), has the authority to establish by rule, pursuant to chapter 120, restricted areas on the waters of the State for any purpose deemed necessary for the safety of the public, including, but not limited to, vessel speeds and vessel traffic, where such restrictions are deemed necessary based on boating accidents, visibility, hazardous currents or water levels, vessel traffic congestion, or other navigational hazards. Along with this authority comes the responsibility of ensuring that the Intracoastal Waterway (ICW) is not being unnecessarily burdened by the regulation of both recreational and commercial vessels along this maritime highway. (Laws of Florida 1972, Chapter 55).

The FWC is sensitive to those who own property adjacent to the ICW. However, the law only allows for the FWC to regulate for boating safety purposes, not for property protection. With this authority also comes the responsibility to ensure that any regulation of the State waterways is done based solely on those criteria stipulated in section (FAC) 68D-23.105, Florida Administrative Code entitled *Criteria for Approval of Regulatory Markers*.

The Division of Law Enforcement, Boating and Waterways Section, identified the need for a data-driven approach to evaluate requests and applications for the establishment of boating safety speed zones in the ICW. FWC tasked Post, Buckley, Schuh & Jernigan (PBS&J), to oversee the project, who in turn, partnered with the University of Florida Sea Grant College Program (FSG). FSG has developed a prototype Decision Support System (DSS) model to aid FWC in evaluating risk for given safety situations and relevant waterway characteristics.

The Geographic Information System-based procedure implemented in this study is intended to assist FWC in the evaluation of inquiries regarding boating safety criteria, boating safety risk and local government applications for vessel traffic and/or public safety management zones. A critical requirement of the procedure is

that evaluation and decision-making be defensible and based on measurable criteria.

The DSS prototype model was successfully applied on Florida's waterways and considers the physical conditions and boating characteristics of the Palm Beach County Intracoastal Waterway (ICW) for this Study. The approach described in this report utilizes decision criteria stipulated in sec. 68D-23.105, FAC within a geographic information system (GIS) DSS to evaluate boating safety risk. The DSS developed for this study: (1) provides a framework for the integration of spatially referenced risk criteria, (2) facilitates the evaluation of risk criteria relevant to an application for new boating safety zones, (3) enables consideration of the suitability of existing safety zones, and (4) provides spatial information to use as a tool to allocate law enforcement resources. The spatial component of the DSS makes explicit the characteristics of the natural and man-made waterway environment, as well as the distribution of boating use that can influence risk to vessel collision, boating safety and maritime property.

1. Introduction

Background

Determining the need for boating safety zones is an important element of the FWC Division of Law Enforcement's mission: "…providing boating safety enforcement and education to the boating public and related industry; providing public safety for citizens on the lands and waters of the state; coordinating with local, state and federal entities on enforcement issues and development of regulations…" (FWC Programs, 2006, p 23). Section 68D-23.105 FAC, "Criteria for Approval of Regulatory Markers," outlines the stipulations for imposing boating safety zones. In keeping with this regulation, the FWC Division of Law Enforcement, Boating and Waterways Section, identified a need to standardize its procedure for determination of levels of risk to boating safety in the Intracoastal Waterway (ICW). This procedure addresses aspects such as the evaluation of inquiries regarding boating safety criteria, boating safety risk and local government applications for vessel traffic and/or public safety management zones.

The DSS model was initially developed as part of the Martin County Vessel Traffic Study and is being applied and evaluated in this Palm Beach County Vessel Traffic Study. The intent is to standardize and employ a data-driven approach to assess risks associated with the County waterway boating safety situations. The DSS model described in this report utilizes the decision criteria stipulated in section 68D-23.105 FAC (Rule), within a geographic information system (GIS) to identify actual and perceived boating safety risks. The present vessel traffic study provides a model DSS that relies on an inventory of relevant waterway features and pre-existing waterway conditions, and assessess features and conditions pertinent to the following three boating safety situations identified in the Rule:

1. Vessel collision risk
2. Public safety risk

3. Maritime property endangerment

Study Goal and Objectives

The study goal is to calibrate and apply this data-driven, standardized approach to assess factors affecting risk to vessel collision, public safety, and maritime property using best available data in accordance with the requirements and specifications of the Rule. The model design is based on a statewide framework, which allows the model to be transferable to all Florida waterways under FWC recreational boating jurisdiction. The following seven supporting objectives were pursued in order to apply the model to conditions on the Palm Beach County waterways:

1. Consult with FWC Law Enforcement and officials with knowledge of the local boating environment to identify relevant risk issues and problems.
2. Evaluate section 68D-23.105 FAC to determine safety situations, risk criteria, risk levels, and safety zone options.
3. Inventory, compile, and map relevant waterway features (risk criteria) that include the following: physical characteristics, existing infrastructure, signs and other management zones, accidents and citations, and vessel traffic density within a GIS.
4. Develop a survey instrument to rate relevant risk criteria associated with boating safety situations.
5. Relate spatially explicit, weighted risk criteria scores to Intracoastal Waterway (ICW) segments within Palm Beach County, Florida.
6. Determine boating safety risk level options for ICW segments derived from the spatial evaluation of weighted risk criteria scores.
7. Summarize public feedback and consensus regarding boating safety risk recommendations.
8. Offer recommendations for enhancing the GIS-based risk evaluation method and revisions to the Rule.

Palm Beach County Waterway

The Palm Beach County section of the ICW extends from the south Martin County Line approximately one mile north of the Jupiter Inlet to the Broward County line, near the Boca Raton Inlet, a distance of approximately 47 statutory miles (see Palm Beach County Study Area, Figure 1-1). This section of the waterway is an integral link in the ICW that extends 1,391-miles between Trenton, New Jersey and Miami, Florida. Within Florida, the waterway follows natural coastal rivers, lagoons and lakes that are linked by periodic land cut channels to provide a continuous protected navigational route along the Florida East Coast. While there are variations in the channel design and conditions along the Palm Beach County's section of the ICW, in general the channel is maintained at a minimum of 125 feet channel width at the bottom with a navigational depth of 10 feet mean low water level (MLW). At turns and intersections the waterway is wider to accommodate barges and larger vessels.

This Vessel Traffic Study centers on the ICW and the regulatory controls that promote public boating safety. However, there are notable areas adjacent to the Palm Beach waterways that promote and encourage public boating activities along the ICW. These include the four inlets connecting the waterway to the Atlantic Ocean, the Loxahatchee River, and the Lake Worth Lagoon. The ICW and these physical waterway features provide a variety of recreational boating opportunities for regional and transient boaters.

The four inlets along the Palm Beach County waterway include the Jupiter Inlet to the north, Lake Worth Inlet near downtown West Palm Beach, the Boynton or South Lake Worth Inlet, and the Boca Raton Inlet to the south.

Another recreational boating amenity is the Loxahatchee River, whose lower reaches include the northern segment of the Palm Beach County ICW near the City of Jupiter. The north fork of the River extends northwest from the ICW into northern Palm Beach County and southeast Martin County.

Compliments Figure 1-1.Palm Beach County Study Area

Location	Statute Mile*
Jupiter Inlet	1005
Lake Worth Inlet	1018
Boynton Inlet	1033
Boca Raton Inlet	1048

*** Approximate Intracoastal Waterway Statute Mile South From Norfolk**

Figure 1-1. Palm Beach County Study Area

The Florida Inland Navigational District (FIND) serves as local sponsor of the ICW in twelve (12) east coast counties, including Palm Beach. The FIND coordinates channel maintenance activities on the ICW with the Army Corps of Engineers (USACE), State of Florida and local governments. In this role, FIND provides all lands required for the projects and funds to maintain the navigable channel and improve boating access to the waterway. The Florida Fish and Wildlife Conservation Commission, Division of Law Enforcement, Boating and Waterways Section, coordinates with the United States Coast Guard (USCG) regarding the regulation of the waterway, enforcement of boating and public safety and the placement of navigational and regulatory markers.

Palm Beach County Boat Registration and Population Trends

The Intracoastal Waterway is a significant and active recreational waterway providing transit navigational routes north/south along the Florida Coast.

While this waterway is an important route for transient boaters; the majority of boats using the waterways are registered in Palm Beach and adjoining counties. Table 1-1, Historic Annual Vessel Registration Data, documents the annual number of registered boats in Palm Beach County for the period between 2000 and 2007. As of 2007 there were 44,416 registered boats in the County. The County has experienced a 10 percent increase of 4,307 registered boats over the 40,109 boats registered in 2000. This seven-year increase in the number of registered boats can largely be attributed to the population growth in the County and the new residents participating in boating activities in the coastal waters of the ICW. The 2006 population of Palm Beach County, based on the census data on fedstats.gov[1], is 1,274,013 residents. The ratio of boat ownership to this 2006 population indicates that there are approximately 3.49 boats for every 100 people residing in Palm Beach

[1] http://www.fedstats.gov/qf/states/12/12099.html (accessed February 18, 2008).

County. This number increases to 3.92 boats for every 100 people in Palm Beach County with forecasts to 2020.

Table 1-1. Historic Annual Registration Data

	CLASS A-1		CLASS A-2		CLASS 1		CLASS 2		CLASS 3		CLASS 4		CLASS 5		CANOES		GRAND
	Less than 12'		12' - 15'11"		16' - 25'11"		26' - 39'11"		40' - 64'11"		65' - 109'11"		110' or more				TOTAL
Year	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	
2007	8,550	67	5,535	154	21,374	507	6,054	229	1,068	84	111	16	12	0	264	2	44,416
2006	8,604	72	5,761	160	21,674	501	6,015	220	1,092	86	101	16	10	0	247	2	44,964
2005	8,752	76	6,009	169	21,660	514	5,962	213	1,128	80	102	15	5	0	245	2	45,350
2004	8,616	69	6,199	168	21,178	510	5,655	208	1,113	87	93	12	6	1	235	3	44,560
2003	8,604	82	6,478	174	20,925	497	5,418	207	1,114	93	91	17	6	1	242	4	44,391
2002	8,360	88	6,648	180	20,461	520	5,200	201	1,077	87	87	15	5	1	221	4	43,632
2001	8,242	63	6,674	182	19,661	521	4,832	196	1,022	91	80	16	5	1	184	1	42,292
2000	7,739	47	6,393	169	18,761	489	4,592	198	994	145	73	17	1	1	1	0	40,109
2020	10,137	97	3,704	120	27,038	512	9,134	282	1,276	0	174	13	26	-2	641	5	53,306

Source: Florida Department of Highway Safety and Motor Vehicle and PBS&J Vessel Development Model

Palm Beach County public marina facilities currently accommodate 5,590 stored boats (see Table 2-2 Palm Beach County Marinas) in wet slips and dry storage facilities. With approximately 54 percent (3,021) being dry storage, and 46 percent (2,614) being wet storage/slips. Using 2007 data, approximately 12.6 percent of the 44,416 registered vessels can be accommodated in the county's marinas facilities with approximately 5.9 percent in wet slips and 6.8 percent dry storage facilities. The limited number of public wet and dry slips means that 87.3 percent of the boaters in Palm Beach County are dependent on either private marinas, residential slips and/or are trailered boats that are dependent on boat ramps for access to the waterways.

Figures 1-2, 1-3 and 1-4 note the locations of Palm Beach County public marinas, fuel docks and boat ramps. Table 2-1 provides an inventory of the public boat ramps and Table 2-2 provides an inventory of these marinas and their respective facilities.

Compliments Figure 1-2.Palm Beach County Public Marinas

Location	Statute Mile*
JIB Yacht Club & Marina	1004.1
Jupiter Seasport Marina	1004.7
Jonathan's Landing Marina	1007.3
Loggerhead - Palm Beach Gardens	1009.4
PGA Marina	1012.6
North Palm Beach Marina	1013.8
Old Port Cove Marina	1014.2
Lake Park Harbor Marina	1016.6
Loggerhead - Riviera Beach	1017.2
Cannonsport Marina	1017.6
New Port Cove Marine Center	1017.6
Sailfish Marina & Resort	1017.7
Riviera Beach Municipal Marina	1018.0
Palm Beach Town Docks	1022.7
Loggerhead - Lantana	1030.5
Loggerhead - South Lantana	1030.5
Palm Beach Yacht Center	1032.7
Two Georges Marina	1035.0
Marina Delray	1038.7
Delray Harbor Club Marina	1041.5

*** Approximate Intracoastal Waterway Statute Mile South From Norfolk**

Figure 1-2. Palm Beach County Public Marinas

Figure 1-3. Palm Beach County Public Fuel Docks

Compliments Figure 1-3.Palm Beach County Public Fuel Docks

Location	Statute Mile*
JIB Yacht Club & Marina	1004.1
Jupiter Seasport Marina	1004.7
Jonathan's Landing Marina	1007.3
Loggerhead - Palm Beach Gardens	1009.4
PGA Marina	1012.6
North Palm Beach Marina	1013.8
Old Port Cove Marina	1014.2
Lake Park Harbor Marina	1016.6
Loggerhead - Riviera Beach	1017.2
Cannonsport Marina	1017.6
New Port Cove Marine Center	1017.6
Sailfish Marina & Resort	1017.7
Riviera Beach Municipal Marina	1018.0
Loggerhead - Lantana	1030.5
Palm Beach Yacht Center	1032.7
Two Georges Marina	1035.0
Marina Delray	1038.7
Delray Harbor Club Marina	1041.5

*** Approximate Intracoastal Waterway Statute Mile South From Norfolk**

Figure 1-4. Palm Beach County Public Boat Ramps

Compliments Figure 1-4. Palm Beach County Public Boat Ramps

Location	Statute Mile*
Burt Reynolds Park (East) (Ramp)	1005.7
Burt Reynolds Park (West) (Ramp)	1005.7
Bert Winters Park Ramp	1009.9
Juno Park Ramp	1012.0
Lake Park Marina Ramp	1016.6
Phil Foster Park Ramp	1017.2
Currie Park Ramp	1020.6
Bryant Park Boat Ramp	1028.9
Sportsman's Park Boat Ramp	1031.0
Boat Club Park Ramp	1033.6
Knowles Park Ramp	1040.6
Silver Palm Park Boat Ramp	1047.4

*** Approximate Intracoastal Waterway Statute Mile South From Norfolk**

Boating Trend Forecast

County population growth is an important factor in forecasting the future number of registered boats in the county and boaters utilizing Palm Beach County waterways. Forecasting the future number of boats within the county in 2020 (Table 1-2) is possible using population projections and trends in boat ownership shown in Table 1-1.

Table 1-2. Forecasted 2020 Vessel Registration Data

	CLASS A-1		CLASS A-2		CLASS 1		CLASS 2		CLASS 3		CLASS 4		CLASS 5		GRAND
	Less than 12'		12' - 15'11"		16' - 25'11"		26' - 39'11"		40' - 64'11"		65' - 109'11"		110' or more		TOTAL
Year	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	Pleas	Com'l	
2020	10,137	97	3,704	120	27,038	512	9,134	282	1,276	0	174	13	26	0	53,306
class size	10,234		3,824		27,550		9,416		1,276		187		26		-

Source: Florida DHSMV and PBS&J Vessel Model

The growth in boat ownership over the next 13 years will continue to increase traffic on the county's waterways, boating access facilities, and marinas. Projections from PBS&J's vessel model, calibrated by population census counts obtained at Fedstats.gov for Escambia County, forecast the county population is projected to

increase 28.7 percent to 1,639,316 residents by 2020, an increase of 365,303 new residents.

Considering the growth trends of registered boats documented over the last seven years and the projected population growth for the county, a significant growth in registered boats in Palm Beach County is forecasted through the year 2020 as noted above per class. While some annual variations in boat registration may be expected, the number of registered vessels is expected to increase by approximately 20 percent, or 8,890 additional vessels by 2020. These projections do not reflect vessels registered in other counties or transient vessels.

Several classes of boats show a notable downward trend according to the 2000 to 2007 vessel registration data provided by the Florida Department of Highway Safety and Motor Vehicles (DHSMV). These annual variations may be due to a number of environmental and socio-economic factors including: The costs associated with boat ownership, waterway congestion, boater discontent with speed zones, boating access opportunity and capacity. A further study on these and other potential limiting factors would be needed to determine the reasons for the potential decline and the impact these trends would have on Palm Beach County waterways if they were to continue or increase dramatically.

Adjacent counties can be major contributors to vessels on the waterways due to close proximity (Sidman et. al., 2007). Martin and Broward are the two counties bordering Palm Beach County to the north and south, respectively. Martin has a population of 139,393 in 2006 (per Fedstats.gov) and 16,772 registered vessels for 2007 per the DHSMV. Broward County has a population of 1,787,636 in 2006 (per FedStats.gov) and 50,823 registered vessels for 2007. Therefore, as of 2007, 112,011 boats were registered within the tri-county area of Martin, Palm Beach and Broward counties.

2. Data Collection and Inventory of Waterway Features

Data collection and inventories on the Palm Beach County waterways included four primary tasks as well as literature research and interviews with FWC Law Enforcement staff and marina operators. All available literature was reviewed for these waterway inventories; however, the primary information for this study is based on field data collected in the tasks described below. The physical inventory included a waterway reconnaissance, inventory of marinas and boat ramps within the county, quarterly aerial vessel traffic surveys, traffic video monitoring at key locations, and incorporation of a waterway inventory of FWC markers, which was conducted under a separate project.

Waterway Inspection and Reconnaissance

Four staff members of the FWC Boating and Waterway Management Program (BWMP) team participated in a reconnaissance level field inspection of the Palm Beach County section of the ICW on April 26, 2007, under the guidance of FWC Lt. Russo and Officer Garzanitti, of the FWC Palm Beach Office. This field inspection was conducted to familiarize the team with waterway conditions, areas of boating congestion and associated vessel traffic safety concern. Lt. Russo characterized the Palm Beach section of the ICW as being very active with seasonal transient and local vessels.

This waterway reconnaissance began at the FWC Jupiter Office on Marcinski Road and headed north towards the Loxahatchee River and Jupiter Inlet. The tour continued north on the ICW past the Martin County line before turning south. Officer Garzanitti pointed out areas of boating congestion along these northern sections of the waterway, including recreational boating congregation areas near Jupiter Inlet and the Jupiter bridge area (U.S. Hwy 1 and SR 811).

Donald Ross Bridge

Indiantown Bridge

The waterway follows the Loxahatchee River past the U.S. Highway 1 Bascule Bridge and then turns south onto Lake Worth Creek near the City of Jupiter and continues south for approximately 11 miles through the Creek and land cuts towards Lake Worth. Officer Garzanitti noted that the boat ramp at the Burt Reynolds Park was the closest public ramp to the Jupiter Inlet and often experienced congestion on weekends and holidays. Further south along this reach, the Bert Winters Park and Juno Park boat ramps provide public access just north of Lake Worth.

Burt Reynolds and Bert Winters Park Boat Ramps

Land uses along this section of the waterway include moderate to high-density residential land uses. A number of navigable canals extend into the residential communities to the west of the waterway along this reach. Private marinas and residential docks along these canals provide berths for recreational watercraft of all

sizes. Four public marinas were noted in passing along this section of the waterway, all of which provide dockside marine fueling facilities.

Seminole Marine

PGA Marina

Two Georges

Often these fueling areas were exposed to the waterway; raising concern for boat wakes affecting refueling and creating the potential for fuel spills.

Four bridges cross the northern portion of the waterway between the Loxahatchee River and Lake Worth. Consequently, Slow Speed, Minimum Wake regulated zones were noted at bridge approaches. These boating safety regulatory and manatee zones join at intervals along the reach and often extend the speed zones to lengthy sections of the waterway between bridges. However, other segments of the waterways have manatee zones allowing speeds of 25 miles per hour in channel between October 1 thru May 31 and 30 mph in channel for the remainder of the year.

The reconnaissance tour emerged from the northern reach of the waterway into Lake Worth approximately 12 miles south of the Palm Beach County line. Lake Worth is an open coastal lagoon that affords unrestricted boating speeds in the channel along the waterway between bridges. Officer Garzanitti noted that heavy boat traffic travel this open section of the waterways, often resulting in confused seas from numerous boat wakes and congestion. Slow speeds are required within 300 feet of the shoreline for manatee protection. There are six (6) bridges over Lake Worth, each with Slow Speed, Minimum Wake regulated zones. Five public marinas are located along the northern section of Lake Worth. Four of these are located in the vicinity of the Blue Heron Bridge. He noted that congestion was specifically pronounced around the Blue Heron Bridge and Peanut Island, and South Lake Worth (Boynton Beach) Inlet on weekends and holidays.

Lake Worth

*Photograph shows area south of Blue Heron Bridge including channel with SSMW zone.

Peanut Island

Officer Garzanitti noted that the congestion at Peanut Island had resulted in several boating accidents (five boating accidents and one citation over the 2000 to 2006 time period per database). Consequently, this area is frequently patrolled by both FWC and Palm Beach County Marine Officers. The Slow Speed, Minimum Wake zone begins north of the Blue Heron Bridge and extends south of Peanut Island where it joins with a seasonal manatee zone (ISNW between 11/15 and 3/31). These combined zones result in an approximate 2.0 mile stretch of the ICW with SSMW limits.

Marinas and Mooring Fields near the Blue Heron Bridge

Also, the Palm Beach Port is located south of the Bridge adjacent to the Lake Worth Inlet. The Palm Beach Port is an active commercial port facility accommodating general and bulk cargo and cruise ships. These large commercial ships cross the ICW south of Peanut Island between the Lake Worth Inlet and the Port berthing facilities on the mainland.

Container Vessel at Port of Palm Beach

The Lake Worth Inlet is a federally maintained channel with a 37-foot depth. Consequently, in addition to the commercial vessels, the inlet is accessible by larger recreational vessels in transit along Florida's east coast and Atlantic offshore waters. These vessels can be seen moored in season, in protected waters and slipped in the marinas around the inlet.

Large Recreational Vessel near Lake Worth Inlet

South of the Boynton Beach Inlet the waterway narrows and is crossed by eight (8) low bascule bridges, many of which are operated on timed opening intervals, causing larger vessels to congregate and wait for these scheduled bridge openings. The waterway shoreline is often a sea wall along this southern section. Land uses adjacent to the waterway are highly developed with a mix of high-rise condominiums, apartments, single-family residential and waterfront commercial activities. Many side canals off of the waterway include numerous private docks and berths for recreational boats. There are three marina facilities with fuel docks and two public boat ramps along this southern reach of the Palm Beach Waterway. With the exception of several Idle Speed, No Wake zones near bridge crossings (S.R. 804, NE 8th St., and S.R. 806), the majority of the waterway within Boynton Beach and Delray Beach areas have zones allowing 30 mph in channel between June 1 and September 30, and 25 mph in channel for the remainder of the year.

Boynton Beach Inlet

South of Lake Wyman, a Slow Speed, Minimum Wake (SSMW) only zone extends shoreline to shoreline including the waterway, all of Lake Boca Raton and Boca Raton Inlet. As with the other inlets along the Palm Beach County waterway, Lake Boca Raton attracts boaters who congregate near the inlet on weekends and holidays for recreation.

Palm Beach Inlets

While not specifically included in the regulatory evaluation of the ICW, the four inlets within Palm Beach County are a significant influence on recreational boating along the ICW and are worthy of special mention in this Study.

The northernmost Jupiter Inlet is an improved natural inlet connecting the Loxahatchee River and ICW to the Atlantic Ocean. Local boaters use this inlet extensively. However, coastal processes in the vicinity of the inlet result in shifting shoals and channel alignment and local knowledge is recommended for vessels seeking to navigate the inlet. The Jupiter Inlet District, a special taxing district, is responsible for the continued management and maintenance of the inlet and portions of the Loxahatchee River.

The Lake Worth Inlet, approximately 12 miles south of Jupiter Inlet, is a federally maintained inlet with a 37-foot deep-water channel serving the commercial Port of Palm Beach. Palm Beach Harbor is a 35 feet deep 400 X 0.8 mile long entrance channel merging with an inner channel of 33 feet deep by 300 feet wide X 0.3 mile into the 33 feet deep turning basin with a 25 feet extension on the north side. As the deepest and most regularly maintained inlet within this section of the ICW, Lake Worth serves both commercial and recreational traffic and provides navigable access to the Atlantic Ocean for vessels of all sizes. Consequently, the Lake Worth Inlet serves as a destination of larger recreational vessels that cruise the east coast of Florida and off shore Atlantic waters.

The Boynton Beach Inlet, also known as the South Lake Worth Inlet, is an improved tidal inlet connecting Lake Worth and the ICW to the Atlantic Ocean. The inlet was originally intended as a flushing channel to improve the water quality of the southern portion of Lake Worth. However, the inlet is popular with local fishermen and is navigable by smaller vessels. This narrow, shallow inlet has low bridge clearance (fixed 18 ft. vertical) and often experiences strong currents during tidal changes. In addition, recreational boats congregate around the island north of the inlet on weekends and holidays.

The Boca Raton Inlet, the southernmost within Palm Beach County, is an improved natural inlet between Lake Boca Raton, the ICW and the Atlantic Ocean. The Boca Raton Inlet is also subject to shoaling and local knowledge of potentially hazardous channel conditions is recommended.

In addition to the boating access to the Atlantic Ocean, these inlets, as noted on Figure 1-1, offer destinations for boaters who congregate along the shoreline and anchor on adjacent shoals for recreation. As noted previously, Peanut Island, located near the Lake Worth Inlet, is a prime example of the recreational boating activities around these inlets. The Island is a FIND dredge material disposal site

that has been developed as a park and environmental restoration project. Amenities include a boat basin and transient dock, bathrooms, picnic shelters, trails, a marked swimming area and scenic overlooks. The Island has become a popular destination of local boaters and is often crowded with small boats especially on weekends and holidays.

Marina, Boat Ramp, and Fuel Dock Facility Inventory

Boating and Waterway Management Program team members used the 2006 Boaters' Guide of Palm Beach County produced by the Marine Industries Association of Palm Beach County and internet research to develop a list of marine facilities located in Palm Beach County.

On December 4 – 8, 2006 the team conducted a full on-site data collection effort of boat ramps, marinas, fueling facilities, lock and bridge structures, water confluences, hazards (derelict vessels, currents, and blind corners), as well as existing boating safety and manatee zone markers. The field survey identified visible facility infrastructure and collected the Global Positioning System (GPS) coordinates of marine "launching and landing" facilities and public fuel docks[2] using a Trimble handheld GPS device and a custom-developed ArcPad application. PBS&J verified facility names by internet research and follow-up phone calls. Table 2.1 provides a list of boat ramp names, verified by Palm Beach County, collected during the data collection effort.

[2] The locations of marine launching and landing facilities and public fueling docks are identified in section 68D-23.105 FAC as important factors in assessing risk to vessel collision, public safety, and maritime property endangerment.

Table 2-1. Palm Beach County Public Boat Ramps

Facility	City	Wetslips	Trailer Parking	Statute Mile*
Burt Reynolds Park (West) Ramp	Jupiter	0	42	1005.7
Burt Reynolds Park (East) Ramp	Jupiter	0	80	1005.7
Bert Winters Park Ramp	Juno Beach	0	23	1009.9
Juno Park Ramp	Juno	0	15	1012.0
Lake Park Marina Ramp	Lake Park	103	44	1016.6
Phil Foster Park Boat Ramp	Riviera Beach	0	62	1017.2
Currie Park Ramp	West Palm Beach	0	56	1020.6
Bryant Park Boat Ramp	Lake Worth	0	42	1028.9
Sportsman's Park Boat Ramp	Lantana	0	32	1031.0
Boat Club Park Boat Ramp	Boynton Beach	0	136	1033.6
Knowles Park Ramp	Delray Beach	0	12	1040.6
Silver Palm Park Boat Ramp	Boca Raton	0	28	1047.4

*Approximate Intracoastal Waterway Statute Mile South from Norfolk

Table 2-2. Palm Beach County

Marinas

Marina	Marina Status			Fuel Dock			Capacity			Statute
	Public	Private	Condo	Yes¤	No	Protected	Dry	Wet	Total	Mile*
JIB Yacht Club & Marina	☑			4		☑	0	20	20	1004.1
Castaways Marina		☑			☑		0	15	15	1004.5
Jupiter Seasport Marina	☑			3		No	210	42	252	1004.7
Jupiter Cove Condominium Assoc.		☑	☑		☑		0	58	58	1004.9
Jupiter Yacht Club Marina		☑	☑		☑		0	79	79	1006.6
Jonathan's Landing Marina	☑		☑	2		No	376	31	407	1007.3
Admiral's Cove Marina		☑	☑	2		☑	0	70	70	1008.0
Palm Beach Gardens Yacht Haven		☑	☑		☑		0	70	70	1008.6
Loggerhead - Palm Beach Gardens	☑			3		☑	83	100	183	1009.4
Bay Colony Marina Condo		☑	☑		☑		0	19	19	1010.8
Seminole Marine Maintenance	☑			9		No	0	9	9	1012.4
E&H Boatworks Inc.	☑				☑		45	10	55	1012.4
Soverel Harbour Marina		☑	☑		☑		0	142	142	1012.5
PGA Marina	☑			3		No	462	16	478	1012.6
Harbour Point Marina	☑		☑		☑		0	50	50	1013.1
North Palm Beach Marina	☑			4		No	0	109	109	1013.8
Old Port Cove Marina	☑		☑	2		☑	0	200	200	1014.2
Lake Park Harbor Marina	☑			4		No	0	145	145	1016.6
Loggerhead - Riviera Beach	☑			3		☑	300	0	300	1017.2
Singer Island Yacht Club		☑	☑		☑		0	14	14	1017.3
Captain's Walk		☑	☑		☑		0	18	18	1017.4
New Port Cove Marine Center	☑			☑		☑	280	45	325	1017.6
Cannonsport Marina	☑		☑	4		No	0	22	22	1017.6
Viking Yachts at Florida Marine		☑			☑		10	12	22	1017.6
Sailfish Marina & Resort	☑			7+	☑	No	0	94	94	1017.7
Buccaneer Marina	☑		☑	4		☑	0	18	18	1017.7
Riviera Beach Marina	☑				☑		0	36	36	1017.7
Viking Service Center		☑			☑		8	16	24	1017.9

Marina	Marina Status			Fuel Dock			Capacity			Statute Mile*
	Public	Private	Condo	Yes¤	No	Protected	Dry	Wet	Total	
City of Riviera Beach Marina	☑			7+		No	340	150	490	1018.0
Sailfish Club of Florida		☑			☑		0	70	70	1018.8
Rybovich Marina	☑			6		☑	0	38	38	1019.8
Palm Beach Yacht Club & Marina	☑				☑		0	46	46	1021.7
Palm Harbor Marina	☑			☑		No	0	131	131	1021.9
Town of Palm Beach Docks	☑		☑		☑		0	87	87	1022.7
Murrelle Marine	☑				☑		0	36	36	1030.5
Loggerhead - South Lantana	☑		☑		☑		0	70	70	1030.5
Loggerhead - Lantana	☑			4		No	340	28	368	1030.5
Palm Beach Yacht Center	☑			☑		No	287	85	372	1032.7
Gateway Marina		☑		1		☑	225	0	225	1033.1
Ocean Inlet Marina	☑				☑		0	20	20	1033.7
Marina Village		☑	☑				0	38	38	1034.9
Two Georges Marina	☑			4		☑	0	23	23	1035.0
Pelican Cove		☑	☑		☑		0	62	62	1035.2
Marina Delray	☑			2		No	55	6	61	1038.7
Delray Beach Municipal Marina	☑				☑		0	24	24	1039.7
Yacht Club at Delray Beach	☑				☑		0	44	44	1039.7
Delray Harbor Club Marina	☑		☑	☑		☑	0	43	43	1041.5
Sea Ranch Club of Boca		☑	☑		☑		0	82	82	1044.7
Boca Raton Yacht Club		☑	☑		☑		0	50	50	1044.8
San Remo Marina		☑	☑		☑		0	21	21	1045.5
Totals							1247	1154	2401	

Marina details as reported by each marina. Many marinas reported "public" if transient slips are available. This report does not consider these marinas as "public" marinas; the following private marinas are not reported in the table abouve: Suni Snds Mobile Home Park, Oak Harbor Marina, and Flagler Yacht Club.

¤Number of fuel berths per location;
* Approximate Atlantic Intracoastal Waterway Statute Mile South From Norfolk

Waterway Marker Data Collection Inventory

PBS&J assisted FWC with developing a system designed to capture waterway marker data to be stored as an inventory into an asset management database with geospatial mapping functionality. These waterway markers include the state and local regulatory and manatee signage strategically placed and annotated to identify spatial extent and respective speed limits required of the zone. This inventory process required the development of a personal geodatabase that was designed to house all waterway marker assets (signs and buoys) owned by FWC and/or permitted through FWC. In December 2006, a field crew embarked on the effort of collecting waterway marker information to populate the database and to generate information that could be reviewed for accuracy (proper placement, messaging, etc.), or for further development of a contractor's list of repairs. At the same time, the field crew used a similar system to capture marine facilities information along the ICW. Features that were captured along the waterway included boat ramps, marinas, bridges, water confluences, derelict vessels, and lock and dam structures. Marina site information included a count of fueling berths, boat slips (wet and dry), vessel transport mechanisms and types, and identification of whether the facility was for public or private use.

The data collection effort using mobile GIS technology in the field eliminated extra steps to manually enter data after it was collected in a paper format, and expedited the quality control (QC) process. The data was preserved in an electronic GIS format for easier transition to ArcGIS for both data and spatial analysis.

The analysis of the Palm Beach County waterway marker data provided information on the marker condition and need for potential repair, and also the appropriateness of each marker's message, rule and permit number, and mapping

the markers allowed the analysis of the placement of the markers to the existing regulations in the waterway.

Vessel Traffic Inventory

A study of vessel traffic patterns was identified in the Rule as an important criterion in the evaluation of risk to public safety, vessel traffic safety, and to maritime property endangerment. To identify these countywide traffic patterns, Jay Gorzelany conducted a series of aerial surveys of boat traffic in Palm Beach County between January 2007 and December 2007. Data collection followed established protocols from similar surveys conducted in Lee County, Florida (Gorzelany, 1998, 2002), Broward County, Florida (Gorzelany, 2005) and Martin County (Gorzelany, 2006-2007). These aerial surveys were typically conducted by helicopter flying at altitudes of 750-850 feet and a speed of approximately 90 knots. Altitude was reduced to 500 feet in proximity to Palm Beach International Airport to avoid airspace conflicts. The single observer / videographer method developed by Gorzelany (1998) was employed. For this method, a single observer / videographer was seated in the co-pilot seat of the survey aircraft. An image-stabilizing Sony Digital 8mm video camcorder with date and time stamp was used to record all vessels in-use while flying a standard flight path (Figure 2-1).

A vessel in-use was defined as either 1) A vessel underway, or 2) A stationary vessel in the process of being used. This included fishing, picnicking, sightseeing, or similar recreational activities, along with vessels at short-term dockage or anchorage sites such as waterside restaurants, fuel docks, waterside bait and tackle shops, fishing piers, boat ramps, beaches, spoil islands, or sand bars. "In-use" did not include stationary vessels located at long-term storage facilities such as anchorages, wet and dry storage marinas, or yacht clubs. Stationary (moored) vessels located at single family or multi-family residential docks, or mooring fields were not considered "in use." The aerial observer also provided voice-over audio

recording of both location information and vessel information through a remote microphone attached to an aircraft headset.

The survey area included the ICW and all adjacent waters within Palm Beach County, including Jupiter Inlet, Lake Worth Lagoon and Inlet, and Boca Raton Inlet. The Loxahatchee River, including Jonathon Dickinson State Park, was also videotaped during aerial surveys, but survey data was not processed under this scope of work. The linear track length of the aerial survey route was approximately 100 nautical miles (115 statute miles)(Figure 2-1). The survey track was modified slightly at times in order to avoid conflicts with other air traffic. A total of 15 aerial survey flights were conducted, including seven weekday (three morning and four afternoon) and eight weekend (four morning and four afternoon) surveys. One weekend survey was conducted over a holiday weekend (Memorial Day). See Table 2-3 for a complete listing of flight dates, timing and number of vessels observed. Once completed, aerial survey footage was transferred to a high Digital Video Disc (DVD) format for analysis. Figure 2-2 presents a snapshot of video footage taken from the aerial reconnaissance. Each vessel in-use observed on the video footage was hand-plotted onto a series of true color digital orthophotos using ArcMap © software (Figure 2-3). Attribute data collected included survey time, vessel type, size, activity, qualitative speed, direction of travel (if any) and a unique alphanumeric code for each vessel observed. Vessel class/type was adapted from Florida Statutes, Chapter 328. Along with vessel data, physical conditions including weather, wind speed and direction, and overall boating conditions were also recorded. All aerial video footage was archived and is available upon request.

The 15 aerial surveys yielded a total of 5,276 vessel observations. Table 2-3 provides a listing of the flight dates and times, season, and numbers of vessels observed. Appendix A provides a description of the types of information collected and a breakdown of vessels observed according to type and length class.

Table 2-3. Flight Dates, Timing and Number of Vessels Observed

Date	AM/PM	WE/WD*	Season	# Vessels Observed
1/19/07	PM	WD	Winter	172
2/24/07	AM	WE	Winter	368
2/24/07	PM	WE	Winter	589
4/02/07	PM	WD	Spring	248
4/21/07	AM	WE	Spring	282
5/26/07	PM	WD	Spring	747
6/10/07	PM	WE	Summer	1412
6/24/07	AM	WE	Summer	290
7/18/07	AM	WD	Summer	135
8/23/07	PM	WD	Summer	91
10/15/07	AM	WD	Fall	58
10/15/07	PM	WD	Fall	70
11/04/07	AM	WE	Fall	208
11/04/07	PM	WE	Fall	658
11/19/07	AM	WD	Fall	128
Total Vessels Observed				5,276

*WE=Weekend; WD = Weekday

To improve location accuracy, Digital Orthophoto Quarter Quadrangles (DOQQ) imagery served as the base map for data entry. All plotted survey data were checked against the original video footage for QC. Linked to a Microsoft Excel spreadsheet, GIS spatial data allowed for vessel type, length, direction of travel (if underway), and an alphanumeric code for each observed vessel. Environmental conditions including weather, wind speed and direction, and Beaufort scale also were recorded.

Figure 2-1. Martin County Standard Flight Path (2/22/07 survey flight)

Figure 2-2. Snapshot of Video Footage from Aerial Reconnaissance

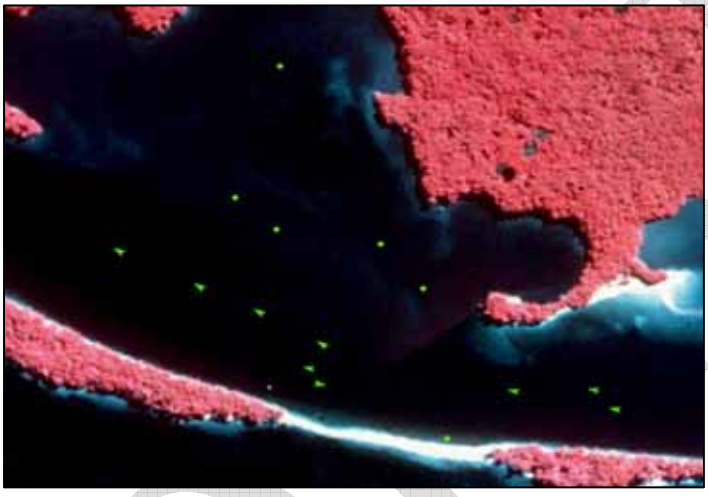


Figure 2-3. GIS Depiction of Vessels' Locations from Aerial Reconnaissance

Additional GIS functionality was used to quantify and map the distribution of vessel traffic as "density of occurrence," which illustrates the degree of concentration or clustering of observed vessel locations. Vessel clustering patterns for Palm Beach County waterways were mapped using 60-foot grid cells and a search radius of 600 feet. Figures 2-4 and 2-5 provide a close-up of vessel traffic density for the Boca Raton Inlet, Peanut Island and Blue Heron Bridge areas. The results show the highest density of vessels to be near Peanut Island and Blue Heron Bridge. Similar congregations of recreational boats were also observed at Jupiter, South Lake Worth and Boca Raton Inlets.

Figure 2-4. Vessel Traffic Clustering: The Boca Raton Inlet Area

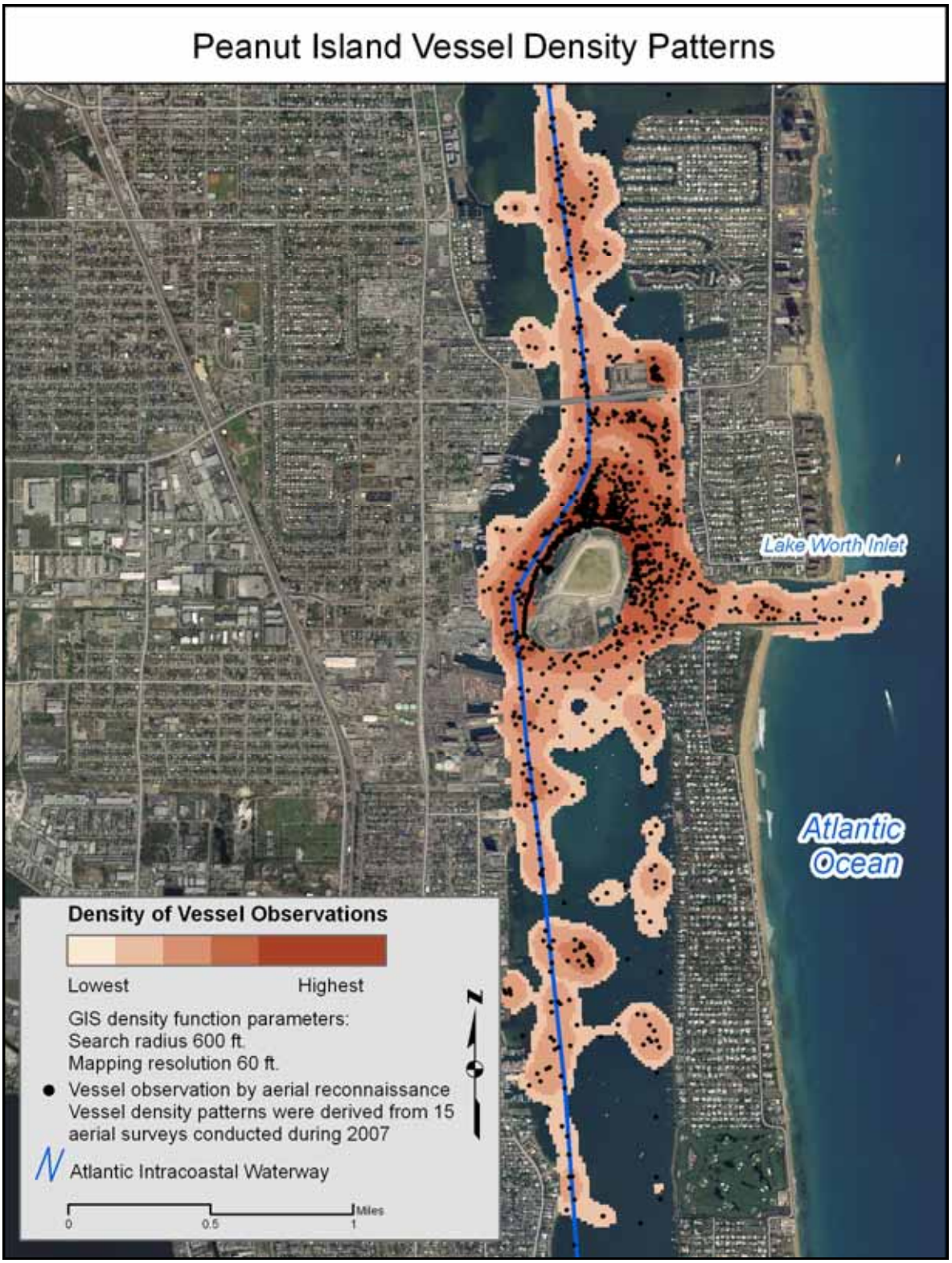
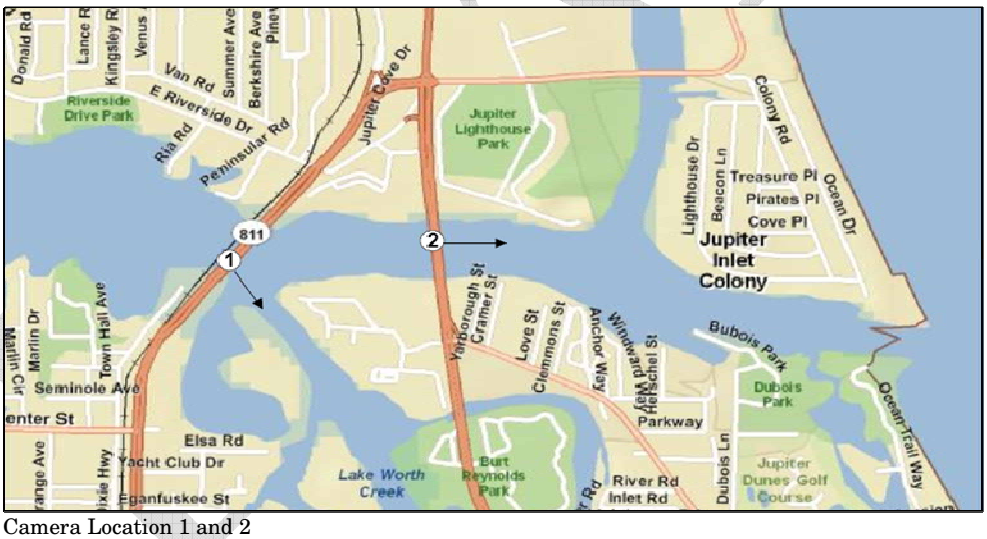


Figure 2-5. Vessel Traffic Clustering: The "Peanut Island" Area

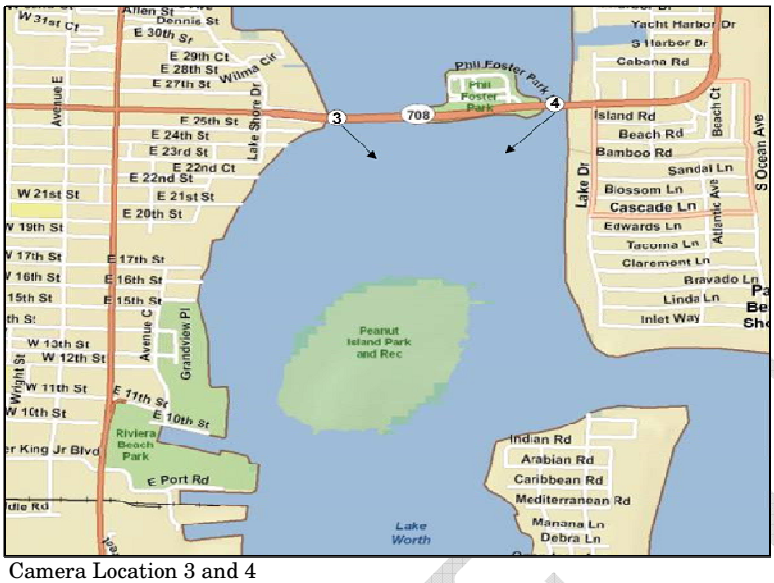
Vessel Traffic Video

The aerial surveys referenced above recorded up to 1,400+ vessels per survey day (June 10, 2007) on the Palm Beach waterway. In order to further characterize waterway congestion created by this number of recreational watercraft, video cameras were installed and monitored for three days at six key locations. The purpose of this effort was to obtain real time views of vessel traffic movement and document the levels of congestion experienced on the waterway. To monitor vessel traffic, video cameras were installed and monitored for 16-hour periods between August 17th and 19th of 2007 at the three strategic inlets. Camera 1 was placed at Jupiter SR 811/Alt A1A Bridge to record directional vessel traffic between Lake Worth Creek and the Loxahatchee River. Camera 2 was located on the U.S. Highway 1 Bridge to record vessels traveling in an east/west direction in the vicinity of the Jupiter Inlet.



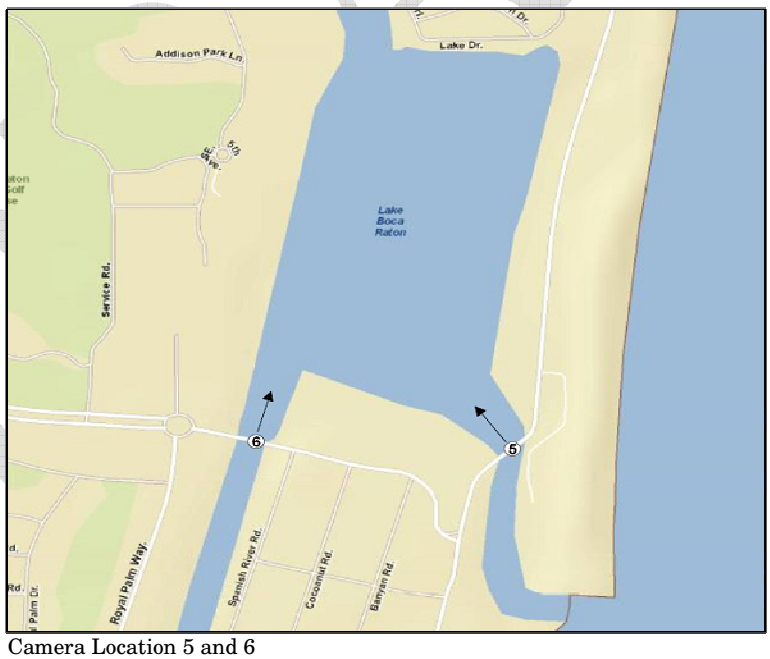
Camera Location 1 and 2

Camera 3 and 4 were located on the Blue Heron Bridge recording vessels movements in a southeasterly and southwesterly direction respectively. These cameras were placed on Blue Heron Bridge with clear views of Peanut Island and the adjacent waterways.



Camera Location 3 and 4

Camera 5, recording vessels traveling in a in a northwest/southeast direction, was placed at the U.S. A1A Boca Raton Inlet Bridge. Camera 6 was placed on the Camino Real Bridge to record vessel traffic in a north/south direction in Lake Boca Raton.



Camera Location 5 and 6

The video at each of these above locations was taken from 6:00 AM until 10:00 PM for three consecutive days.

Compliments Camera Location Graphics for Traffic Video Locations

Location	Statute Mile*
Jupiter #1	1005.1
Jupiter #2	1004.8
Lake Worth #3 and #4	1017.3
Boca #5	1048.1
Boca #6	1048.2

*** Approximate Intracoastal Waterway Statute Mile South From Norfolk**

The data was collected and analyzed to quantify the existing vessel traffic volume that passed the monitoring stations at these key locations. The resulting analyses provided the average daily trips (ADT) experienced at those locations as well as AM and PM peak hours for the three monitoring days of Friday, Saturday, and Sunday. Table 2-4 below provides actual 2007 traffic counts (ADT and Peak Hour) and future forecast through the year 2030 for the peak days at each monitoring site. Additional monitoring data is provided in Appendix F and G. As noted on the Table, the traffic volume projections for future years, through 2030, were forecast using the projected growth in both Palm Beach County's population and number of registered vessels developed in Chapter 1 of this report.

Table 2-4. Forecast Volume of Vessel Traffic

Location	Data Summary	Total Vessel Volumes 2007 to 2030					
		2007	2010	2015	2020	2025	2030
Jupiter # 1 (Saturday)	Large Vessels	2	3	3	3	3	4
	AM Peak Volume	84	88	95	103	111	118
	PM Peak Volume	144	151	164	176	189	203
	Total ADT Volume	992	1042	1128	1213	1304	1393
Jupiter # 2 (Saturday)	Large Vessels	0	0	0	0	0	0
	AM Peak Volume	84	88	95	104	110	119
	PM Peak Volume	189	199	215	231	248	266
	Total ADT Volume	1112	1169	1264	1359	1461	1565
Lake Worth # 3 and # 4 (Sunday)	Large Vessels	6	7	7	8	8	9
	AM Peak Volume	152	160	173	187	199	162
	PM Peak Volume	217	229	247	266	286	264
	Total ADT Volume	1487	1563	1690	1823	1956	2091
Boca # 6 (Sunday)	Large Vessels	1	2	2	2	2	3
	AM Peak Volume	66	70	75	81	87	93
	PM Peak Volume	122	128	139	150	159	172
	Total ADT Volume	649	678	738	792	853	910
Growth Rates from Base Year 2007		--	5.13%	13.72%	22.47%	31.43%	40.61%

The ADT and PM peak hour traffic volumes in this table revealed elevated traffic counts on Lake Worth and Jupiter Inlets on a typical mid-August Sunday in 2007. Peak seasonal and/or holiday vessel traffic can be significantly higher. The PM peak hour vessel traffic volume in the range of 200 plus trips means that three to four boats per minute are passing the monitoring station. The Average Daily Trip (ADT) count of 1,487 vessels near the Lake Worth Inlet on this Sunday means that approximately 93 vessels per hour are traversing the channel over the 16 hour monitoring period. Forecasted traffic through 2030 continues to rise and further exacerbate congestion on these waterways, with over 2,000 ADT anticipated on the Lake Worth section of the waterways during a similar off-peak Sunday. To some extent vessel congestion becomes self-regulating, with boaters exercising increased

caution in crowded waterways. However, in most cases regulated speed zones will be needed to promote boating safety in these increasingly congested waterways. Section 68D-23.105 Florida Administrative Code (FAC) identifies the decision-making factors for evaluation of risk criteria to public safety and the establishment of appropriate regulatory zones in congested areas. To quantify and standardize congestion conditions on the waterways, an applicable Level of Service (LOS) standard, similar to that used on Florida roadways, would be a helpful tool. A proposed approach to establishing a uniform LOS was presented in the full text of the Palm Beach County Vessel Traffic Video Monitoring Report prepared for the FWC on December 7, 2007.

Review of Boating Accident Reports and Citation Data

Boating accident reports and uniform boating citations are referred to in the Rule as important criteria for demonstrating risk to public safety, vessel traffic safety, or maritime property endangerment. In keeping with this Rule, boating accident reports and uniform boating citation databases for Palm Beach County were assembled, formatted, and imported into the GIS as data themes. The databases included all relevant vessel citations for 2000 to 2006, and all relevant vessel accidents from 1998 to 2006. Ten citations, issued for careless operation and lack of a personal flotation device (PFD), were included in the analysis. PFDs are included in the analysis due to their widely accepted role in minimizing the risk of drowning associated with recreational boating activities. The initial accident database for Palm Beach County included 2,821 reports, which when filtered for duplicates, location and relevance, yielded 66 accidents within the time period of 2002 to 2006. A detailed description of the analysis procedure and graphics illustrating the number of accidents by category are included in Appendix E.

Most records in the accident report and uniform citation databases included a latitude and longitude coordinate and were characterized by: (1) The primary and secondary causes for the accident or citation, (2) The type of accident or citation, (3)

The number of injuries and fatalities, and (4) A detailed description of the event. A content analysis of the types and causes for accidents and citations, as well as the officer's description of the accident or citation was undertaken. The content analysis identified those events that were relevant to an assessment of risk to public safety, vessel traffic safety, or maritime property endangerment, as stipulated in the Rule (Table 2-5).

Table 2-5. Boating Accidents and Citations Relevant to an Assessment of Risk

Relevant Boating Accidents	
1. Collision	1a. With a person
	1b. With a bridge
	1c. With a piling
	1d. With a Vessel
2. Congested waters	
3. Hazardous waters	3a. Grounding
	3b. Underwater object
	3c Blind corner
4. Wake	4a. Injury to person(s)
	4b. Damage to vessel
Relevant Boating Citations	
1. No personal floatation device	
2. Careless operation	

Workshops/Meetings with FWC Personnel

PBS&J and FSG team members participated in numerous meetings with FWC personnel over the course of 2007 and into 2008 to: (1) Establish study components and the analytical framework, (2) Present the methods and initial results of the boating risk analysis, and (3) To implement an evaluation of relevant risk criteria, as a further refinement of the GIS model to estimate risk levels. Once the initial framework and methodology of the analysis was agreed upon, subsequent meetings

focused on review of results and effective means of presentation of results and regulatory options for consensus building in public workshops and public hearings.

Mapping Waterway Features

A review of the Rule identified primary factors relevant to the vessel traffic study. These factors included waterway infrastructure, waterway features, vessel traffic, and management aspects. Waterway infrastructure elements included public boat ramps, public marinas, public fuel docks, bridges and locks, the ICW channel, and navigation aids. Physical waterway features included confluences of waterways that represent blind corners, waterway width, areas of shoaling and strong currents. Vessel traffic was characterized by aerial surveys of vessel locations. Lastly, management factors included reported boating accidents, boating citations, waterway signs and markers, and existing regulation zones. A number of these factors and conditions were used to evaluate risk to vessel traffic and public safety, and to maritime property endangerment. The GIS risk analysis, described in Chapter 3, relied upon the best available information. However, PBS&J and FSG team members did supplement best available data when appropriate (such as locations of boat ramps, marinas, fuel docks, bridges, signs/markers). Table 2-6 lists pertinent GIS databases acquired or developed for the vessel traffic study.

Manatee zones are not addressed under Rule 68D-23.105 FAC; "Criteria for Approval of Regulatory Markers," which formed the basis and rationale for this model and study. In addition, FWC Boating and Waterways Section personnel directed the project team to exclude manatee zones, Exclusion zones and Other Boating Restricted Areas from this model and study. Finally, no manatee zone-related citations were considered in this model and study.

Table 2-6. Data Themes Assembled for the Vessel Traffic Study

Analysis Factors	Data Theme	Source
Waterway Infrastructure	Bridges/bridge fenders/locks	FIND
	Marinas (launch/landing facilities)	PBS&J, FSG
	Public ramps	PBS&J, FSG
	Public fuel docks	PBS&J, FSG
	ICW channel centerline – Atlantic	FIND, FSG, NWN
	ICW channel centerline – Okeechobee	FIND, FSG
Waterway Features	Confluences and blind corners	PBS&J
	Aerial imagery (DOQQ)	LABINS (Florida State University)
	Hazards	PBS&J
	Waterway width	FSG
Vessel Traffic	Vessel locations	Jay Gorzelany
Management	Markers and signs	PBS&J
	Reported boating accidents	FWC Division of Law Enforcement
	Boating citations	FWC Division of Law Enforcement
	Existing regulation zones	FWC, FWRI and FSG

Note: Signs and existing regulation zones were not used in the GIS analysis of boating safety risk.

The following is a description of the GIS data features assembled or created for the vessel traffic study:

- Bridges and bridge fenders are vector files obtained from the Florida Inland Navigation District (FIND). The bridge file contains horizontal and vertical clearance information for each bridge. FSG edited the original file to adjust bridge locations relative to the Land Boundary Information System (LABINS) DOQQ's. The locks file contains polygons created by FSG and derived from an interpretation of the LABINS DOQQ imagery. Bridges and lock features were buffered at a radius of 300 feet consistent with specifications in section 68D-23.105 FAC. Figure 2-6 presents the location of bridges and locks relevant to the vessel traffic study.

- Public launching/landing facilities, marinas, public boat ramps, and public fueling facilities are point files derived from PBS&J, compiled by FSG and sourced from GPS locations obtained in the field. These features were buffered at a radius of 500 feet in those portions of the ICW that are greater than 300-feet wide and buffered at 300 feet in those portions of the waterway less than 300-feet wide, consistent with specifications in section 68D-23.105 FAC. Figures 1-2, 1-3, and 1-4, respectively, illustrate public marinas, fuel docks, and public boat ramps.
- The ICW centerlines in the study area are based on an edited digital compilation of the National Waterway Network, which is a line representation of navigable waterways in the United States (Bureau of Transportation Statistics) and centerline line files sourced from the FIND. Fish and Wildlife Research Institute (FWRI) completed the initial editing and compilation. FSG conducted minor edits and QC prior to preparing both files for the analysis. For example, ICW line files were projected to Stateplane, Florida East, NAD83 datum to maintain geospatial consistency with 2004 DOQQ's (LABINS). While the waterway files contained absolute geographic coordinates in feet, it was necessary to incorporate relative geographic coordinates to facilitate the dual purposes of analysis and presentation. FSG decided on waterway miles, which refer to statute mile notations on NOAA navigation charts appearing at five-mile intervals. FWRI had a digital point file of waterway mile markers, which was attached to each ICW line file. Integration of the waterway line files and the mile marker point files resulted in the creation of a route file, which forms the base layer containing both absolute (x, y) and relative (waterway mile) locations.
- Waterway navigation hazards is a point file locating blind corners at the intersection of major navigable waterways, areas of strong currents or shoaling, and is derived from a field inventory conducted by PBS&J in 2007 (Figure 2-7). Navigation hazards were buffered at a radius of 300 feet consistent with specifications in the Rule.

- Waterway width is a vector file created by FSG from analysis of the LABINS DOQQ's and based on the "greater than" or "less than or equal to" 300-foot waterway width criteria specified in the Rule.
- Vessel location data are point files identified via aerial reconnaissance using field methods described in the section titled "Vessel Traffic Inventory" (Figures 2-2 and 2-3).
- Reported vessel accidents (Figure 2-8) and boating citations (Figure 2-9) were received by FSG as spreadsheet files from the FWC Division of Law Enforcement. These data were reviewed and the relevant accidents and citations were extracted. Usable geographic coordinates associated with each record were used to create point shapefiles. See Appendix E for FSG content analysis procedures for review of the FWC vessel accident database.
- Existing Regulatory Zones is a polygon file sourced from FWRI that contains relevant portions of State regulatory zones within Palm Beach County waterways (Figures 2-10 and 2-11).

Compliments Figure 2-6.Palm Beach County Bridges and Locks (Courtesy of FIND literature)

Location	Bridge	Statute Mile*
Jupiter Island	(S.R. 7007) Jupiter Island Bridge	1004.1
Jupiter	(U.S. 1) Jupiter River Bridge	1004.8
Jupiter	Ernest Lyons Bridge	1005.1
Jupiter	(S.R. 7006) Indiantown Bridge Road	1006.2
Juno Beach	(Donald Ross Rd.) Juno Beach Bridge	1009.3
Palm Beach Gardens	PGA (Blvd.) Bridge	1012.6
North Palm Beach	(Parker U.S. 1) N. P. B. Bridge	1013.7
Riviera Beach	Blue Heron Bridge	1017.3
Palm Beach	Flagler Memorial Bridge	1021.8
Palm Beach	Royal (Park) Palm Beach Bridge	1022.6
Palm Beach	(S.R. 700) Southern Blvd. Bridge	1024.7
Lake Worth	(S.R. 802) Lake Worth Ave. Bridge	1028.8
Lantana	Lantana (Ave.) Bridge	1031.0
Boynton Beach	(Ocean Ave.) Boynton Beach Bridge	1035.0
Boynton Beach	15th Ave. Bridge	1035.8
Delray Beach	N. E. 8th St. Bridge (George Bush Blvd.)	1038.7
Delray Beach	(S.R. 806) Atlantic Ave. Bridge	1039.6
Delray Beach	Linton Blvd. Bridge	1041.1
Boca Raton	(N. E. 40th St.) Spanish River Blvd. Bridge	1044.9
Boca Raton	(S.R. 798) Palmetto Park Road Bridge	1047.5
Boca Raton	Camino Real Bridge	1048.2

*** Approximate Intracoastal Waterway Statute Mile South from Norfolk**

Figure 2-6. Palm Beach County Bridges and Locks

Figure 2-7. Palm Beach County Navigation Hazards

Figure 2-8. Palm Beach County Reported Boating-Related Accidents from2002 - 2006

Figure 2-9. Palm Beach County Boating-Related Citations from2002 - 2006

Figure 2-10. Palm Beach County Boating Safety Zones

Figure 2-11. Palm Beach County Boating Safety Zones

3. Boating Safety Risk Analysis

The boating safety risk analysis undertaken as part of the vessel traffic study utilizes spatial data assembled as described in Chapter 2. The model design employs a multi-criteria rating and weighting scheme and GIS "linear referencing" functionality to estimate and map boating safety risk levels for ICW segments. The analytical process involved five elements:

1. A review of existing studies
2. An evaluation of section 68D-23.105 FAC
3. The scoring and weighting of risk criteria
4. The association of weighted risk factor scores to the ICW using GIS "linear referencing" functionality
5. The composite scoring of risk factors associated with ICW segments to estimate risk to vessel traffic, boating safety, and maritime property.

Existing Studies

There is substantial literature on the design, testing, and application of spatial decision support systems. In addition, the risk analysis literature is extensive and spans many disciplines, including discussions on definitions of risk and methodologies for quantifying it. To date, there are few published materials available that address the quantitative assessment of risk specifically applied to boater behavior and waterway characteristics. The remainder of this section provides a small sample of the decision support and risk literature that was reviewed over the course of this study. This literature offers guidance and support for the approach taken in this boating safety risk analysis.

Ascough (et. al., 2002) provides a good overview of the component parts of a spatial DSS, including examples of applications and some suggestions for future developments and research activities. Torun and Duzgun (2006) present a project

summary that utilized existing spatial data to predict the vulnerability of the coastal population and infrastructure to damage from oil spills and fires in the Istanbul Strait. Their result included a prediction of vulnerability based on proximity to the Strait, population density and presence of infrastructure. Zanatta (et. al., 2005) offers an econometric quantification and analysis of the cost to recreational boaters resulting from the imposition of speed limits in the Lagoon of Venice, Italy. The analysis was derived from the results of a questionnaire eliciting information on boat ownership, as well as type of use and trip, given to boaters at ramps and marinas. This article provided insight into the value judgments that boaters make with regard to speed limits and acceptable costs.

Hendershot (1997) provides a useful publication for conceptualizing the procedure for risk calculation. His work offers a series of examples that illustrate the risk model construction procedure, including relevant criteria for consideration and various means for score calculation. Judson (1992) used probability statistics derived from boating collision and injury statistics to highlight the conflict between boating traffic and activities near the Strait of Juan de Fuca. Influencing factors identified included vessel speed, traffic density, visibility, and weather conditions. Based upon spatially analyzed statistical results and influencing factors, suggested changes to current traffic patterns in order to minimize the possibility of collision and conflict were presented.

A methodology known as the Ports and Waterways Safety Assessment (PAWSA) was reviewed for insight into a participant-based risk assessment procedure. The USCG developed this parametric procedure for identifying and assessing waterway risk factors near major ports and marine infrastructure features. The report also offers strategies to mitigate boating risk within congested port waterways. The method consists of convening a workshop comprised of waterway stakeholders who identify waterway issues and risk factors and then assign values to these risk factors. Risk factor values are then input into a "Waterway Risk Model," which is

driven by condition variables such as vessel traffic, weather, and waterway characteristics. Output includes current risk levels, absolute risk levels, and immediate and subsequent consequences (USCG, 2005).

The Marine Safety Foundation (2000) conducted an extensive study for the USCG with regard to recreational boating safety. One objective was to evaluate critical components for development of a risk management approach to boating safety. Another objective was to develop a framework and taxonomy for the analysis of the Coast Guard's Boating Accident Report Database (BARD). Selected findings were that there are numerous methods for characterization of boating safety risk and an assortment of available software to assist in this effort. In addition, a very detailed analysis of boating accident circumstances and existing conditions is needed to provide any sort of predictive conclusion regarding accident causes and future accident mitigation. This report can be accessed on the Marine Safety Foundation's web site (www.marinesafety.org).

Two other publications were useful in confirming the utility of the approach taken in this vessel traffic study. Rundmo and Moen (2006) examined risk perception, worry and demand for risk mitigation in a land-based transportation context by surveying the public, politicians and experts. These three groups were surveyed as to the subjective probability of an "average Norwegian" experiencing a health injury or accident, in public or private transportation settings, when using one of ten types of transportation. Transportation types were considered risk sources. After analysis of the survey results the authors concluded that "consequences are more important for demands of risk mitigation than probability assessments" (Rundmo and Moen, p.623). In addition, a difference in perception was found between the public and politicians as one group and experts as another. The demand for risk mitigation (e.g. speed regulation) by the public and politicians is "determined by their evaluation of consequences as well as their worry related to risk" (Rundmo

and Moen, p.637). For experts, worry with regard to a perceived risk is the determining factor in demand for risk mitigation.

Finally, Holton (2004) provides a survey of the philosophical discussions underpinning the definition of risk in the financial literature. This paper provides a historical and philosophical framework for the approach we have taken to represent perceived risk in the Palm Beach County Vessel Traffic Study. The discussion draws a distinction between the position of probability and belief in defining and assessing risk. Holton notes that there are subjective and objective interpretations of probability, the former considered a belief, used to characterize individual uncertainty, while the latter considered objective and requiring logic or statistical analyses (p.19). Holton cites the common usage of risk as entailing "both uncertainty and exposure – possible consequences" (p.20). Operationalism is a financial concept that defines an outcome in the context of the operations that generated that outcome. Holton concludes that "it is impossible to operationally define risk", rather only "our perception of risk" (p.24). Allowing that "perceived risk takes many forms", there are many different metrics that can be used to measure perceived risk levels (p.24).

Evaluation of Section 68D-23.105 FAC

Florida Administrative Code (FAC) 68D-23.105 specifies the "Criteria for Approval of Regulatory Markers" for boating safety. The Rule: (1) Identifies relevant risk criteria, (2) Identifies safety situations, (3) Specifies risk levels, and (4) Assigns appropriate safety zone options based on levels of risk. Safety zone options provided in the Rule are based on the level of risk associated with the occurrence and/or combination of certain waterway characteristics and infrastructure features as well as indicators of boater behavior and activities.

The diagram in Appendix C illustrates a literal interpretation of the Rule based on a compilation and logical organization of the Rule terminology. Major criteria are

organized under two main categories: Risk and Metric. Risk criteria are those associated with levels of uncertainty and perceived consequences. These are vessel collision, public safety, and maritime property endangerment, which are considered essentially qualitative in nature. While the results of a loss associated with vessel collision or vessel traffic safety can be quantified, uncertainty and perceived consequences can only be estimated. Therefore, quantifiable indicators of level of risk associated with qualitative criteria were developed from "other creditable data sources" as allowed for in the Rule specifications. These sources included:

1. Uniform boating citations
2. Boating accident reports
3. Vessel traffic patterns.

Aspects of the citation and accident reports, as well as a series of sixteen aerial surveys of vessel traffic provided supplemental information to estimate risk criteria levels. For example, accident reports contain information regarding the type of collision that occurred, the cause of the accident and whether injuries or fatalities were involved.

In contrast, risk levels for metric criteria can be directly measured (either through presence/absence or by physical characteristics). Metric criteria outlined in the Rule that influence risk include the following:

1. Waterway infrastructure features
2. Waterway width
3. Hazardous water levels or currents
4. Confluence of waterways presenting obstructed visibility (e.g., blind corner).

Safety situation types were determined based on an interpretation of the Rule and reflect concerns and terminology found within the specifications for each of the

boating safety zone options. The safety situation types defined in the Rule are:

1. Vessel collision risk
2. Public safety risk
3. Maritime property endangerment.

Boating safety situations are associated with criteria through level of risk, with an increase in relative risk yielding a more restrictive safety zone option. In this study, risk is quantified based on a summary of the weighted scores associated with the aforementioned criteria. These scores are evaluated using numeric thresholds which are directly related to mitigation options as specified in the Rule. An example relevant to vessel collision includes "Risk" yielding a Numeric Speed Limit option, "Significant Risk" yielding a Slow Speed, Minimum Wake option and "High Risk" yielding an Idle Speed, No Wake option.

Terminology taken directly from the Rule was used to develop a hierarchy of risk (e.g. from "Risk" to "High Risk" under vessel collision, or "Risk" to "Wake Likely to Endanger" under vessel traffic safety). Note that added to each criterion was a "Low Risk" category in which case there is no safety zone designation. Potential boating safety speed zone outcomes, or options associated with safety situation types, are specified in the Rule under the noted subsections, are shown in the diagram in Appendix C and include:

1. (1)(a): Idle Speed, No Wake (ISNW)
2. (1)(b): Slow Speed, Minimum Wake (SSMW)
3. (1)(c): Numerical Speed Limit (NSL)
4. (1)(d): Vessel Exclusion Zone (VEZ)
5. (1)(e): Other Boating Restricted Area (OBRA).

Scoring and Weighting of Risk Criteria

The rating of selected criteria drives the risk evaluation process implemented for the vessel traffic study and the weighting of criteria attributes relative to boating safety situations. Weighted criteria are subsequently linked to ICW segments using GIS linear-referencing functionality. A composite score derived from the summation of risk factor weighted scores for a given ICW segment is compared with a range of possible score thresholds to estimate the risk level associated with public safety, vessel collision, and maritime property endangerment safety situations for a given waterway segment. Figure 3-1 illustrates a conceptual diagram of the DSS model information flow and its component parts.

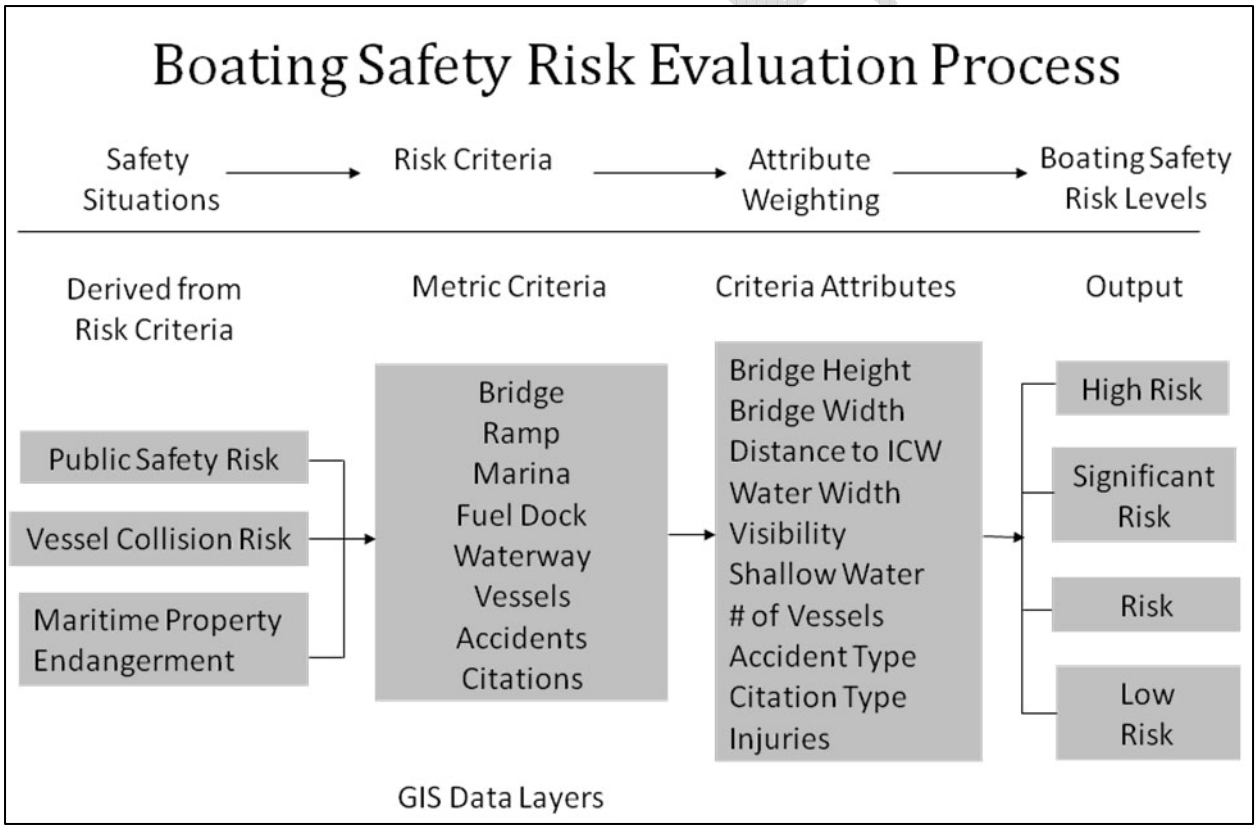


Figure 3-1. Boating Safety Risk DSS Conceptualization

A boating safety criteria evaluation form was developed to allow subject matter experts (i.e. persons with boating and waterway use and/or management

experience) to rate criteria and criteria attributes either specifically mentioned in the Rule or selected as indicators of perceived risk to address qualitative criteria specified in the Rule. The evaluation form was similar in design to the USCG Ports and Waterways Safety Assessment (PAWSA), which was used to quantify risk, associated with vessel traffic and waterway conditions in port areas (USCG, 2005).

The evaluation form consisted of the following ten variables:

1. Number of accidents
2. Injuries sustained
3. Type of accident
4. Cause of accident
5. Boating citation type
6. Vessel traffic condition
7. Vessel length categories
8. Vessel speed categories
9. Waterway conditions
10. Presence of waterway infrastructure.

Each variable, in turn, was characterized by attributes that could be scored from one to seven. For example, accident reports identify the primary causes and type of accidents; boating citations are classified according to a description of the infraction; waterway features include blind corners, hazardous currents, underwater objects, and waterway width; marine infrastructure features include ramps, locks, bridge fenders and fuel docks relative to waterway width and distance from the ICW.

The evaluation form was constructed so that higher scores (associated with the presence of a condition or waterway feature) reflect greater perceived risk. The evaluation instrument allowed the attributes to be scored, weighted, and compared

for each of the three boating safety situation types identified in the Rule. Weighting was a function of an attribute's position in the relative risk hierarchy. This position was based on the magnitude of the potential contribution to perceived risk or loss as identified by FWC personnel who completed the evaluation form. See Appendix B for the "Risk Criteria Evaluation Form."

Ideally, a group of subject-matter experts (30 or more) would complete the form for statistical purposes so that median ratings could be derived for each attribute of each variable. As the Palm Beach County DSS is a prototype, it was determined that the best initial effort would be to have the form completed by the FWC assistant general counsel, who was responsible for drafting the Rule. Responses for each question included attribute ratings that characterize the ten variables for each safety situation (public safety risk, vessel collision risk, and maritime property endangerment). To account for variation in the number of attributes associated with a given variable standardized scores were calculated for each variable. In addition, standardized weights were calculated for each attribute associated with a given variable.

Association of Risk factors to ICW Segments: GIS Linear Referencing

The GIS analysis is comprised of the data themes listed in Table 2-6. The base layer that all data are built upon is the ICW channel centerline. This vector file was converted to an ArcGIS™ "route" file using the waterway miles point file, which consists of the georeferenced location of five statute mile interval markers found on the standard NOAA Raster Navigation Charts. A "route" is a vector file that contains both absolute (geographic x, y) and relative (ICW waterway mile) coordinates. This method provides a statewide framework upon which to build subsequent boating safety DSS models. The route file facilitates the linear referencing of the data themes, within the GIS, with respect to their location along the ICW. After referencing the route files, relevant data themes were combined into an ArcGIS shapefile for each of the three safety situations, which contained tabular

fields from each data theme. Fields for the calculation and storage of waterway segments, attribute scores, weights, and weighted scores were added. The result was an ICW channel centerline database for each safety situation that contained a composite score identifying boating risk associated with each ICW segment. ICW segments were subsequently categorized using thresholds derived from natural breaks in the distribution of risk scores. The model includes data from shoreline to shoreline, as modified by the distance and waterway characteristics criteria in Rule 68-D-23.105 FAC. As the objective of the assessment is to quantify perceived risk, one decision rule employed in the study was that concentrations of vessels outside the channel proper would at some point enter the channel (e.g. to travel onwards or return to their launch point). A second decision rule was that accidents and citations in the vicinity of the channel are indicators of conditions of higher risk to boating safety, based on the safety situations and criteria derived from Rule 68-D-23.105 FAC. The next section describes the composite scoring of risk factors.

Composite Scoring of Risk Factors to Identify Risk Levels

The DSS model uses a linear algorithm to sum weighted attribute scores by variable and ICW waterway analysis segment for each safety situation. The analysis segments are assigned to the appropriate risk level based on the total weighted score for that segment. Risk level thresholds and categories are then calculated based on the distribution of weighted score values. The graph in Appendix D illustrates the scoring structure of the Public Safety Risk Situation Model as an example.

Two issues were considered in the implementation of the model. These issues include the integration of different data types, and the aggregation effects derived from the unit of analysis (i.e., the ICW segment).

Due to the variability in the factors that affect risk levels (e.g., activities, behavior, consequences, and conditions), the boating safety risk analysis requires the integration along an ordinal scale of three data types:

1. Nominal (number of accidents; vessel traffic condition)
2. Ordinal (type of accident; cause of accident)
3. Dichotomous (bridge, lock, public boat ramp).

Implementation of the risk evaluation form and the calculation of standardized scores and weights helped to accomplish this data integration.

For nominal data, decisions establishing categories were made based on the frequency distribution in the source data or from suggestions found in the literature. Implications for this modeling effort are that the implemented categories either do not reflect local conditions or are not appropriate for a statewide standard. For example, it is possible that an analysis of statewide traffic conditions would yield different vessel density categories. The approach taken to date is to utilize local differences in the definition of vessel traffic density based on county-level data.

In the case of ordinal data, attributes were drawn directly from source data and reflect countywide conditions. Dichotomous variables refer to the presence or absence of primarily waterway and infrastructure features (e.g., bridges, locks, ramps, blind corners, waterway width). The model design allowed for representation of nominal, ordinal and dichotomous data on an ordinal scale, establishing a ranking of risk associated with each variable.

Once the composite weighted scores per segment (1000 feet or approximately 305 meters) for all variables and each safety situation were calculated, the frequency distribution of the range of values was examined to identify boating safety risk thresholds. Thresholds were derived based on natural breaks in the data and four

risk level classes: Low risk, risk, significant risk and high risk. ICW segments were assigned a risk level for each safety situation based on the sum of the criteria weighted scores.

Segmentation of the safety situation shapefiles begins at the lowest waterway mile value and proceeds to the highest. Segments are equal in length and take no account of existing features. Summed weighted scores are assigned to an entire segment, which means that the score associated with a feature at any given location within the segment is reflected across the entire segment. For example, if qualifying marine infrastructure is located at one end of a segment, that score is applied across the entire segment. Limiting the length of each segment to 1000 feet minimizes the influence of this effect.

4. GIS Model Output

Output from the GIS model takes two forms—tabular and graphic. The tabular databases contain all of the original fields and records from the source data as well as necessary fields for variable and attribute scoring and compilation. Although the analysis utilizes the same variables and attributes throughout, the position of those variables in the hierarchy of "perceived risk" varies by safety situation, based upon their scores and weights. For example, the variable "boating citation type" with an attribute of "no personal flotation device" (No PFD) has a weighted score by safety situation:

Safety Situation	Boating Citation Type	No PFD	Weighted Score
Vessel Collision Risk	0.8387	0.1429	0.1199
Public Safety Risk	1.0000	0.7143	0.7143
Maritime Property Endangerment	0.7778	0.1429	0.1111

Therefore, the contribution of boating citation type to perceived risk is greater in the public safety risk situation than the vessel collision risk or maritime property endangerment situations.

Another example is the variable "cause of accident" with an attribute of "hazardous waters."

Situation	Cause of Accident	Hazardous Waters	Weighted Score
Vessel Collision Risk	0.5161	0.1429	0.0738
Public Safety Risk	0.8333	0.5714	0.4761
Maritime Property Endangerment	0.7222	0.5714	0.4127

In the case of cause of accident, the contribution to perceived risk is greater in the public safety risk situation than in the vessel collision or maritime property endangerment situations.

A GIS database was created for each safety situation. Tables 4-1, 4-2, and 4-3 provide a summary of the risk variables used to calculate a composite score for nine ICW segments in the Peanut Island area in Lake Worth, Florida. An examination of the tables illustrates the relative differences in the hierarchy of risk that variables are assigned to within safety situations. The risk variable headings are organized from highest to lowest rank score for the given safety situation. The differences in rank score, with resulting effects on weighted score and composite score produces apparent differences in risk levels between safety situations. For example, waterway segment safety zone options for the vessel collision risk safety situation are derived, in part, from the variables listed in Table 4-1.

Table 4-1. Vessel Collision Risk Variables and Risk Level Estimates by Waterway Segment

Waterway Segment	Type Of Accident	Number Of Accidents	Type Of Citation	Vessel Traffic Condition	Marine Infrastructure	Injuries Sustained	Risk Level
5369	WPS	1	NA	1	NA	1	Low Risk
5370	CP	1	NA	2	NA	1	Risk
5371	WMP, CV	2	No PFD	2	Bridge	0	Significant Risk
5372	CV,CV,CV	3	NA	3	NA	0	High Risk
5373	CON, CV	2	NA	3	NA	0	High Risk
5374	CUO	1	NA	3	NA	0	Risk
5375	CV	0	1	2	Marina, Fuel Dock	0	Significant Risk
5376	CV,CV, WPS	1	3	3	NA	1	Significant Risk
5377	CV	0	1	2	NA	0	Risk

Table notes: CV = collision with another vessel; CB = collision with a bridge; 4 careless = four careless operation citations; 2 PFD = two no personal flotation device citations; Moor = mooring field; vessel traffic condition values: 1= < 10 vessels, 2 = 10-50 vessels;

The structure of the model and analysis of risk is such that scores are derived for three accident-related criteria: number of accidents, type of accident and cause of accident(s). For number of accidents, a score is derived for the presence of 1 or more accidents. This score is then weighted based on the actual number of accidents that have occurred (i.e. 1; 2-7; >7). For type of accident, each accident receives a score, which is then weighted based on the collision type (e.g. underwater object,

grounding, another vessel, bridge, person, etc.). For a physical cause of accident, each accident is given a score and weighted based on a waterway condition (e.g. wake, congested or hazardous waters). More detail can be found in Appendix B and Appendix D.

Waterway segment safety zone options for the public safety risk safety situation are derived, in part, from the variables listed in Table 4-2.

Table 4-2. Public Safety Risk Variables and Risk Level Estimates by Waterway Segment

Waterway Segment	Type Of Citation	Marine Infrastructure	Type Of Accident	Injuries Sustained	Number Of Accidents	Vessel Traffic Condition	Risk Level
5369	NA	NA	WPS	1	1	1	Risk
5370	NA	NA	CP	1	1	2	Significant Risk
5371	No PFD	Bridge	WMP, CV	0	2	2	High Risk
5372	NA	NA	CV,CV,CV	0	3	3	High Risk
5373	NA	NA	CON, CV	0	2	3	High Risk
5374	NA	NA	CUO	0	1	3	Risk
5375	NA	Marina, Fuel Dock	CV	0	1	2	High Risk
5376	NA	NA	CV,CV, WPS	1	3	3	High Risk
5377	NA	NA	CV	0	1	2	Risk

Table notes: CV = collision with another vessel; CB = collision with a bridge; 4 careless = four careless operation citations; 2 PFD = two no personal flotation device citations; Moor = mooring field; vessel traffic condition values: 1= < 10 vessels, 2 = 10-50 vessels;

Waterway segment safety zone options for the maritime property endangerment safety situation are derived, in part, from the variables listed in Table 4-3.

Table 4-3. Maritime Property Endangerment Variables and Risk Level Estimates by Waterway Segment

Waterway Segment	Type Of Accident	Type Of Citation	Number Of Accidents	Marine Infrastructure	Vessel Traffic Condition	Injuries Sustained	Risk Level
5369	WPS	NA	1	NA	1	1	Low Risk
5370	CP	NA	1	NA	2	1	Risk
5371	WMP, CV	No PFD	2	Bridge	2	0	Significant Risk
5372	CV,CV,CV	NA	3	NA	3	0	High Risk
5373	CON, CV	NA	2	NA	3	0	High Risk
5374	CUO	NA	1	NA	3	0	Risk
5375	CV	NA	1	Marina, Fuel Dock	2	0	Significant Risk
5376	CV,CV, WPS	NA	3	NA	3	1	Significant Risk
5377	CV	NA	1	NA	2	0	Risk

Table notes: CV = collision with another vessel; CB = collision with a bridge; 4 careless = four careless operation citations; 2 PFD = two no personal flotation device citations; Moor = mooring field; vessel traffic condition values: 1= < 10 vessels, 2 = 10-50 vessels;

Tables 4-1, 4-2, and 4-3 represent only a small amount of the data available for each of the three safety situation GIS themes generated from the analysis. As an example, under waterway segment 5372, there are three "CV" (collision with another vessel) entries under "type of accident." In the GIS shapefile databases each of these entries is a separate record with fields containing much of the relevant information from the actual vessel accident report. This information includes:

1. Case number
2. USCG access number
3. Year of the accident
4. Type of accident
5. Cause of the accident
6. Location of the accident
7. Whether there were any injuries or fatalities associated with the accident.

Similar information can be found in the GIS shapefile databases for each of the data themes, listed in Table 2-6, that comprise the analysis.

For the purposes of this study, graphic output from the GIS analysis takes the form of a series of ICW line segments color coded to correspond to risk levels for each of the three safety situations. Figure 4-1 focusing on the Lake Worth Peanut Island area is examined in detail based on the information presented in the example safety zone option Tables 4-1, 4-2, and 4-3.

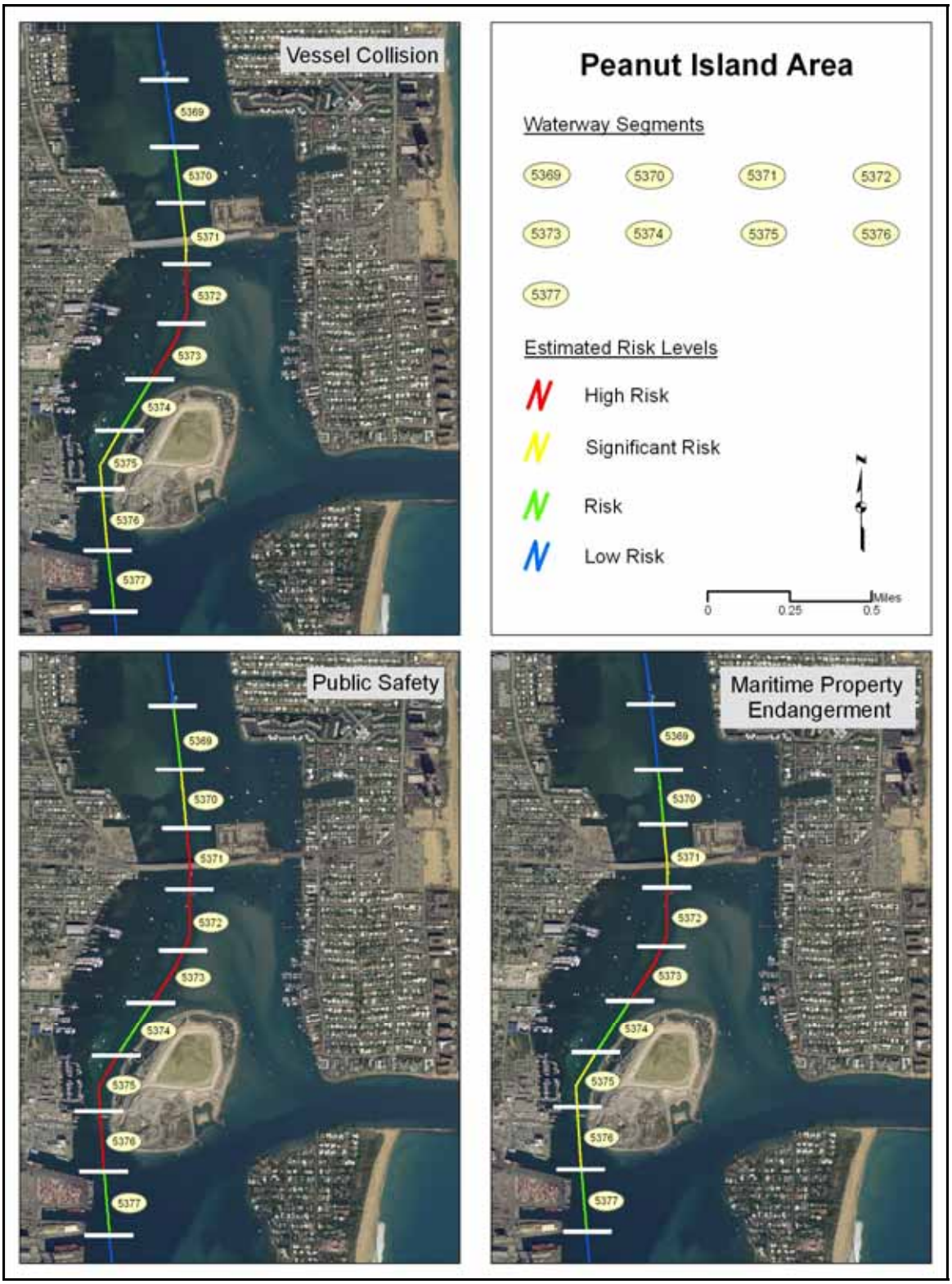


Figure 4-1. Graphic Output for Waterway Segments in the Lake Worth Peanut Island Area

Waterway segment 5369 was assigned a Low Risk level estimate for vessel collision and maritime property endangerment safety situations and a Risk level estimate for the public safety situation. The predominant variables or triggersthat influenced the composite scores are type of accident, number of accidents and number of injuries.

Waterway segment 5370 was assigned Risk level estimates for maritime property endangerment and vessel collision risk, respectively. It attained a Significant Risk estimate level for public safety risk. The triggers that influenced the composite Significant Risk score for public safety risk are the number and type of accidents, as well as the level of vessel traffic condition (density).

Waterway segment 5371 was assigned a High Risk level estimate for the public safety risk safety situation. Maritime property endangerment and vessel collision risk safety situations received a risk level estimate of Significant Risk. The predominant triggers that influenced the composite scores are the presence of bridge infrastructure, type of citations, type and number of accidents, as well as a moderate vessel traffic condition level.

Waterway segment 5372 was assigned a High Risk level estimate for vessel collision risk, public safety risk and maritime property endangerment safety situations. The predominant triggers that influenced the composite scores are type and number of accidents, and a high vessel traffic condition level (i.e. vessel traffic congestion).

Waterway segment 5373 was assigned a High Risk level estimate for vessel collision risk, public safety risk and maritime property endangerment safety situations. The predominant triggers that influenced the composite scores are type and number of accidents, and a high vessel traffic condition (i.e. vessel traffic congestion).
Waterway segment 5374 was assigned a Risk level estimate for vessel collision risk, public safety risk and maritime property endangerment safety situations. The

predominant triggers that influenced the composite scores are type and number of accidents, and a high vessel traffic condition (i.e. vessel traffic congestion).

Waterway segment 5375 was assigned a Significant Risk level estimate for the maritime property endangerment and vessel collision risk safety situations. A "High Risk" level estimate was assigned for the public safety risk safety situation. The predominant triggers for this segment are the presence of a marina and fuel dock, the type of accident (collision with a vessel) and moderate vessel traffic condition level.

Waterway segment 5376 was assigned a Significant Risk level estimate for the maritime property endangerment and vessel collision risk safety situations. A "High Risk" level estimate was assigned for the public safety risk safety situation. The predominant triggers for this segment are the type of accident and number of accidents, the presence of an accident-related injury and a high vessel traffic condition level.

Waterway segment 5377 was assigned a Risk level estimate for vessel collision risk, public safety risk and maritime property endangerment safety situations. The predominant triggers that influenced the composite scores are type of accident, and a moderate vessel traffic condition level.

There are examples where waterway segments attain the same risk level in more than one safety situation, in spite of the fact that predominant risk variables are different. Figure 4-2 is a ternary diagram that graphically depicts the proportional rank score of risk variables within the three safety situations. The position of each variable within the ternary diagram provides an indication of the relative influence of these variables in each safety situation. The cluster denoting number of accidents, collision type, marine infrastructure, and vessel traffic condition illustrates the similarity of outcomes for particular waterway segments regardless

of safety situation. With the exception of injuries (inj), which received relatively higher risk scores in the public safety risk criterion, similar results for different safety situations likely resulted from a consistent variable rating on the evaluation form. These results are based upon ratings from the completion of a single evaluation form.

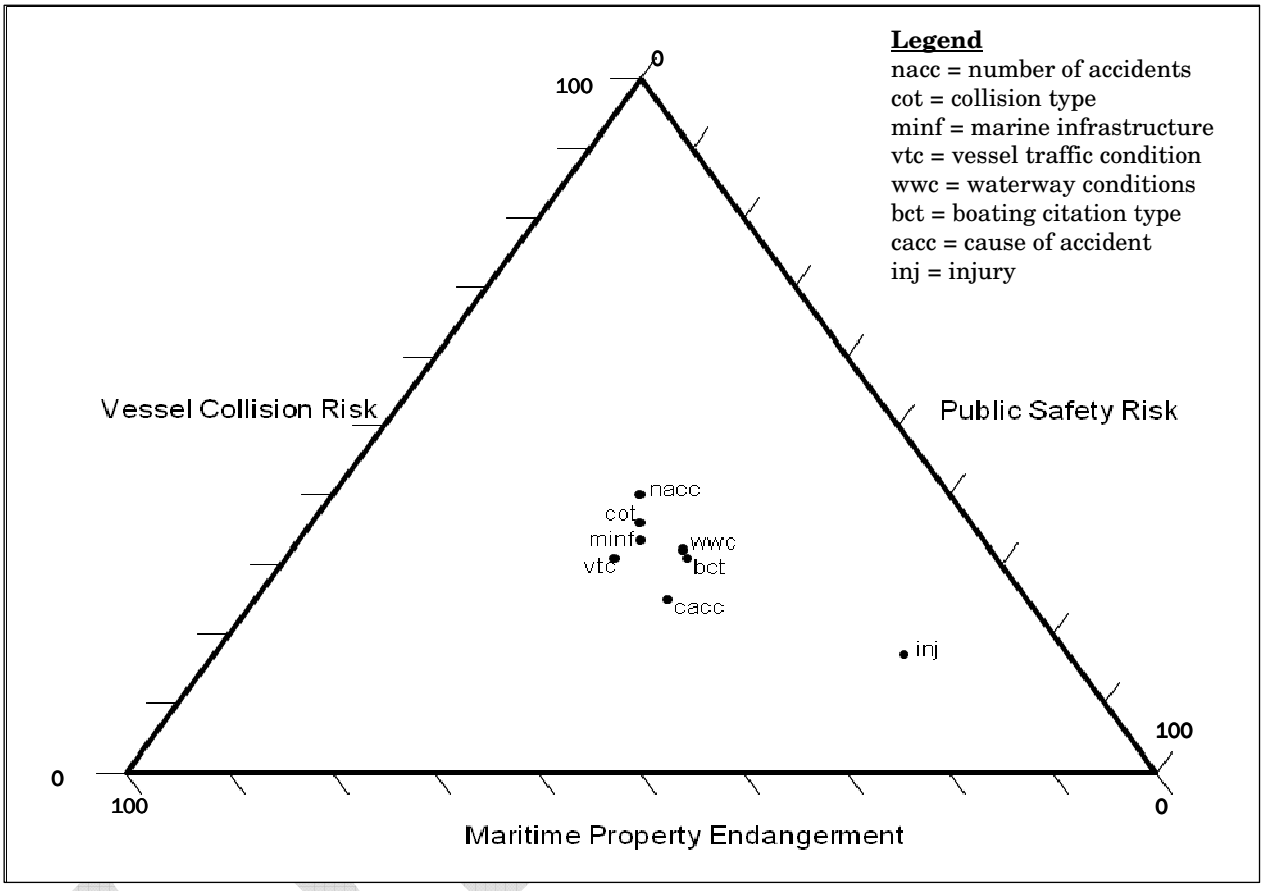


Figure 4-2. Dispersion of Risk Variables by Safety Situation

Finally, a series of figures that graphically depict risk level estimates for selected portions of the ICW are presented. These areas exhibit elevated perceived risk levels as determined by the GIS risk analysis. Figure 4-3 is an index map illustrating the location of focus areas where the results for each safety situation are compared. Figures 4-4 through 4-9 depict the ICW results for each safety situation.

These focus areas include:

1. Loxahatchee River (Figure 4-4)
2. South of Bert Winters Park (Figure 4-5)
3. North Lake Worth (Figure 4-6)
4. Peanut Island (Figure 4-7)
5. Boynton Beach Bridge (Figure 4-8)
6. Knowles Park Boat Ramp (Figure 4-9)
7. Highland Beach (Figure 4-10)

The data used in the classification of the waterway segments is listed in each focus area map legend. In addition, the number of occurrences of a given feature is noted in parentheses next to each listed feature, as well as the type of feature and percentage of the total number of features of that type.

Figure 4-3. Palm Beach County Focus Area Reference Map

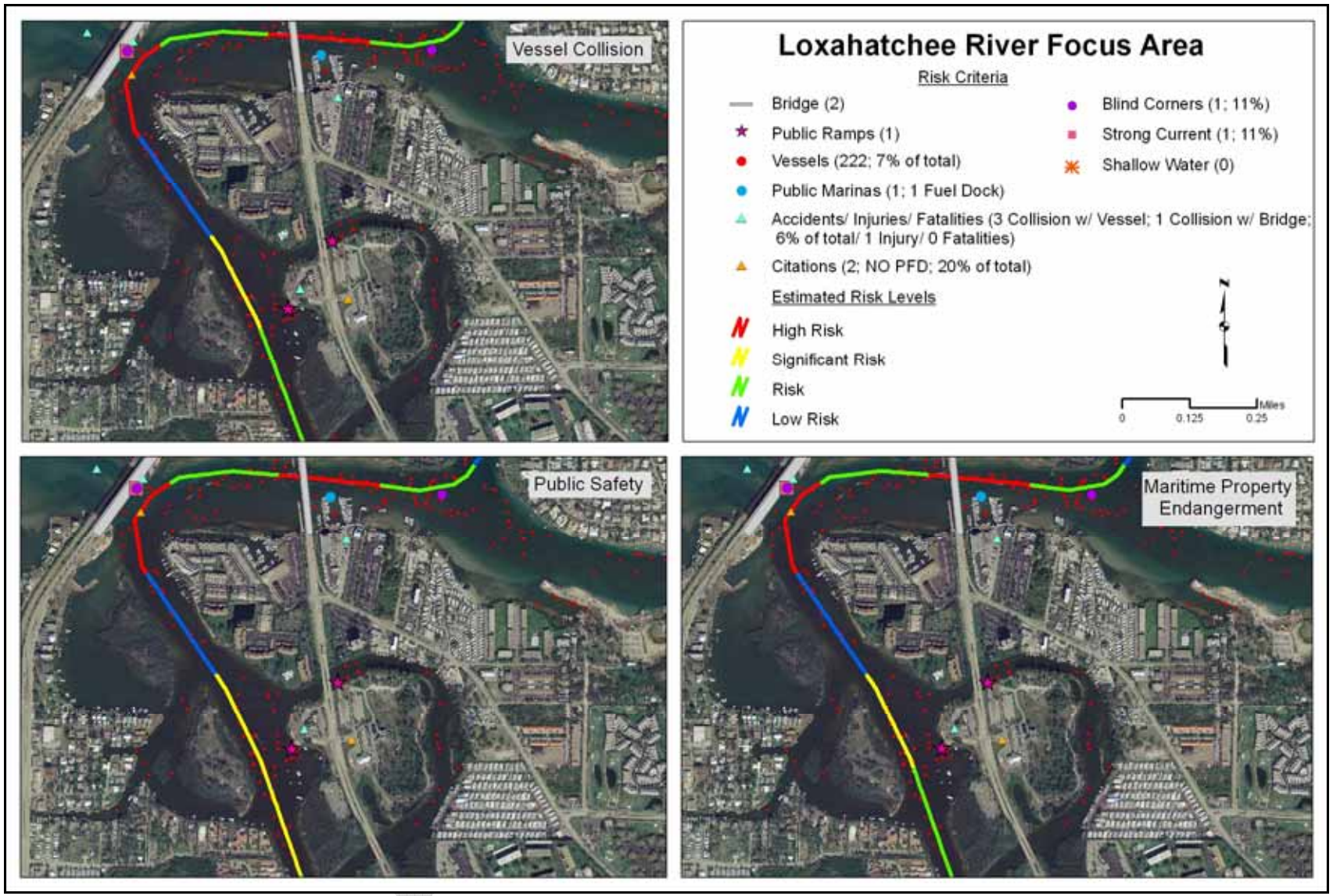


Figure 4-4. Loxahatchee River Focus Area

Figure 4-5. South of Bert Winters Park Focus Area

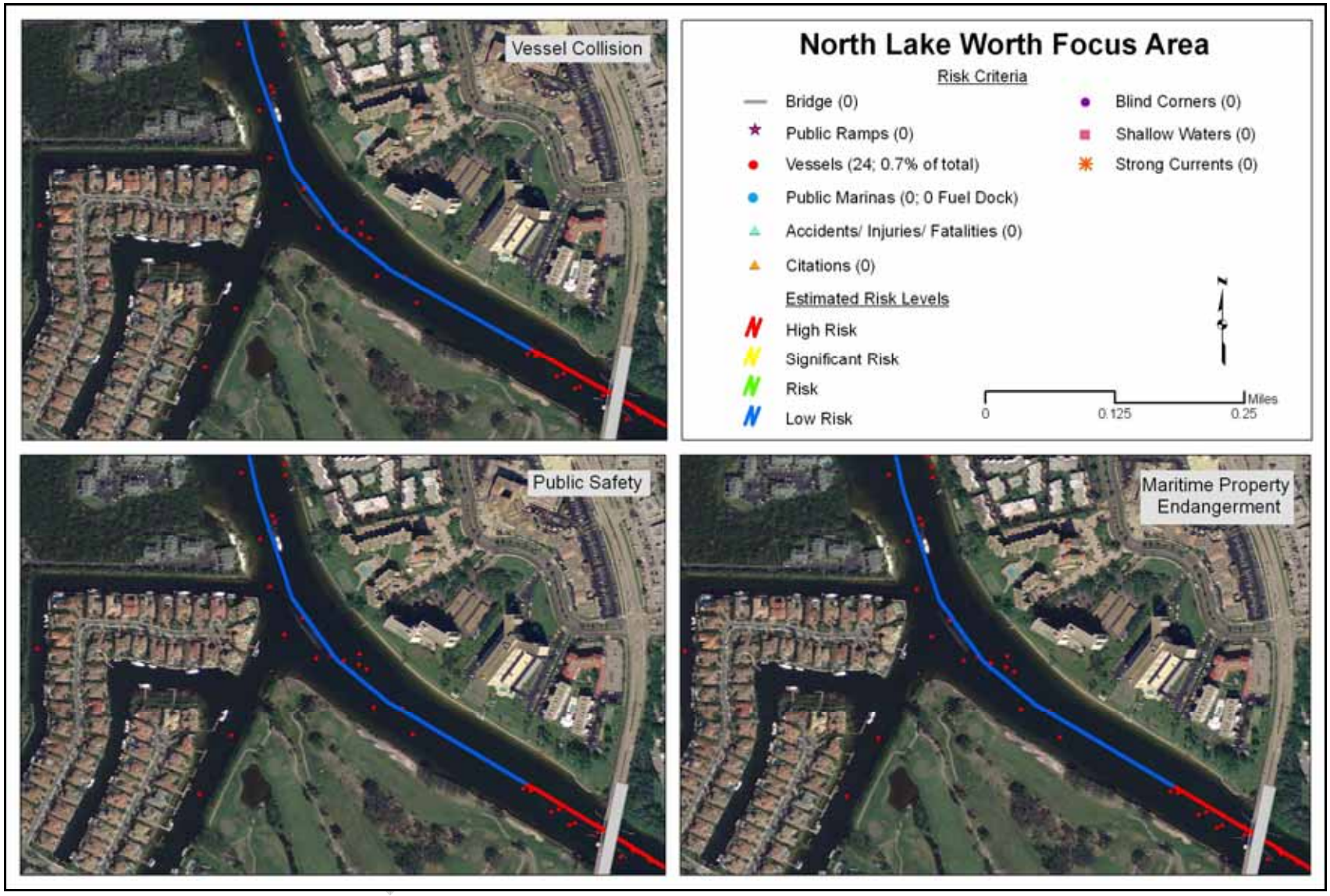


Figure 4-6. North Lake Worth Focus Area

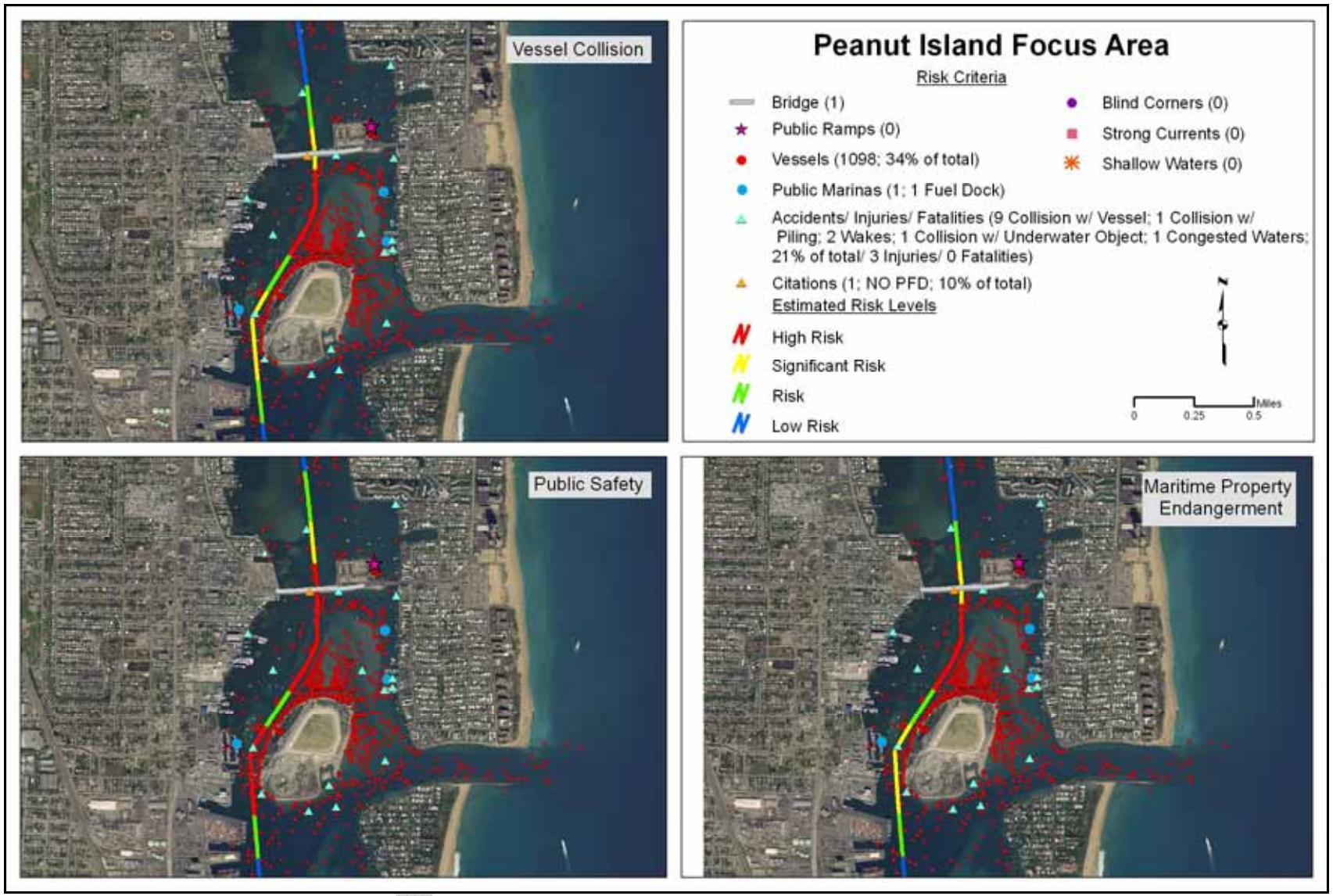


Figure 4-7. Peanut Island Focus Area

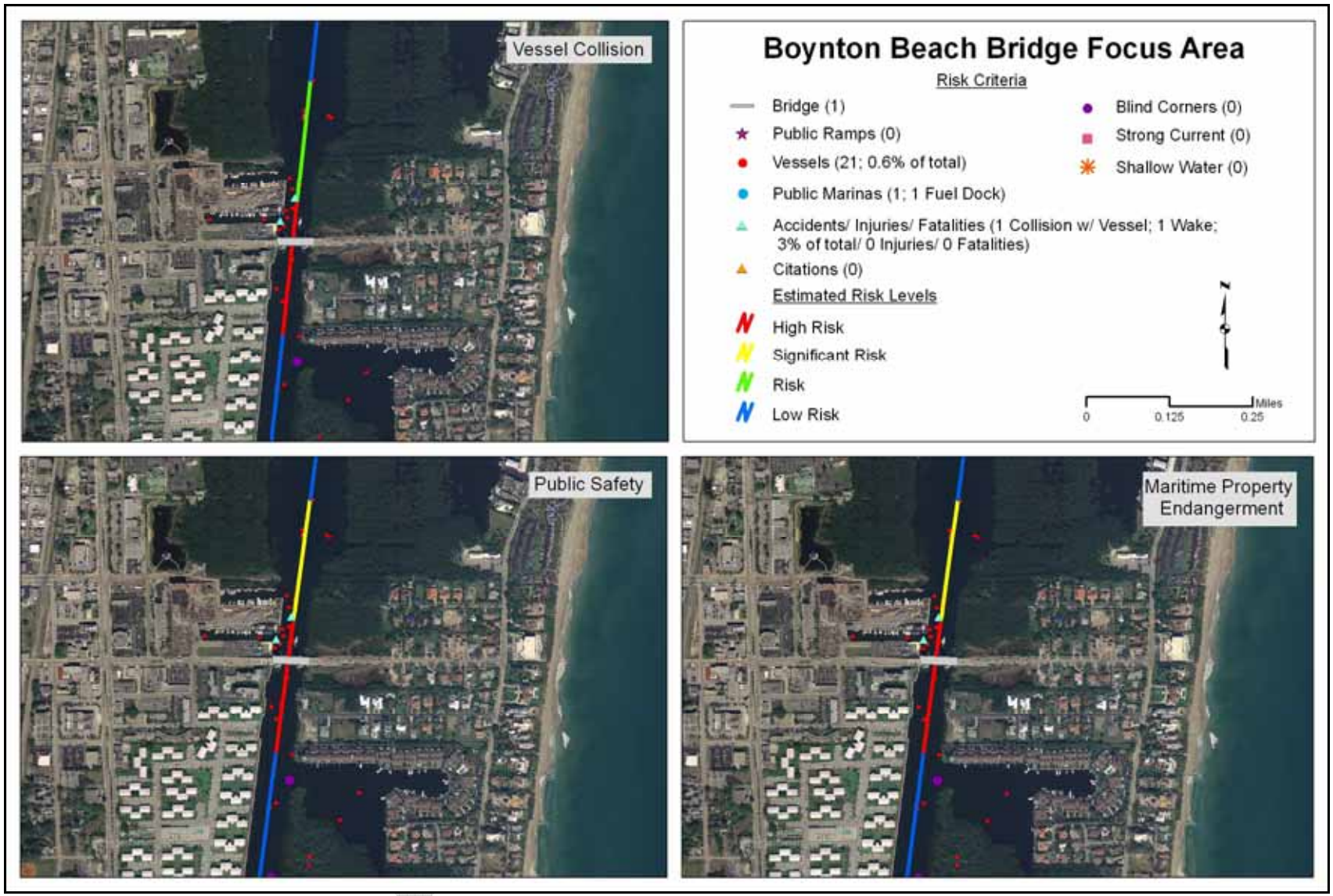


Figure 4-8. Boynton Beach Bridge Focus Area

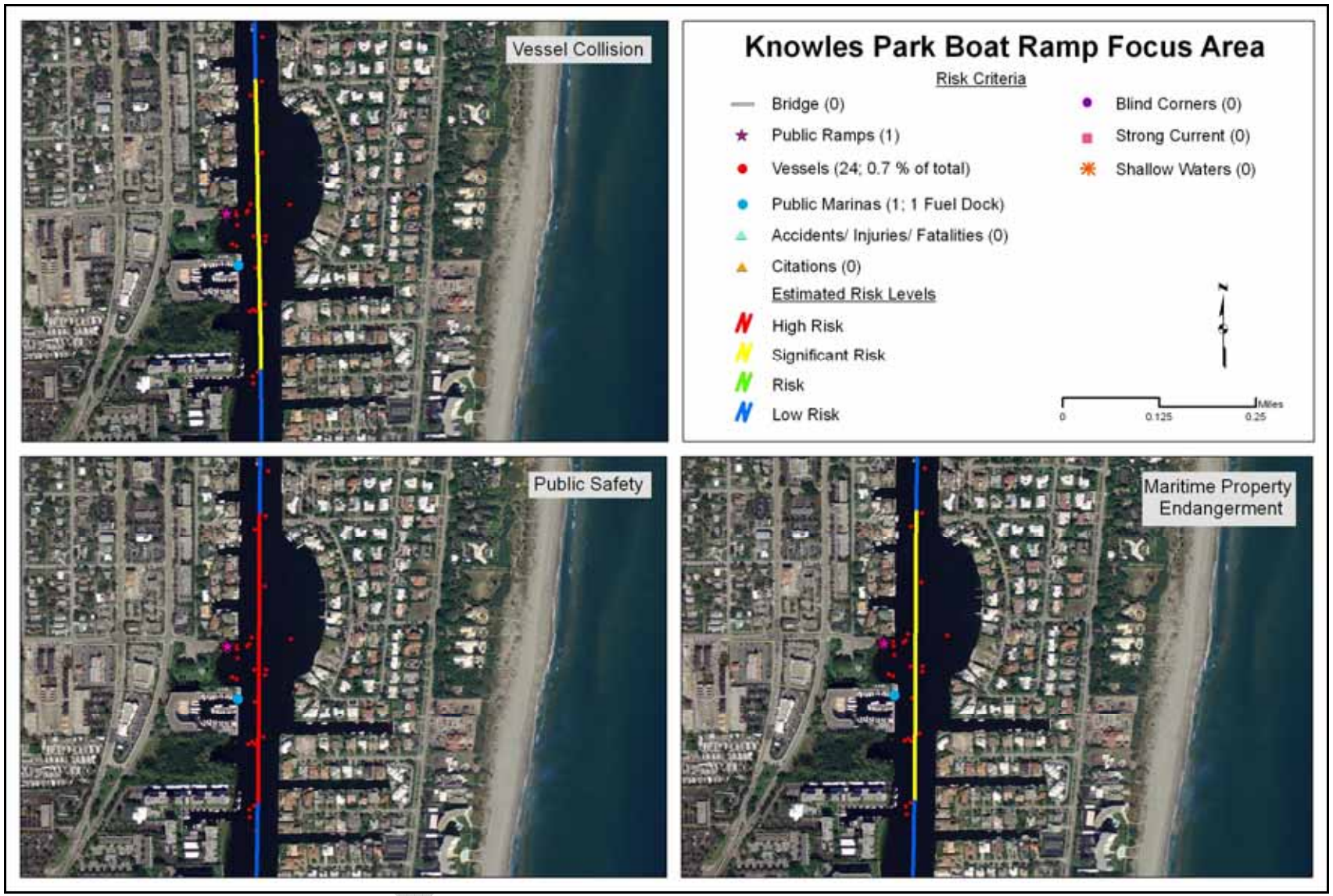


Figure 4-9. Knowles Park Boat Ramp Focus Area

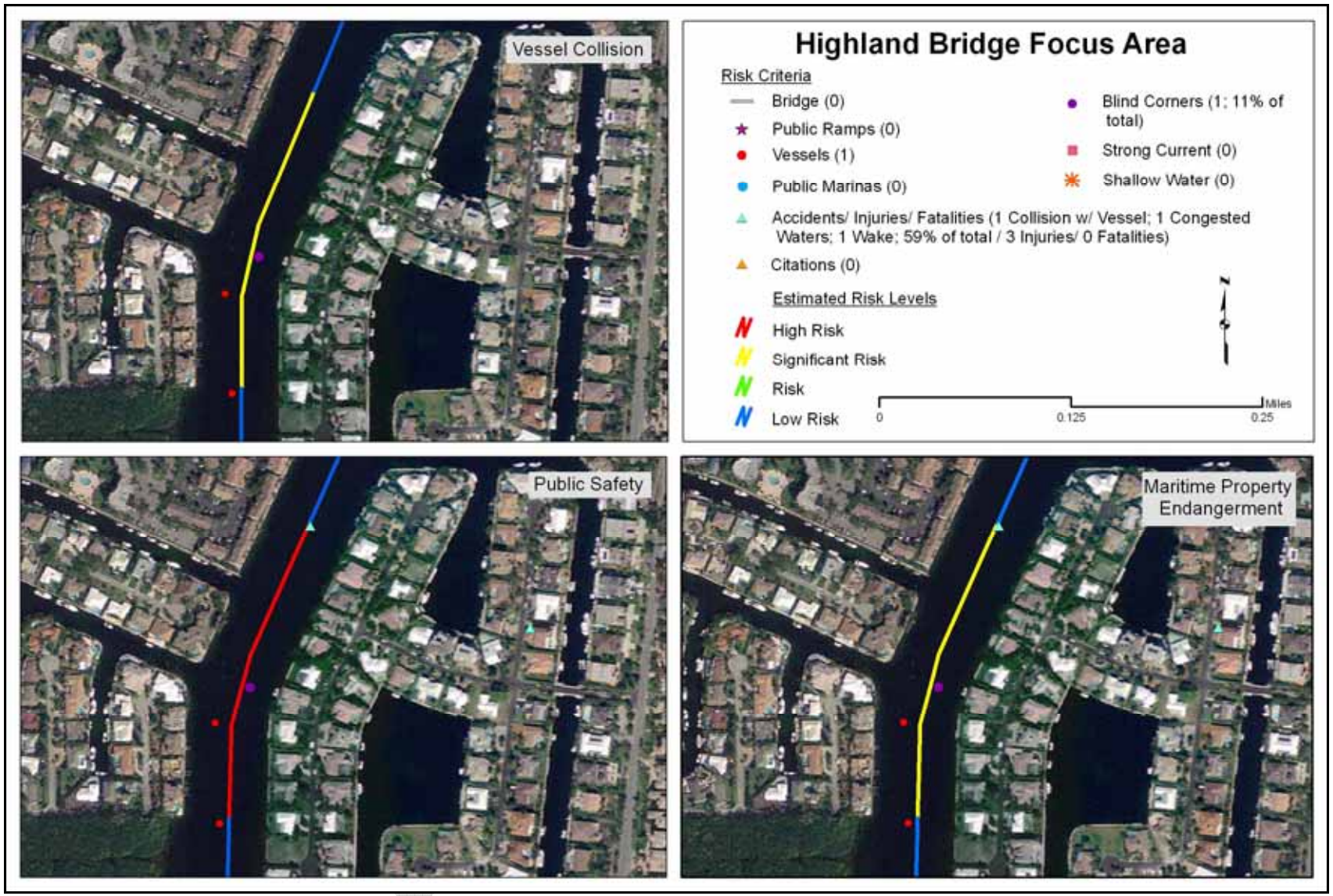


Figure 4-10. Highland Beach Focus Area

5. Public Participation Process

The public participation process consists of several phases, including meetings between the BWMP team and FWC, compilation of stakeholder comments and concerns during field data collection, development and dissemination of a boating safety risk survey and a series of advertised public hearings.

Agency Meetings

Numerous meetings have occurred between the BWMP team and FWC personnel to review boating safety issues and define regulatory and public safety priorities. A substantial amount of meeting time was spent on analyzing and developing regulatory and nonregulatory options for presentation at public hearings. The primary objectives of these options are to enhance boating safety and minimize boating safety risk.

Field Data Collection

Collection of field data provided an opportunity for the BWMP team to gather not only facility and feature information, but comments and opinions from stakeholders such as marine law enforcement personnel, marina owners, fishermen and recreational boaters. Stakeholder comments were collected during field data collection in 2006 and 2007. A listing of these comments can be found in Appendix F.

In Palm Beach County this anecdotal information was supplemented by a formal survey of marina owners. A three-phased approach was used to contact marina operators through the use of a Marina Survey to verify facility infrastructure and

discuss waterway issues and concerns. Details of this activity are provided in Chapter 5, Public Participation Process.

The three-phased approach included transmittal of the Marina Survey (Appendix I-1) by:

1. Email (Electronic Version)
2. U.S. mail (Hard Copy Version)
3. Site visit

On May 25, 2007 an FWC-approved electronic Marina Survey form was sent to marina operators in Palm Beach County. On June 20, 2007 a hard copy version of the Marina Survey was mailed in a pre-stamped envelope to the marina operators who had not responded electronically. Finally, on August 2 – 3, 2007 a Boating and Waterway Management Program team member conducted a field visit to the marina facilities that had not yet responded to the Marina Survey. A total of 50 responses were received (11 responses were received electronically, 17 responses were received by U.S. mail, and 22 responses were received by site visit). Table 2-2 provides a list of the names and locations of marinas, storage capacities, and fueling infrastructure current as of August 2007.

On September 21, 2007 PBS&J transmitted an FWC-approved press release to Dani Moschella (FWC) for distribution. The press release is available as Appendix I-2.

Many marina operators took the opportunity to use the Marina Survey form and/or the site visit to convey issues or concerns regarding boat wakes. Most marina operators indicated that their slips and fuel docks were adequately protected from boat wakes. There were, however, exceptions, most notably, the following public marina operators requested rule amendments to protect their facilities: Jonathan's Landing Marina, Palm Beach Yacht Center, and the City of Riviera Beach Marina.

Private marina operators at Sailfish Club of Florida and Bay Colony Marina Condominium also requested rule amendments to protect their facilities. Operators indicated that vessels in slips and dock infrastructure were susceptible to damage from boat wakes. More specifically, the Jupiter Yacht Club operator stated that damage to vessels and dock infrastructure was due to wakes from large vessels. The following public marina operators indicated that their facilities were susceptible to impact from boat wakes due to boater compliance issues with existing rules: Loggerhead – Lantana and the Town of Palm Beach Docks. The operator of Jupiter Yacht Club Marina, a private facility, also indicated boater compliance concerns with existing rules. Finally, the operator of Viking Service Center, a private service yard facility, requested consideration to their need to conduct sea trials in Lake Worth, north of the Blue Heron Bridge.

Public Meetings

The purpose of holding public meetings is twofold. The first objective is to inform the public and stakeholders about the activities of the FWC, relevant statutory requirements and proposed regulatory and nonregulatory options to promote and enhance boating safety. The second objective is to solicit opinions regarding boating safety issues and concerns and suggested approaches to address these concerns. A listing of the public meetings held by date and location is shown below in Table 5-1. Minutes of these meetings can be found in Appendix F.

Insert

Table 5-1 Listing of Public Meetings

An innovative method was employed by the BWMP team to gather and analyze the reactions and opinions of meeting attendees. Areas of the waterway are identified as needing regulatory or nonregulatory management through a combination of agency decisions, GIS risk analysis and public input. A matrix of management

options is created by the BWMP team in consultation with FWC. This matrix is composed of regulatory, signage and educational actions with a series of options listed in each column, along with a section for public comment. Table 5-1 provides examples of options that could be applied under a given action.

Regulatory	**Signage**	**Educational**
Establish a Slow Speed Minimum Wake zone	Install information signage	Develop boater guides and informational hand outs
Expand an existing speed zone	Update and improve existing signage	Establish a boating safety informational kiosk
Better enforcement of existing zones/speed limits	Install progressive signage	
Other	Other	Other

Table 5-2 Example Boating Safety Option Decision Matrix

A series of stations are arranged in the meeting hall, one for each discussion area. Each station contains an enlargement of an aerial photograph and a NOAA nautical chart to depict the location and physical characteristics of the discussion area, as well as a large-format matrix. Each column of the matrix is assigned a color. Upon arrival to the meeting, each attendee is given a specified number of dots in each of the colors representing a matrix action. Specifying the number of dots limits incidences of over-voting for a particular option and enables a more accurate summary and analysis of the number of opinions or "votes" received for each option.

Meeting attendees place dots in the boxes containing their option of choice. Subsequent to the meeting, dots are tallied by option and action and then converted to percentages. Other comments are reviewed and options are ranked by percentage, which reflects public opinion and preferences.

Public meeting minutes and comments compiled during field data collection can be found in Appendix F.

THIS SECTION TO BE COMPLETED AFTER PUBLIC HEARINGS

6. Summary and Recommendations

The Palm Beach County Vessel Traffic Study's primary objective was to apply a DSS model to aid FWC in evaluating criteria and estimating boating safety risk levels for waterways under specified safety situations and relevant circumstances. The approach utilizes decision criteria stipulated in Rule 68-D-23.105 FAC within a geographic information system DSS framework.

The DSS: (1) Provides a model structure for the integration of spatially referenced risk criteria, (2) Facilitates the evaluation of risk criteria relevant to an application for regulatory marker placement, (3) Allows for the proactive estimation of boating safety risk levels for ICW segments, (4) Enables consideration of the suitability of existing safety zones, and (5) Provides a tool for the allocation of law enforcement resources. The spatial component of the DSS makes explicit the characteristics of the natural and man-made waterway environment as well as the distribution of boating use that can influence risk to vessel collision, to boating safety, and to maritime property endangerment.

Proposed Boating Regulatory Areas

Based upon the results of the boating safety risk assessment and evaluation of public comments and concerns, the following boating regulatory zones are proposed as listed below. Each proposed zone includes a geographic description and a summary of the risk features, or "triggers" that support its designation.

THIS SECTION TO BE COMPLETED AFTER PUBLIC HEARINGS

Recommendations for Future Effort

Based upon data compilation, data development, the analysis methods, and the integration of these data into FWC Division of Law Enforcement, Boating and Waterways Section decision processes identified, the team offers the following recommendations:

Data Compilation

Issue 1.1. The analysis used best available data. Some of the data themes assembled for the study require considerable checking for spatial accuracy and attribute completion and consistency (e.g., waterways, bridges, trestles, marinas, ramps, and accident and citation report locations).

Recommendation 1.1. A provision should be made to update and check for the completeness, accuracy, and currency of the data and attributes. For example, verification of the spatial accuracy of accident and citation locations could be accomplished by the reformatting and updating of accident and citation databases within a GIS.

Data Development

Issue 2.1. The prototype GIS analysis was based on a composite of all boating accident and citation data for Palm Beach County. The accident database contained reports from 2002 through 2006. The citation database consisted of records from 2000 through 2006.

Recommendation 2.1a. Conduct an analysis of the variation in the number of accidents per year related to boating safety situation risk. For example, determine the number of accidents per year (by type) that constitute "Low Risk," "Risk," "Significant Risk," and "High Risk."

Recommendation 2.1b. Develop standard statewide thresholds for ranges of accidents and citations associated with levels of risk by which to evaluate the ICW in any given county.

Issue 2.2. The prototype GIS analysis was based on a composite of boating observations from sixteen aerial surveys conducted during 2007.

Recommendation 2.2a. Develop vessel congestion thresholds based on average daily traffic counts and/or peak hour counts as opposed to composite vessel traffic counts. Average daily traffic counts are likely to more accurately reflect vessel traffic conditions.

Recommendation 2.2b. An analysis of existing recreational boating survey reports (sponsored by the FWC) and data should be undertaken to develop a "perceived congestion" scale based on recreational boater responses to the surveys, to determine when perceived congestion influences recreational boating activities. From this, standardized congestion thresholds (levels of service) can be established based on statewide data for use as a benchmark for evaluating vessel traffic congestion estimates for individual counties.

Recommendation 2.2c. Determine the impact that popular destination locales (located adjacent to the ICW) have on level of waterway service, which in turn may affect boating safety.

Method Enhancement

Issue 3.1. Risk criteria rating and scoring for the prototype GIS analysis is based primarily on the responses of a subject matter expert.

Recommendation 3.1a. The team recommends a wider distribution of the criteria evaluation form. Having FWC personnel and subject matter experts complete the evaluation form will help refine the prototype DSS. A minimum number of thirty completed forms would provide a statistically valid sample, based on the assumption of a normal distribution and an acceptable level of error, while providing a deeper understanding of the perception of risk associated with

recreational boating and enforcement activities. Risk criteria ratings and attribute weights would be processed to derive median values and analyzed using measures of similarity and dispersion to illustrate the structure of the risk criteria hierarchy.

Issue 3.2a. The result of the prototype DSS risk assessment needs to be validated.

Issue 3.2b. Determine the role that individual risk criteria play in influencing safety zone options.

Issue 3.2c. Determine the effects of the temporal versus composite analyses of risk criteria on influencing safety zone options (e.g., average daily traffic; annual accident reports).

Recommendation 3.2a. A determination of the decision-making process regarding existing regulatory zones, including the date of establishment, whether the current rule was in effect at the time of zone creation, and what criteria were used in the process may provide a useful validation, in the form of a pilot project, of the prototype DSS results.

Recommendation 3.2b. Conduct a sensitivity analysis to measure the portion of uncertainty associated with metric and qualitative criteria scoring and weighting. The intent is to determine the proportional contribution of each risk criterion to the overall variability inherent in the composite weighted scores. A sample of thirty or more completed evaluation forms would facilitate the sensitivity analysis.

Recommendation 3.2c. A temporal classification of traffic congestion thresholds and accident and citation criteria would provide a test against the composite totals currently used in the DSS prototype. Hypothetically, a temporal classification and evaluation of these variables will produce more realistic safety zone options.

Issue 3.3a. The GIS analysis would benefit from automation.

Recommendation 3.3a. Automation of aspects of the model would greatly enhance its utility by allowing for the analysis of specific areas selected by the user, examination of what-if scenarios by focusing the analysis on risk criteria of the user's choosing, and finally, by eliminating the segmentation effect described in Chapter 3 (i.e., currently the GIS analysis output is limited to a pre-determined ICW segment length). The automation process would produce a simplified toolkit

that would operate on user inputs such as typing in coordinates or selecting an area of interest, as well as selecting the desired risk criteria from a master list for the estimation of risk levels for a particular waterway segment.

Integration and Training

Issue 4.1. Provide for the integration and use of the geospatial datasets and methodology provided by this study into the FWC Division of Law Enforcement, Boating and Waterways Section decision process.

Recommendation 4.1. Provide orientation and training for FWC Division of Law Enforcement Boating and Waterways staff on the use of the data and GIS software. The training will be designed around the display, query, and mapping of geospatial data and GIS analysis output compiled as part of the Palm Beach County Vessel Traffic Study.

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Appendix A

Data Dictionary for Aerial Reconnaissance of Boating

Table A1. Vessel Type Categories

Code	Description	Comments
AR	airboat	2-digit character string
OM	open motorboat	includes open fisherman, flats boats, deck boats, sport/runabout/ski boats
CB	cabin motorboat	includes all closed-cabin boats, including yachts, cruisers, trawlers, cuddy cabin-type, etc.
CF	commercial fishing	crab boat, net boat, trawler, etc.
SA	sailboat	includes both sail and auxiliary sailboats
JB	Johnboat	includes all tiller-steered power boats
IN	inflatable	zodiac or other inflatable-type vessel
HB	houseboat	
PT	pontoon boat	
PW	personal watercraft	
HP	high performance/ racer	scarab/cigarette-type boat
KC	kayak/canoe	
TG	commercial tug/ tender	
BG	commercial barge	construction barges, dock & davit, etc. Note: Includes barges that are being moved by other types of vessels.
TR	commercial transport	water taxi, ferry, sightseeing
EN	enforcement	includes local, state, federal (USCG), etc.

Table A2. Vessel Size, Activity, and Speed Categories

Characteristic	Code	Description	Comments
Size	15	< 16 feet in length	numeric
	16	16 - 25 feet in length	numeric
	26	26 - 39 feet in length	numeric
	40	40 - 64 feet in length	numeric
	65	65 - 109 feet in length	numeric
	110	> 109 feet in length	numeric
Activity	T	travel	movement in one prevailing direction
	M	milling	movement but no prevailing direction
	A	drift/anchor	a vessel being used, but not underway
	S	ski	includes skiing, tubing and wakeboarding
	R	recreation	other watersports-type activity, typically associated with Personal Watercraft (thrill-riding).
Speed	0	anchor/drift	vessel in use but stationary
	1	under sail	sailboat with sails up
	2	idle/slow	includes sailboats under power
	3	plowing	plowing hull vessels-only
	4	cruising	non-planning hull vessels-only
	5	planning	planning hull vessels-only

Table A3. Summary of Vessel Types Observed via Aerial Reconnaissance (2006–2007)

Type Category	1/19/07 (am)	1/19/07 (pm)	2/24/07 (am)	2/24/07 (pm)	4/2/07 (pm)	4/3/07 (am)	4/21/07 (am)	5/26/07 (pm)	6/10/07 (pm)	6/24/07 (am)	7/18/07 (am)	8/23/07 (pm)	10/15/07 (am)	10/15/07 (pm)	11/4/07 (am)	11/4/07 (pm)	Total
Airboat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Open Motorboat	58	64	223	371	161	73	160	552	1079	220	70	46	23	28	134	386	**3648**
Closed Cabin	41	54	79	145	43	36	57	120	201	29	25	23	15	17	46	189	**1120**
Commercial Fishing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Sailboat	19	20	33	17	12	20	14	25	22	6	13	5	2	2	4	18	**232**
Johnboat	0	2	0	0	1	1	1	0	3	3	0	0	1	1	2	3	**18**
Inflatable	0	1	1	1	0	1	3	1	0	0	1	1	0	1	3	1	**15**
Houseboat	0	0	3	3	0	0	0	0	3	0	1	0	0	0	1	1	**12**
Pontoon Boat	0	1	4	2	1	0	0	6	12	2	3	1	0	2	2	2	**38**
Personal Watercraft	0	16	6	20	12	3	7	32	77	9	5	4	0	2	7	35	**235**
High Performance	0	0	1	4	1	1	0	1	2	1	0	0	0	0	1	5	**17**
Kayak / Canoe	5	7	8	15	10	1	27	10	7	18	3	2	4	2	6	10	**135**
Commercial - Tug / Tender	1	0	0	0	0	1	2	0	2	1	0	0	0	3	0	1	**11**
Commercial - Barge	3	5	4	4	6	3	6	0	3	0	6	5	11	8	1	4	**69**
Commercial - Transport	0	1	3	4	1	1	2	0	1	1	6	2	1	2	1	1	**27**
Commercial - Other	0	0	0	1	0	0	3	0	0	0	1	2	1	1	0	0	**9**
Enforcement	1	1	3	2	0	0	0	0	0	0	1	0	0	1	0	2	**11**
Total	**128**	**172**	**368**	**589**	**248**	**141**	**282**	**747**	**1412**	**290**	**135**	**91**	**58**	**70**	**208**	**658**	**5597**

Table A4. Summary of Vessel Size Classes Observed via Aerial Reconnaissance (2006-2007)

Size Class	1/19/07 (am)	1/19/07 (pm)	2/24/07 (am)	2/24/07 (pm)	4/2/07 (pm)	4/3/07 (am)	4/21/07 (am)	5/26/07 (pm)	6/10/07 (pm)	6/24/07 (am)	7/18/07 (am)	8/26/07 (pm)	10/15/07 (am)	10/15/07 (pm)	11/4/07 (am)	11/4/07 (pm)	Total
< 16 ft	9	29	35	45	38	9	43	57	133	32	15	7	5	6	20	54	**537**
16-25 ft	63	71	249	400	151	74	157	575	1052	217	78	49	21	31	121	401	**3710**
26-39 ft	23	37	47	76	26	26	41	85	161	36	25	13	11	5	42	97	**751**
40-64 ft	16	24	20	40	16	14	24	22	48	3	9	6	5	9	15	54	**325**
65-109 ft	15	7	12	21	12	17	13	6	16	2	5	12	8	14	8	51	**219**
> 110 ft	2	4	5	7	5	1	4	2	2	0	3	4	8	5	2	1	**55**
Total	**128**	**172**	**368**	**589**	**248**	**141**	**282**	**747**	**1412**	**290**	**135**	**91**	**58**	**70**	**208**	**658**	**5597**

Appendix B

Risk Criteria Evaluation Form

This questionnaire, developed by the University of Florida Sea Grant College Program, is intended to allow FWC Law Enforcement personnel to rate factors identified as being relevant to determining risk within the following three primary boating safety situations identified in section 68D-23.105 "Criteria for Approval for Regulatory Markers."

1. Vessel Collision (between vessels or with fixed objects)
2. Public Safety (protection of life and limb)
3. Maritime Property Endangerment (vessels and personal property onboard)

The Rule identifies information collected by law enforcement officers to help assess risk for safety situations. This includes boating accident reports and uniform boating citations that identify locations along the waterway where vessel traffic safety and public safety has been compromised. Accident reports identify the primary causes and type of accidents; boating citations are classified according to a description of the infraction. The Rule also describes vessel traffic conditions, waterway conditions, and marine infrastructure features that can contribute to increased risk of vessel collision, to public safety risk, and to maritime property endangerment. Vessel traffic features comprise estimates of congestion and use. Waterway features include blind corners, hazardous currents, underwater objects, shoals and waterway width. Marine infrastructure features refer to the location of ramps, locks, bridge fenders and fuel docks relative to waterway width and distance from the ICW.

Your responses on this evaluation form will be used to rate the relevance of factors mentioned in the Rule to each of the three safety situations. The rated factors will

then be used to identify and map potential boating safety risk levels on the ICW. For the analysis, boating safety risk levels identified in the Rule include:

1. Low Risk
2. Risk
3. Significant Risk
4. High Risk

Questionnaire

Instructions

Please answer all parts of the following ten questions.

The following are a series of tables that list factors, outlined in section 68D-23.105 FAC, that potentially contribute to the risk of vessel collision, to public safety risk, or to the endangerment of maritime property.

Please circle a number from 1 to 7, with 1 being the lowest and 7 being the highest, which best reflects your opinion of each factor's relative contribution to risk of vessel collision, public safety risk, or to the endangerment of maritime property.

Base your answers on your personal experience and knowledge of the entire ICW channel through your county, **not** keyed to any particular location on the ICW. In other words, do not try to rank features relative to each other, only relative to each safety situation.

Question 1. In the table below, please rate the risk for each safety situation related to the number of reported accidents involving collisions with other vessels or with fixed objects. Circle a number from 1 to 7.

Number of Accidents	Safety Situation	Risk Low Medium High
1 reported collision	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
2 – 5 reported collisions	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
More than 5 reported collisions	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 2. In the table below, please rate the risk for each safety situation related to the degree of injury sustained from reported accidents. Circle a number from 1 to 7.

Injuries Sustained	Safety Situation	Risk Low Medium High
None or minor injuries sustained from accident	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Substantial injuries from accident	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Fatality from accident	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 3. In the table below, please rate the risk for each safety situation related to the type of reported accidents. Circle a number from 1 to 7.

Type of Accident	Safety Situation	Risk Low Medium High
Collision with another vessel	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Collision with an underwater object	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Collision with a piling	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Collision with bridge/ fender system	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Collision with a person	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Grounding	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 4. In the table below, please rate the risk for each safety situation related to the cause of reported accidents. Circle a number from 1 to 7.

Cause of Accident	Safety Situation	Risk Low Medium High
Vessel wake	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Hazardous waters	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Congested waters	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 5. In the table below, please rate the risk for each safety situation related to the type of boating citation reported. Circle a number from 1 to 7.

Boating Citation Type	Safety Situation	Risk Low Medium High
No personal flotation device	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Speeding through existing speed zones	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Careless operation	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 6. In the table below, please rate the risk for each safety situation related to the amount of vessel traffic. Circle a number from 1 to 7.

Vessel Traffic Condition	Safety Situation	Risk Low Medium High
Less than 10 vessels	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
10–50 vessels	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Greater than 50 vessels	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 7. In the table below, please rate the risk for each safety situation related to vessel length categories. Circle a number from 1 to 7.

Vessel Length Categories	Safety Situation	Risk Low Medium High
Less than 12 feet	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
12–15 feet	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
16–26 feet	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
27–40 feet	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Greater than 40 feet	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 8. In the table below, please rate the risk for each safety situation related to vessel speed categories. Circle a number from 1 to 7.

Vessel Speed Categories	Safety Situation	Risk Low Medium High
Anchored/ Drifting	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Idle/Slow	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Under Sail	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Plowing	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Cruising	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Planning	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 9. In the table below, please rate the risk for each safety situation related to the identified waterway conditions. Circle a number from 1 to 7.

Waterway Conditions	Safety Situation	Risk Low Medium High
A blind corner	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
A confluence of waterways	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Strong currents	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Shoal (shallow waters)	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Waterway greater than 300 feet wide	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Waterway less than 300 feet wide	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

Question 10. In the table below, please rate the risk for each safety situation related to the presence of marine infrastructure features. Circle a number from 1 to 7.

Presence of Marine Infrastructure	Safety Situation	Risk Low Medium High
Mooring field	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Public marina	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Boat ramp	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Fuel dock	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Lock	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7
Bridge	Vessel Collision	1 2 3 4 5 6 7
	Maritime Property	1 2 3 4 5 6 7
	Public Safety	1 2 3 4 5 6 7

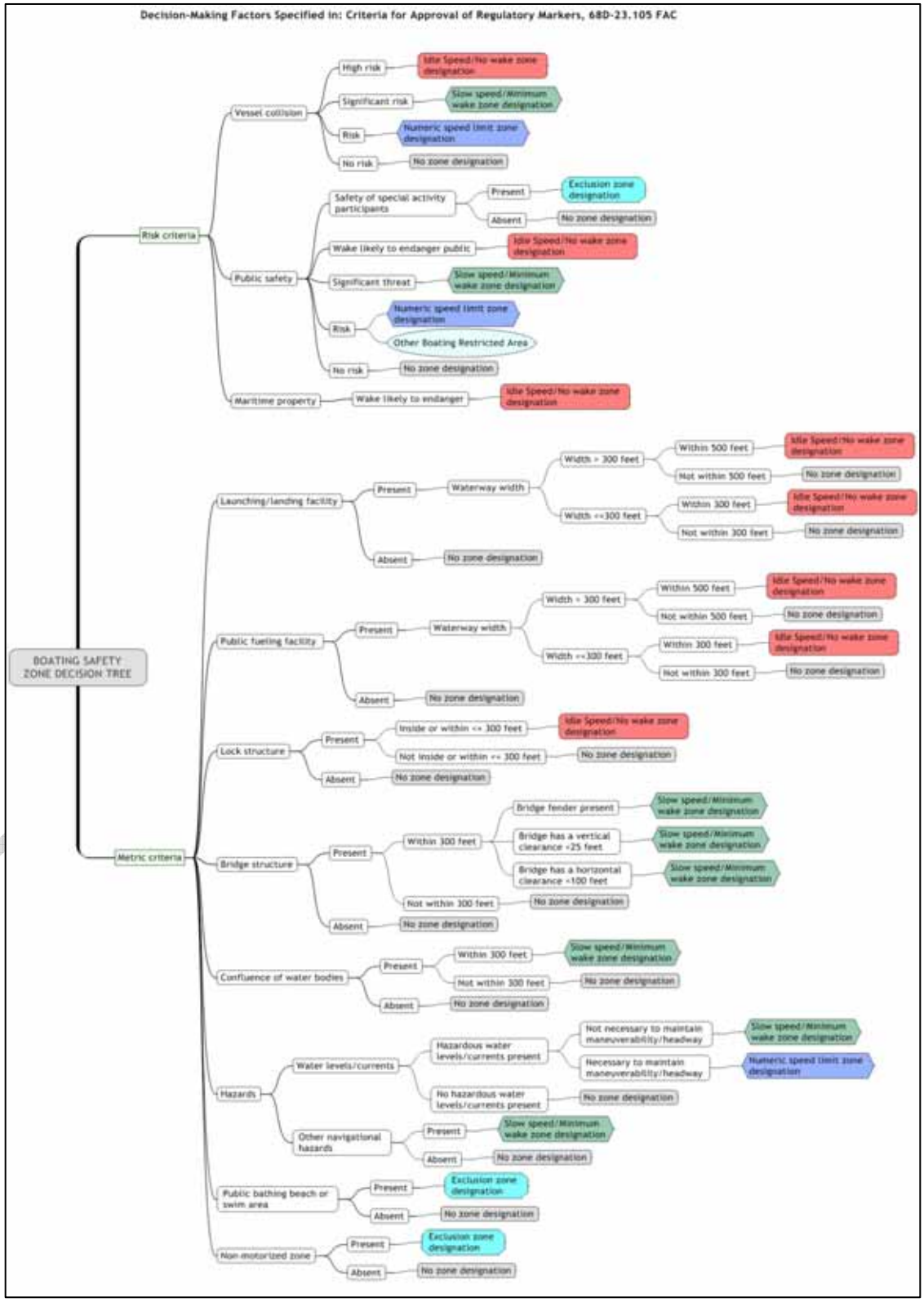
Thank you for completing this questionnaire.

Please return the completed questionnaire to:

Tara Alford, Management Analyst
FWC Division of Law Enforcement
Boating and Waterways Section
620 South Meridian Street
Tallahassee, FL 32399

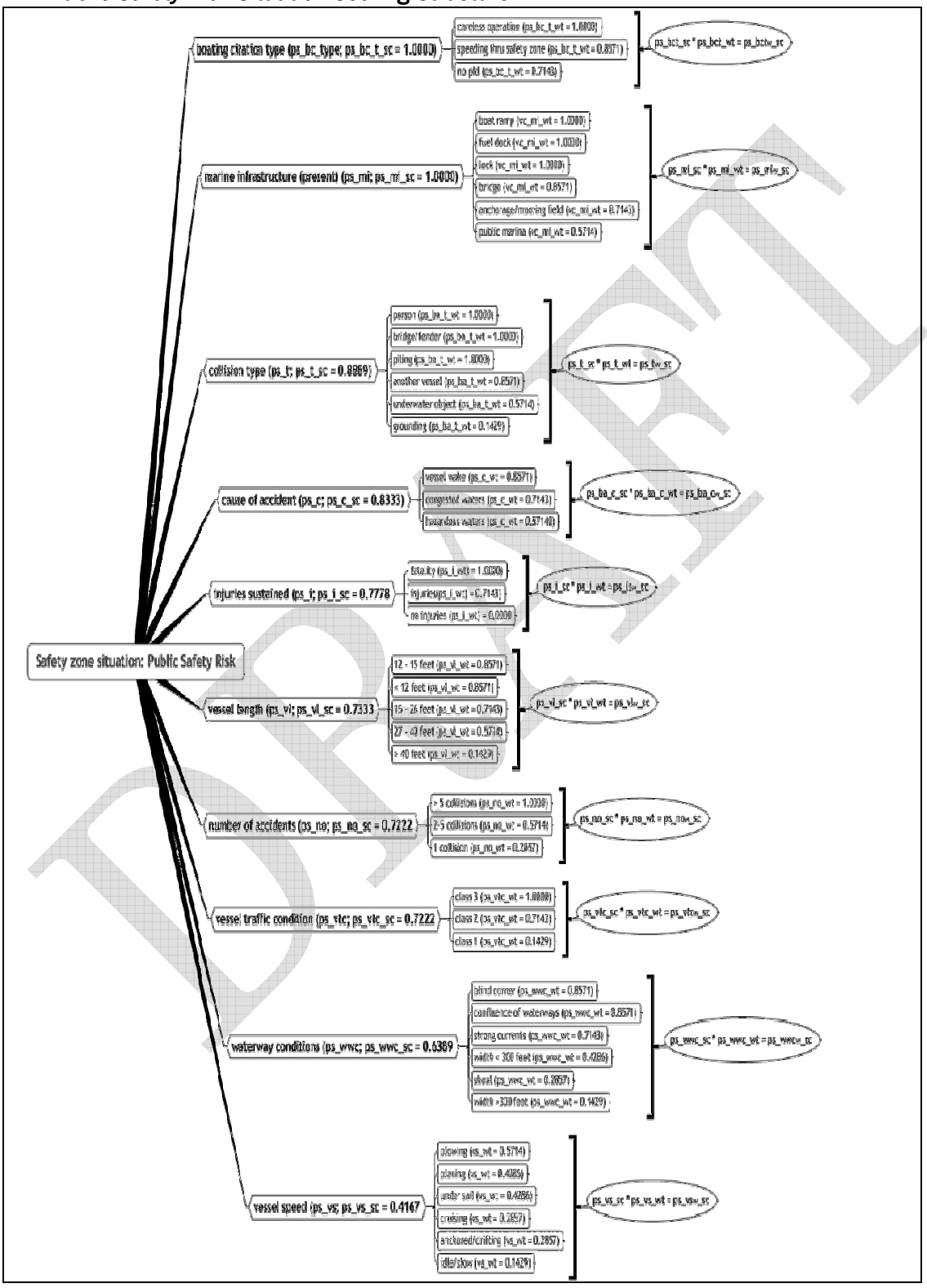
Appendix C

Diagram of Section 68D-23.105 FAC Interpretation



Appendix D

Public Safety Risk Situation Scoring Structure



Appendix E

Florida Sea Grant Content Analysis Procedures for Review of FWC Vessel Accident Database

Data is provided by FWC in either text file or MS Excel ™ spreadsheet file format. For Palm Beach County, the original accident database contained 2,821 records. After applying the content analysis process listed below, the relevant accidents used in the risk analysis totaled 66 accidents. Process steps are listed below. Field headings are shown in **bold** text.

1. Review and select fields with a unique USCG Accident Case File number (**Acc Us Cg**) to eliminate duplicate records. Sometimes it is necessary to check FWC Accident Case File number field (**Acc Case No**) to confirm.

2. Using Study Area extents coordinates, review the **Latitude** and **Longitude** fields to be sure that the record is in the study area extent. In addition, delete all records that don't have coordinates.

3. Create a shapefile from the edited accident using the ESRI ArcMap ™ program, and perform a locational select for only those areas within the geographic limits of the Boating Safety Risk Analysis model study area (in the Palm Beach County case, this is within the Intracoastal Waterway (ICW) shoreline to shoreline). Export the selected records to a new shapefile. Review the field **Acc_Body_O** to ensure that all records are located within the ICW, and delete any record that is not in that location.

4. Browse each record, determine which **accident description** and listed safety type that best fits the description (see below). Use the description as your primary source of information but also consider the **Primary Accident Causes** and **Primary Accident Types,** which are coded numerically (see

below). In the case of conflicting information, **Primary Accident type** should have precedence over **Primary Accident Causes**. When a safety type is determined add the appropriate code to the **Safety type** field based on the abbreviations below.

Code	Definition
CB	Collision with a bridge
CP	Collision with a piling
CPS	Collision with a person
CV	Collision with a vessel
WMP	Wake /maritime property
WPS	Wake / public safety
R	Reckless operation
BC	Blind corner
CON	Congested waters
CUO	Collision with underwater objects
G	Grounding
HW	Hazardous waters
NA	Not applicable

Table E1. Safety Type Code Definition

SAFETY TYPE DESCRIPTIONS

CPS (collision with person): a vessel strikes a person. If the person falls from the vessel and strikes any part of the vessel, then this should not be included. Primary Accident types include: 3 (collision with person), 19 (struck by a boat), 20 (struck by skeg/prop).

CB (collision with bridge): When a vessel hits a bridge regardless of the cause. Primary Accident type includes: 4 (collision with fixed objects).

CV (collision with vessel): If two vessels collide regardless of the cause. An exception to this category is machine failure (16) as a primary cause of collision; these records will be included as Not Applicable (NA). Primary Accident type involved: 5 (collision with vessel). Some cases will have a number different than 5 as the primary accident type. However if the description mentions a collision between vessels, these records can be included as CV.

CP (collision with piling): It does not matter what the cause of the crash was if the result hits a piling or a marker. Primary Accident type involves: 4 (collision with fixed objects).

HW (hazardous waters): Usually results from wave action. Description would mention rough waters or seas, large waves (several feet), heavy seas, etc. If the description contains the word "wake" it will be considered under another category. Primary Accident Cause involved: mostly 9 (hazardous waters) but could include others. Primary Accident type involved: mostly 12 (flooding/swamping), 2 (capsize), but perhaps includes others except for 5 (CV).

WPS (wake public safety): Damage caused from the action of wakes (from other vessels) where a person was injured. Primary Accident type involved: mostly 6 (fall in boat), 9 (falls overboard), but would include others (14, 22).

WMP (wake maritime property): Damage caused from the action of "wakes (from other vessels) where a vessel was damaged. Primary Accident type involved: mostly 22 (vessel wake damage), but would include others (12, 3, 4).

CON (congested waters): Describes high vessel traffic, heavy boat traffic, congested waters, etc. Primary Accident cause involved: 3 (congested waters), but can also be accepted as a secondary or tertiary cause if the description mentions congestion. Primary Accident type involved: mostly 6 (fall in boat), but could include others (4, 14, 12) except 5 (CV).

G (grounding): Describes vessels "running aground" or "grounding." Primary Accident type involved: 13 (grounding).

CUO (underwater objects): Describes collision with submerged or underwater objects. Primary Accident type involved: mostly 21 (underwater objects), but could include others (4, 3).

R (Reckless Operation): Applies to accidents involving alcohol or reckless behavior. Primary Accident Cause involved: 23 (reckless), 1 (alcohol). There are multiple types of accidents, but 5 (CV) cannot be included.

BC (blind corner): Describes physical barriers that obstruct the operator's vision, but 5 (CV) cannot be included.

NA (Not Applicable): Contains records that describe non-relevant boating safety issues. Primary Accident type involved: machine failure (16), collision with fixed objects like a seawall, a dock (4) (except collision with piling or bridge), also could include other types. These records are not included in the analysis.

TYPE OF ACCIDENT	CAUSE OF ACCIDENT
1)Alcohol use	1)
2)Careless/inattention	2)Capsizing
3)Congested Waters	3)Coll. w/floating object/person
4)Dam or lock	4)Coll. w/fixed object
5)Drug use	5)Coll. w/vessel
6)Equipment failure	6)Fall in boat
7)Excessive Speed	7)Fall on PWC
8)Failure to vent fumes	8)
9)Hazardous waters	9)Falls overboard
10)Hull failure	10)Fire/explosion
11)Ignition of fuel vapor	11)Fire/explosion (non-fuel)
12)Improper anchoring	12)Flooding/swamping
13)Improper loading	13)Grounding
14)Lack of vessel flotation	14)Other
15)Lack of proper lights	15)Sinking
16)Machine failure	16)Skier hit object
17)No proper look out	17)Skier mishap/fall
18)Off throttle steering jet	18)Starting engine
19)Operator inexperience	19)Struck by boat (person)
20)Operator inattention	20)Struck by skeg/prop
21)Other	21)Struck underwater object
22)Overloading	22)Vessel wake damage
23)Reckless operation	23)
24)Sharp turn	24)
25)Skier occupant behavior	25)
26)Stand/sit on gunwale, transom, or bow	26)
27)Violation or navigation rules	27)
28)Vision Obstructed	28)
29)Weather	29)

Table E2. ACCIDENT Type and CAUSE Codes

Figure E1 illustrates the distribution of accidents by type for those 66 accidents included in the analysis.

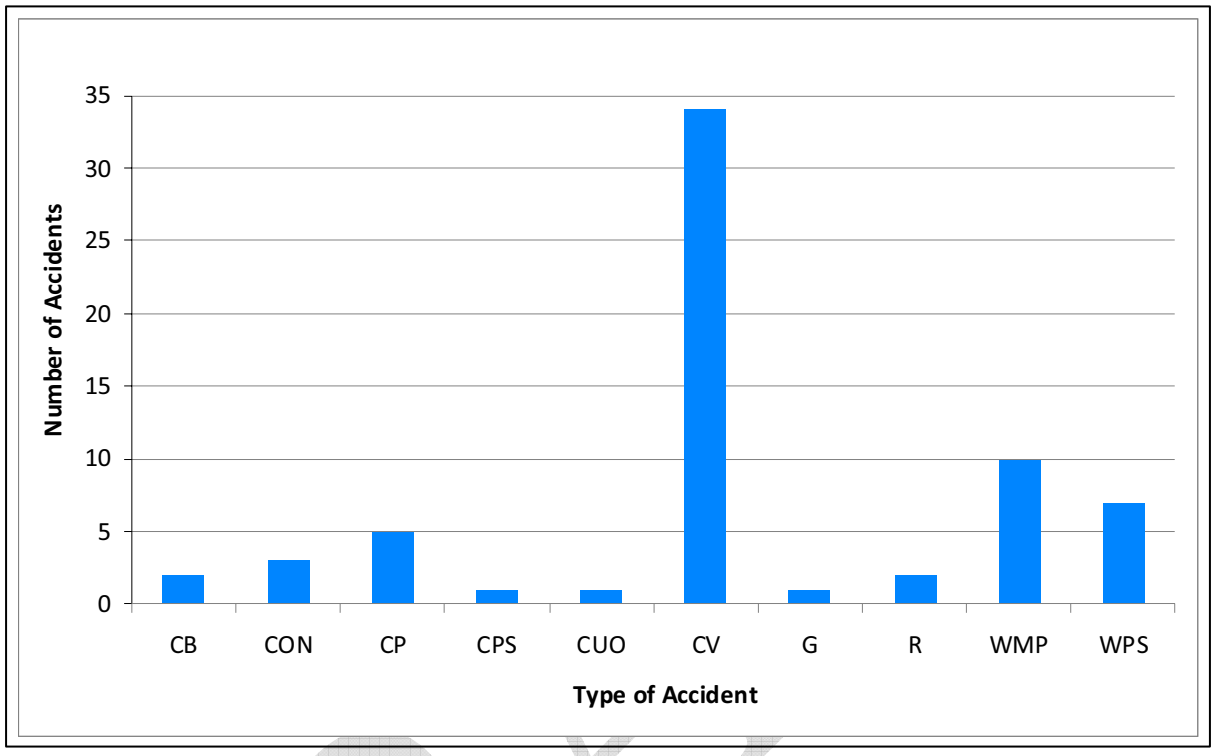
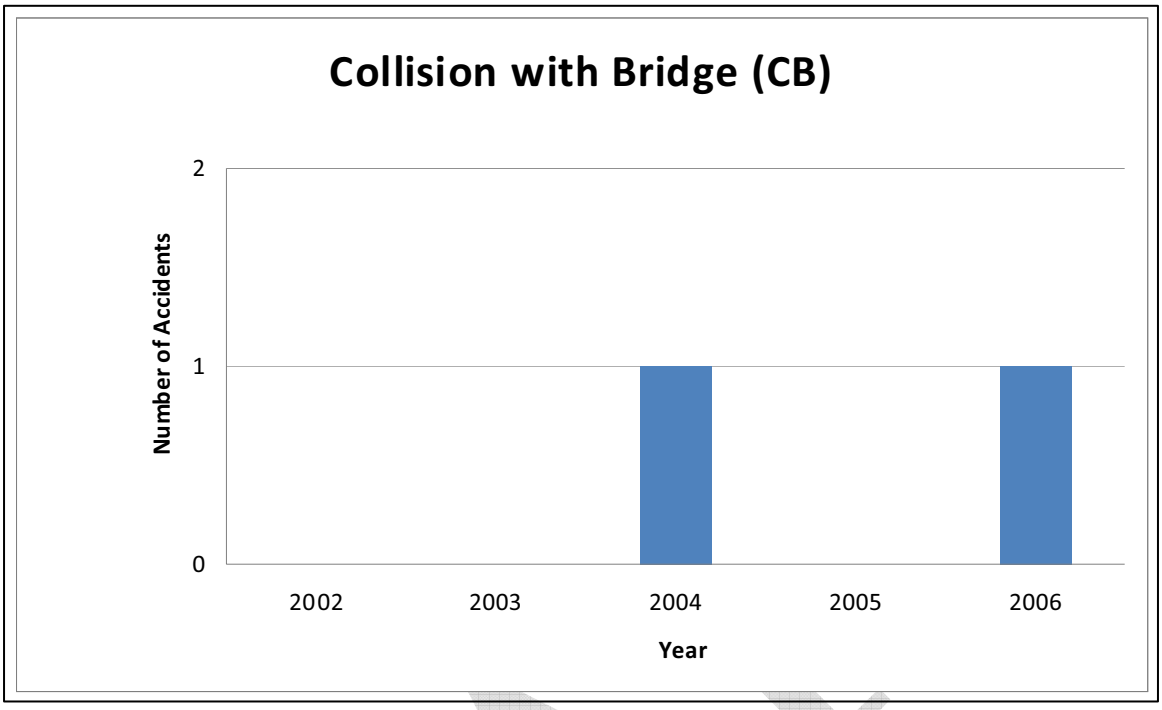
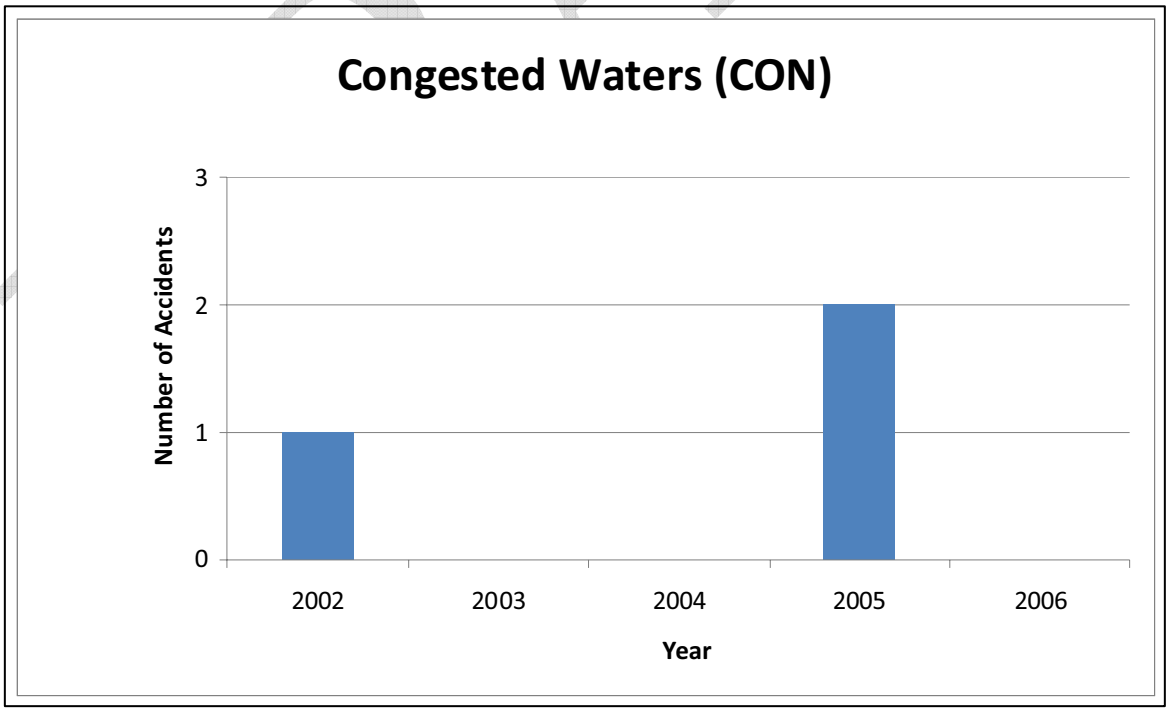
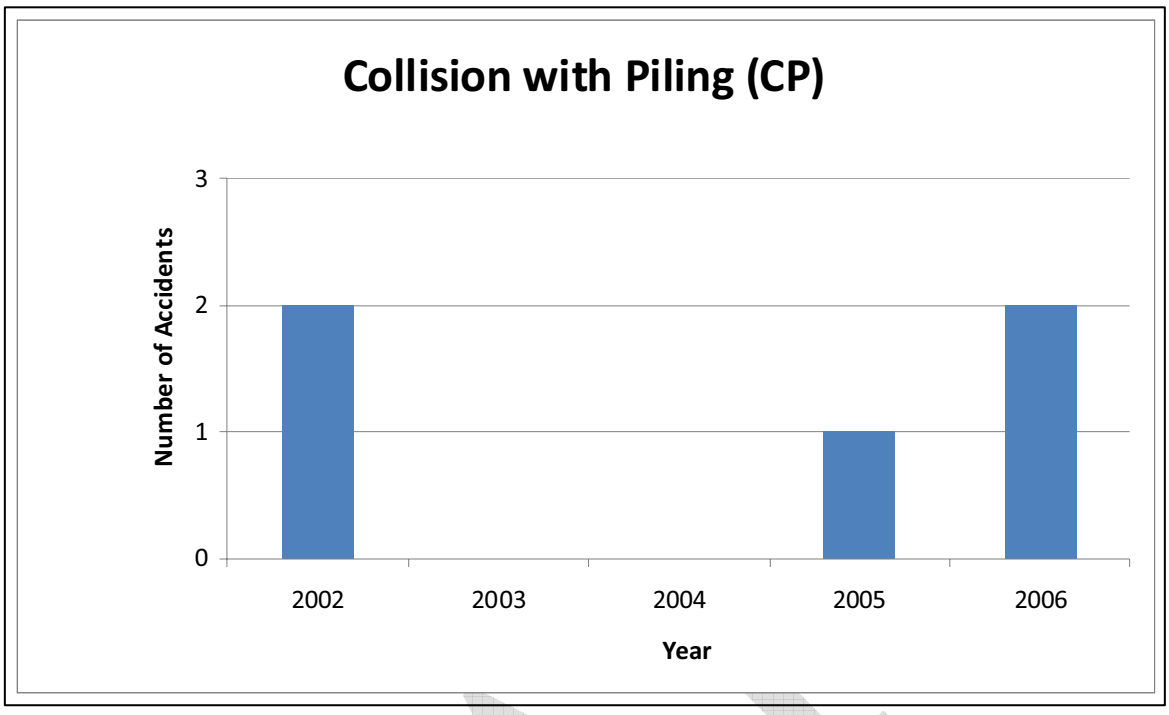


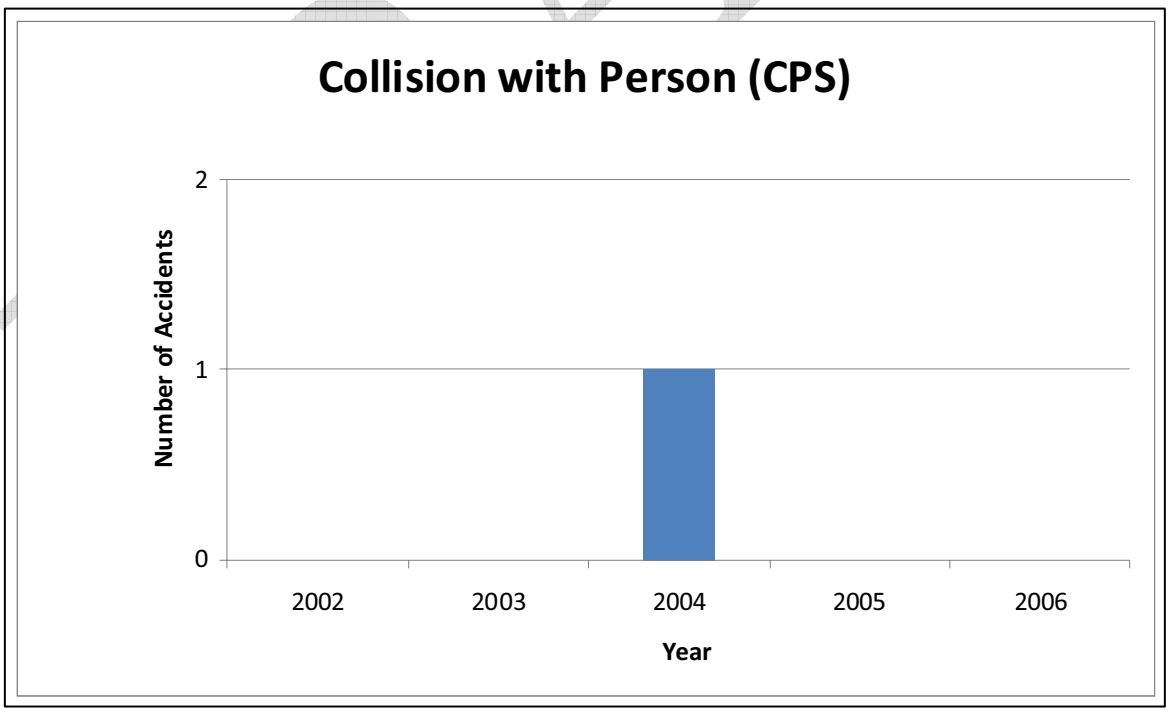
Figure E1. Number of Accidents by Type

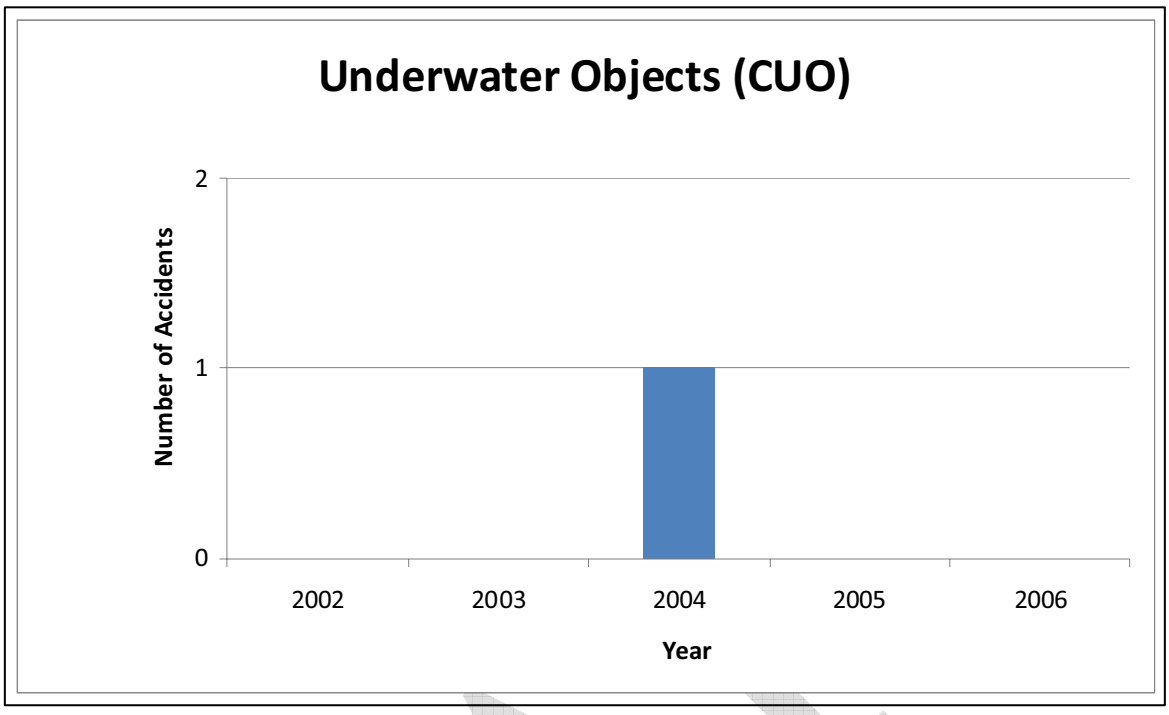
The following figures provide a breakdown of accidents by type and year of occurrence. The time period of five years (2002 to 2006) over which these accidents occurred is too limited to draw any substantive conclusions regarding accident patterns. A longer time period is necessary for any sort of meaningful analysis of trend and type characteristics.

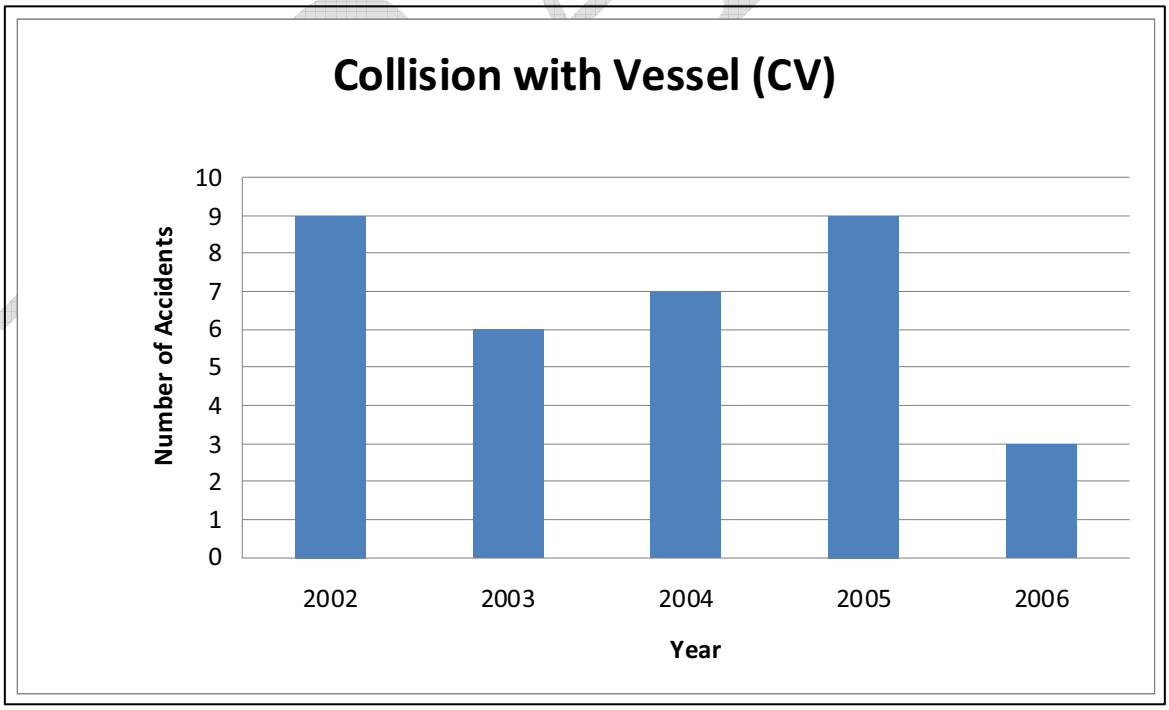

Collision with Bridge (CB)
Number of Accidents
2
1
0
2002
2003
2004
2005
2006
Year

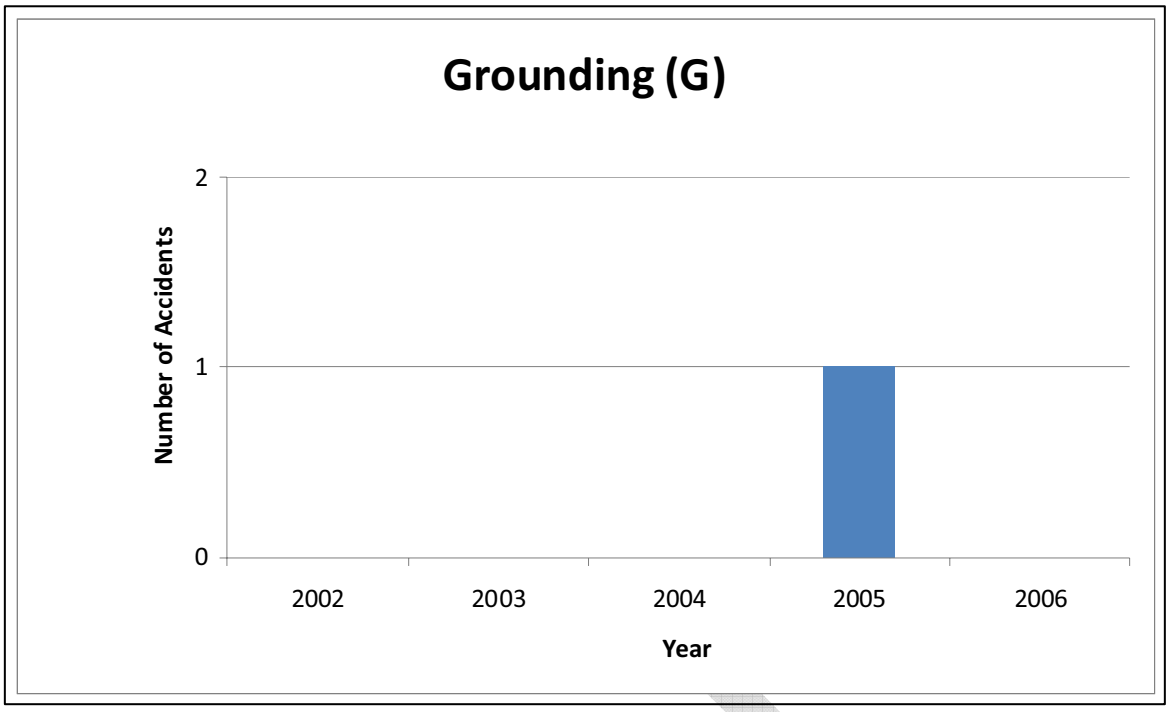

Congested Waters (CON)
Number of Accidents
3
2
1
0
2002
2003
2004
2005
2006
Year

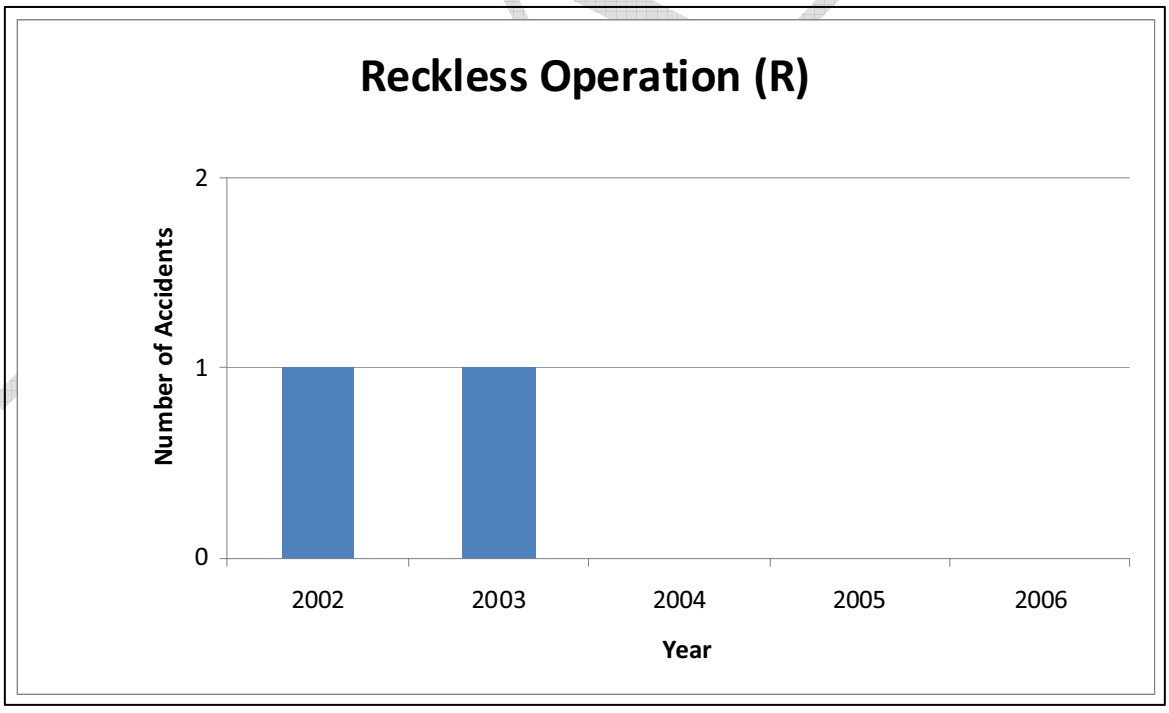

Collision with Piling (CP)
Number of Accidents
3
2
1
0
2002
2003
2004
2005
2006
Year

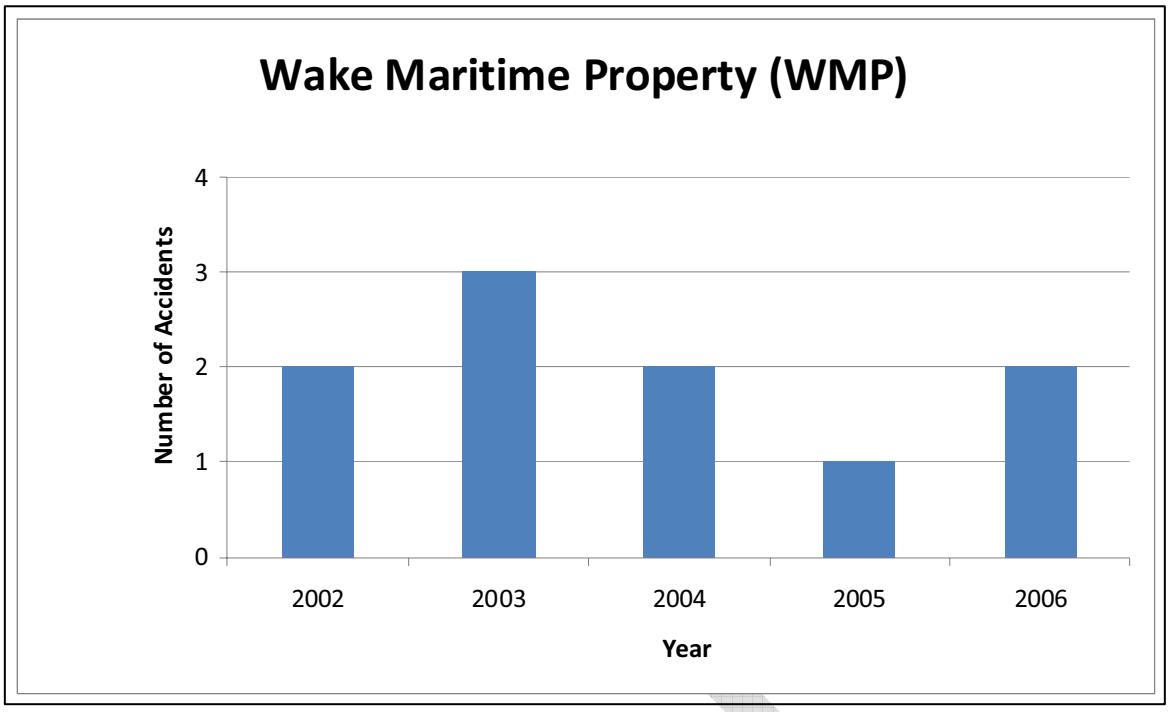

Collision with Person (CPS)
Number of Accidents
2
1
0
2002
2003
2004
2005
2006
Year

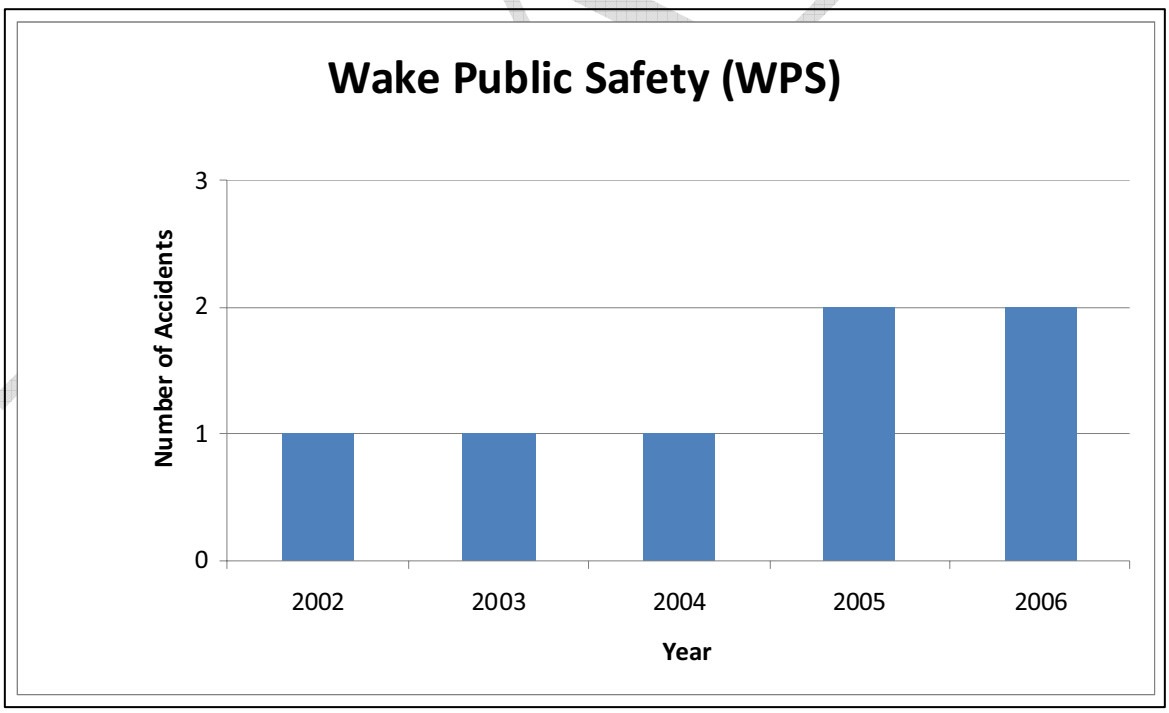

Underwater Objects (CUO)
Number of Accidents
2
1
0
2002
2003
2004
2005
2006
Year


Collision with Vessel (CV)
Number of Accidents
10
9
8
7
6
5
4
3
2
1
0
2002
2003
2004
2005
2006
Year


Grounding (G)
Number of Accidents
2
1
0
2002
2003
2004
2005
2006
Year


Reckless Operation (R)
Number of Accidents
2
1
0
2002
2003
2004
2005
2006
Year


Wake Maritime Property (WMP)
Number of Accidents
4
3
2
1
0
2002
2003
2004
2005
2006
Year


Wake Public Safety (WPS)
Number of Accidents
3
2
1
0
2002
2003
2004
2005
2006
Year

Appendix F

Public Meeting Minutes and Stakeholder Comments

March 16, 2006 Meeting Minutes
Author: Tara Alford, Boating and Waterways Section

68D-24.017 – Palm Beach County Boating Regulatory Areas
Minutes from Public Workshop
Palm Beach County Commission Conference Facility

March 16, 2006 - 6:00p – 8:30p

The workshop convened at 6:00 p.m.

FWC staff included Major Paul Ouellette, Captain David Stermen, Lieutenant Chuck Russo, Officer Paul Alber, Ms. Dani Moschella, Ms. Tara Alford, and Mr. Luke Davis. Attendees also included Mr. Joe Embres, USCG – Miami and Mr. Mark Tamblyn, FIND.

We had seventeen (17) attendees with the following individuals providing their comments regarding the ICW within Palm Beach County.

Speakers –

Mr. Len Rubin – Legal Counsel for Dr. Schiff. On behalf of his client he is requesting FWC close the "gap" between Bert Winter Park and Juno Park. Believes this area is boating safety issue, provided documentation from individuals in support of regulation in this area.

Mr. Pat Sisselberger – Resides at Sugar Sands Condos on Singer Island and believes this area is dangerous because boats drop down just north of the Phil Foster Island to obey the Slow Speed Minimum Wake regulation at the north end of Peanut Island.

He is recommending extending zone to the north approximately 2 channel markers, which would increase the travel time to bridge by approximately 5 minutes. Mr. Sisselberger stated the conditions were very bad on the weekends and suggested we take a look at the area during this time.

Also talked about a proposed mooring field in the Riviera Beach area and the wakes would create problem for these moored vessels; (locally known as Hong Kong Harbor).

Mr. Jeff Kuehl - Resides on ICW just south of Bert Winter Park. Mr. Kuehl is not satisfied with the length of time it will take to implement any changes to existing rule. He believes this area should have been amended to a slower speed 5-10 years ago.

Mr. Kuehl supports 500' either side of the S. R. 708 Bridge, and thinks it will be safer, as this area is shallow at low tide. He spoke about 3 injuries sustained in his area.

Thought the distance to close the gap would be less than a mile. Thinks a Slow Speed Minimum Wake zone in this area would alleviate the problem. He also recommends closing the gap between the ends of the Parker Bridge to the south end of the Juno Bridge.

He also wants FWC to have a little more vision when looking at rulemaking issues.

Mr. Larry Smith – Legal Counsel for several clients in the "gap" area. He believes Mr. Kuehl "hit the nail on the head" with the recommendation for a Slow Speed Minimum Wake zone in this area. Thinks that the increase in boaters and inexperienced boaters are adding to the problem and thinks the zone (Bert Winter) should run from Donald Ross to the Lake Worth Creek.

Mr. Charlie Isiminger – President, Marine Industries of South Florida. And will submit written comments relative to rule at later date.

Captain N. J. Marinaro – Had questions regarding boating data, and the careless and reckless operation of vessels.

Mr. Gerald Ward – Resides in Riviera Beach and is a Coastal Engineer. He thinks it is good that development has been initiated by FWC. Thought we should pull the 1990 Palm Beach County survey and use as historical guidance. Also stated he thought Palm Beach County had one of the more extensive rulemakings in the state.

He also wants more information regarding the FWC Vessel Traffic Study for this area.

Mr. Ward mentioned a county project proposed for the SR 706 Bridge stated that Palm Beach County is building a park with a boat ramp(s). He will provide a copy of his information to our office.

Mr. Ward is familiar with the area just south of the Bert Winter Park zone and stated, as proposed by some stakeholder who had previously spoken to be a 1.05 (1.2

statute miles) nautical mile closure, the area known as “the gap” (between the Bert Winter Park and top of PGA Boulevard). He believes closure of this area would impede use of waterways; and stated the channel is approximately 300’ in width in this area.

He also mentioned the existing boat slips just south of Bert Winter Park and noted that these were in place when the zone was originally created.

Mentioned the weekend Slow Speed Minimum Wake zone to the south of Lake Boca and the usage by vessels of the ICW in this area and suggested we see if this zone is still applicable.

Discussed the Peanut Island zone, specifically the Sugar Sand area. Thinks wave attenuators or the like might be appropriate rather than additional regulation.

Advised the area known as Hong Kong Harbor area was no longer being considered by the local governments.

Mr. Greg Reynolds – Executive Director of Lagoon Keepers – Believes the area just south of Bert Winter Park (the “S” curve) is dangerous for small boaters.

Officer Paul Alber – Understands some of the concerns for the residents in “the gap” but does not believe it needs 24/7 regulation; weekend regulation would work.

Mr. Larry Kelleher – Provided comments via e-mail (he arrived near the close of the workshop and asked if he could submit in this fashion)

Thank you for allowing me to e-mail my comments. I believe the general opinion of people at the meeting in West Palm Beach was similar to mine, that is that the ICW north of PGA Blvd. to Bert Winters Park should be classified a "no wake" zone.

Currently there are two (2) "no wake" zones in this section of the ICW. I believe for the following reasons the entire area between PGA and Bert Winters Park (approximately 1/3 to 1/2 mile) should be "no wake".

1. At low tide, the water depth is 0 to 5 ft. outside the channel, and this is a narrow, winding section of the ICW. This causes it to be very dangerous to manatees, which frequent this area regularly.

2. Also because of the narrow width of this section and high boat traffic, it is extremely dangerous when boats traveling at high speeds pass slower boats or when 2 boats race. Both these scenarios create serious wake and congestion problems for boats approaching from the opposite direction.

3. There are 2 existing marinas in this area which are seriously impacted by the speed of boats and wake size. It can be hazardous just slowing to enter the marinas.

4. Because the area contains 2 "no wake" zones, boats are constantly speeding up and slowing down between them, causing more environmental erosion and creating a dangerous situation because bigger boats no sooner get up on plane than they have to slow down again. Then, smaller, faster boats attempting to pass hit the large wake of the bigger boat slowing down. I have seen boats lose control and passengers fall over or out of boats in this scenario.

5. This area has become so busy; you can not lower a boat off a lift because the boat wake is so frequent and large it causes the boat to slam down on the lift, thus damaging both the boat and the lift.

6. This area is frequently a dangerous speed zone because of people leaving the restaurants on PGA, many times having had too much to drink.

7. Weekends year round are dangerous, with fast boats, jet skis and water skiers, few of whom seem to obey the speed limits.

8. Barge traffic seems to be increasing, making hazardous conditions when boats try to pass because the waterway is so narrow. It is especially dangerous during low tides for oncoming boats.

9. This area has also become the boat testing and sea trial area for the boat yards north of PGA, i.e. Seminole, E & H and Soverel.

10. The real hazards are for children and manatees, both of whom will continue to be hurt or even killed in this narrow, bending area of the ICW as long as boats travel at high rates of speed in this area - which they are doing increasingly.

As there were no other members of the audience wishing to speak, we adjourned the workshop at 6:35 p.m., but remained at the library until 7:30p for discussion with participants.

As there were no other members of the audience wishing to speak, we adjourned the workshop at 7:50 p.m.

The following are unedited e-mails received since our workshop from individuals regarding the Palm Beach County (68D-24.017 FAC) workshops.

Susanna B. Klavora -- I was delighted to read the article in Sunday's Palm Beach Post regarding the speed/wake zones. I have been trying for the last 5 years to get someone's attention to this area without success. I have e-mailed and called only to be told I had the wrong department and try somewhere else. This area that I am referring to is in between two areas of no wake zones and I can not understand why. The boats race from one end to the other and most of the times it is the smaller boats that do so and I have seen countless "almost accidents" by the grace of God there has not been an accident in this area. There are kayakers and jet skis that use this area and at one time there were manatees here, I am not sure that the manatees are still around. I would appreciate anything that could be done to get something going in order to make this area a "no wake zone" along with the no wake zone we already have nearby. I would be willing to help in any way I can to get this going and the sooner the better. Thank you so much for your attention to this matter.

Larry Kelleher -- Thank you for allowing me to e-mail my comments. I believe the general opinion of people at the meeting in West Palm Beach was similar to mine, that is that the ICW north of PGA Blvd. to Bert Winters Park should be classified a "no wake" zone. Currently there are 2 "no wake" zones in this section of the ICW. I believe for the following reasons the entire area between PGA and Bert Winters Park (approximately 1/3 to 1/2 mile) should be "no wake". 1. At low tide, the water depth is 0 to 5 ft. outside the channel, and this is a narrow, winding section of the ICW. This causes it to be very dangerous to manatees, which frequent this area regularly. 2. Also because of the narrow width of this section and high boat traffic, it is extremely dangerous when boats traveling at high speeds pass slower boats or when 2 boats race. Both these scenarios create serious wake and congestion problems for boats approaching from the opposite direction. 3. There are 2 existing marinas in this area which are seriously impacted by the speed of boats and wake size. It can be hazardous just slowing to enter the marinas. 4. Because the area contains 2 "no wake" zones, boats are constantly speeding up and slowing down between them, causing more environmental erosion and creating a dangerous situation because bigger boats no sooner get up on plane than they have to slow down again. Then, smaller , faster boats attempting to pass hit the large wake of the bigger boat slowing down. I have seen boats lose control and passengers fall over or out of boats in this scenario. 5. This area has become so busy, you can not lower a boat off a lift because the boat wake is so frequent and large it causes the boat to slam down on the lift, thus damaging both the boat and the lift. 6. This area is frequently a dangerous speed zone because of people leaving the restaurants on PGA, many times having had too much to drink. 7. Weekends year round are dangerous, with fast boats, jet skis and water skiers, few of whom seem to obey the speed limits. 8. Barge traffic seems to be increasing, making hazardous conditions when boats try to pass because the waterway is so narrow. It is especially dangerous during low tides for oncoming boats. 9. This area has also become the boat testing and sea trial area for the boat yards north of PGA, ie. Seminole, E & H

and Soverel. 10. The real hazards are for children and manatees, both of whom will continue to be hurt or even killed in this narrow, bending area of the ICW as long as boats travel at high rates of speed in this area - which they are doing increasingly. Thank you again for the opportunity to submit comments.

Lydia Pfund -- I'm a former boater...now a condo owner with a sea wall to worry about...boating speed in the Spanish River to Linton sector of Int. Coastal is Excessive as practiced today and needs oversight.

Don Winans -- I am the marine representative for the Boca Harbour home owners association. I try to keep up with marine issues so I can inform the home owners/boaters what will affect their boating pleasures. The meeting in March was not widely advertised so I missed it. Since it seems to have been requested by Highland Beach, I only assume it was attended by the "high rise" group that tried to get the area designated a slow speed zone a couple of years ago. At that time they used the manatee as the reason, they lost. I guess they are now trying the "safety issue" to get things down to an idle speed. The issue is really noise. The muscle boats, I agree are noisy, but that is normal when you purchase property on the intra coastal. Highland Beach has very few boating communities compared to Boca Raton.

Walt DiNardo – I would like to be involved in the discussion of the no wake zone, As the President and manager of Palm Beach Yacht Center, A board member of the Marine industries P. B. County and advisory board member of the South Lake Worth Inlet (Boynton Inlet) I believe I may be able to help in the disseisin making process.

Greg Boan -- I recently received a copy of your communication with Mr. Winans of the Boca Waterways Committee. I reside in Highland Beach and I understand the town held a meeting on March 15th to discuss Intracoastal speed restrictions, safety and property damage issues along the ICW within town limits. Unfortunately, the town did not clearly define the intent of the meeting in it's website posting, therefore I did not attend. Attached is an email correspondence to our town manager, Mr. Sugerman which reflects my position and like-thinking citizens in Highland Beach. Our concern is current laws on the books are not being enforced in spite of redundant, overlapping waterway jurisdiction from multiple law enforcement agencies. We are certain the present speed limits are sufficient to preserve and protect this precious natural resource for the enjoyment of all Florida residents, if only robust enforcement were implemented. This stretch of the Intracoastal is the VERY LAST section in South Palm Beach County where boating enthusiasts and their families can enjoy water skiing, tubing or just an enjoyable cruise on a weekend afternoon. <u>There is no place left</u>. It would be a tragedy to eliminate this recreational resource to appease developer special interest groups and a vocal minority that object to the sound of marine activity. Thank you in

advance for your anticipated attention in this matter. *(FWC did not receive the e-mail mentioned by Mr. Boan).*

Cass Riese -- Extreme movement and not common sense is once again at hand with my city commssioners. The Intracoastal waterway should NOT be turned in a no wake no speed zone .I live in Highland Beach directly on the Intracoastal and I own a boat .I do NOT want to see any changes made regarding the ICW there are laws in place right now for speeders and boats that are to loud. Its the job of the Boca Marine Police the Palm Beach Marine Sheriff Division and the Florida Marine Patrol to enforce and act on these the laws (do we shut down I-95 because some people speed on that? of course not) Its the last open space left in the South Palm Beach area to ENJOY boating,ie:water skiing,tubing,etc. I expect and want common sense by my Highland Beach commissioners not radical movements to appease a few.the Intracoastal is meant for all to enjoy, I vote I remember,

Mywayiii -- please do not let the people who are not boaters make decisions about a life style that most of us moved to florida for There decision is based on noice only this is not the way the recreational community should be voted on

Jerry Bradley -- If this no wake zone becomes law, I, and many more boaters would, I'm sure, sell their boat. I have a small boat, and if I can no longer go 20 MPH, then why am I here? I would certainly hope that the measure does not pass, but if it does, it will save me a lot of money in the future as there is no good reason to own a boat any longer.

Catherine Wolff -- Thank you again for visiting and lending an ear to the residents of Highland Beach. This is the most pro-active government has ever been in this manner. I live about a half mile north of Spanish River Bridge, and I see that our "highway" is unsafe at present speeds. This is compounded by the jet-skiers who treat the "highway" as a playground. Cautionary signs mean nothing to these people. Just last weekend we narrowly averted an accident when we were out in our boat. Fortunately we were in the established Minimum Wake zone at Deerfield Beach, otherwise we would have not been able to avoid the family of three in a small rental boat who pulled out from nowhere and made a lazy u-turn in the path of oncoming boaters, then looked a little surprised when those oncoming boats didn't stop at quite the same speed as automobiles. Tara, my husband was once asked how he slowed his boat down and he jokingly replied "Oh, I just stick my foot in the water and it slows down." Some people actually believe this is how a boat is handled. Heaven help us when they rent a boat for a weekend family "event." The event may include a fatality or severe injury.

Dr. Stewart Perlow -- My wife and I are residents of Toscana West in Highland Beach. We support a speed/wake zone. We see every day an accident waiting to happen!

Capt. Harvey Starin, Royal Pelican Yacht Club -- I am aware of the recent meeting in Highland Beach (which I missed due to lack of publicity) regarding slowing the ICW between Delray Beach and Lake Boca to a no-wake or slow speed zone. As a responsible boater, a licensed Coast Guard Captain and staunch supporter of the environment I wish to register my sincere disapproval of any such measure.

It seems that the residents of a few beachside condos who like their view but not the activities that actually take place on the water, are at it again. I attended meetings over a year ago in Boca when this group of condo tower dwellers tried to use the subterfuge of protecting the manatees as their excuse for eliminating the reasonable use of our waterway. The City of Boca, thankfully, saw past their argument and saw it for what it was. Now it appears that the issue has been brought up again.

Since I did not know of the meeting in time and could not attend I do not know the response by the State or FWC to this most recent resurrection of the issue. But I sincerely hope that you will agree that enforcement of the rules we have, notably the 25 MPH speed limit, will be sufficient to bring order to our waterway. This groups' claim of boats going 75 to 100 MPH is laughable. Do they understand how few boats are made that could even approach 50 MPH? My suspicion is that there are a few that may go 30 or even 40, which is pretty fast for a boat. If we could enforce the 25 MPH rule I think the noise would be kept to a minimum, wakes would by tolerable and those of us who actually use the ICW to get to the ocean could do so in a safe manner that would still allow us to reach it under an hour.

Please urge your colleagues to maintain a reasonable approach to the use of our waterways. I urge you to not change any of our already limited 25 MPH zones to anything lower.

Stakeholder Comments

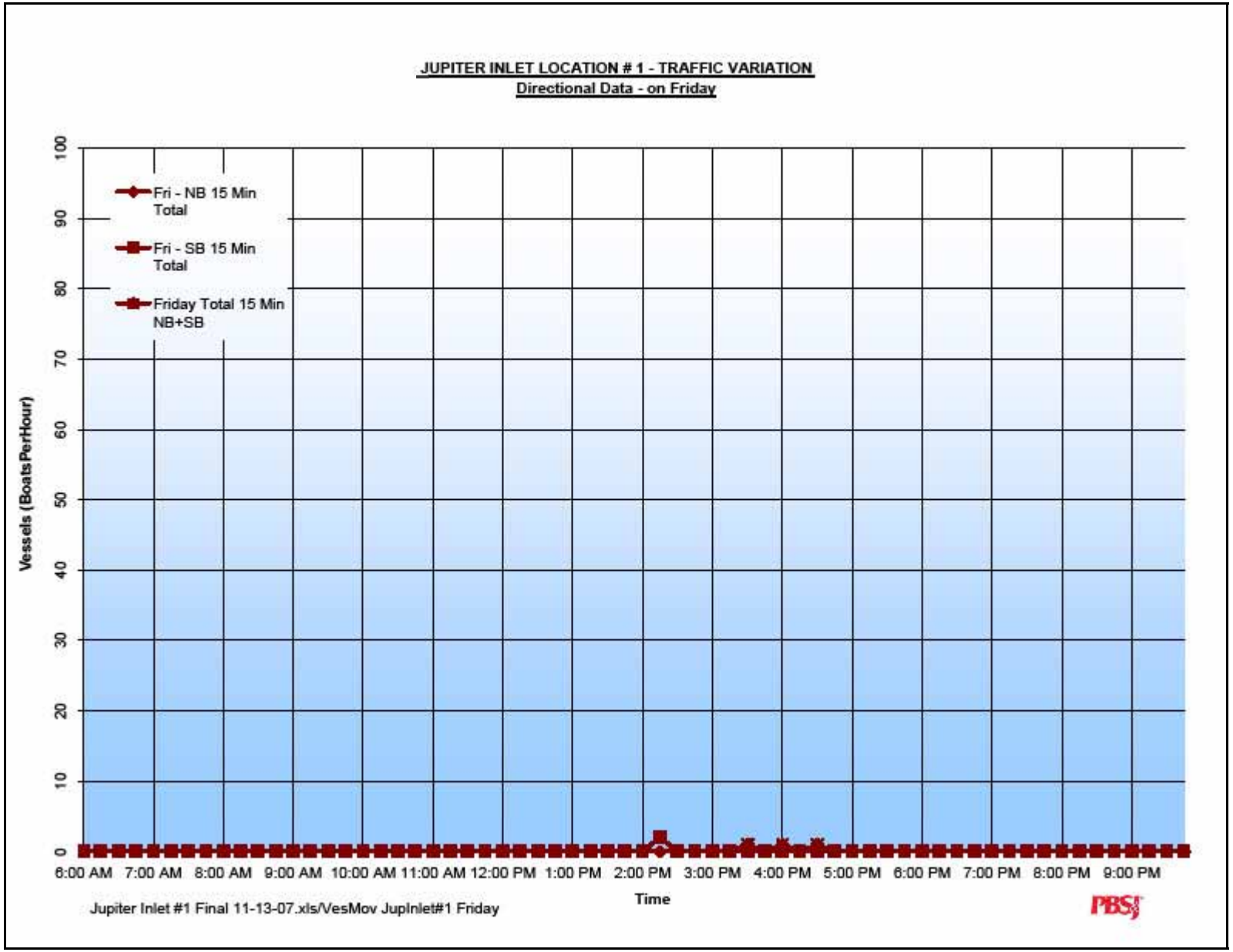
- Jonathan's Landing Marina – Applied for a "No Wake" zone to protect open fuel docks. They were denied.
- Palm Beach Yacht Center – Requested an idle speed zone to protect lifts, fuel, etc on the ICW
- Loggerhead Marina - Has compliance and enforcement issues with existing zones
- Sailfish Club of Florida – Requested the existing "Minimum Wake' to be extended year round.

- Jupiter Yacht Club and Marina – Has Compliance and enforcement issues with existing zone
- Bay Colony – Has requested a zone
- Town of Palm Beach Docks – States that wakes are a problem

Appendix G

Vessel Volume Graphs Using 15-Minute Interval Directional Data

Graphs were developed to provide a visual representation of the peak and off-peak hours for each day. These graphs are presented in this Appendix as well as in Analysis 2 of the Palm Beach County Vessel Traffic Video Monitoring Report prepared for the Florida Fish and Wildlife Conservation Commission on December 7, 2007. These graphs also show the bidirectional hourly variation in vessel traffic under the bridge for each location. The peak hours for each day including Friday, Saturday and Sunday are readily recognized in the graphs.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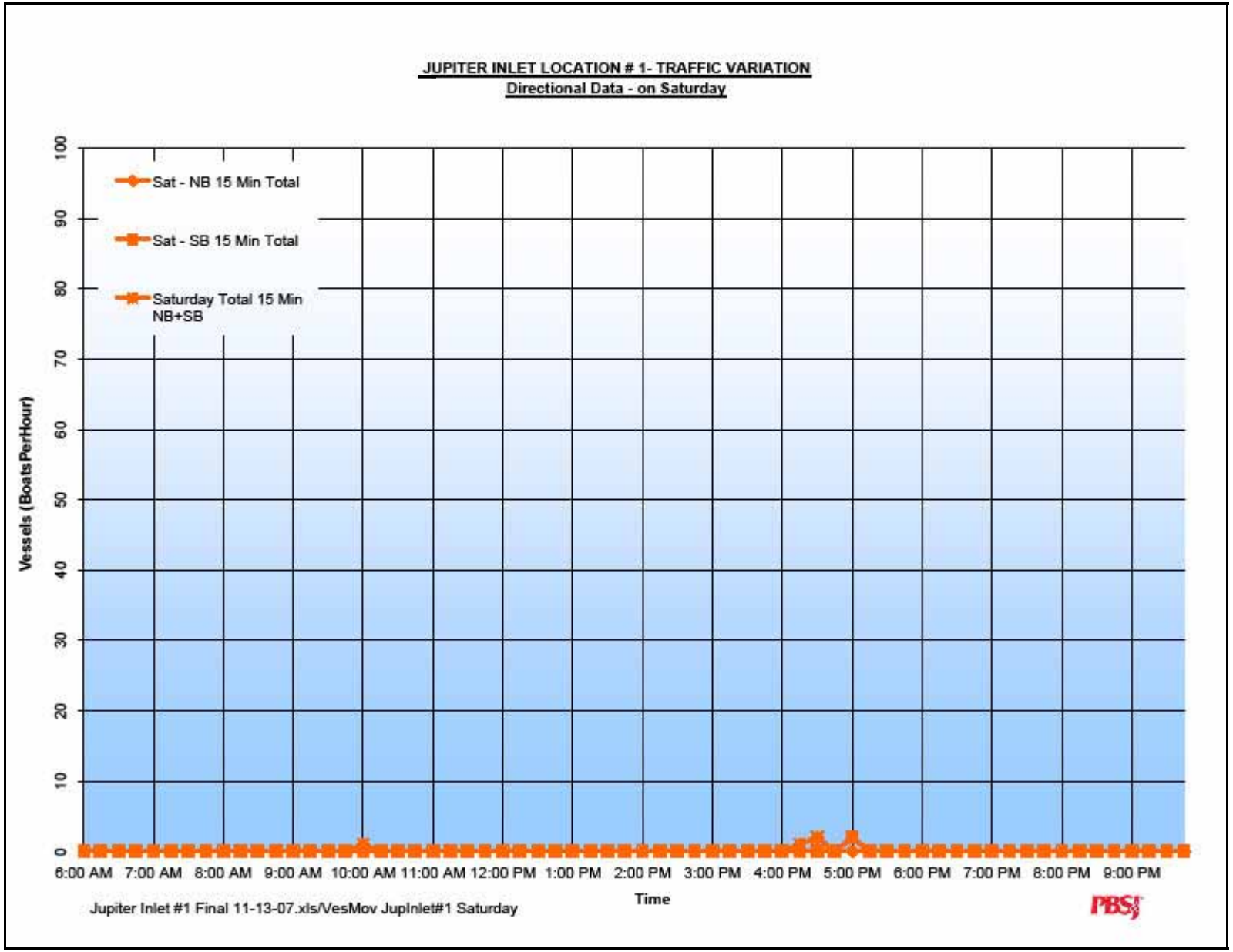
Directional Data - on Friday
Fri - NB 15 Min Total
Fri - SB 15 Min Total
Friday Total 15 Min NB+SB
Vessels (Boats PerHour)
0
10
20
30
40
50
60
70
80
90
100
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
Time
Jupiter Inlet #1 Final 11-13-07.xls/VesMov JupInlet#1 Friday
PBSJ


JUPITER INLET LOCATION # 1- TRAFFIC VARIATION
Directional Data - on Saturday
Sat - NB 15 Min Total
Sat - SB 15 Min Total
Saturday Total 15 Min NB+SB
Vessels (Boats PerHour)
0
10
20
30
40
50
60
70
80
90
100
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
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9:00 PM
Time
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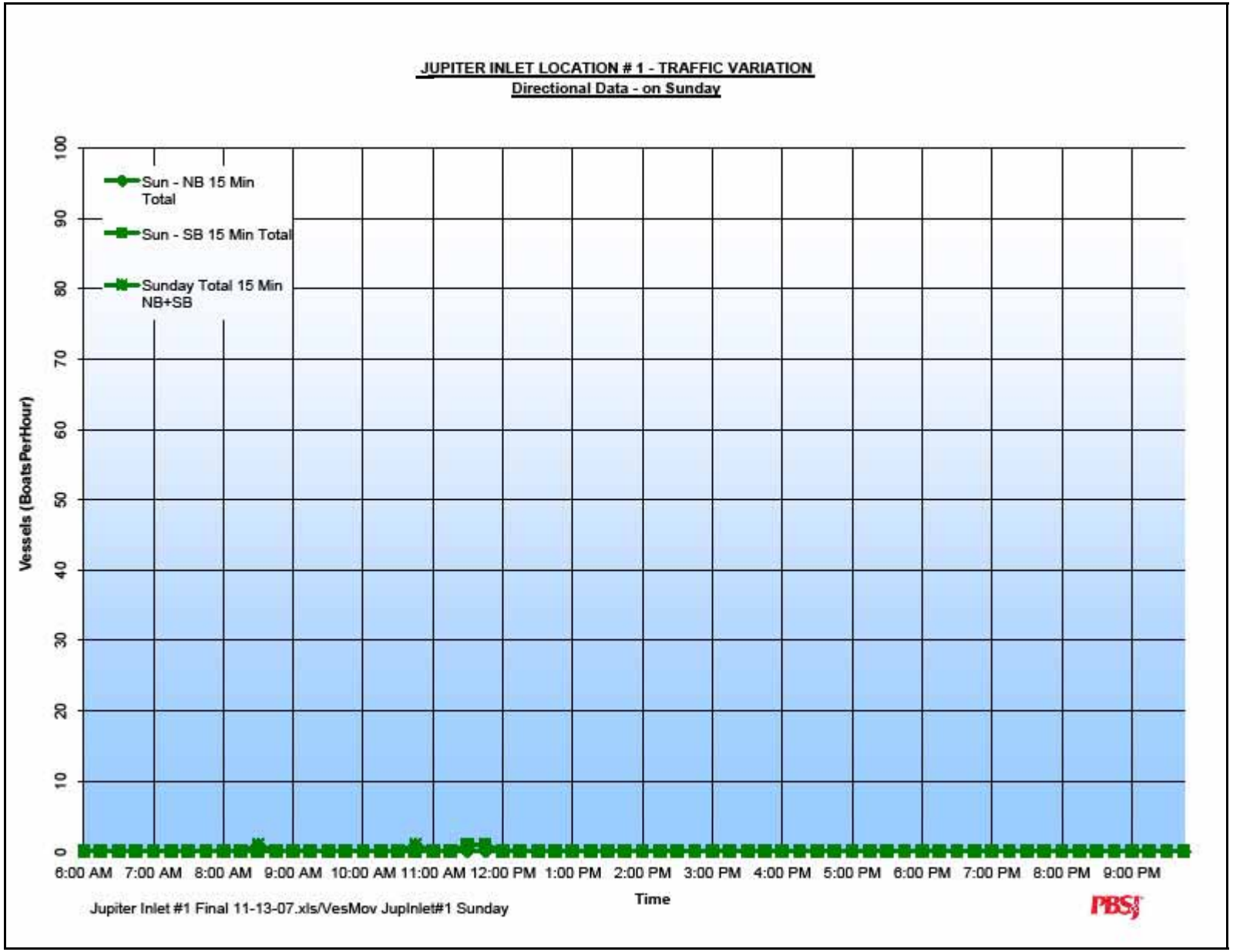
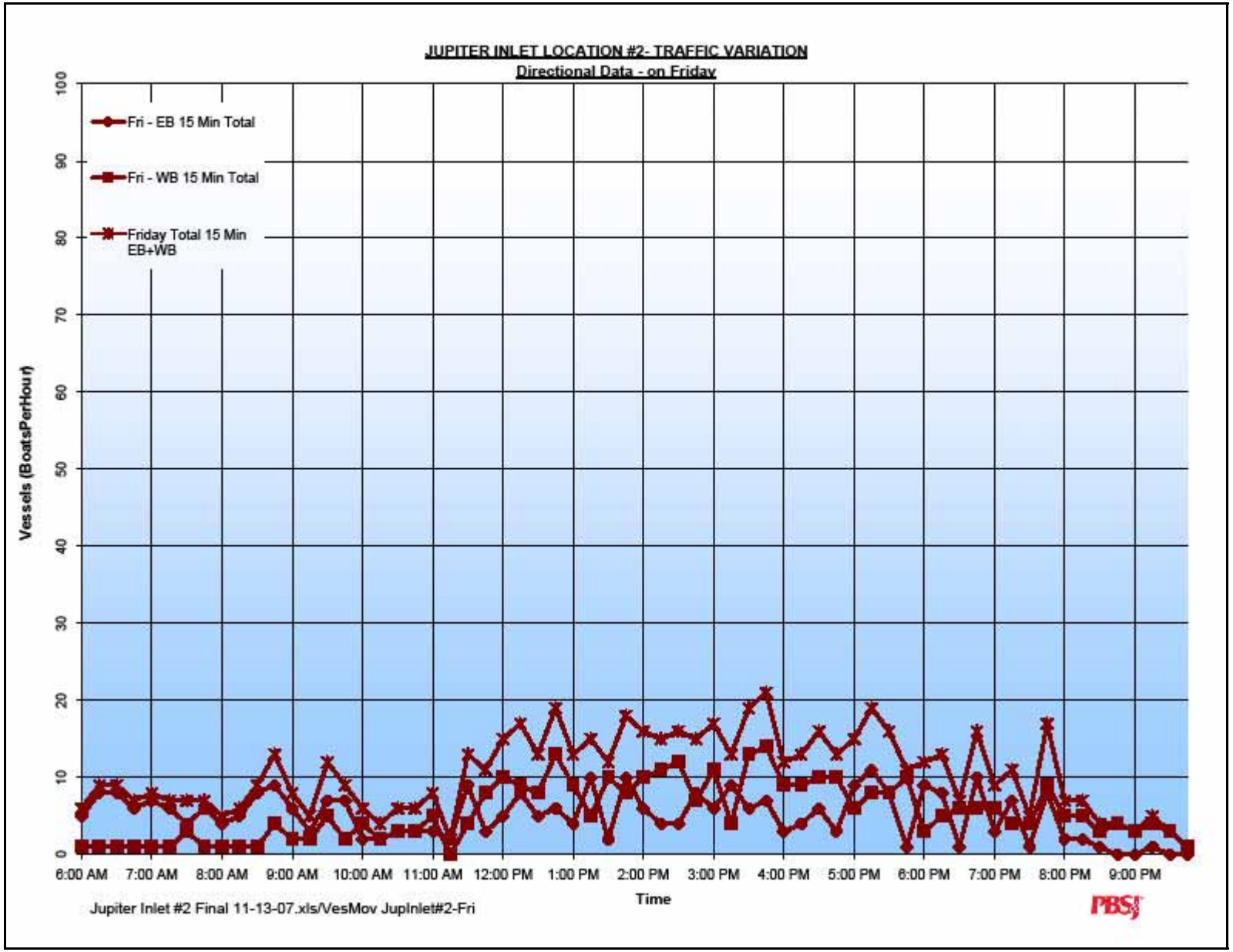
PBSJ


JUPITER INLET LOCATION # 1 - TRAFFIC VARIATION
Directional Data - on Sunday
Sun - NB 15 Min Total
Sun - SB 15 Min Total
Sunday Total 15 Min NB+SB
Vessels (Boats PerHour)
0
10
20
30
40
50
60
70
80
90
100
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
Time
Jupiter Inlet #1 Final 11-13-07.xls/VesMov JupInlet#1 Sunday
PBSJ


JUPITER INLET LOCATION #2- TRAFFIC VARIATION
Directional Data - on Friday
Fri - EB 15 Min Total
Fri - WB 15 Min Total
Friday Total 15 Min EB+WB
Vessels (BoatsPerHour)
0
10
20
30
40
50
60
70
80
90
100
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
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5:00 PM
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Time
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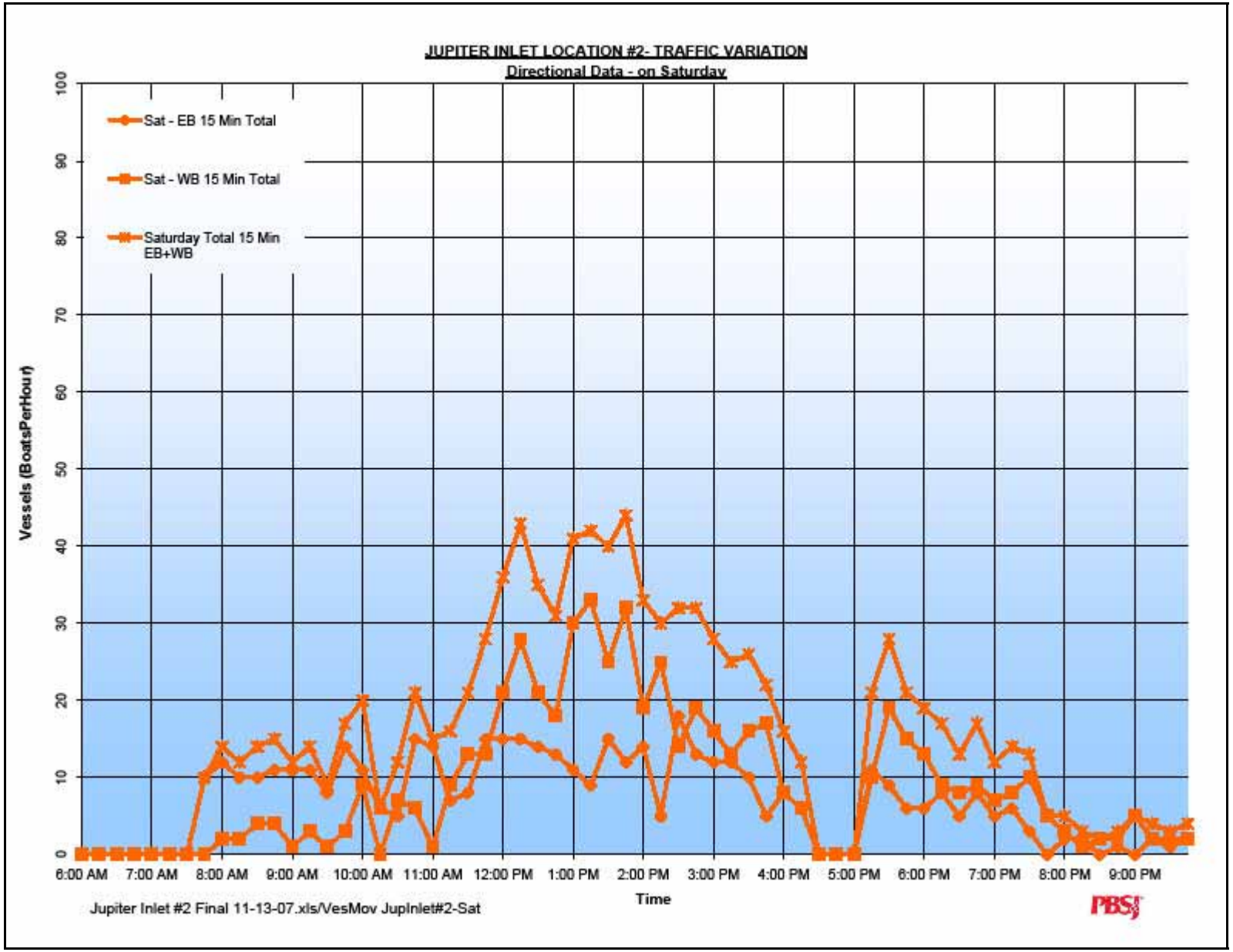
PBSJ


JUPITER INLET LOCATION #2- TRAFFIC VARIATION
Directional Data - on Saturday
Sat - EB 15 Min Total
Sat - WB 15 Min Total
Saturday Total 15 Min EB+WB
Vessels (BoatsPerHour)
0
10
20
30
40
50
60
70
80
90
100
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
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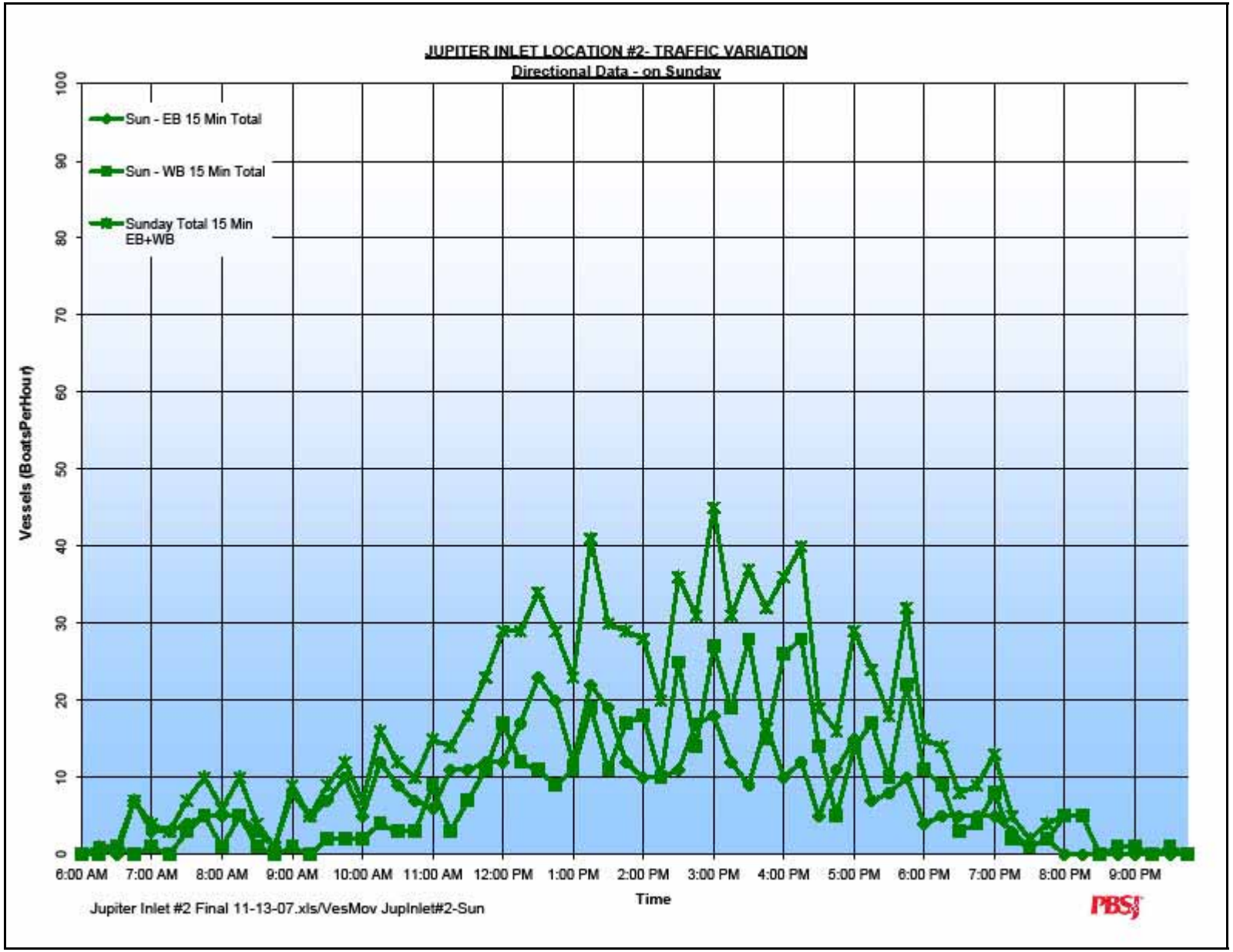
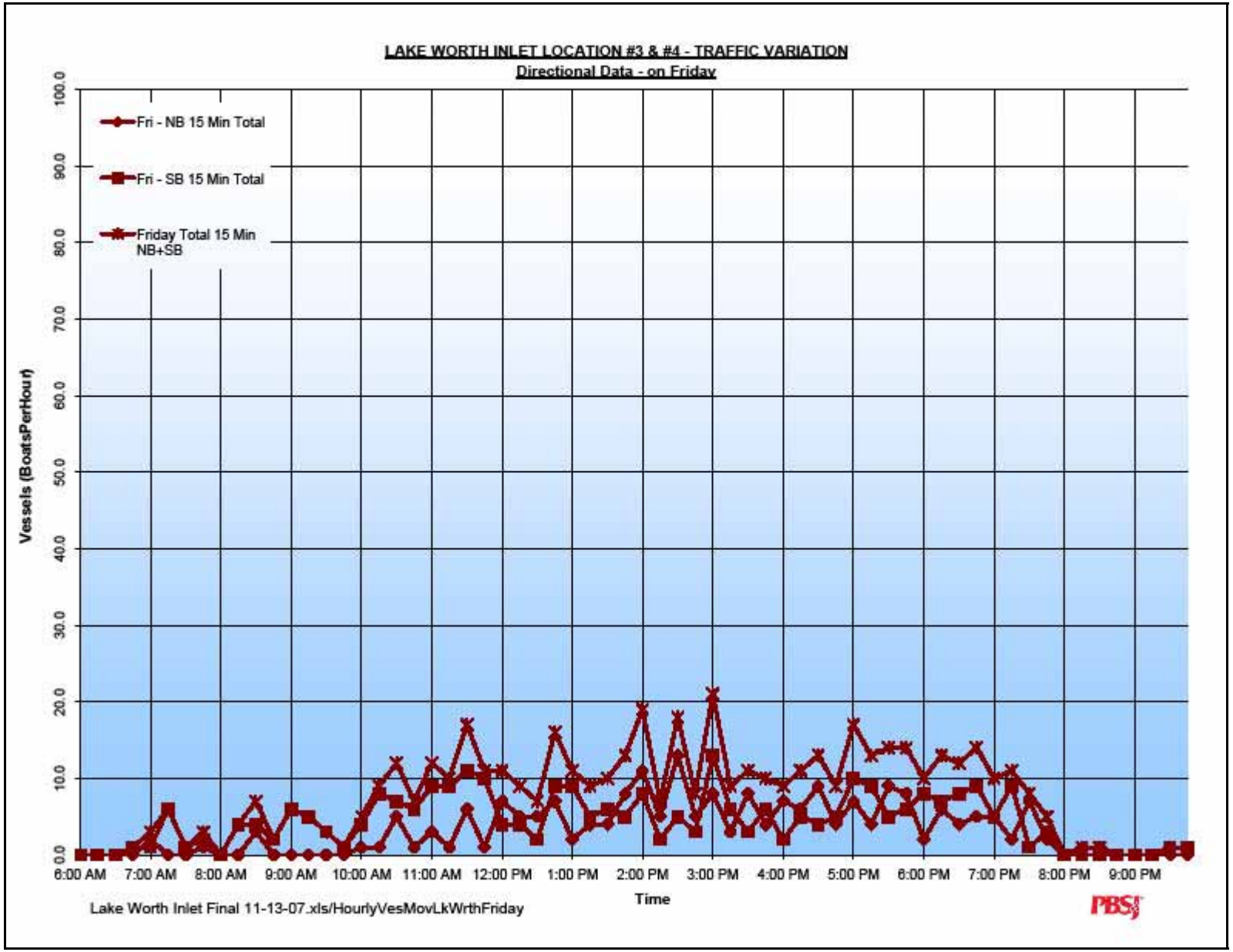
8:00 PM
9:00 PM
Time
Jupiter Inlet #2 Final 11-13-07.xls/VesMov JupInlet#2-Sat
PBSJ


JUPITER INLET LOCATION #2- TRAFFIC VARIATION
Directional Data - on Sunday
Sun - EB 15 Min Total
Sun - WB 15 Min Total
Sunday Total 15 Min EB+WB
Vessels (BoatsPerHour)
0
10
20
30
40
50
60
70
80
90
100
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
Time
Jupiter Inlet #2 Final 11-13-07.xls/VesMov JupInlet#2-Sun
PBSJ


LAKE WORTH INLET LOCATION #3 & #4 - TRAFFIC VARIATION
Directional Data - on Friday
Fri - NB 15 Min Total
Fri - SB 15 Min Total
Friday Total 15 Min NB+SB
Vessels (BoatsPerHour)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
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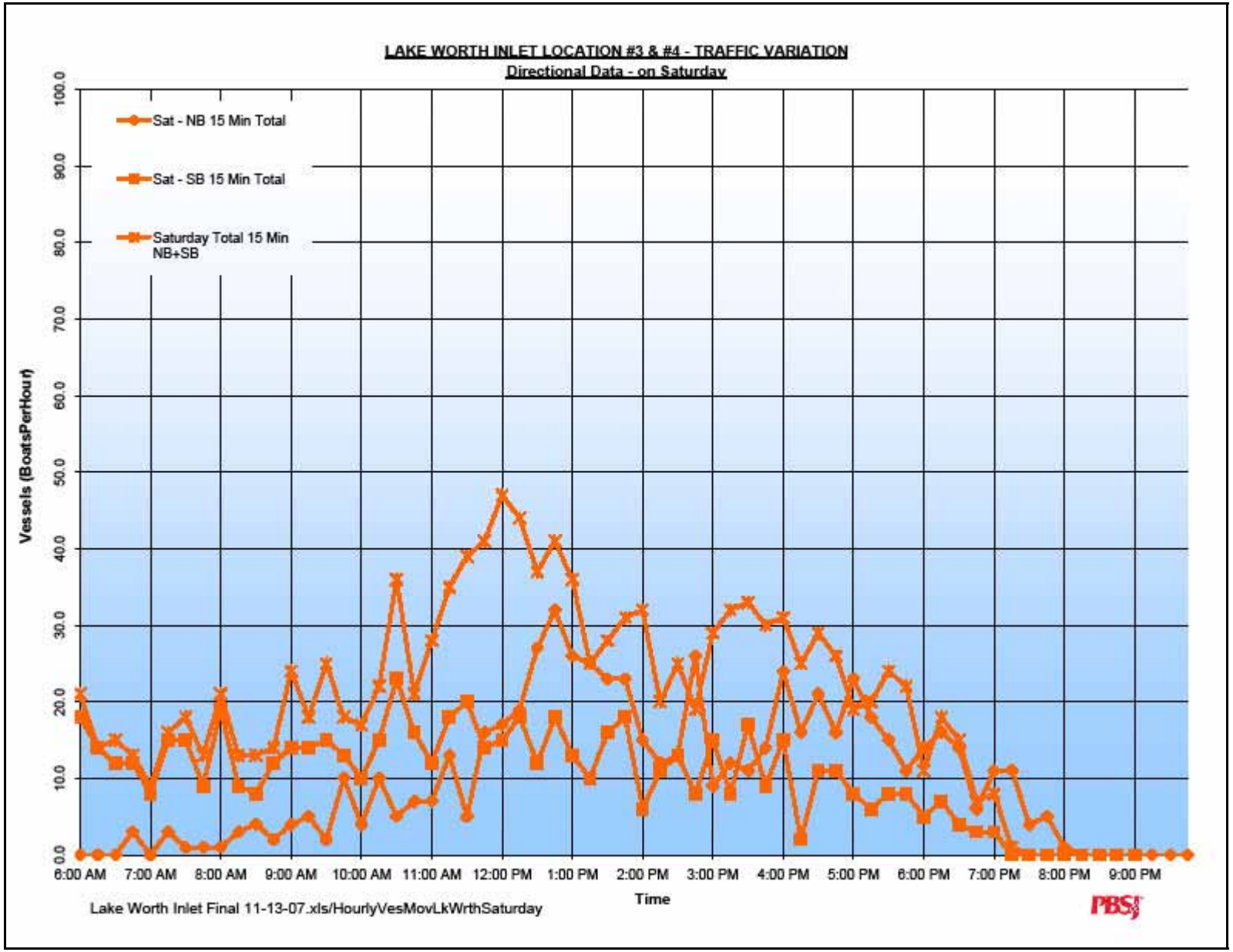
Time
Lake Worth Inlet Final 11-13-07.xls/HourlyVesMovLkWrthFriday
PBSJ


LAKE WORTH INLET LOCATION #3 & #4 - TRAFFIC VARIATION
Directional Data - on Saturday
Sat - NB 15 Min Total
Sat - SB 15 Min Total
Saturday Total 15 Min NB+SB
Vessels (BoatsPerHour)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
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8:00 PM
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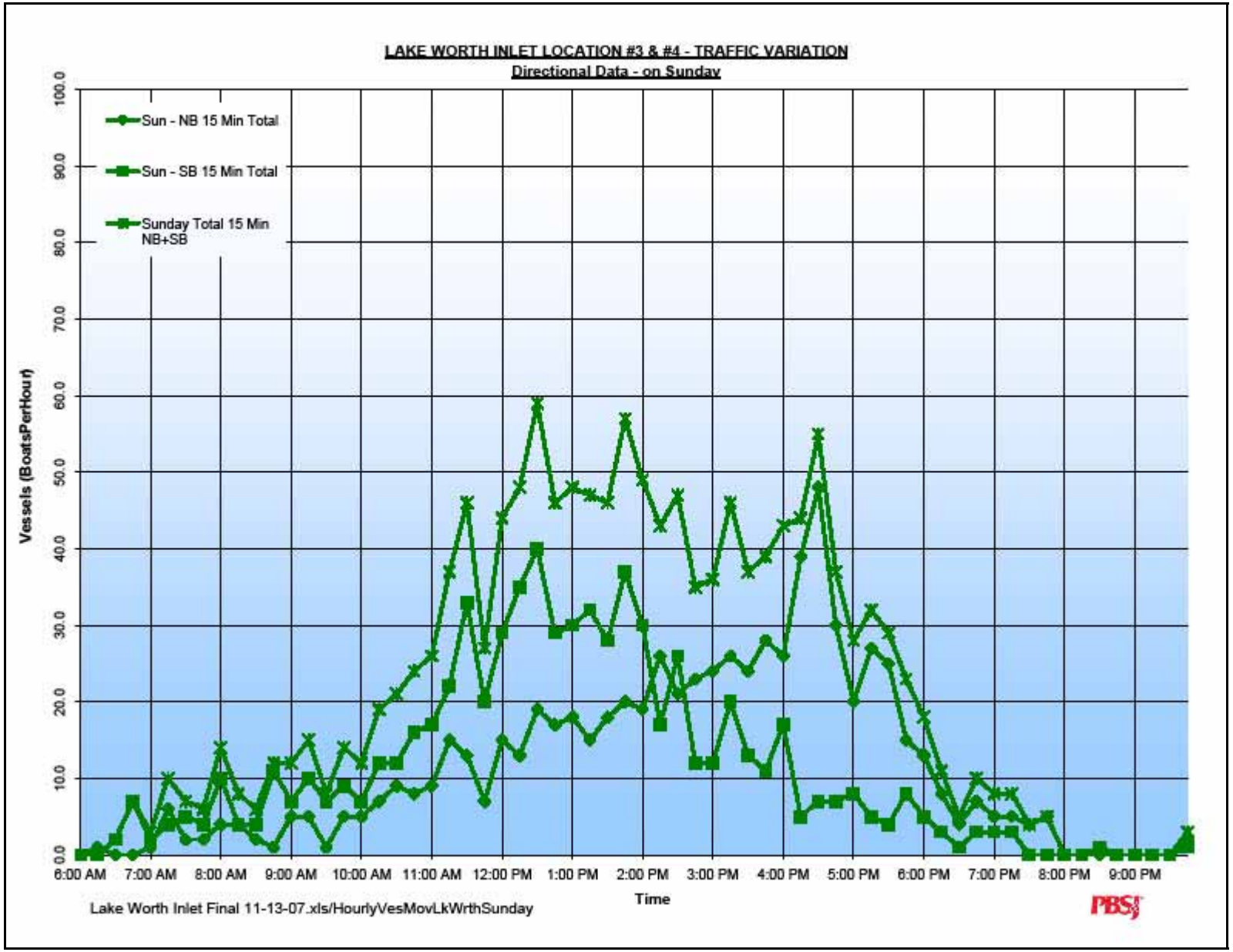
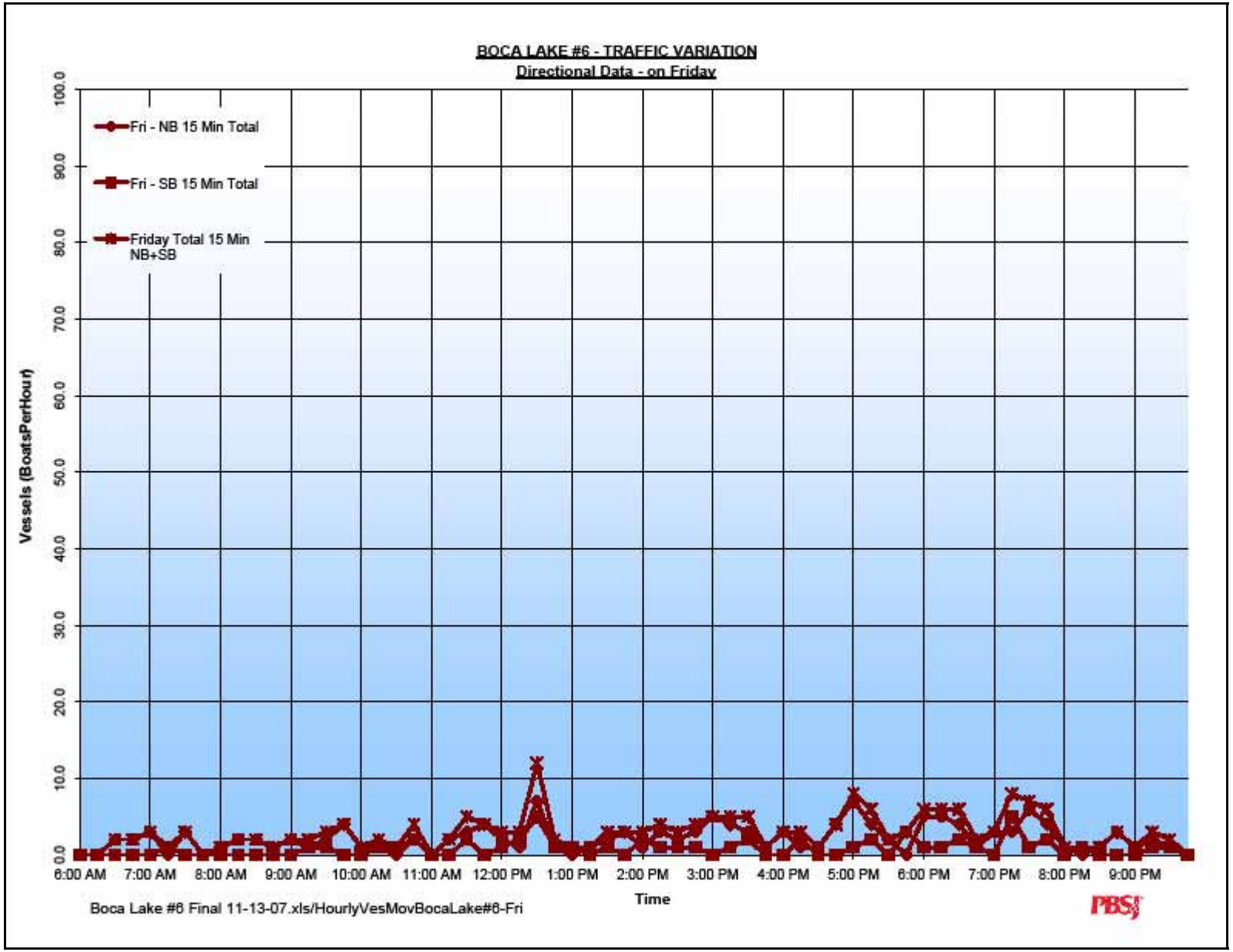
Time
Lake Worth Inlet Final 11-13-07.xls/HourlyVesMovLkWrthSaturday
PBSJ


LAKE WORTH INLET LOCATION #3 & #4 - TRAFFIC VARIATION
Directional Data - on Sunday
Sun - NB 15 Min Total
Sun - SB 15 Min Total
Sunday Total 15 Min NB+SB
Vessels (BoatsPerHour)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
Time
Lake Worth Inlet Final 11-13-07.xls/HourlyVesMovLkWrthSunday
PBSJ


BOCA LAKE #6 - TRAFFIC VARIATION
Directional Data - on Friday
Fri - NB 15 Min Total
Fri - SB 15 Min Total
Friday Total 15 Min NB+SB
Vessels (BoatsPerHour)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
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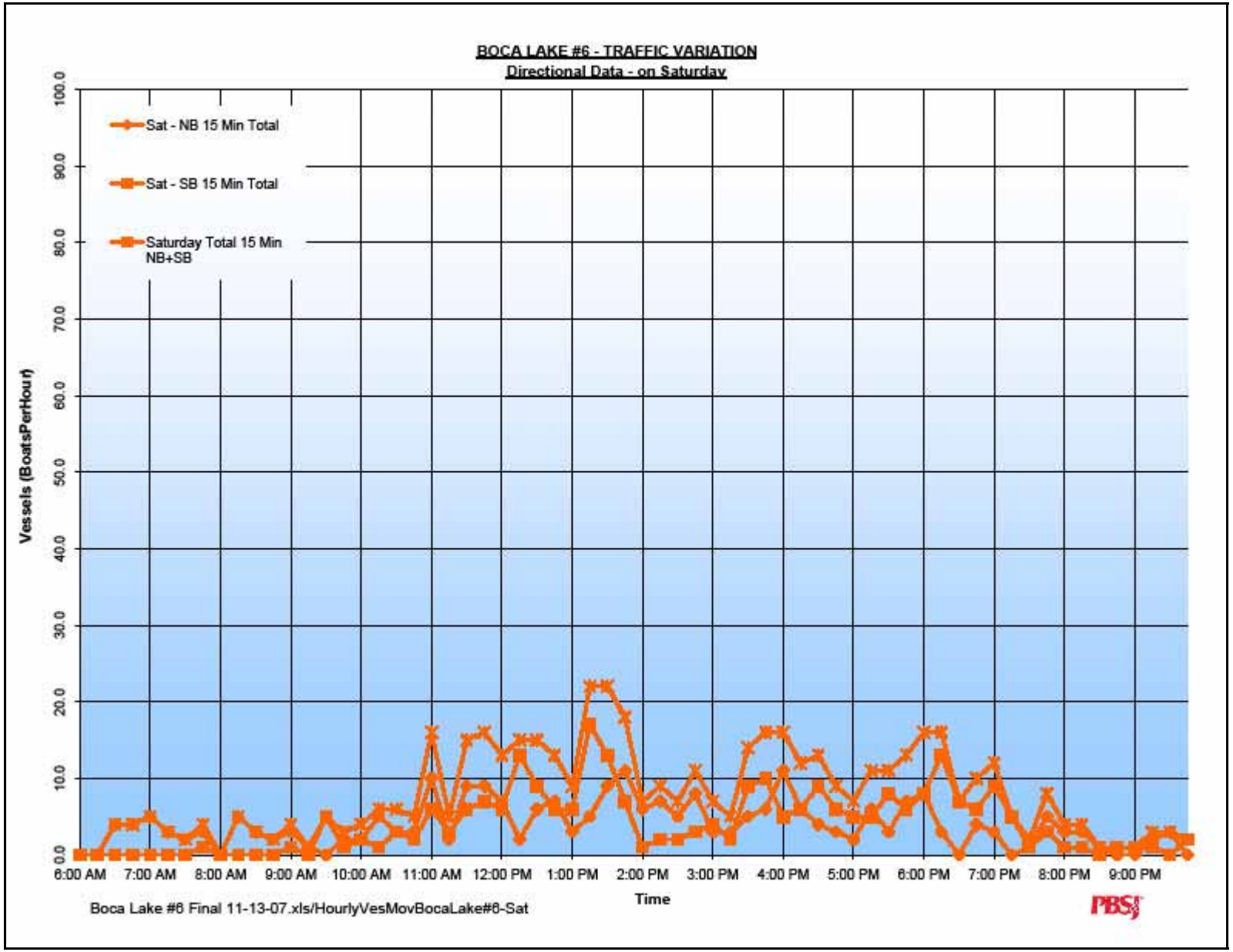
8:00 PM
9:00 PM
Time
Boca Lake #6 Final 11-13-07.xls/HourlyVesMovBocaLake#6-Fri
PBSJ


BOCA LAKE #6 - TRAFFIC VARIATION
Directional Data - on Saturday
Sat - NB 15 Min Total
Sat - SB 15 Min Total
Saturday Total 15 Min NB+SB
Vessels (BoatsPerHour)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
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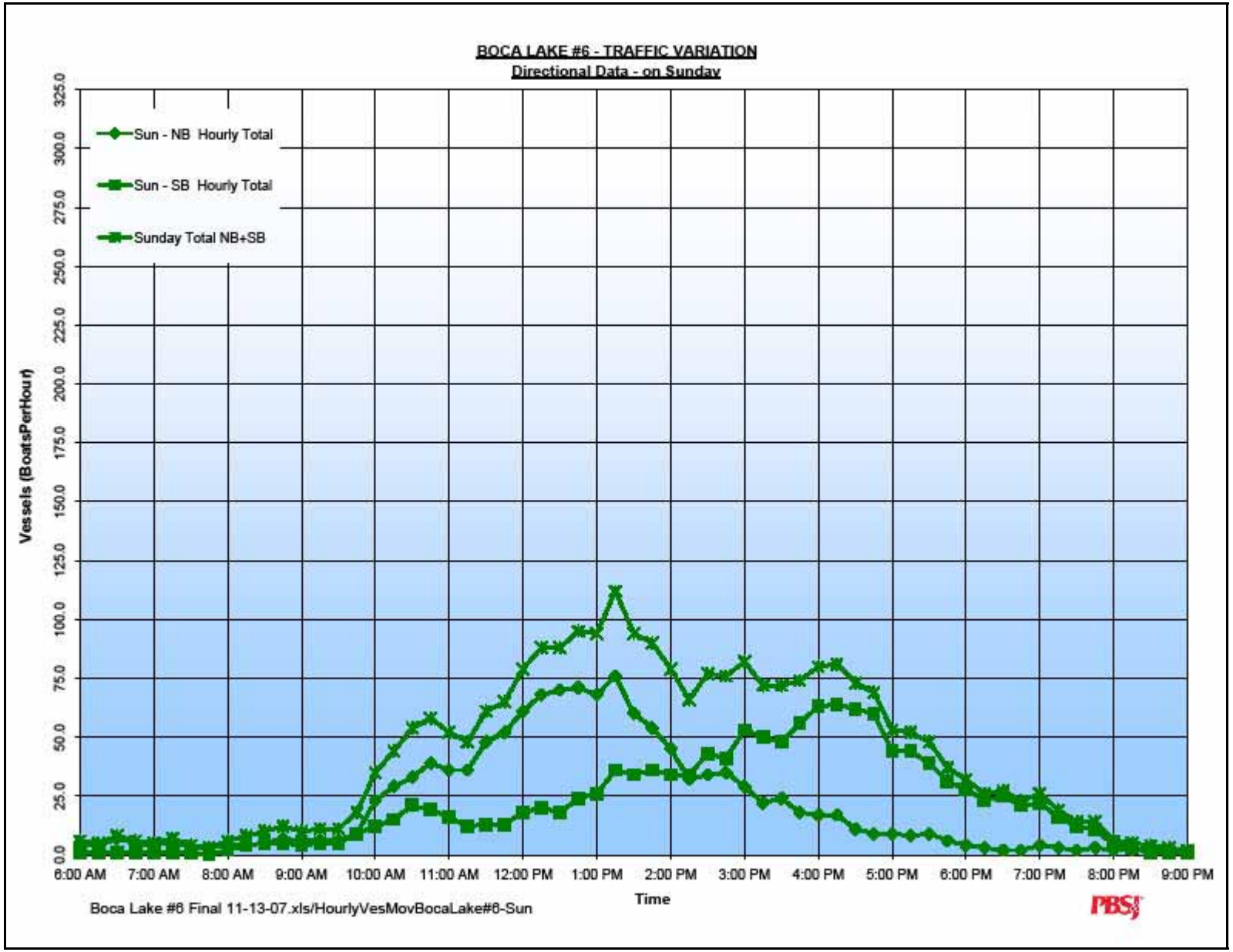
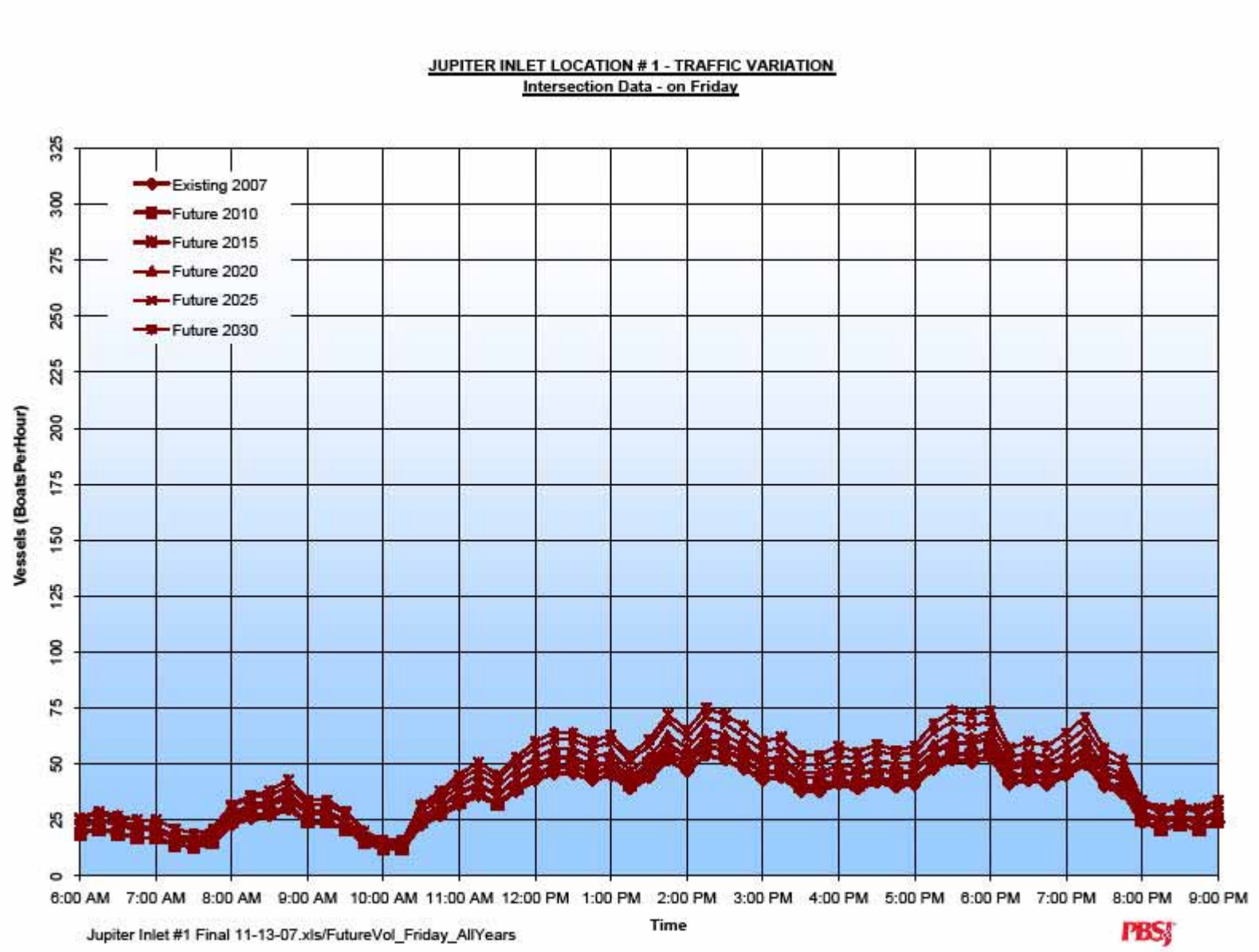
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
Time
Boca Lake #6 Final 11-13-07.xls/HourlyVesMovBocaLake#6-Sat
PBSJ


BOCA LAKE #6 - TRAFFIC VARIATION
Directional Data - on Sunday
Sun - NB Hourly Total
Sun - SB Hourly Total
Sunday Total NB+SB
Vessels (BoatsPerHour)
0.0
25.0
50.0
75.0
100.0
125.0
150.0
175.0
200.0
225.0
250.0
275.0
300.0
325.0
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
Time
Boca Lake #6 Final 11-13-07.xls/HourlyVesMovBocaLake#6-Sun
PBSJ

Appendix H

Future Vessel Volume Graphs

These graphs show comparative growths for future years.


JUPITER INLET LOCATION # 1 - TRAFFIC VARIATION
Intersection Data - on Friday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
0
25
50
75
100
125
150
175
200
225
250
275
300
325
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
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Time
Jupiter Inlet #1 Final 11-13-07.xls/FutureVol_Friday_AllYears
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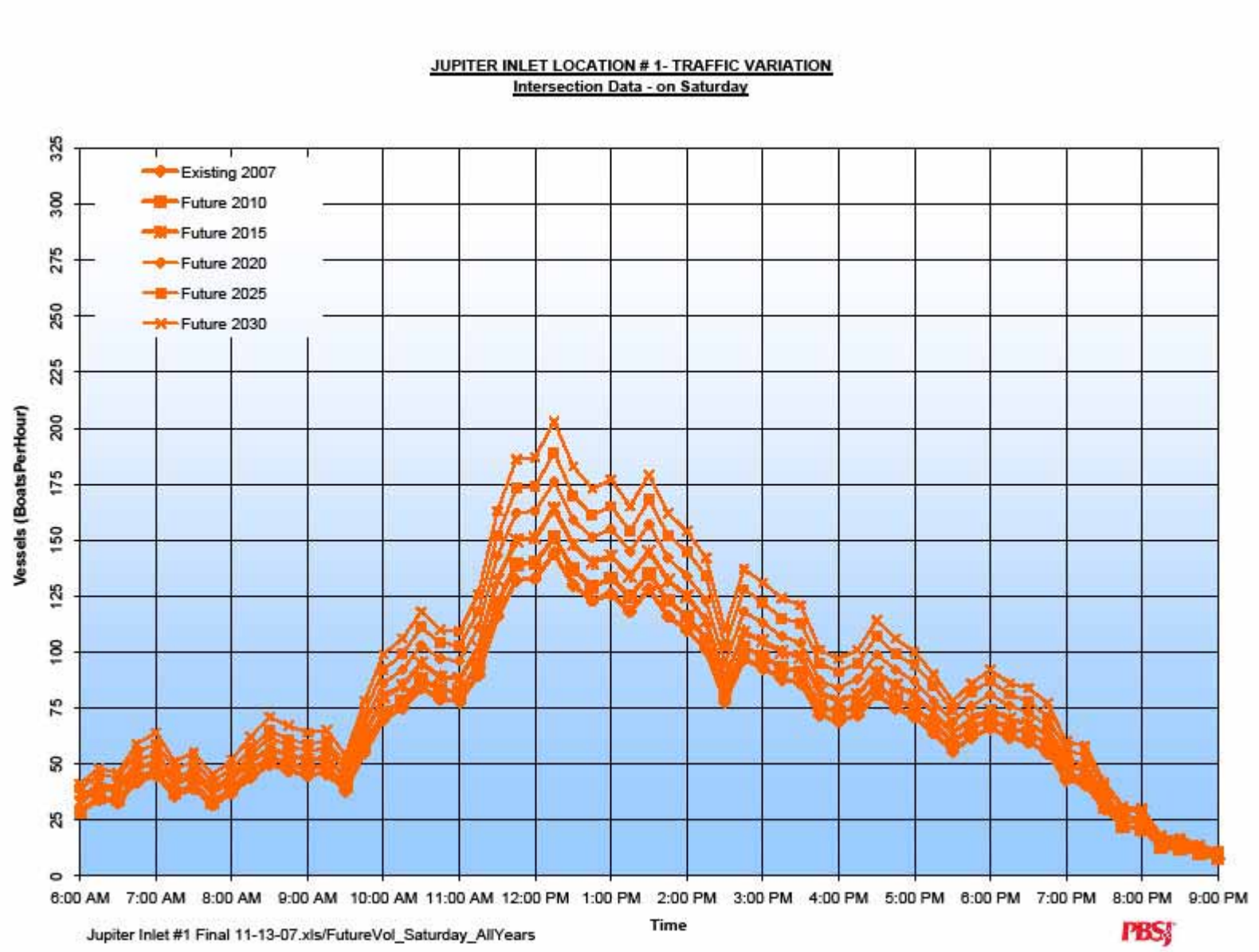
JUPITER INLET LOCATION # 1- TRAFFIC VARIATION
Intersection Data - on Saturday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
0
25
50
75
100
125
150
175
200
225
250
275
300
325
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
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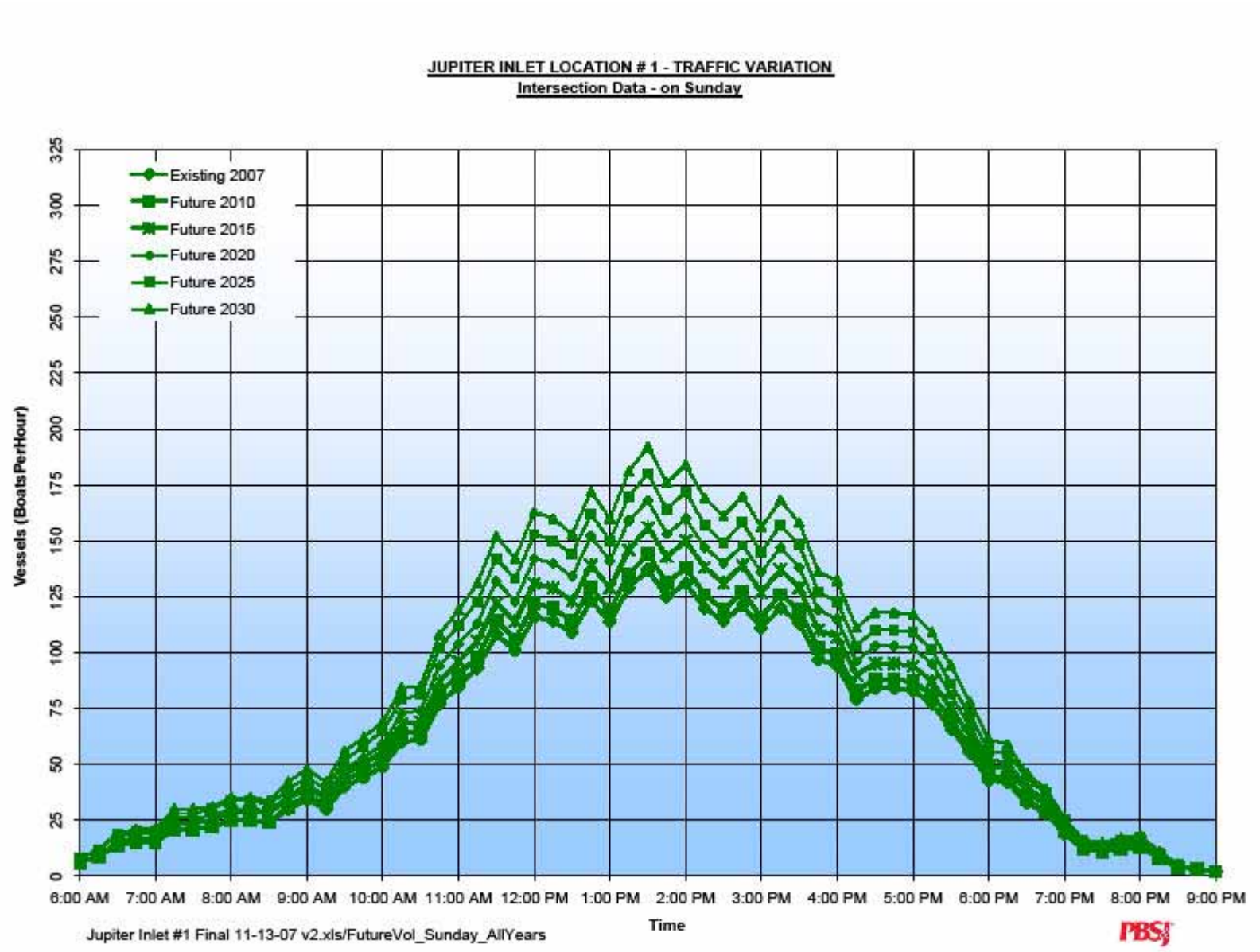
Time
Jupiter Inlet #1 Final 11-13-07.xls/FutureVol_Saturday_AllYears
PBSJ


JUPITER INLET LOCATION # 1 - TRAFFIC VARIATION
Intersection Data - on Sunday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
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Time
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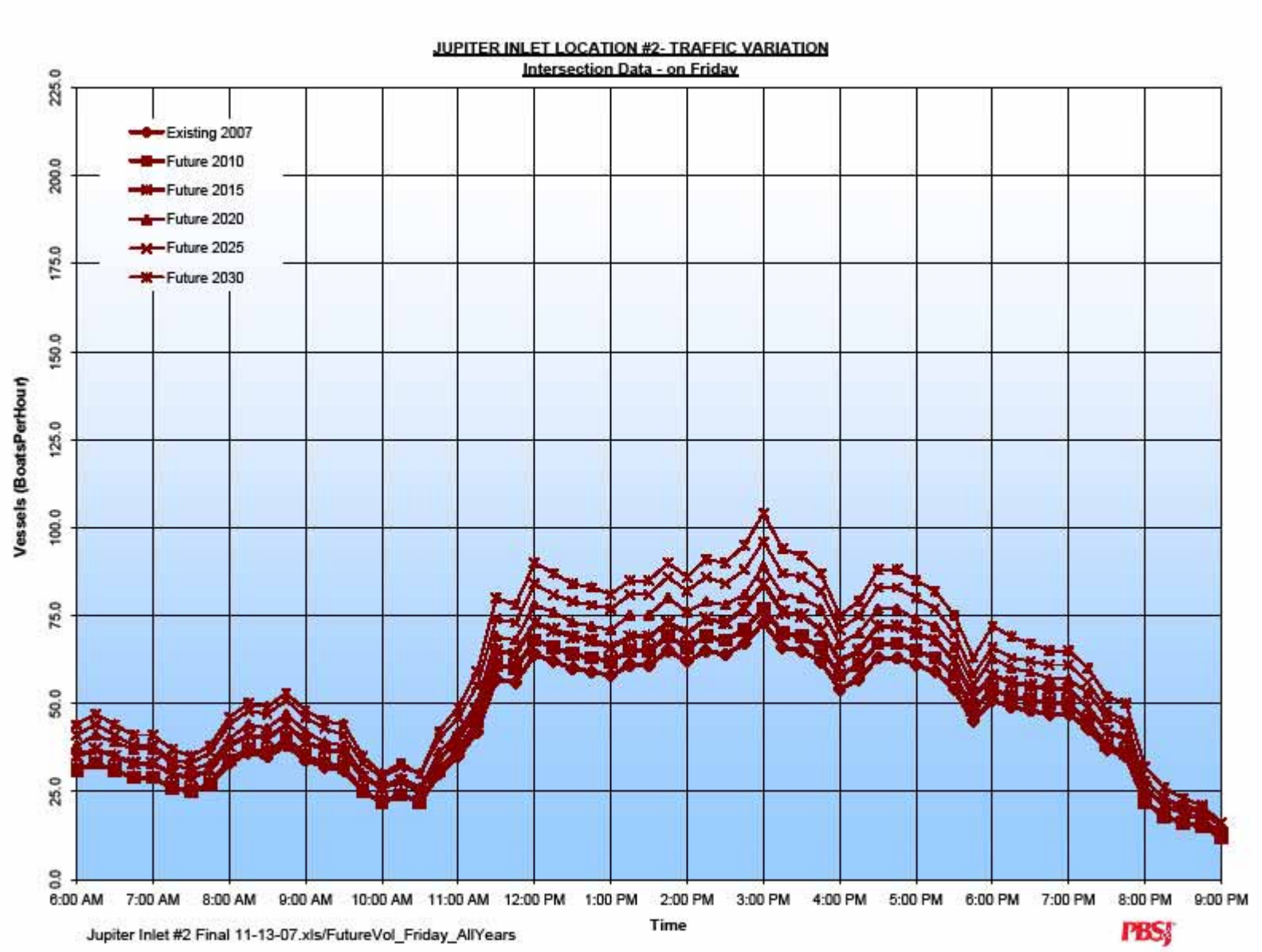
PBSJ


JUPITER INLET LOCATION #2- TRAFFIC VARIATION
Intersection Data - on Friday
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Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
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225.0
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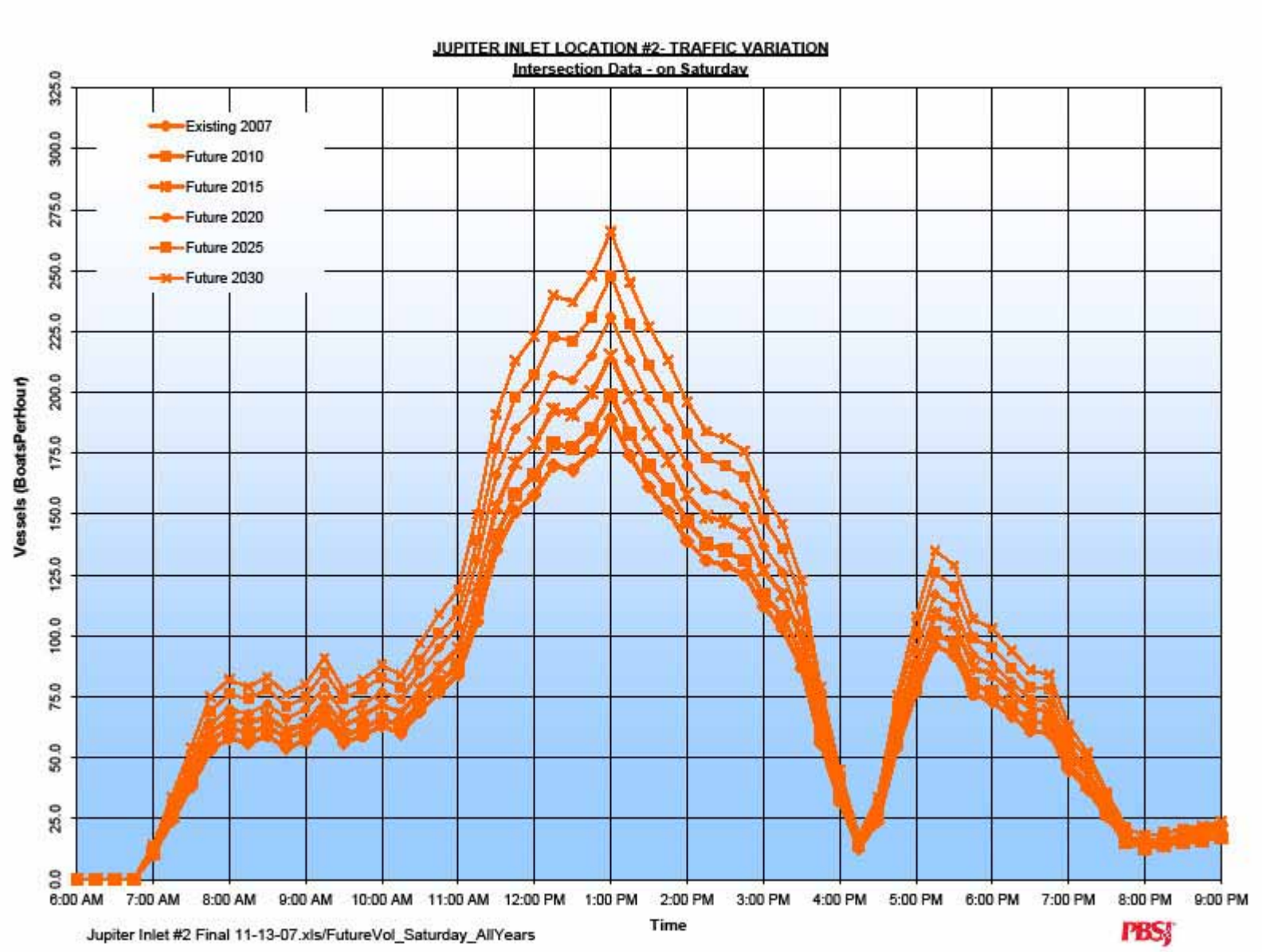
JUPITER INLET LOCATION #2- TRAFFIC VARIATION
Intersection Data - on Saturday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
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Time
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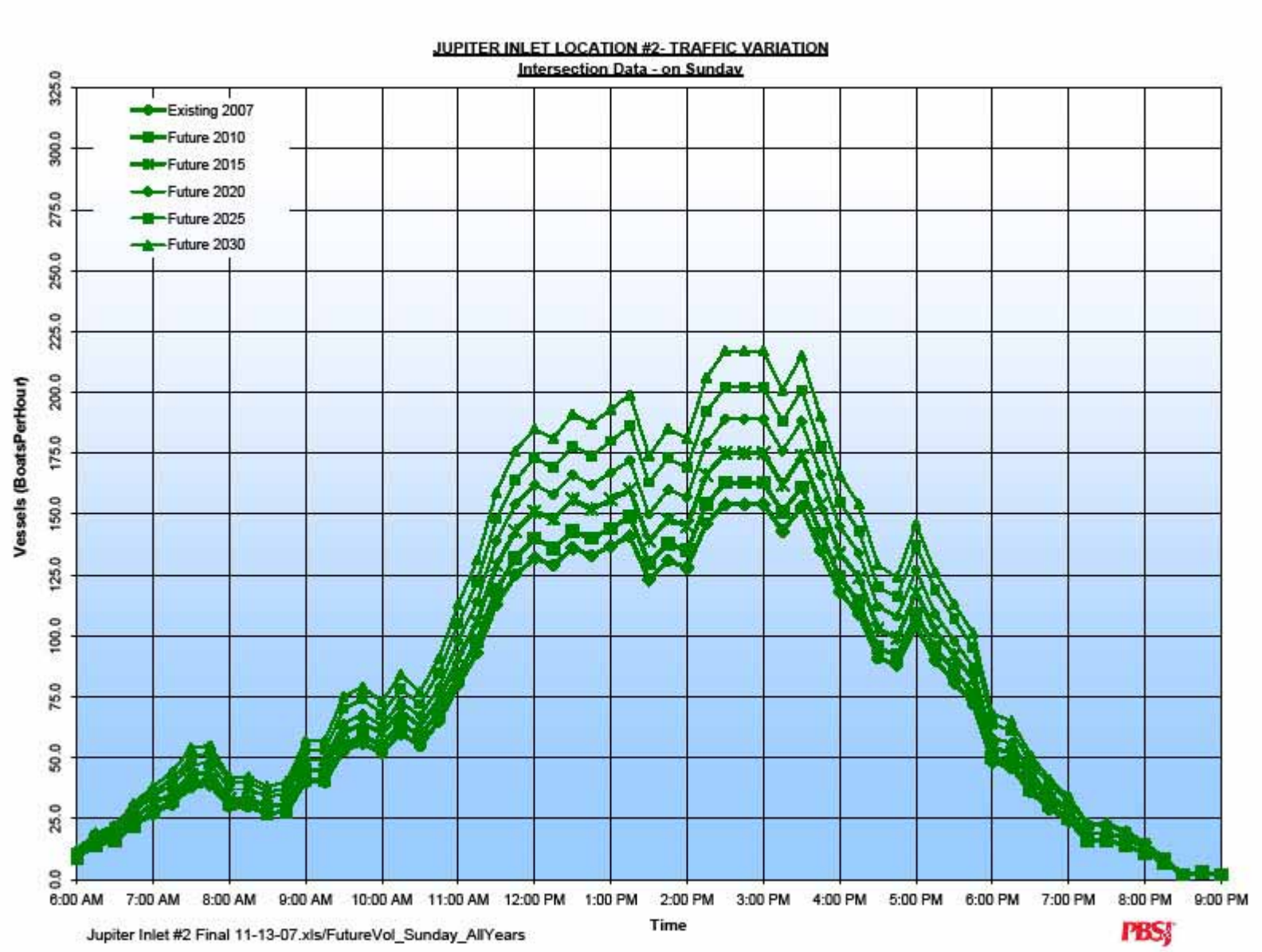
PBSJ


JUPITER INLET LOCATION #2- TRAFFIC VARIATION
Intersection Data - on Sunday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
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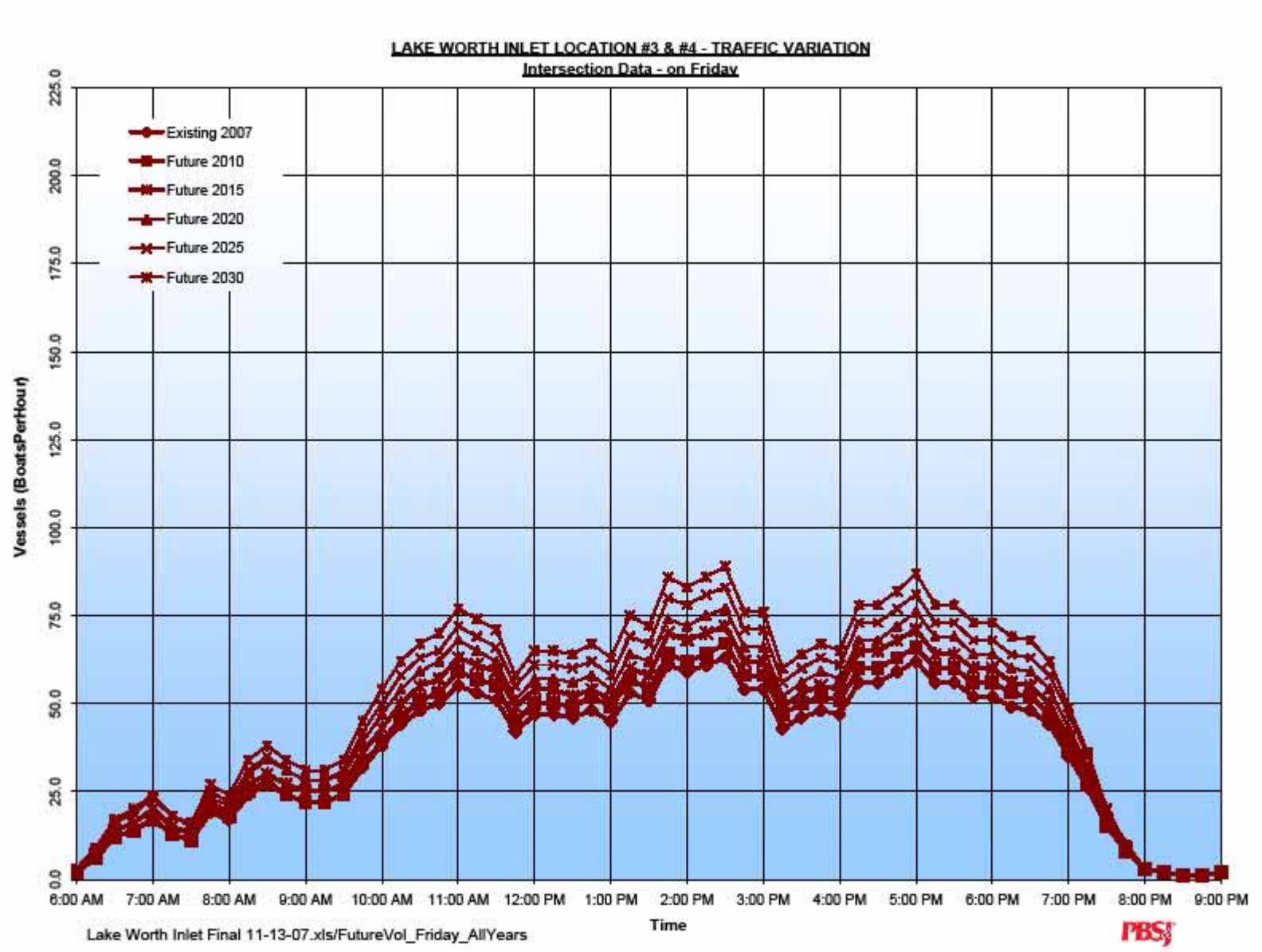
Time
Jupiter Inlet #2 Final 11-13-07.xls/FutureVol_Sunday_AllYears
PBSJ


LAKE WORTH INLET LOCATION #3 & #4 - TRAFFIC VARIATION
Intersection Data - on Friday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
225.0
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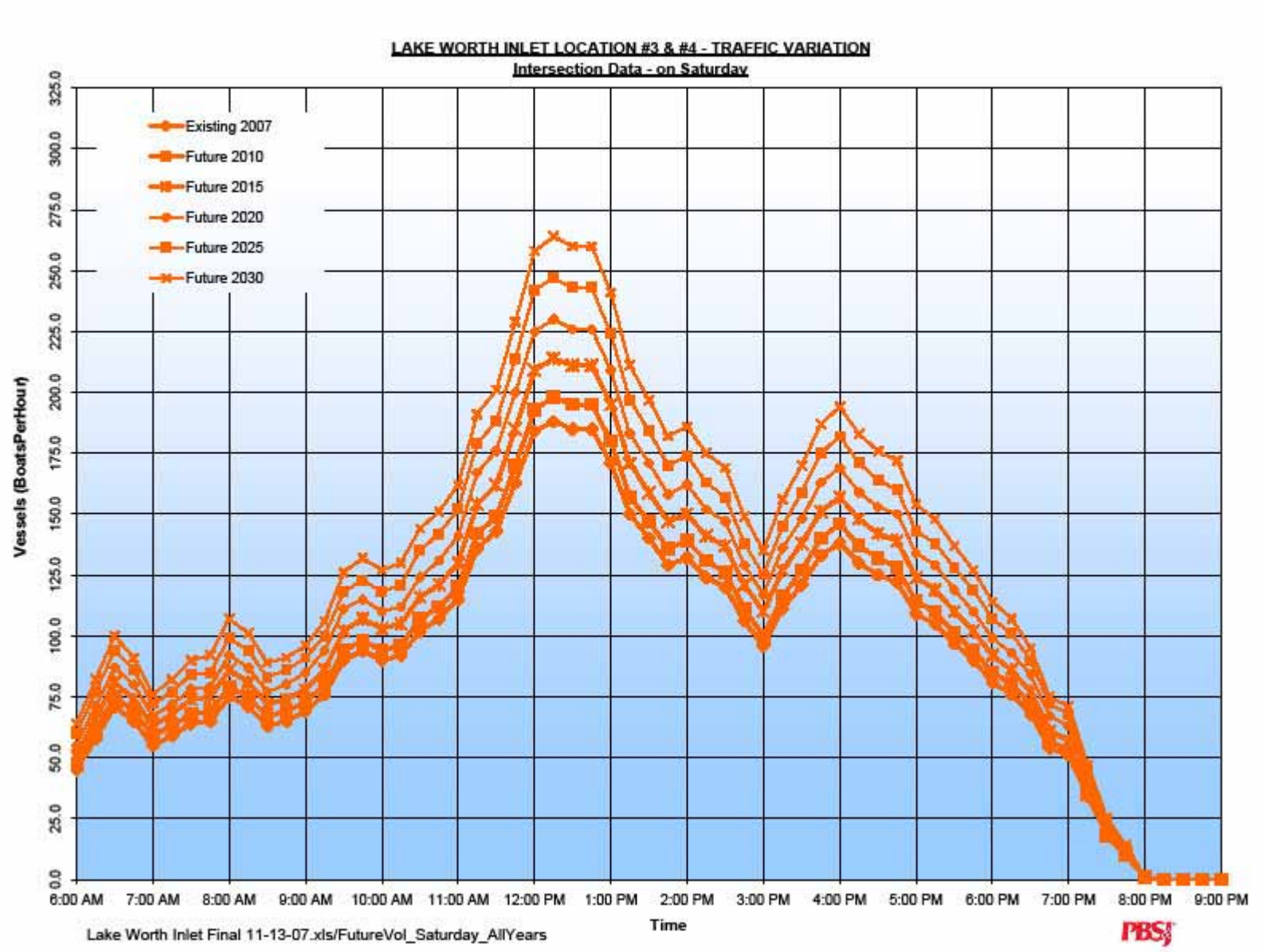
Time
Lake Worth Inlet Final 11-13-07.xls/FutureVol_Friday_AllYears
PBSJ


LAKE WORTH INLET LOCATION #3 & #4 - TRAFFIC VARIATION
Intersection Data - on Saturday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
0.0
25.0
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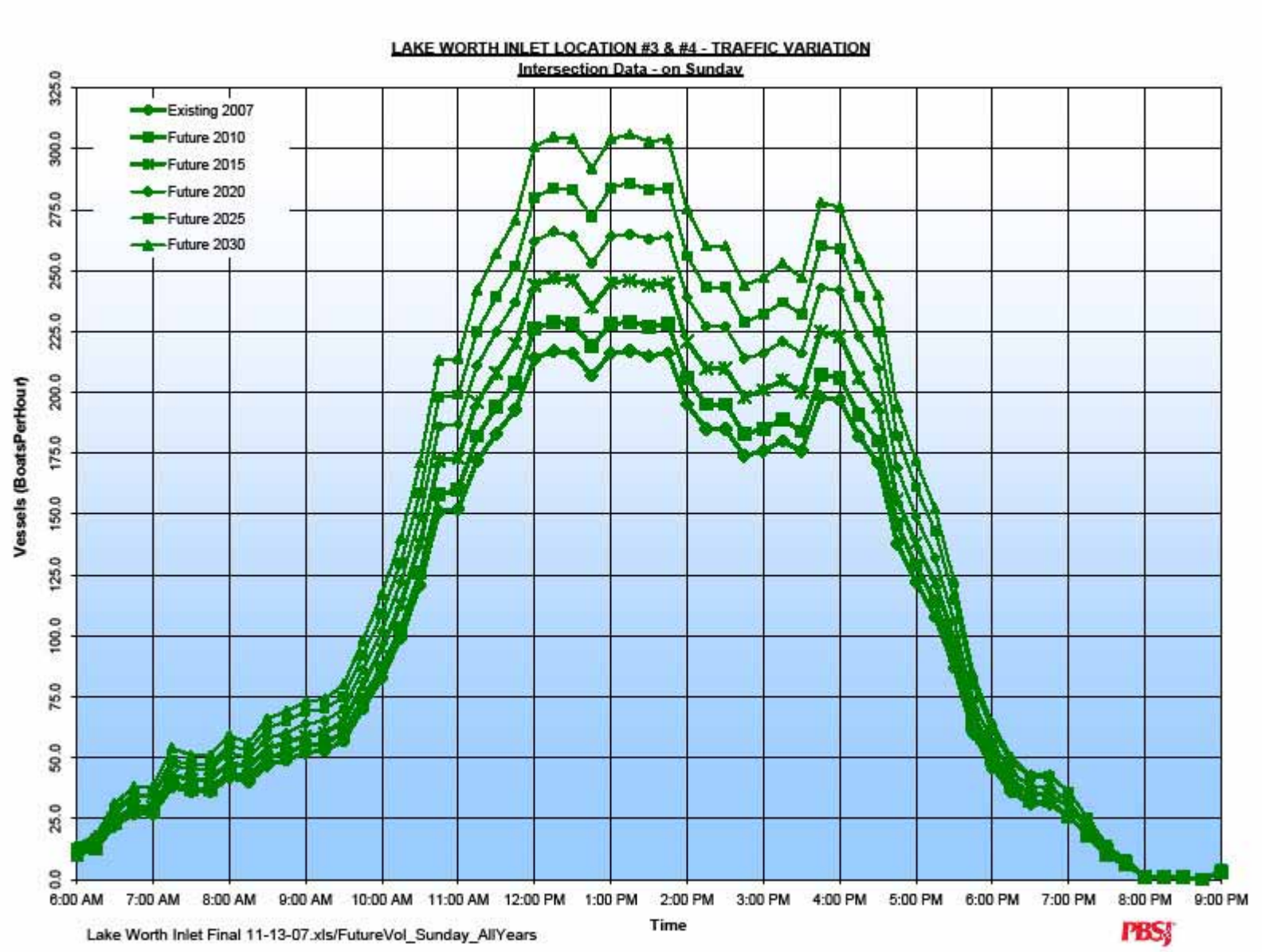
Time
Lake Worth Inlet Final 11-13-07.xls/FutureVol_Saturday_AllYears
PBSJ


LAKE WORTH INLET LOCATION #3 & #4 - TRAFFIC VARIATION
Intersection Data - on Sunday
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Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
0.0
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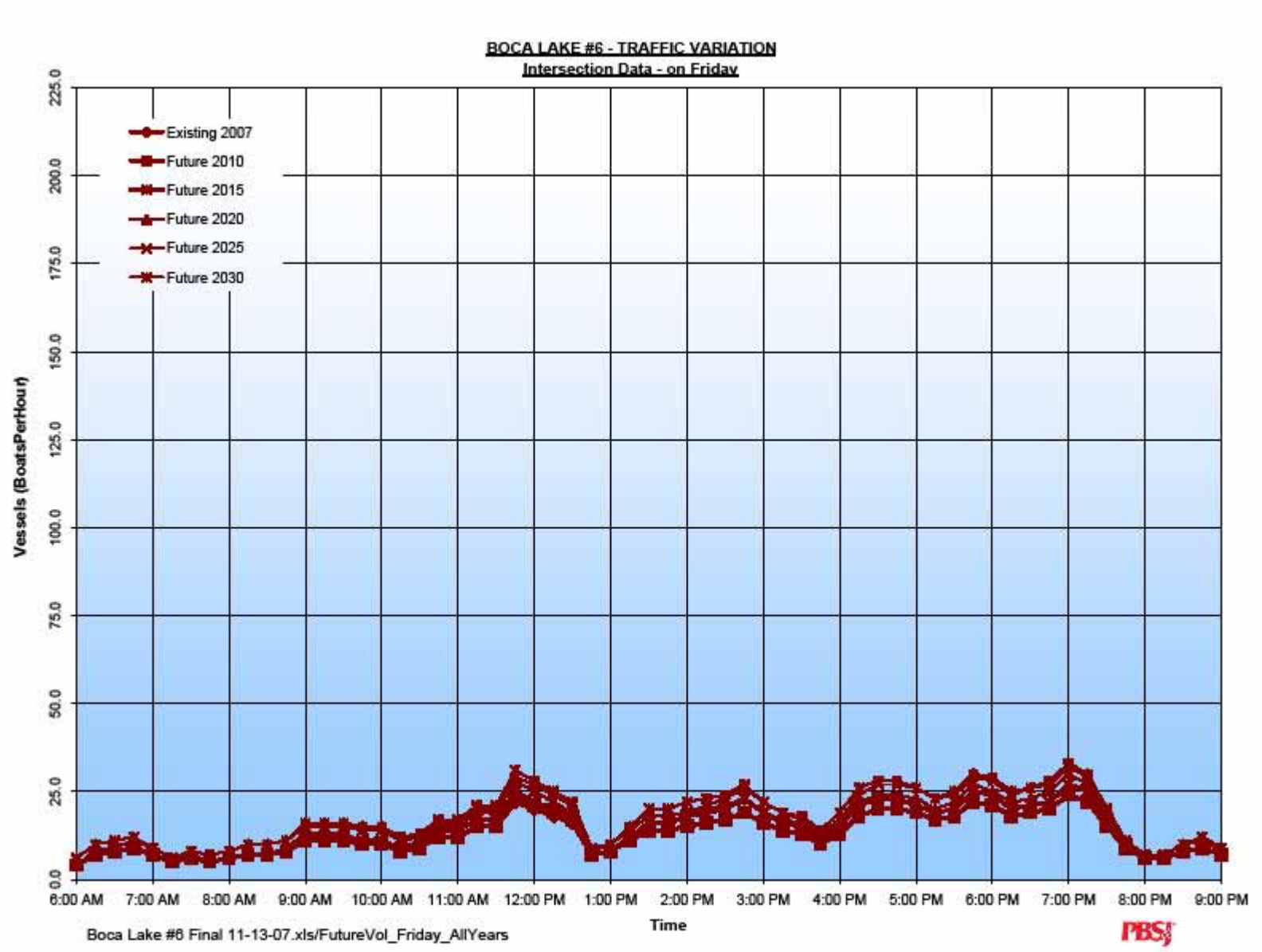
Time
Lake Worth Inlet Final 11-13-07.xls/FutureVol_Sunday_AllYears
PBSJ


BOCA LAKE #6 - TRAFFIC VARIATION
Intersection Data - on Friday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
225.0
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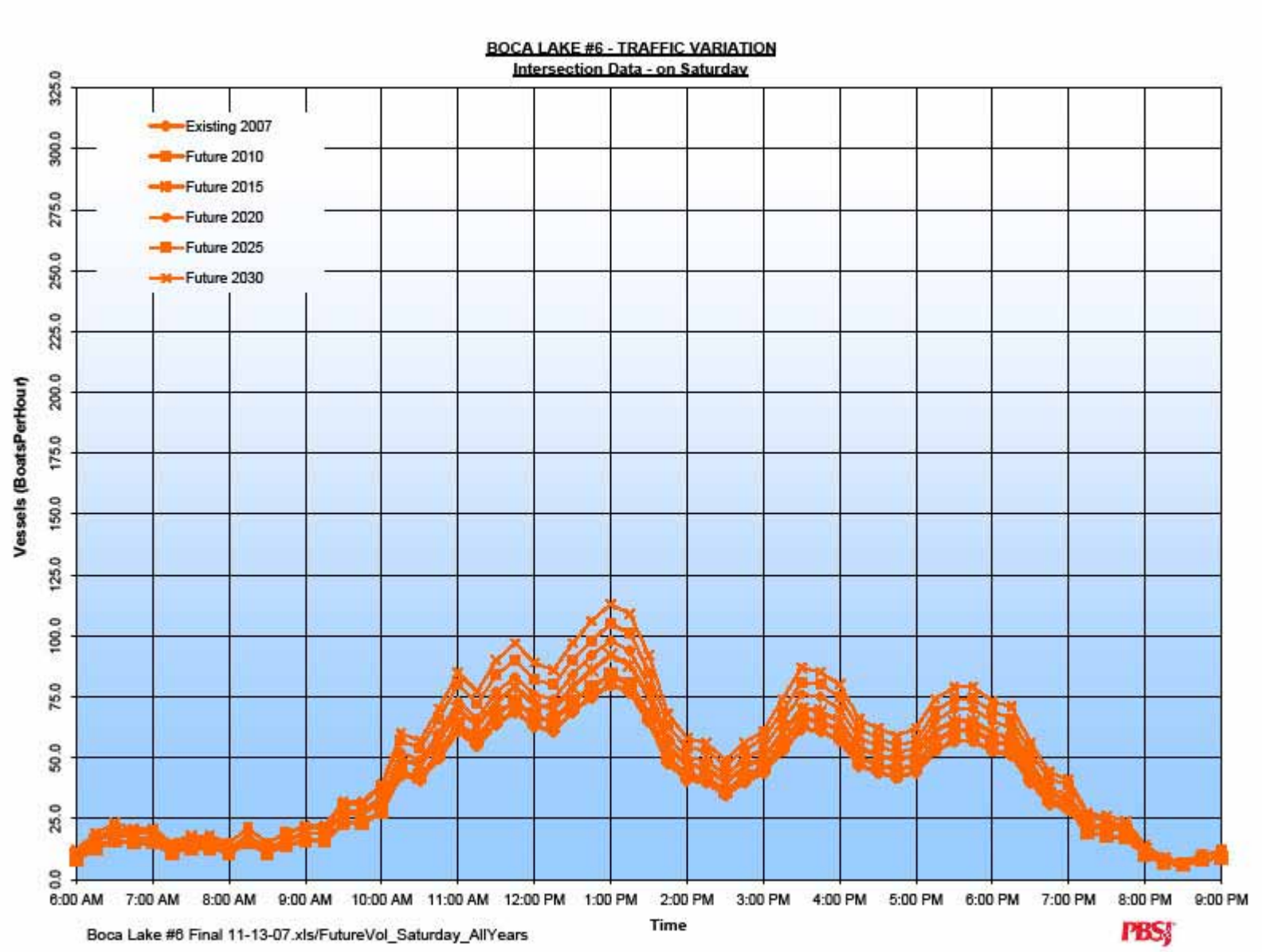
Time
Boca Lake #6 Final 11-13-07.xls/FutureVol_Friday_AllYears
PBSJ


BOCA LAKE #6 - TRAFFIC VARIATION
Intersection Data - on Saturday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
0.0
25.0
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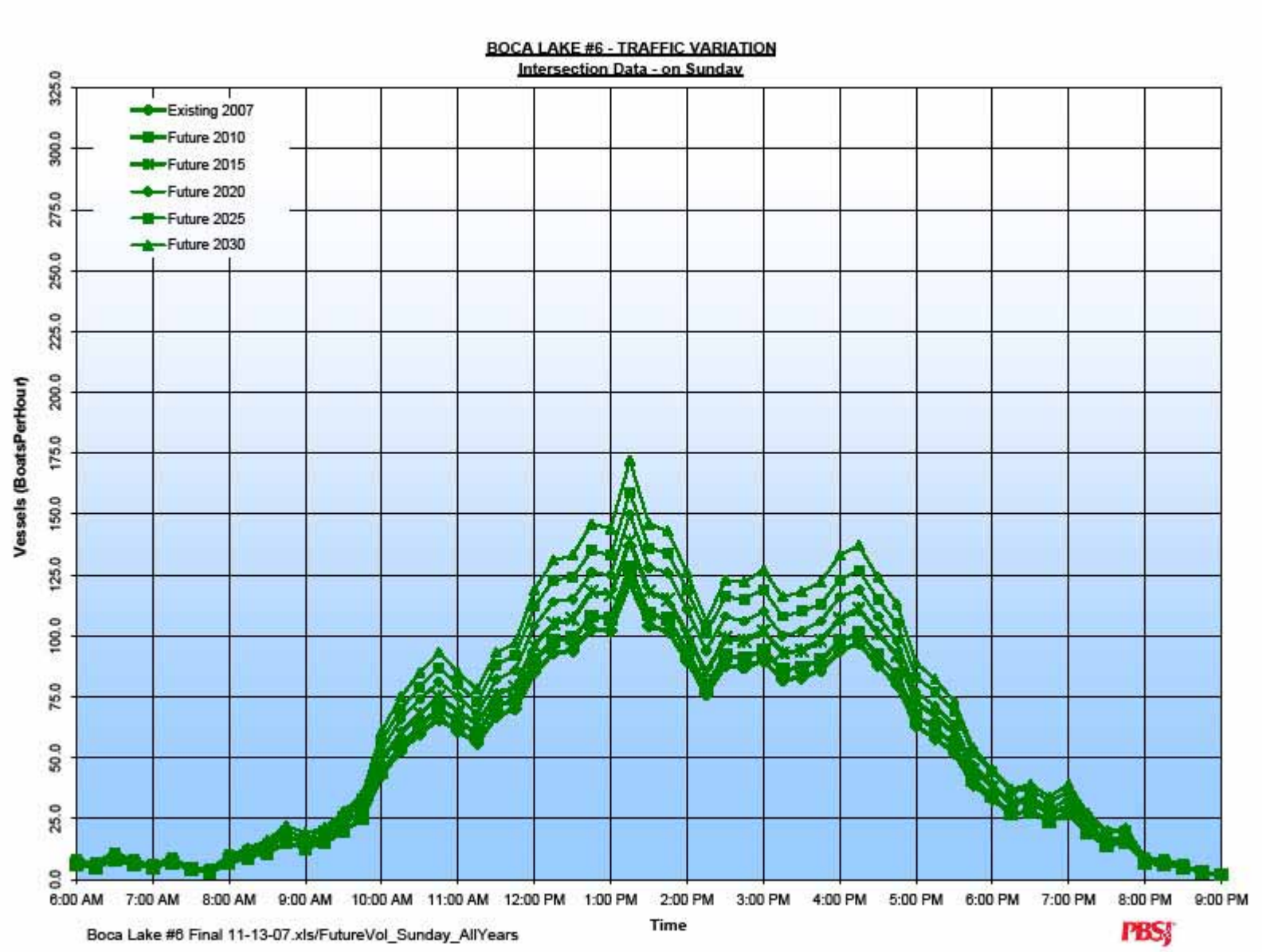
Time
Boca Lake #6 Final 11-13-07.xls/FutureVol_Saturday_AllYears
PBSJ


BOCA LAKE #6 - TRAFFIC VARIATION
Intersection Data - on Sunday
Existing 2007
Future 2010
Future 2015
Future 2020
Future 2025
Future 2030
Vessels (BoatsPerHour)
0.0
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Time
Boca Lake #6 Final 11-13-07.xls/FutureVol_Sunday_AllYears
PBSJ

Appendix I1

Palm Beach County Marina Survey

Thank you for completing the Palm Beach County Marina Survey. The information collected will be used as part of a vessel traffic study being conducted by the Florida Fish and Wildlife Conservation Commission. The information you submit will provide data to support possible additional regulation within the Intracoastal Waterway (ICW) in Palm Beach County. Please submit this information to us in the provided self-stamped envelope. If you have any questions, please contact us at (321) 242-4942, ext. 231.

Marina Name _____

Contact Name _____ E-mail _____

Address _____ State _____

City _____ Zip Code _____

Marina Information

Indicate the appropriate information regarding your marina.

Is the marina public or private? ○ Public ○ Private

Is this marina part of a private condominium complex? ○ Yes ○ No

Additional Notes

Fueling Information

Does the marina have a fuel dock? ○ Yes ○ No

Is the fuel dock protected from vessel wake? ○ Yes ○ No

Number of fueling berths

Additional Notes

Storage Capacity

Does the marina have dry storage slips? ○ Yes ○ No

Does the marina have wet storage slips? ○ Yes ○ No

Number of dry storage slips

Number of wet storage slips

Total wet/dry slips

Sea Grant FLW PBSJ

Thank you for your participation in this survey.
Please return in the enclosed self addressed stamped envelope.

PBS&J * 7195 Murrell Road * Melbourne * FL * Phone: 321.242.4942 Fax: 321.242.6101 * www.pbsj.com

Any information obtained from this survey is intended strictly for use in the Palm Beach County Vessel Traffic Study.

Appendix I2

News release

For immediate release
Contact: Tara Alford, FWC Boating and Waterways, (850) 410-0656 ext. 17169

FWC conducts vessel traffic studies in Martin and Palm Beach counties

Boating is one of Florida's most popular outdoor activities, and boater safety is a top priority for the Florida Fish and Wildlife Conservation Commission (FWC).
In an effort to improve boater safety and to minimize damage to vessels and maritime property, FWC periodically evaluates boating regulations on various waterways to ensure and promote safe boating. These waterway evaluations include information on whether existing boating-restricted zones are effective and if any changes to those zones are necessary to promote safety on the water.

FWC has assembled a team of marine biologists, academic professionals, and engineering consultants to conduct an 18-month vessel traffic study along the Intracoastal Waterway (ICW) in Martin and Palm Beach counties. This study will help evaluate whether segments of the waterway need adjustments to existing boating restriction zones due to development of new or existing bridges, public piers, docks, boating access facilities, or vessel congestion in certain areas per Florida regulations (Rule 68D-23). Data being collected and reviewed in the study include vessel counts, public marinas, boat ramps, swim areas, and hazards. Public workshops will be conducted prior to any changes to current boating restrictions.

The Martin County Vessel Traffic study is scheduled for completion by December 31, 2007. The projected completion date for the Palm Beach County study is March 31, 2008.